K2022578590 (SOUTH AFRICA) PTY LTD

PROPOSED UP TO 130 MW PHULA PV FACILITY, NEAR STEELPOORT IN THE LIMPOPO PROVINCE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS CONSULTATION ENVIRONMENTAL IMPACT REPORT

DFFE Ref: 14/12/16/3/3/2/2350

Report No.: JW345/23/K135 - Rev 1

October 2023

Jones & Wagener
Engineering & Environmental Consultants

Internet presence: www.jaws.co.za

EXECUTIVE SUMMARY

Background of the project

K2022578590 (South Africa) Proprietary Limited (hereafter referred to as "The Applicant") is proposing to develop a solar photovoltaic (PV) energy facility, and associated infrastructure (hereafter referred to as the "Phula PV project") on the Remainder of Farm De Grooteboom 373 KT and Portion 2 of the Farm De Grooteboom 373 KT in the Limpopo Province.

The proposed project site is situated in close proximity to the local chrome and platinum mines near Steelpoort and 33km north-west of the town of Lydenburg.

The planned installed capacity output of the solar PV facility is up to 130 Megawatts (MW). The Phula PV project is being developed with the aim of generating renewable energy to supply to the national grid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or similar procurement programme. The developer will submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP or similar procurement process) to evacuate the generated power into the national grid.

The development area is approximately 249 hectares (ha). The proposed site was identified by the Applicant as a suitable area for the proposed Phula PV project. The Applicant assessed the site as being favourable for the development of a solar PV plant, considering its proximity to the local mines, which are in the process of decarbonisation, identifying energy supply solutions, and reducing energy costs.

The proposed Phula PV facility will consist of the following infrastructure:

- PV panels mounted on either a single axis tracking or fixed structure;
- Inverters and transformers;
- Low voltage cabling between the PV panels to the inverters;
- Fence around the project development area with security and access control;
- Camera surveillance;
- Internet connection;
- 33kV cabling between the project components and the facility substation;
- 33/132kV onsite facility substation;
- Battery Energy Storage System (BESS) with a footprint of 2.5 ha;
- Site offices and maintenance buildings, including workshop areas for maintenance and storage as well as parking for staff and visitors;
- Laydown/staging area on-site in front of mounting structures during installation;
- Temporary store area close to the site entrance (less than 2ha);
- Access roads (up to 6m wide) and internal distribution roads (up to 5m wide);
- Temporary concrete batching facility; and
- Stormwater management infrastructure.

Legal requirements

In terms of the Environmental Impact Assessment (EIA) Regulations promulgated under the National Environmental Management Act (Act 107 of 1998) (NEMA), an Environmental Authorisation (EA) is required for the proposed solar PV facility.

The full extent of the proposed development area for the Phula PV project has been considered in this EIA process. The developer has identified two (2) alternatives for the grid connection infrastructure for the proposed project. However, the EA application for the grid infrastructure will be subject to a separate Basic Assessment (BA) process.

EIA process approach

Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants (J&W) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and Environmental Impact Assessment (S&EIA) process for the required EA. In terms of Government Notice (GN) 779 of July 2016, the Department of Forestry, Fisheries and the Environment (DFFE) is the Competent Authority (CA) for all projects related to power generation planning. Therefore, the EA application for the proposed Phula PV facility was lodged with the DFFE on 15 May 2023 and acknowledgement email was received on 16 May 2023 with EA application **Reference No. 14/12/16/3/3/2/2350**. Subsequently, the Scoping Report including the Plan of Study was submitted to the DFFE.

The Final Scoping Report (FSR) was accepted by the DFFE on 04 August 2023 (see **Appendix F** with the acceptance letter). Following the acceptance of the FSR, the EAP commenced with the EIA Phase and specialists commenced with their impact assessments **(Appendix D)**. The specialist reports will be refined after the public review of this consultation Environmental Impact Assessment Report (EIAr), addressing comments received.

This EIAr was compiled in line with Appendix 3 of the 2014 EIA Regulations, as amended. The findings of the specialist assessments informed this EIAr. The Environmental Management Programme (EMPr) and Generic EMPr reports are also attached to this report, appended in **Appendix E.**

Section 7 provides details on the process being undertaken for this project.

Public participation process as part of the EIA phase:

The Consultation EIAr together with the EMPr and Generic EMPr are being submitted to the DFFE and commenting authorities, and being made available for public review and comment from **10 October 2023** to **09 November 2023** and can be accessed at the following locations:

Location		
Escal Truck Stop on the R577 road, Steelpoort – at the security office, and on the J&W website (link below). *https://www.jaws.co.za/public-document/phula-solar-consultation-eir/*		
Contact person	**Electronic copies**	**Tel**
Ms Anelle Lotter (public participation office) Ms Jana Minnaar (de Jager) EAP	(www.jaws.co.za) under public documents, alternatively phone and request an electronic copy.	012 667 4865 or email anelle@jaws.co.za *jana@jaws.co.za*

Comments received during the review of the consultation documents will be considered in refining and updating of the Final EIAr, EMPr and Generic EMPr. The final documents will be made available for stakeholder information purposes and notification of availability of the reports will be uploaded on the J&W website.

All stakeholders will be notified of the outcome of the DFFE decision with regards to the application for an Environmental Authorisation. This will be done in accordance with the NEMA requirements, and the notification received from the DFFE.

Summary of the impact assessment

Independent specialists undertook assessments of the identified potential environmental impacts or sensitivities using the development layouts provided by the Developer. The identified environmental sensitivity areas/features are detailed in **Section 10.1** and outlined in **Table 10-1** to **Table 10-3**. From the specialist impact assessments undertaken, **Table 12-1** provides the specialist key findings and concluding statements based on the preferred Phula PV facility layout.

The recommended environmental management measures for the proposed activities are documented in **Table 10-1** to **Table 10-3** for all the development phases of the project.. These management measures are also outlined EMPr to ensure compliance throughout the project implementation phases (**Appendix E**).

The EMPr provides details on the implementation of the management measures (timeframes, as well as roles and responsibilities) required to mitigate or reduce impacts identified. The monitoring and auditing programme is also outlined in the EMPr. This provides an assessment of the success of mitigation measures implementation as well as compliance and allows for continual improvement and remedy.

EAP reasoned opinion

The need and desirability associated with the development of a utility-scale solar PV is driven by several factors, including environmental, economic, and social factors, which includes reducing dependence on fossil fuels and enhancing energy security and resilience against electricity supply disruptions. The solar PV sector has also become a major source of employment in many regions, from manufacturing and installation to operation and maintenance.

An impact assessment was undertaken for the development of the Phula PV facility by relevant specialists to determine the impact of the proposed development on the environment. Specialists identified sensitive features/areas on the initial layout provided by the applicant. Through the integration of the specialist's sensitivity data, as well as the consideration of the technical aspects and land availability for this development, the Applicant designed an updated layout plan to avoid sensitive areas and features identified onsite where possible. Two (2) alternatives have been considered for the Phula PV project during the iterative design process.

- **Alternative 1:** Implementation of engineered stormwater management measures and minimal avoidance of sensitive areas;
- **Alternative 2 (Preferred):** Avoid certain key sensitive areas and features as well as the associated buffers, where practically and feasibly possible. It also includes the implementation of the stormwater management measures which will ensure maintenance and stability of the aquatic biodiversity, and strategically allow for continued habitat connectivity.

The Aquatic and Terrestrial Biodiversity specialists have indicated that although the project may initially result in negative impacts on the environment, the implementation of the recommended measures and engineered and naturalised (hybrid) stormwater management measures will reduce the impacts to an acceptable level.

All significant project and cumulative impacts associated with the Phula PV Facility have been identified and sufficient mitigation, management and monitoring measures have been prescribed. These are included in the EMPr.

Overall, the potential project and cumulative impacts identified are rated as High to Moderate and can be mitigated to Moderate to Low by measures described in this report. From, the socio-economic perspective, the positive benefits of the proposed project outweigh the potential negative impacts that may occur. In addition, considering the inherent mining dominated land use of the broader project area, the development of the proposed Phula PV project generally has less significant residual impacts. The specialists have agreed that the development should proceed provided that the recommended mitigation measures stipulated are included in the EMPr and

implemented. Monitoring of the impacts as per the EMPr should be conducted to determine if any corrective actions are required.

Specialist mitigation measures and recommendations presented in **Section 10.2** of this report and the EMPr attached in **Appendix E** are designed to address specific environmental concerns identified during the EIA process and feasibility of the project. Therefore, the layout illustrated in **Figure 3-6** can be considered as the final layout for approval.

Considering the above, it is, therefore, the opinion of the EAP that the proposed project has an acceptable impact on the surrounding environment and subsequently ensures the optimal utilisation of resources, provided that the project details in this report remain unchanged and mitigation measures set out in this report and in the EMPr are implemented and audited.

DOCUMENT APPROVAL RECORD

Report No.: JW345/23/K135 - Rev 1

ACTION	FUNCTION	NAME	DATE	SIGNATURE
Prepared	Environmental Assessment Practitioner	Luceth Khumbuzi (Reg EAP, EAPASA)	21/09/2023	
Reviewed	Project Coordinator & Environmental Assessment Practitioner	Jana Minnaar (Reg EAP, EAPASA; PriSciNat)	28/09/2023	
Approved	Project Director	Jacqui Hex (Reg EAP, EAPASA; PriSciNat)	29/09/2023	

LOCATION: Lat: -24.946272°
(Decimal Degrees) Long: 30.144112°

RECORD OF REVISIONS AND ISSUES REGISTER

DATE	REVISION	DESCRIPTION	ISSUED TO	ISSUE FORMAT	NO. COPIES
28/09/2023	B	Draft for internal review	J. Hex	Electronic	N/A
2/10/2023	0	Draft for Client review	K. Williams	Electronic	N/A
10/10/2023	1	Draft for public review	I&APs	Electronic & Hard Copy	1

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ABBREVIATIONS/ACRONYMS USED IN THIS REPORT

ABBREVIATION/ACRONYM	TERM
AC	Alternating Current
AGV	K2022578590 (South Africa) Proprietary Limited
AIP	Alien Invasive Plant
~	Approximately
ASPT	Average Score Per Taxon
BA	Basic Assessment
B-BBEE	Broad-Based Black Economic Empowerment
BESS	Battery Energy Storage System
BID	Background Information Document
BMS	Battery Management System
BPG	Best Practice Guide
CA	Competent Authority
CAA	Civil Aviation Act (Act 13 of 2009)
CARA.	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CEIAr	Consultation Environmental Impact Assessment Report
COP	Convention of the Parties
CR	Critically Endangered
CRR	Comments and Response Report
CSR	Consultation Scoping Report
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DC	Direct Current
DEC	Default Ecological Class
DEM	Digital Elevation Model
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
DNI	Direct Normal Irradiation
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EcoStatus	Ecological Status
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment

ABBREVIATION/ACRONYM	TERM
EIAr	Environmental Impact Assessment report
EI&S	Ecological Importance and Sensitivity
EMF	Environmental Management Framework
EMPr	Environmental Management Program report
EN	Endangered
EPC	Engineering Procurement and Construction
ESA	Ecological Support Areas
FRAI	Fish Response Assessment Index
FROC	Fish Frequency of Occurrence
FSR	Final Scoping Report
FTLM	Fetakgomo Tubatse Local Municipality
GA	General Authorisation
GHG	Greenhouse gas
GHI	Global Horizontal Irradiation
GN	Government Notice
GNR	Government Notice Regulation
GVA	Gross Value Added
GWh	Gigawatt-hours
ha	Hectares
HDI	Human Development Index
HIA	Heritage Impact Assessment
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IAP2	International Association of Public Participation
I&APs	Interested and Affected Parties
IBA	Important Bird Area
IDP	Integrated Development Plan
IRP	Integrated Resource Plan
J&W	Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants
km	kilometres
km^2	square kilometres
kV	kilovolt
kWh/m^2	kilowatt hours per square metre
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LEGDP	Limpopo Employment Growth and Development Plan
LGEP	Limpopo Green Economy Plan
LIHRA	Limpopo Heritage Resources Authority

ABBREVIATION/ACRONYM	TERM
LN	Listing Notice
LSDF	Limpopo Spatial Development Framework
LT	Least Threatened
m	metres
m^2	square metres
m^3	cubic metres
mamsl	meters above mean sea level
MENCO	M^2 Environmental Connections (Pty) Ltd
mm	millimetres
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MSA	Middle Stone Age
MW	Megawatt
NBA	National Biodiversity Assessment
NCR	Noise Control Regulations
NDCR	National Dust Control regulations
NDP	National Development Plan
NFA	National Forests Act (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
NEM:BA	National Environmental Management Biodiversity Act (Act 10 of 2004)
NEM:AQA	National Environmental Management: Air Quality Act (Act 39 of 2004)
NEM:WA	National Environmental Management Waste Act (Act 59 of 2008).
NEMA	National Environmental Management Act (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NMC	Lithium Nickel Manganese Cobalt batteries
NRTA	National Road Traffic Act (Act 93 of 1996)
NWA	National Water Act (Act 36 of 1998)
O&M	Operations and Maintenance
PCS	Power Conversion Stations
PES	Present Ecological State
PGS	PGS Heritage (Pty) Ltd
PPP	Public Participation Process
PSB	Sodium polysulfide-bromine
PV	Photovoltaic
QDGs	Quarter Degree Grid
RAL	Road Agency Limpopo
REC	Recommended Ecological Class

ABBREVIATION/ACRONYM	TERM
REDZs	Renewable Energy Development Zones
REEA	Renewable Energy EIA Application Database
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RLS	Rustenburg Layered Suite
SACAA	South African Civil Aviation Authority
SASS	South African Scoring System
SDM	Sekhukhune District Municipality
S&EIA	Scoping and Environmental Impact Assessment
S&EIR	Scoping and Environmental Impact Report
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANRAL	South African National Roads Agency SOC Ltd
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEF	Solar Energy Facilities
SEA	Strategic Environmental Assessment
SHEQ	Safety, Health, Environment and Quality
SR	Scoping Report
SS	Switching Substation
Sub-WMA	Sub-Water Management Area
SWMP	Stormwater Management Plan
TLB	Tractor-Loader-Backhoe
ToR	Terms of Reference
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VIP	Ventilated Improved Pit – latrines
VRFB	Vanadium Redox Flow Battery
VU	Vulnerable
WMA	Water Management Area
WML	Waste Management Licence
WUA	Water Use Authorisation
ZNBR	Zinc-Bromine Flow Batteries

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1. INTRODUCTION

K2022578590 (South Africa) Proprietary Limited (hereafter referred to as the Applicant) is proposing to develop a Solar Photovoltaic (PV) energy facility and associated infrastructure (hereafter referred to as "Phula PV project")[1] on the Remainder of, and Portion 2 of the farm De Grooteboom 373 KT in the Limpopo Province. The proposed project site is situated in close proximity to the local chrome and platinum mines near Steelpoort, 33 km south-east of the town of Mashishing/Lydenburg **(Figure 2-1**).

The development area of approximately 249 hectares (ha) was identified by The Applicant as a suitable area for the Phula PV project. The Solar PV planned generation capacity output will be up to 130 Megawatts (MW). The proposed Phula PV project is being developed with the aim of generating renewable energy to supply to the national grid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or similar procurement programme.

In terms of the Environmental Impact Assessment (EIA) Regulations promulgated under National Environmental Management Act (Act 107 of 1998), as amended (NEMA), an Environmental Authorisation (EA) is required for the proposed Phula PV project. The Applicant has also identified two (2) alternatives for the grid connection infrastructure for the proposed Solar facility, however, an EA application for the grid infrastructure will be subject to separate Basic Assessment (BA) process.

Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants (J&W) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and Environmental Impact Assessment (S&EIA) process for the required EA.

1.1 Background of the project

The proposed Phula PV project is in response to the identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes, as discussed in **Section 5**. The developer will explore opportunities to submit a bid in terms of a regulated power purchase procurement process (e.g., REIPPPP or similar procurement programme) to evacuate the generated power into the national grid. This will aid in the diversification and stabilisation

[1] It should be noted that the proposed project was previously referred to as the Platinum PV project. However subsequent to Approval of Scoping the Applicant was required to change the name of the proposed project due to requirements from Eskom's Grid Access Unit (GAU). A notification regarding the name change has been provided to stakeholders.

of the country's electricity supply, which is in line with the objectives of the Integrated Resource Plan (IRP). The proposed Phula PV project is set to inject up to 130MW into the national grid.

From a regional perspective, the area within the Limpopo Province was identified for the development of a commercial PV facility due to the excellent solar resources, proximity to local mining sector, topography that is suitable for a solar PV facility, and availability of land on which the development can occur.

1.2 EIA process requirement

In terms of the EIA Regulations (GNR 326) as amended, activities described in Listing Notice (LN) 1 (GNR 327) and LN 3 (GNR 324) requires that a BA process be followed. Any activities triggered in LN 2 (GNR 325) require a full S&EIA process to be followed. Based on the information reviewed, the proposed Phula PV project is subject to an EA application following the S&EIA process due to LN 2 activities being triggered. The detailed list of triggered listed activities is provided in **Section 5.4.1** and **Table 5-2**. The process proposed, in summary, comprises of the following main phases:

- Initial design phase
- EIA process comprising of:
  - Submission of EA application forms to the DFFE;
  - Scoping Phase including public participation; and
  - EIA Phase including public participation (**current phase**).

Section 7 of this report provides the detailed process being undertaken for this project.

1.3 Objectives of this report

This report addresses the requirements of the Environmental Impact Assessment report (EIAr) as outlined in Appendix 3 of EIA Regulations, 2017, as amended. The aim of this EIAr is to:

- determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context (**Section 5**);
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report (**Section 6.1**);
- identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment (**Section 10**);
- determine the:
  - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - degree to which these impacts can be reversed; may cause irreplaceable loss of resources, and can be avoided, managed or mitigated (**Section 10**)

- identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity (**Section 10**);
- identify suitable measures to avoid, manage or mitigate identified impacts (**Section 10**); and
- identify residual risks that need to be managed and monitored (**Section 10**).

1.4 Approval of the Scoping Report

The Final Scoping Report (FSR) and Plan of Study for EIA was accepted by DFFE on **04 August 2023.** Additional information requested by DFFE in the Acceptance of the Scoping Report is included in **Table 1-1**.

Table 1-1: Scoping Acceptance: DFFE Requirements for EIAr

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
(a) Application form and listed activities	(i) You have applied for Activity 14 of Listing Notice 1. Please ensure that the project description provided speaks to the relevant listed activity thresholds (e.g., describe the dangerous goods facility and its capacity).	The proposed development will include storage of solvents, lubricants, transformer oil associated with the onsite substation with capacity not more than 30m^3 during construction and operation phase. The storage area will be aboveground within the site buildings / laydown area. The proposed storage capacity will be less than 30m^3 hence, does not trigger any listed activities in terms of the NEMA EIA Regulations as amended. Management measures for handling of the hazardous material are included in the EMPr.
	(ii) You have applied for Activity 19 of Listing Notice 1. Please provide the exact cubic metres that will be infilled or deposited into a watercourse, as well as the dredging, excavation, removal, or moving of soil, sand, shells, shell grit, pebbles, or rock from a watercourse.	The proposed Phula PV project includes infilling of more than 10m^3 from the existing drainage channels that will be channelled into the proposed Stormwater Management Plan (SWMP). The EA application form has been amended to include Activity 19 under Listing Notice 1. **Table 5-2** details the triggered listed activities included in the amended EA application form. The exact volume is not known at this stage however it will be more than 10m^3
	(iii) You have applied for Activity 15 of Listing Notice 2. In the activity description, please ensure that you provide the required footprint to be cleared. The application form must be amended to describe the portion of the proposed project to which the applicable listed activity relates.	The proposed development will result clearance in the of 184.36 hectares of the overall proposed 249 ha development area. The EA application form has been amended to include this description. **Table 5-2** details the triggered listed activities included in the amended EA application form
	(iv) It is indicated in the report that access roads (up to 6m wide) and internal distribution roads (up to 5m wide) will be required. Please ensure that no listed activities related to access roads are triggered, as this activity has not been applied for.	The EA application form has been amended to include the triggered Activity 4(e)(i) (ee) under Listing Notice 3 of NEMA EIA Regulations as amended. **Table 5-2** details the triggered listed activities included in the amended EA application form.
	(v) Please ensure that all relevant listed activities are applied for, are specific, and can be linked to the development activity or infrastructure (including thresholds) as described in the project description. Only activities and sub-listed activities applicable to the development must be applied for and assessed. When including activities in the application form and draft EIAr, take note of the word OR in between the sub-listed activities.	The EA application form has been amended to include all relevant listed activities for the proposed development. The triggered listed activities are provided in **Table 5-2** of this report corresponds with the amended EA application form.

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
(b) Specific Comments	(i) You have indicated that the project will require battery storage. Please provide the maximum height, volume, and capacity of the BESS and the size of the area to be occupied by the BESS.	BESS will be as follows: Maximum height: up to 3.5m Capacity: 88MW/200MWh Area to be occupied by BESS: 3-5 ha The above listed details are provided in **Table 4-1**of this report
	(ii) You have applied for the onsite substation and BESS. Please investigate other options for the onsite substation and BESS. Furthermore, please explain the differences between the alternatives, as well as why one is preferable over the other.	Details of alternatives considered is provided in **Section 3.3** of this report.
	(iii) The draft EIAr must include the four corner coordinate points for the Solar PV, Inverters and transformers, Battery Energy Storage System (BESS), and Onsite IPP substation. Detailed coordinates for the starting, middle, and ending points of the powerline, internal and external roads, as well as the length of each road	The coordinates for the following proposed infrastructures are provided on **Table 4-1** of this report: The developer has identified alternatives for the grid connection infrastructure for the proposed solar facility (See **Table 4-1**). However, the EA application for the grid infrastructure will be subject to a separate BA process.
(c) Public Participation	(i) Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to the Limpopo Department of Economic Development, Environment and Tourism (LEDET), Sekhukhune District Municipality, Fetakgoma Tubatse Local Municipality, and the Department of Environment, Forestry and Fisheries: Directorate Biodiversity and Conservation.	All comments received from the relevant stakeholders form part of this EIAr. This is included in the Comments and Responses Report (CRR) attached in **Appendix C.**
	(ii) Please ensure that all issues raised, and comments received on the draft SR and draft EIAr from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section: BCAdmin@environment.gov.za) in respect of the proposed activity are adequately addressed in the Final SR. Proof of correspondence with the various stakeholders must be included in the Final EIAr. Should you be unable to obtain comments, proof must be submitted to the Department of the attempts that were made to obtain comments	Proof of PPP is included in **Appendix C** of this report.

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
	(iii) A comments and response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments (pre- and post-submission of the draft EIAr) received for this development. The C&R report must be a separate document from the main report and the format must be in the table format which reflects the details of the I&APs and date of comments received, actual comments received, and response provided. Please ensure that comments made by I&APs are comprehensively captured (copy verbatim if required) and responded to clearly and fully. Please note that a response such as "Noted" is not regarded as an adequate response to I&APs comments	CRR is included in **Appendix C** of this report.
	(iv) Please ensure that the EIAr indicates when and where the draft SR and EIAr were made available for a 30-day review and comment period.	Details on when and where the draft reports are being made available for the public review is provided in **Section 7.2.2** of this report.
	(v) The Public Participation Process must be conducted in terms of the approved public participation plan and Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended	The PPP is being undertaken as agreed with the DFFE authorities during the pre-application held on 07 February 2023, in line with the Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended. The approval of the public participation plan was deemed not required. Proof of PPP undertaken to date is included in **Appendix C** of this report
(d) Specialist assessments	(i) The EAP must ensure that the terms of reference for all the identified specialist studies include the following: • A detailed description of the study's methodology; an indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations. • Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed.	The specialist studies provide information in line with the relevant protocols. Specialist reports are attached in **Appendix D**.
	(ii) Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the 'no-go' areas.	Detailed specialist assessments have been undertaken as part of the EIA phase and the proposed development layout plan has been revised to exclude development within the areas identified as the "no-go" areas, where feasible. Alternative designs and mitigatory measures have been investigated throughout the design process and informed by

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
		specialist inputs (biodiversity, watercourses, and stormwater management) (refer to **Section 3.3**). The layout plan and identified no-go areas is provided in **Appendix B**.
	(iii) Should the specialist definition of a 'no-go' area differ from the Department's definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable.	The Department's consideration of a no-go area is noted in that no development is permitted within all areas demarcated as a 'no-go' area. No-go areas have been demarcated within the assessed development footprint. In response to the identified need to adequately manage impacts within sensitive areas identified on the site development footprint, and in order to demonstrate the commitment of the project to adhere to recommended mitigation measures, the project Applicant has developed a best practice mitigation strategy with regards to the facility layout, which is demonstrated in **Section 3.3** and **10.2** of this EIAr
	(iv) All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA	The specialist studies undertaken provide detailed impact assessments of potential impacts and recommend detailed project specific mitigation measures for the preferred alternatives. This informed the impact assessment in **Section 10.2** of this report and management actions provided in the EMPr for approval.
	(v) Should a specialist recommend specific mitigation measures, these must be clearly indicated.	
	(vi) It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species), have come into effect. Specialist assessments must be conducted in accordance with these protocols.	Specialist Assessments have been undertaken in accordance with the relevant study protocols. Specialist reports are attached in **Appendix D**.
	(vii) 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.	No contradicting recommendations were noted in specialist studies included in **Appendix D**

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
	(viii) The department provisionally accepts that the following Specialist Assessments will form part of the EIAr, as indicated in the final SR dated June 2023. However, this is subject to change depending on the outcome of the Site Sensitivity Report as indicated in points xi-xiii below. • Soils and land capacity • Wetlands and aquatics • Terrestrial ecology • Avifauna • Socio-economic assessment • Heritage and palaeontology • Visual assessment • Desktop geotechnical investigation	The outcome Site Sensitivity Verification Report (**Appendix D**) aligns with identified specialist studies. All specialist assessment reports are included in **Appendix D**.
	(ix) It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species), have come into effect. **Please note that specialist assessments must be conducted in accordance with these protocols**. Please note further that the protocols require the specialists to be registered with SACNASP.	Specialist Assessments have been undertaken in accordance with the relevant study protocols. Specialist reports are attached in **Appendix D**. The specialists responsible are either registered as candidate or professional natural scientists with SACNASP, specialist details and declarations are provided on declaration forms provided in **Appendix D.**
	(x) In addition, the protocol states as follows: *1.2. The site sensitivity verification must be undertaken through the use of the following: (a) a desktop analysis, using satellite imagery; (b) a preliminary on-site inspection; and (c) any other available and relevant information.* *1.3. The outcome of the site sensitivity verification must be recorded in the form of a report that-*	A site sensitivity verification is included in **Appendix D** with the DFFE Screening Tool Report. **Table 4.3** included in the FSR has been revised in the EIAr to indicate whether or not the specialist or the EAP dispute or confirm the findings of the screening tool. The revised table (**Table 5-3**) is provided in **Section 5.4.2**.

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
	(a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status *(b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and* *(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations (EIA Regulations)."*	
	(xi) Please ensure that a site sensitivity report for all the Themes as identified by the Screening Tool Report is submitted with the draft EIAr. The department takes note of the information contained in **Table 4-3** of the final SR, however, the information in this table and on the attached baseline specialist studies do not indicate whether or not the specialist or the EAP dispute or confirm the findings of the screening tool. It is a legal requirement that the EAP or specialist confirm or dispute the findings of the screening tool, as this is the only legal means the department has at its disposal to verify which specialist studies should form part of the detailed assessment.	
	(xii) Considering the above, you are required to include, as part of the draft EIAr, a table summarising the themes as per the Screening Tool assessment report and their respective sensitivity ratings (very high, high, medium, low), a column indicating the sensitivity of each theme after the EAP/Specialist conducted the Site Sensitivity Verification Assessment (a dispute or confirmation of the finding by the Screening Tool), and a column indicating whether these studies will be conducted or if a compliance statement will be submitted, or motivation in a case where the proposed development is not located close to any landing strips/Airports, or military bases and their respective buffer areas, as per the requirements of the protocols.	

<table>
<tr><th>ITEM</th><th>INFORMATION REQUIREMENTS</th><th>EAP RESPONSE</th></tr>
<tr><td rowspan="4">(e) Environmental Management Programme</td><td>(i) It is drawn to your attention that for substation and overhead electricity transmission and distribution infrastructure, when such facilities trigger activity 11 or 47 of the EIA Regulations Listing Notice 1 of 2014, as amended, and any other listed and specified activities necessary for the realisation of such facilities, the generic Environmental Management Programmes (EMPr), contemplated in Regulations 19(4) must be used over and above the EMPr for the PV facility. Accordingly, there needs to be a generic EMPr for the on-site substation, a generic EMPr for the overhead powerline, and a third, separate EMPr for the PV facility.</td><td>The EMPr including the onsite substation generic EMPr is included in Appendix E.
Please note: The developer has identified two (2) alternatives for the grid connection infrastructure for the proposed solar facility. However, the EA application for the grid connection infrastructure will be subject to a separate BA process. As such, generic EMPr for the overhead powerline will be compiled as part of a separate application process.</td></tr>
<tr><td>(ii) Please ensure that any specific mitigation measures identified in the EIAr and specialist reports for the on-site substation and powerline are incorporated into the site-specific section of the generic EMPrs.</td><td>Mitigation measures identified in this EIAr and outlined in specialist reports are included in the onsite substation generic EMPr, where applicable. See Appendix E.
Please note: The overhead powerline assessment is not included as part of this EIA process. As such, generic EMPr for the overhead powerline will be compiled as part of a separate process.</td></tr>
<tr><td>(iii) Please ensure that the mitigation measures specified in the EIAr and specialist reports for the PV facility are also incorporated into the EMPr for the PV facility. In addition, please ensure that the EMPr complies with the content of the EMPr in terms of Appendix 4 of the EIA Regulations, 2014, as amended.</td><td>Mitigation measures identified in this EIAr and outlined in specialist reports are included in the EMPr for the PV facility (Appendix E). The EMPr has been compiled in compliance with Appendix 4 of the EIA Regulations, 2014, as amended.
.</td></tr>
<tr><td>(iv) Please also include in the EMPrs, a recommended frequency for the auditing of compliance with the conditions of the EA and EMPr, and the submission of such compliance reports to the competent authority</td><td>Section 8, 12 and 13 of the EMPr details the frequency for the auditing of compliance with the conditions of the EA and EMPr and submission to the relevant authority. See Appendix E.</td></tr>
<tr><td>(f) General</td><td>(i) The EIAr must provide the technical details for the proposed facility in a table format, as well as their description and/or dimensions, per the sample below.
Sample of minimum technical details required for the proposed facility.
<table>
<tr><th>Component</th><th>Description/dimensions</th></tr>
<tr><td>Height of PV structures</td><td></td></tr>
</table></td><td>Technical details are provided in Table 4-1 of this report.</td></tr>
</table>

<table>
<tr><th>ITEM</th><th>INFORMATION REQUIREMENTS</th><th>EAP RESPONSE</th></tr>
<tr><td></td><td>
<table>
<tr><td>Capacity of the PV facility</td><td></td></tr>
<tr><td>Surface area to be covered by the facility (i.e., the area occupied by both permanent and construction laydown areas, including PV array area and associated infrastructure such as roads)</td><td></td></tr>
<tr><td>Proximity to grid connection</td><td></td></tr>
<tr><td>Number of overhead power lines required and voltage of overhead power lines</td><td></td></tr>
<tr><td>Height of the Power Line</td><td></td></tr>
<tr><td>Number of substations required and voltage of substations</td><td></td></tr>
<tr><td>Area occupied by inverter/transformer stations/substations</td><td></td></tr>
<tr><td>Area occupied by buildings</td><td></td></tr>
<tr><td>Number of access roads, including length and width</td><td></td></tr>
<tr><td>Length and width of internal roads</td><td></td></tr>
<tr><td>Additional Infrastructure</td><td></td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>(ii) Please ensure that the final EIAr includes the period for which the Environmental Authorisation (EA) is required, the date on which the activity will be concluded, and the post-construction monitoring requirements finalised, as per Appendix 3(3)(1)(r) of the NEMA EIA Regulations, 2014, as amended.</td><td>The period for which environmental authorisation is required is included in Section 14 of the EIAr</td></tr>
<tr><td></td><td>(iii) Confirmation of the availability of services (e.g., sewage, water, etc. if required) must be included in the EIAr.</td><td>Waste removal and sanitation services provided by a sub-contractor (dependent on EPC contract).</td></tr>
</table>

ITEM	INFORMATION REQUIREMENTS	EAP RESPONSE
		Electricity required for construction activities will be generated by a generator. Where low voltage connections are possible, they will be considered. Where possible borehole water will be used from existing onsite boreholes (subject to authorisation). Should water availability at the time of construction be limited, water will be transported to site via water tanks. Water will be used for sanitation and potable water on site as well as construction works. Services provision letters are included in **Appendix G**.
	(iv) Should a Water Use Licence be required, proof of application for a licence needs to be submitted.	Proof of WULA application is provided in **Appendix G.**
The applicant is hereby reminded to comply with the requirements of Regulation 45 of GN R982 of 04 December 2014, as an amendment, with regard to the time period allowed for complying with the requirements of the Regulations.		The EIA process will comply with the prescribed timeframes requirements.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department		The Applicant acknowledges that no activity may commence prior to receipt of the EA.

1.5 Project role players

1.5.1 Applicant details

Table 1-2 below provides the details of the applicant for the proposed Phula PV project. The EA for the proposed project will be issued to this legal institution.

Table 1-2: Details of the Applicant

PROJECT APPLICANT:	**K2022578590 (South Africa) Proprietary Limited**
COMPANY REGISTRATION	2022/578590/07
TRADING NAME (IF ANY):	African Green Ventures
CONTACT PERSON	Dirk Muller
DESIGNATION	Managing Director (African Green Ventures (Pty) Ltd "AGV")
POSTAL ADDRESS:	Canal Edge 2, Tyger Waterfront, Bellville, Cape Town, 7530

1.5.2 EAP details

The EAP is defined as "*the individual responsible for the planning, management, coordination or review of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instruments introduced through regulations*".

All J&W EAPs are registered with the Environmental Assessment Practitioners' Association of South Africa (EAPASA) as a registered EAP or Candidate EAP. This is in accordance with the prescribed criteria of Regulation 15 (2) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the NEMA, 1998).

It is the role of the independent EAP to facilitate the project's application for an EA on behalf of the applicant, as required in terms of the NEMA (as amended). **Table 1-3** provides the details of the Project EAP responsible for this project. The Curriculum Vitae (CV), EAPASA Registration certificate and declaration of independence of the project EAP is included in **Appendix A**. The J&W core team members CVs and professional registrations can be provided upon request.

Table 1-3: Project EAP details

COMPANY	Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants				
PROJECT EAP	Ms. Jana Minnaar (de Jager)				
POSTAL ADDRESS:	PO BOX 1434, Rivonia, 2128				
EMAIL:	jana@jaws.co.za	**TEL:**	+27 11 519 0200	**FAX:**	+27 11 519 0201
PROFESSIONAL REGISTRATION (S):	Registered EAP (EAPASA)	**DATE:**	01/03/2022 – 29/02/2024	**REG NO:**	2019/665

A brief summary of the expertise of the environmental team associated with this project is provided in **Table 1-4** below.

Table 1-4: Expertise of the EAPs

NAME	ORGANISATION	HIGHEST QUALIFICATIONS	EXPERIENCE	PROFESSIONAL REGISTRATIONS
Ms. Jacqui Hex (Project Director)	J&W	MSc Environmental Management	15 years	EAPASA Registered EAP SACNASP PrSciNat
Ms. Jana Minnaar (de Jager) (Project Coordinator -EAP)		MSc Environmental Management	6 years	EAPASA Registered EAP SACNASP PriSciNat
Ms. Luceth Khumbuzi (Environmental Scientist)		BSc Environmental Science	5 years	EAPASA Registered EAP
Ms Anelle Lötter (Public Participation Practitioner)		National Diploma in Journalism	20+ years	Member of the International Association of Public Participation (IAP2)

1.5.3 Specialists

As defined in the NEMA (as amended), a specialist is "*a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies*".

Several specialist disciplines have been identified as relevant to the proposed development and the receiving environment. Specialists have been appointed to undertake the respective studies to inform the project and the EIA process specific to their discipline. The specialist details are set out in **Table 1-5** below and reports attached in **Appendix D**.

Table 1-5: Specialist details

SPECIALIST STUDY	SPECIALIST	ORGANISATION
Soil and Agricultural Assessment	Konrad Kruger	J&W
Visual Impact Assessment (VIA)		
Watercourse Assessment	Sashin Pillay Kathy Taggart	
Desktop Geotechnical Assessment	Richard Puchner	
Aquatic Ecology	Hanjo Fourie	M2 Environmental Connections (Pty) Ltd "MENCO"
Terrestrial Biodiversity Assessment	Reuhl Lombard	
Heritage Impact Assessment (HIA)	Wouter Fourie	PGS Heritage (Pty) Ltd "
Avifauna Impact Assessment	Low de Vries	Volant Environmental (Pty) Ltd
Socio-Economic	Ingrid Snyman	Batho Earth Social and Environmental Consultants "Batho Earth"

1.5.4 Competent Authority - DFFE

A Competent Authority (CA) is defined as, "*in respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing an EA in respect of that activity*" in terms of the EIA Regulation, as amended.

In terms of GN 779 of July 2016, the DFFE is the CA for all projects related to power generation planning.

Details of the case officer at the DFFE assigned to assess the proposed development is provided in **Table 1-6**.

Table 1-6: Case officer details

COMPETENT AUTHORITY	DFFE				
DFFE REF	14/12/16/3/3/2/2350				
CASE OFFICER	Thulisile Nyalunga				
POSTAL ADDRESS:	Private Bag X447, Pretoria, 0001				
EMAIL:	*TNYALUNGA@dffe.gov.za*	**TEL:**	012 399 9405	**FAX:**	+27 12 359 3625

2. DESCRIPTION OF PROPERTY

2.1 Project location

The proposed development site is situated in close proximity to the local chrome and platinum mines near Steelpoort, 33 km north-west of the town of Lydenburg. It is located on the Remainder of, and Portion 2 of the farm De Grooteboom 373 KT within the Fetakgomo Tubatse Local Municipality (FTLM) in the Limpopo Province. The locality of the proposed site is presented in **Figure 2-1** and details of project site is provided in **Table 2-1**.

A detailed description of the baseline environmental factors for the site are included in **Section 8** of this report.

Table 2-1: Site details for the Phula PV project

PROVINCE	Limpopo
LOCAL MUNICIPALITY	Fetakgomo Tubatse (Greater Tubatse)
DISTRICT MUNICIPALITY	Sekhukhune
NEAREST TOWN	33 km north-west of the town of Lydenburg
PHYSICAL ADDRESS	Farm De Grooteboom 373 KT, Greater Tubatse, Steelpoort, 1133
SITE CENTRAL COORDINATES	24°56'46.58"S; 30° 8'38.80"E
SITE AREA	approximately 249 ha
FARM NAME	De Grooteboom 373 KT
PORTION NO.	Remainder of portion 0, and Portion 2

The affected farm names/Erf numbers are included in **Table 2-2**..

Table 2-2: Property details for the proposed project / affected farm names

FARM NAME / ERF NO.	PORTION NO.	21-DIGIT SG CODE	LANDOWNER
De Grooteboom 373 KT	RE/0	T0KT00000000037300000	Estate of the late JR Le Grange Estate Nr: 011296/2018
De Grooteboom 373 KT	2	T0KT00000000037300002	4U2 FARM 002 CC 2001/054653/23

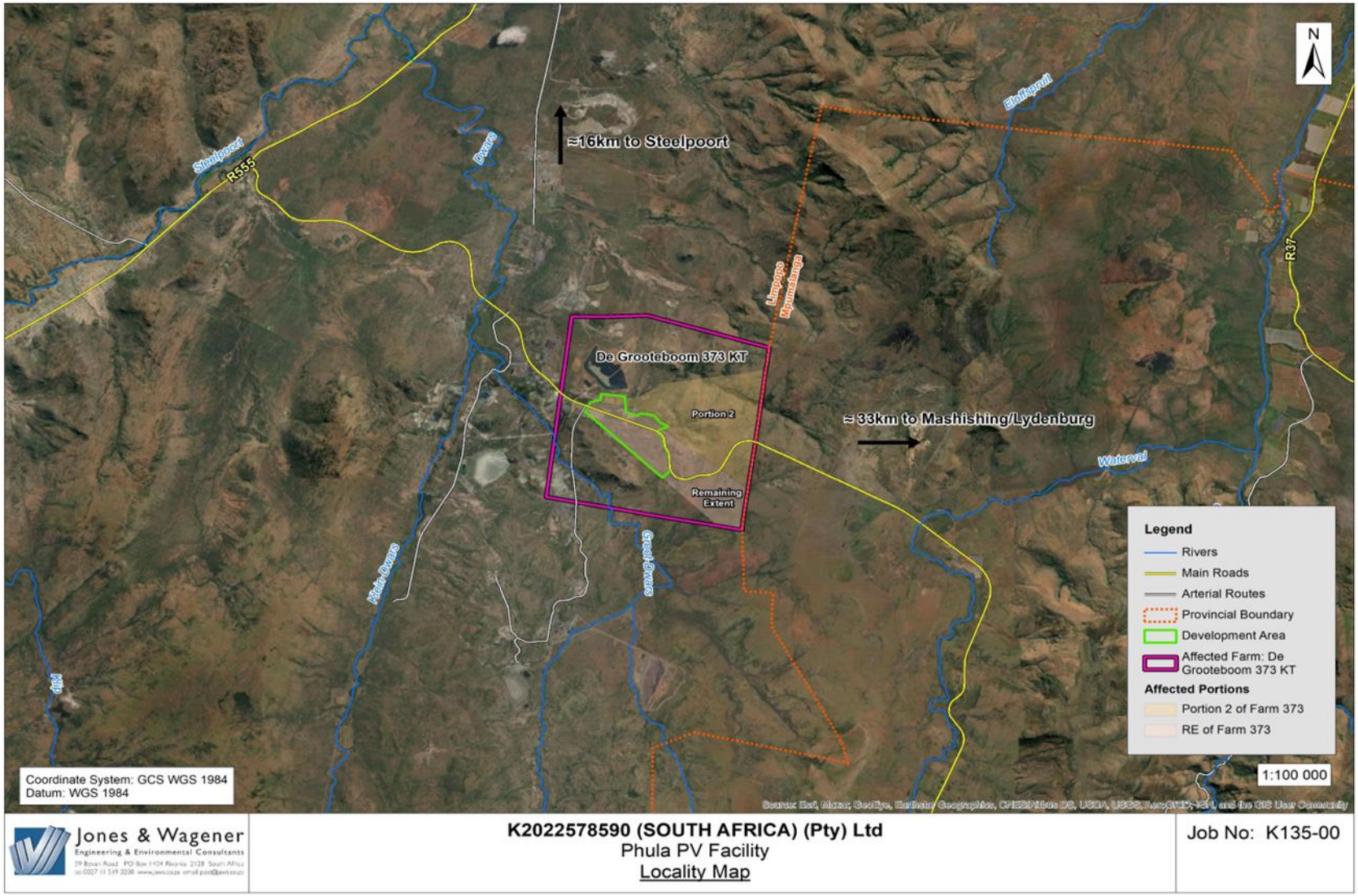


Figure 2-1: Locality map

3. ALTERNATIVES

The NEMA requires that feasible and reasonable alternatives are identified and considered as part of any application for EA. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004). The 2014 EIA Regulations (GN R982), as amended, provide the following definition: "alternatives", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the –

- property on which, or location where, the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity;
- operational aspects of the activity; and
- includes the option of not implementing the activity" ("No-Go" alternative).

3.1 Location Alternatives

The site locations for the proposed Phula PV project are based on the key technical and environmental criteria. The site selection and receptiveness are noted in **Section 3.1.1** of this report. No other locations are being considered for the placement of the PV facility and associated infrastructure.

3.1.1 Site selection and receptiveness

The Applicant was approached by the landowner, a local businessman supplying services to the mining sector, to assess the suitability of the site for energy production through solar PV. A key driver for the site selection was the solar resource which is known to be of good quality in the surrounding area as well as the property viability.

3.1.1.1 Site selection criteria

The proposed Phula PV project site was identified and considered acceptable for installation of solar PV panels through preceding environmental considerations, land availability and technical investigations. The specific constructable area is within the site boundaries through consideration and avoidance, where possible, of the environmental sensitivities identified from desktop datasets available and specialist findings.

The site selection criteria are based on the following key technical and environmental criteria being met:

- Solar resource availability;
- Land availability and topography;
- Site access; and
- Landowner support and land use considerations.

The details regarding site-specific characteristics, and how these provide further motivation for the selection of the specific site for the proposed Phula PV project is provided below.

3.1.1.2 Solar resource availability

Global Horizontal Irradiation (GHI) acts as an important base measurement to help determine regions that receive enough sunlight for solar energy development. The project site received GHI of approximately2059.8 kWh/m^2 and Direct Normal Irradiation (DNI) of 2151.3 kWh/m^2 per year (**Figure 3-1**) The Phula PV project is located in a region with high GHI levels ranging between 5.52 kWh/m^2 and 5.68 kWh/m^2, and DNI ranging between 5.49 kWh/m^2 and 5.94 kWh/m^2 per day (**Figure 3-2**). Therefore, this area was deemed the most suitable for the construction and operation of the proposed solar PV facilities.

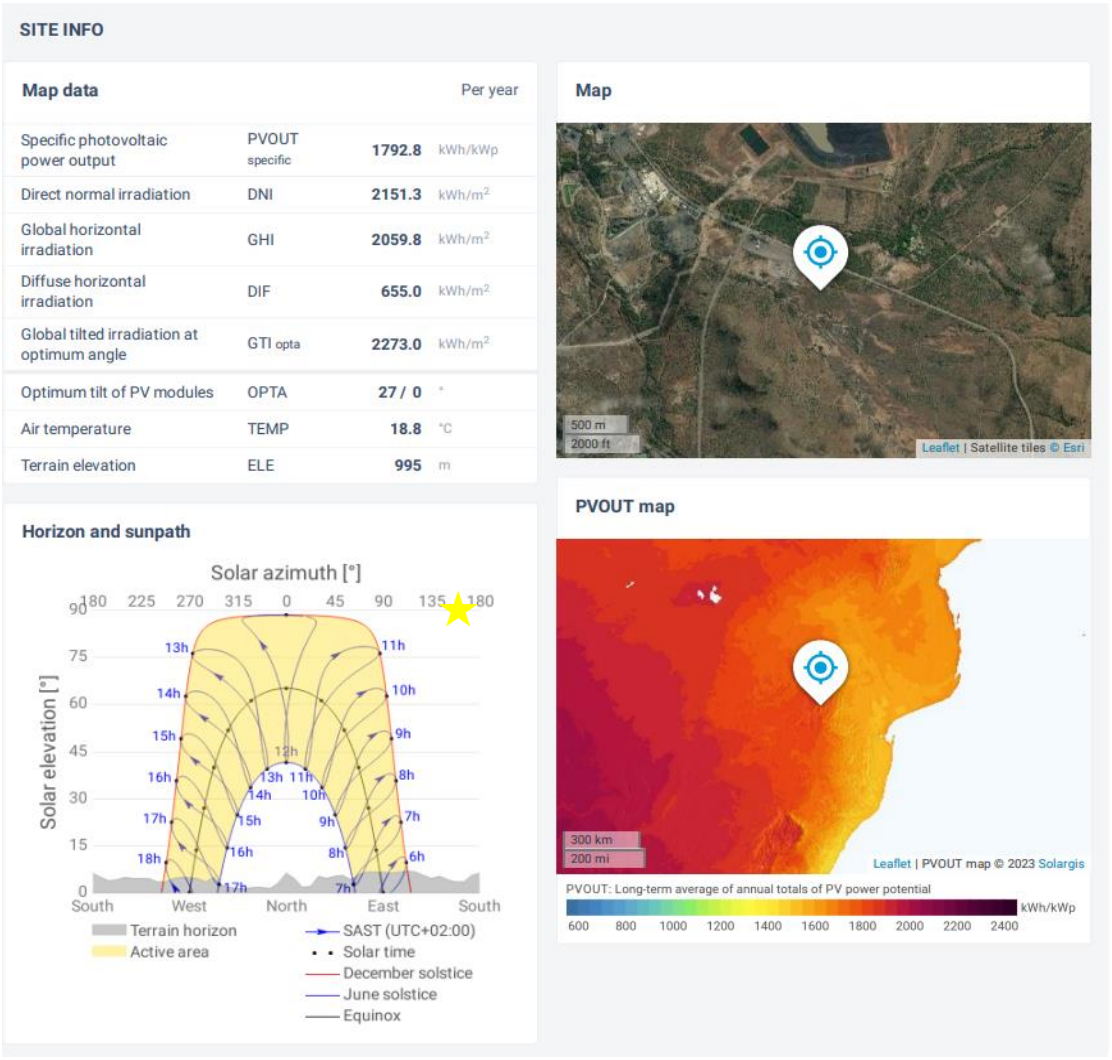
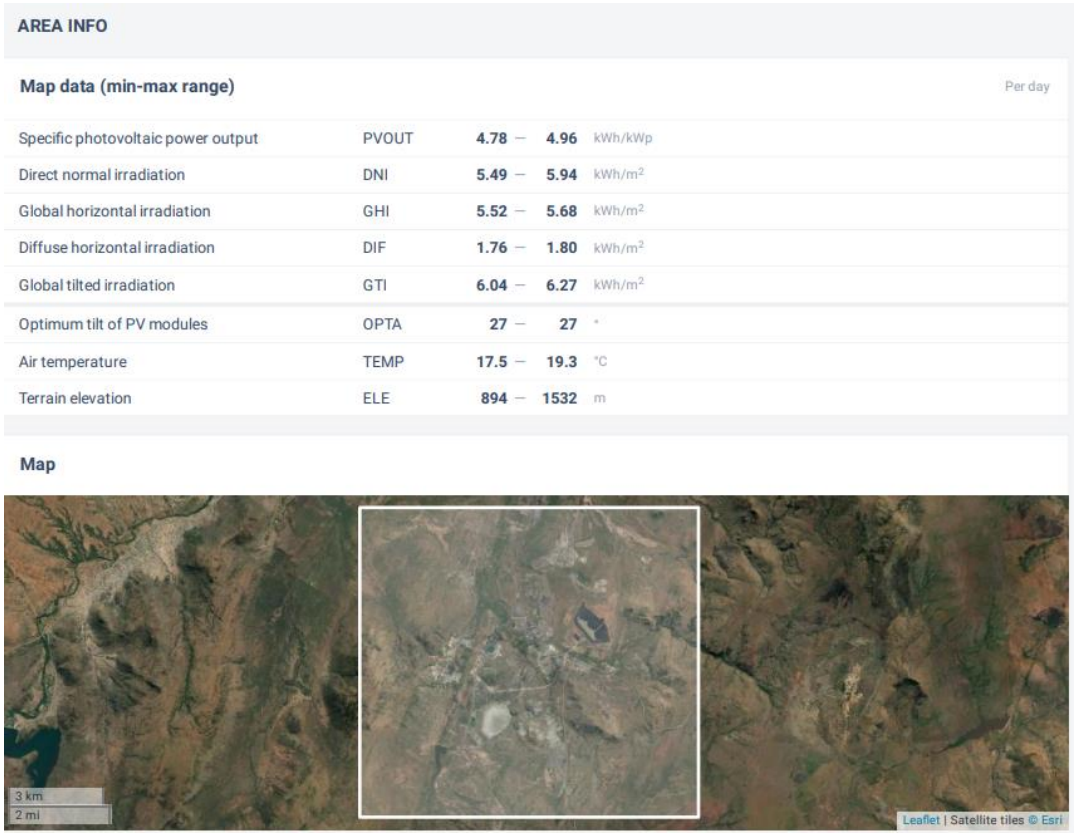


Figure 3-1: Project site solar radiation details (Global Solar Atlas v2.7, June 2022)



AREA INFO

Map data (min-max range) — Per day

Specific photovoltaic power output	PVOUT	4.78	4.96	kWh/kWp
Direct normal irradiation	DNI	5.49	5.94	kWh/m²
Global horizontal irradiation	GHI	5.52	5.68	kWh/m²
Diffuse horizontal irradiation	DIF	1.76	1.80	kWh/m²
Global tilted irradiation	GTI	6.04	6.27	kWh/m²
Optimum tilt of PV modules	OPTA	27	27	°
Air temperature	TEMP	17.5	19.3	°C
Terrain elevation	ELE	894	1532	m

Figure 3-2: Regional solar radiation (Global Solar Atlas v2.7, June 2022)

3.1.1.3 Land availability and topography

The proposed development site covers an area of approximately249 ha which is a suitable size for the proposed project. The property size is sufficient for the proposed solar facility and provides an opportunity for the avoidance of sensitive environmental features, where possible.

The following are key considerations in this regard:

- **Extent of site:** The project site is approximately249 ha in extent, within which the buildable area will be determined based on technical and environmental requirements.
- **Topography:** Elevation ranges from 980 metres above mean sea level (mamsl) at the western end of the site to 1145 mamsl at the eastern end of the site. Localised steeper sections are present in the south-east end of the site. The northwestern portion of the site is considerably flatter.
    - The site boundary lies within a broad valley surrounded by a mountainous ridge to the south-west and a cluster of mountains to the east that extends to the north-east of the site. The lowest elevation within the site boundary is 980 mamsl and the highest mountain within the immediate vicinity of the site is 1320 mamsl.

3.1.1.4 Site access

Access to the site is possible via the D212-040 road which connects from the R555 road. Existing roads will also be used where feasible and practical.

3.1.1.5 Landowner support and land use considerations

The properties included in this project site are privately owned and the landowner does not view the development as a conflict with the current land use practice, which is

dominated by grazing and natural veld (Figure **8**-**3**). Therefore, the landowner has allowed for the property to be leased for the solar PV development.

3.2 Activity alternatives

At present South Africa's power supply is highly constrained. Any downtime (breakdowns or maintenance) may lead to the need for load shedding which has had significant adverse effects for the South African economy, and the safety and wellbeing of its citizens. There is a strong need for new, low carbon energy generation capacity that can be quickly deployed and linked into the national grid (with wind and solar being suitable options).

In light of the above, the developer undertook a site selection assessment, consisting of environmental considerations, land availability and technical investigations and it was considered acceptable for the installation of solar PV panels . A key driver for the proposed development was the solar resource which is known to be of good quality in the surrounding areas, as well as the demand for power supply in the country.

No other land-use or activity other than renewable energy technologies were deemed to be appropriate for the site. The implementation of a Solar Energy Facility (SEF) at the proposed project site is more favourable than other alternative energy facility.

3.3 Site Layout/Design Alternatives

Development layout/design alternatives (i.e., development footprint) should aim to avoid and minimise negative impacts wherever possible. For the proposed Phula PV project, the overall aim of the layout plan for this project is to maximise electricity production through use of renewable energy technology (solar PV) while taking into account the socio-economic andenvironmental impacts associated with the development on the receiving environment.

Based on the site selection criteria, the entire Remainder of, and Portion 2 of the farm De Grooteboom 373 KT was considered for the footprint of the facility. A proposed footprint was then identified, based on the specialist investigation findings.

During the scoping phase, specialists undertook detailed investigations of the site constraints and opportunities to determine if there are fatal flaws or significant no-go areas within the proposed development site that might compromise the project. The specialist investigation during this phase was primarily based on the desktop analysis and field assessments. Potential environmental sensitive areas (**Figure 3-3**) have been identified and were considered during the iterative design process of the project.

Through integration of the specialist's sensitivity data, as well as the consideration of the technical aspects and land availability for this development, the Developer designed a layout plan to avoid sensitive areas and features identified onsite where possible. Where avoidance was not possible, appropriate mitigation and management measures were investigated by specialists based on the preferred layout for implementation during the construction and operation phase. Specialists recommended mitigation and management measures during the lifecycle of the project, these are outlined in **Section 10** and included the EMPr (**Appendix E**) for implementation.

3.3.1 Layout and design alternatives considered

Two (2) alternatives have been considered for the proposed Phula PV project during the iterative design process. The factors taken into consideration in designing the proposed Phula PV project development footprint included the extent of the available buildable area, financial viability (business case), and the sensitive aquatic and ecological features/areas

including buffers identified by specialists. The following layout alternatives were developed and considered.

3.3.1.1 Alternative 1: Alternative development footprint

This layout option was considered based on the premise that stormwater infrastructure can be designed to divert and manage the non-perennial watercourses within the site. This entails developing the entire extent of the proposed development area (approximately 249 ha), with minimal to no avoidance of the sensitive areas and features apart from the Springkaanspruit located within the northern portion of the site (**Figure 3-4**). This alternative will require complete infilling of all the non-perennial watercourses within the development area and clearance of the ridges and slopes located on the eastern site boundary. Stormwater infrastructure associated with the project will also consist of straight concrete channels and does not consider any naturalised features. This alternative presents the best use of the available buildable area and best business case for the proposed project, however the environmental impacts associated with this alternative will be more significant and unavoidable.

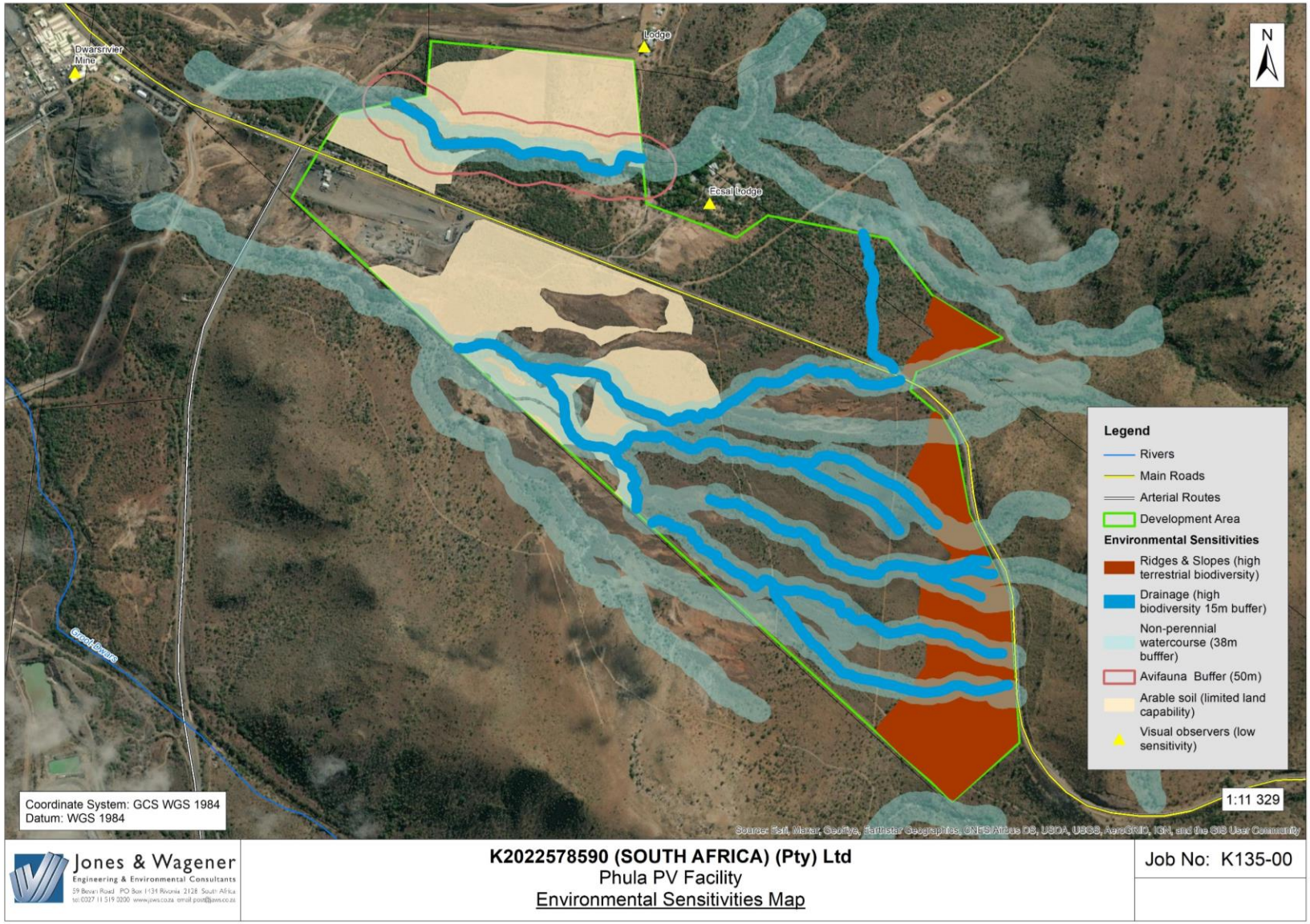


Figure 3-3: Environmental Sensitivities identified during Scoping Phase.

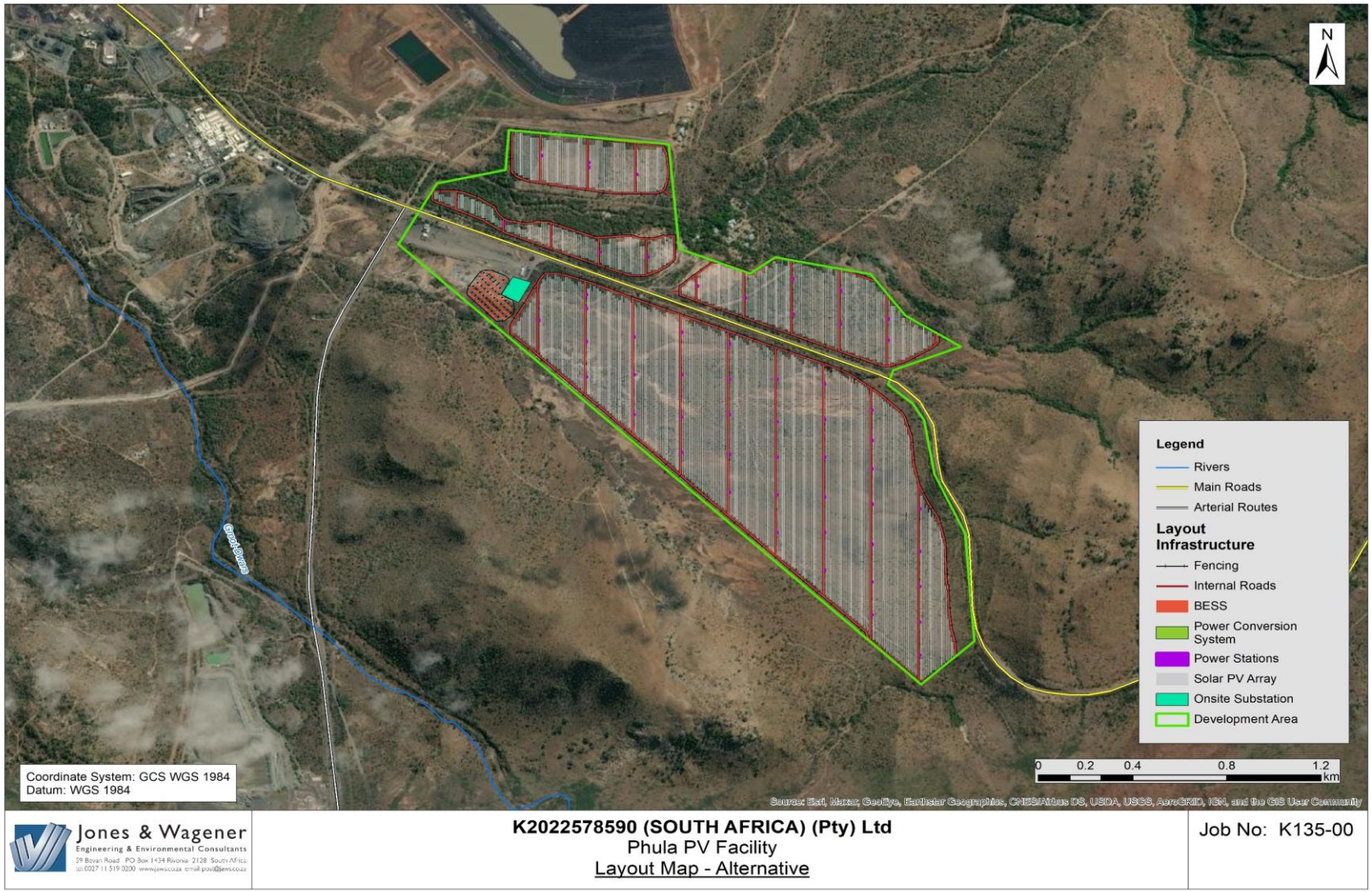


Figure 3-4: Alternative 1 layout and development footprint for the Phula PV facility

3.3.1.2 Alternative 2: Preferred development footprint

Given the significant and unavoidable environmental impacts associated with alternative 1 layout, a mitigated alternative was developed together with inputs from the watercourse and biodiversity specialists to avoid certain key sensitive areas and features as well as the associated buffers, where practically and feasibly possible. Although this layout does not completely avoid all sensitive features or constraints identified it does consider the financial viability of the project (business case) and associated socio-economic benefits, while being cognisant of the environmental constraints of the site. The development area of 249 ha was reduced to approximately 184.36 ha in order to ensure that the development takes the key environmental sensitivity constraints into consideration. The following factors were considered from the development perspective during the iterative design process of the preferred development footprint:

- Implementation of naturalised stormwater management measures;
- Key Biodiversity and ecological corridors;
  - Springkaanspruit and associated buffers
  - Central non-perennial watercourse and biodiversity corridor; and
  - High Biodiversity on eastern ridges and slopes
- Financial variability of the project;
  - Generation capacity required, land availability, strategic location of the project site;
  - Socio-economic benefits associated with project (direct – job creation).
- Current land use of the project site and broader project area.

The layout includes additional stormwater management measures as proposed by the Applicant. These measures have taken into consideration water movement around the development site and ensured some degree of ecological connectivity was still maintained within a section of the proposed Phula PV project footprint. Based on this preferred layout, the Springkaanspruit and associated 50m avifaunal buffer, the main central drainage corridor and part of the eastern ridges and slope, would be avoided. Several smaller non-perennial watercourses will, however, still be infilled as a result of the preferred layout. A stormwater management plan (SWMP) was therefore commissioned by the Applicant which includes:

- The construction of an upstream concrete channel that would intercept the flow that all the non-perennial systems would normally receive during rainfall events. This channel would run along the northern boundary of the southern development area of the proposed Phula PV project footprint;
- The channel, where it intersects the central drainage corridor, will be converted to a system with gabion side slopes and with dissipation structures (steps) and boulders to create additional potential habitat features. At this junction, the flow can either continue in the central drainage corridor or continue down the gabion channel, which will convert to a concrete channel further downstream;
- The central drainage corridor will remain intact for the majority of the system, until it will be diverted into the concrete lined channel on the southern side of the site;
- The southern side of the proposed project site will include a concrete channel to collect storm water off the site and divert the water to downstream of the site.

Stormwater will be directed around the sitewhere feasible, using vegetated drains where space and servitudes would allow for it, and where natural drainage channels cannot be implemented, engineered (concrete) channels are proposed. From the terrestrial

biodiversity perspective, sediment retention areas (sumps/paddocks) incorporated into the stormwater infrastructure will allow for vegetation establishment and natural succession. These will provide refugia for amphibian habitat that will be lost during construction as well as improve connectivity. These sumps/paddocks are to be placed strategically to allow for continued (although restricted and reduced) habitat connectivity. Stormwater will be allowed to transect the site through a main drainage line that has been identified as a "no-go"/refugia area. This drainage line is to be capped with semi-permeable fencing to allow for faunal movement.

The following factors were considered from a terrestrial biodiversity perspective:

- Minimisation of vegetation clearance while still allowing for project viability;
- Site specific sensitivities and avoidance;
- Buffer considerations following Wetland Delineation and Aquatic Ecological inputs;
- Continued (although restricted and reduced) habitat connectivity;
- Corridor maintenance; and
- Stormwater infrastructure allowing for vegetation establishment.

According to the terrestrial biodiversity specialist, crucial to the biodiversity mitigations is the avoidance of identified key sensitive habitats, which have been omitted from the final proposed layout, and the implementation of a naturalised SWMP to ensure ecological connectivity within and around the site.

In terms of the land capability and use, grazing and wilderness dominates the project area. The bulk of the adjacent properties are owned by mining companies that mine platinum and chrome. The biodiversity specialist also indicated that the site as a whole is already impacted to an extent as a result of the adjacent mining activity, which has displaced much of the mammal species compliment either through direct impacts of noise and dust, or through the increased human presence and possible illegal hunting activity.

The layout plan illustrated in **Figure 3-6** is therefore considered to be the most optimal from a technical and environmental perspective. This layout was assessed by specialists as part of the impact assessment process (**Section 10**) and detailed/practical mitigation measures, in line with the mitigation hierarchy have been recommend and included in the EMPr (**Appendix E**).

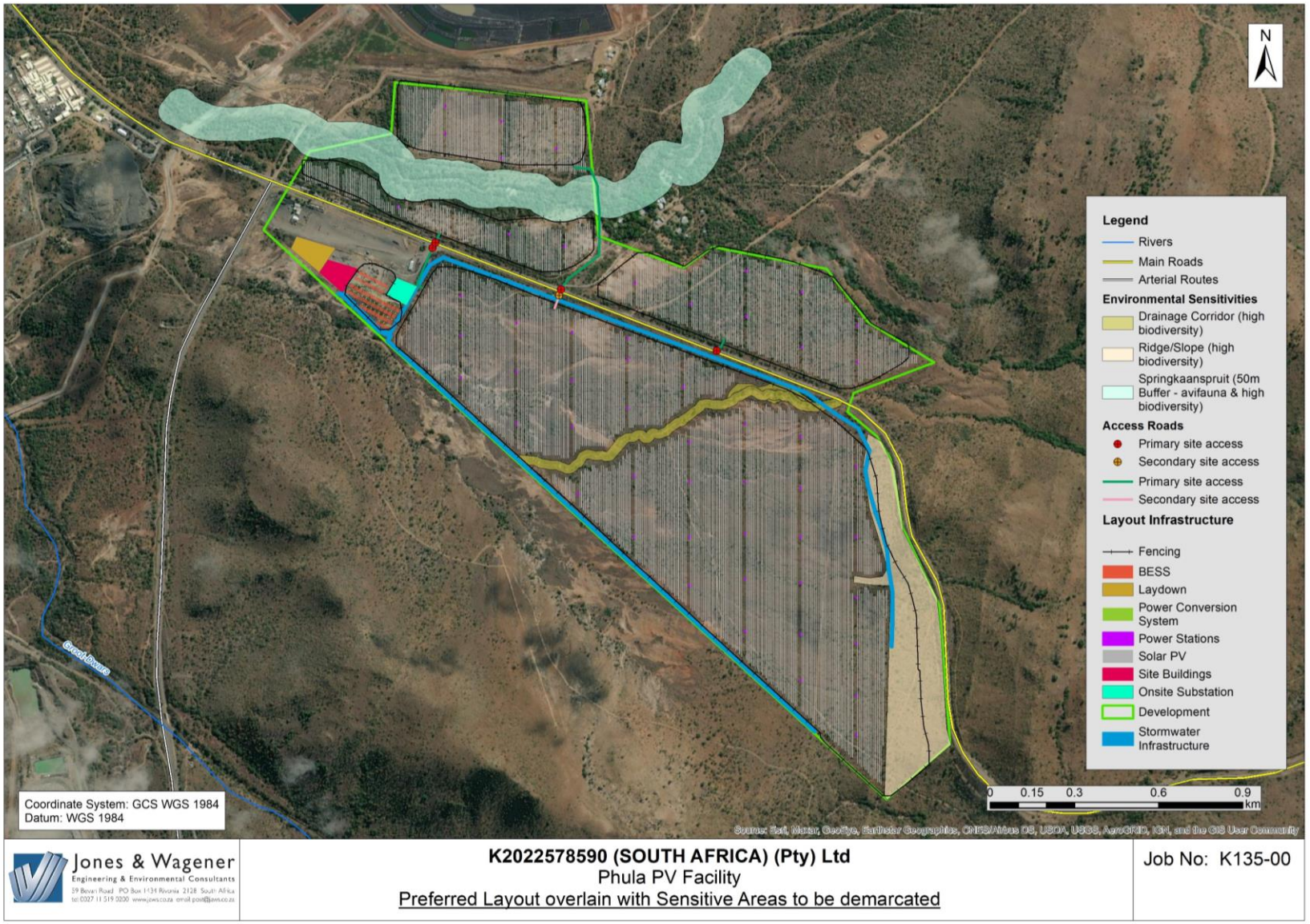


Figure 3-5: Key Environmental Sensitivities overlain with preferred layout (Alternative 2)

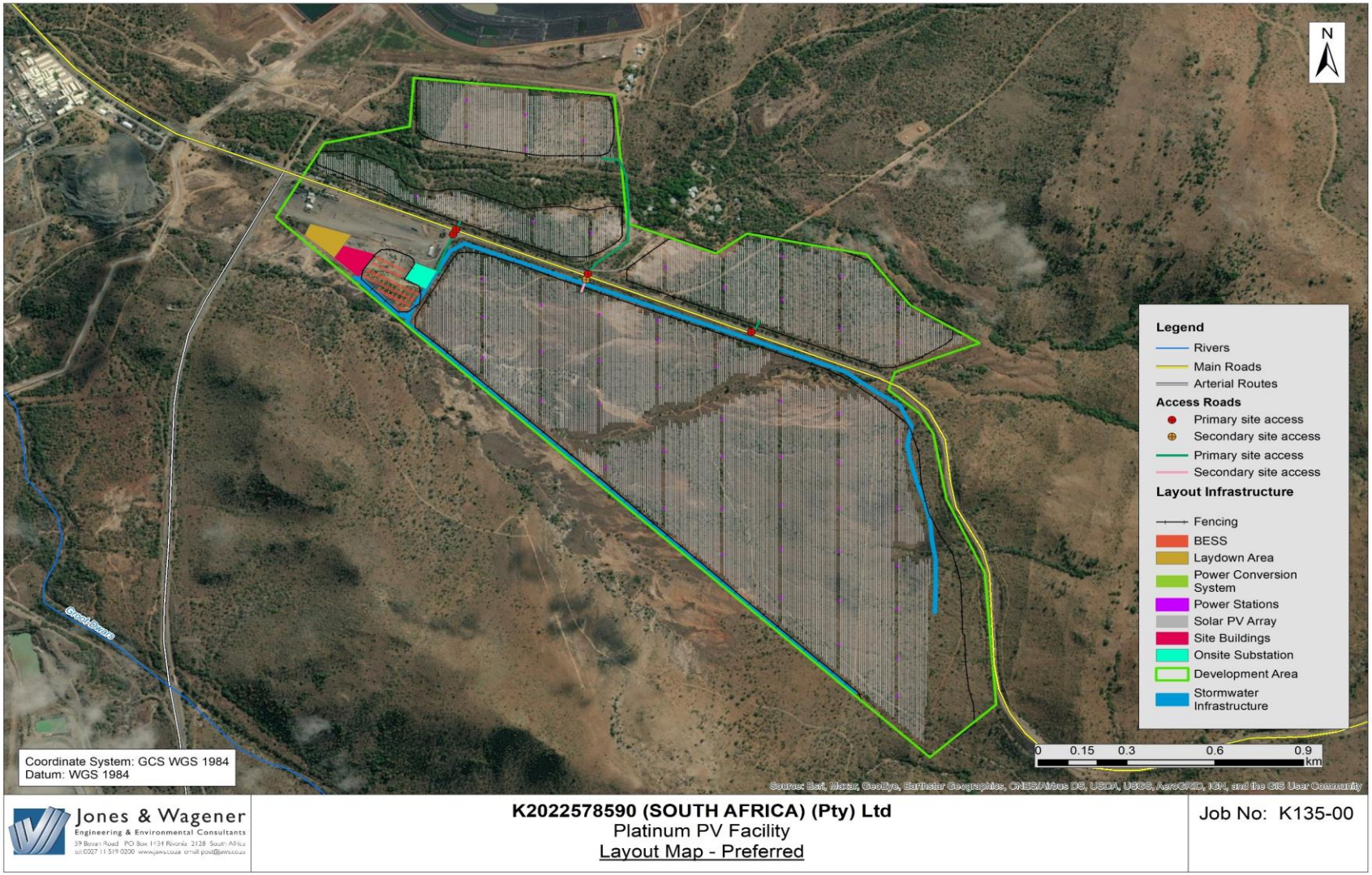


Figure 3-6: Alternative 2 – Preferred layout

3.4 Technology Alternatives

3.4.1 PV Technology

Regarding the generation technology, no other technology is being considered for the project at this stage other than solar PV. Monofacial or Bifacial solar panels will be considered as the preferred solar PV panel type. **Figure 3-7** below shows the schematic example of the bifacial and monofacial solar panels. The specific technology types discussed above will only be determined following Engineering, Procurement and Construction (EPC) procurement.

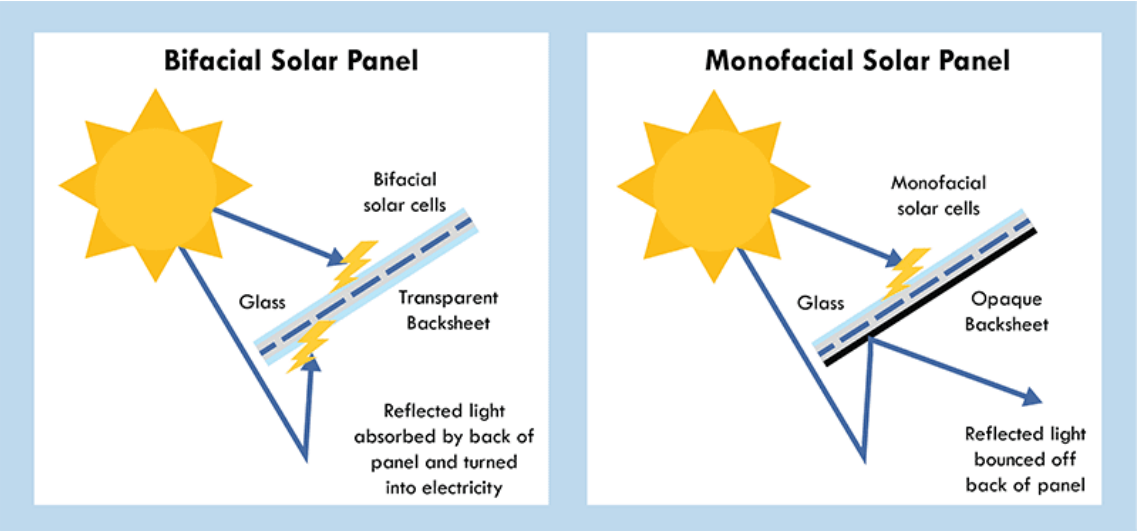


Figure 3-7: Schematic example of bifacial and monofacial solar panels (source: https://www.paradisesolarenergy.com/)

3.4.2 Electricity Distribution and Switching Infrastructure (Onsite Substation)

No technology alternatives exist for electricity distribution and switching technology as the technology has been refined and established by Eskom throughout the country. No further alternatives have been considered in this regard as the technology (i.e., onsite substation) is the most suitable and appropriated for the development.

3.4.3 Battery Energy Storage Systems (BESS)

The BESS will be used to store excess energy generated by the solar facility. It is proposed that Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology. The specific technology type will only be determined following EPC procurement. A summary of the main characteristics, advantages and disadvantages of the considered storage technologies are outlined in **Table 3-1.** An example of a BESS is shown in **Figure 3-8**.

Figure 3-8: Example of typical BESS (Source, year?)

3.4.3.1 Vanadium Redox Flow Battery (VRFB) Installations

Flow-battery technologies are also being considered as an alternative for power smoothing purposes. For this technology, energy is stored as an electrolyte in the flow cells. Options include sodium polysulfide-bromine (PSB) flow batteries, vanadium redox flow batteries (VRFB), and zinc-bromine (ZNBR) flow batteries which would be contained in small bunded areas. VRFB generally consist of two half-cells containing liquid electrolyte systems. Once supplied with electrical energy a reduction-oxidation (redox) reaction between ions of the two electrolytes, separated by a membrane, charge the electrodes with energy (anode [-] and cathode [+]). Energy discharge from a VRFB is achieved by a reversed redox reaction between ions resulting in the potential for electrical energy to be drawn from the electrodes.

Flow batteries are rechargeable and the rechargeability function is enabled by the dissolution of chemical components in the liquid electrolyte within the system that are separated by a membrane. This is an advantage associated with flow batteries as they are easily rechargeable through the replacement of the electrolyte fluid.

The risks associated with this technology alternative are outlined below:

- The most significant hazard with VRFB units is the possibility of spill of corrosive and environmentally toxic electrolyte. Many preventative and mitigative features will be included in the design and operation, e.g., full secondary containment, level control on tanks, leak detection on equipment etc.
- The distances of proposed locations for BESS sites from watercourses also needs to be considered. The integrity of the secondary containment may need to be better than normal practices, e.g., automated bund monitoring, tertiary containment may be required, or an alternative location chosen further from water courses.
- VRFB's do not present significant fire and electrical arcing hazards provided they are correctly designed, operated, maintained, and managed. Suitable battery management system (BMS), safety procedures, operating instructions, maintenance procedures, trips, alarms and interlocks should be in place.

3.4.3.2 Lithium Nickel Manganese Cobalt

Lithium nickel manganese cobalt (NMC) batteries are a popular type of Li-ion battery for several reasons. It features both strong energy and power density and are relatively safe compared to other types of lithium-ion batteries when it comes to thermal runaways. NMC offer a significantly lower number of life cycles compared to Lithium Iron Phosphate (LFP) batteries, generally between 1,000 and 2,000 cycles.

The risks associated with this technology are outlined below:

- With lithium solid-state batteries, the most significant hazard with battery units is the possibility of thermal runaway and the generation of toxic and flammable gases. This type of event also generates heat which may possibly propagate the thermal runaway event to neighbouring batteries if suitable state of the art technology is not employed.
- Due to the large size of the proposed BESS and therefore the potentially large number of containerised batteries, the likelihood of a fire event is relatively high.
- If the flammable gases accumulate within the container before they ignite, they may eventually ignite with explosive force.

Table 3-1: Summary of the main characteristics, advantages and disadvantages of the considered storage technologies (da Silva Lima *et al*., 2021)

CHARACTERISTICS	LITHIUM-ION BATTERY	VANADIUM REDOX FLOW BATTERY
Power capacity/density	200 Wh/kg	16–33 kWh/m3
Lifetime	10–15 years or 3000 cycles	5–20 years or 1500–15000 cycles
Cycle efficiencies	65–95%	70–80%
Operation & maintenance costs	$10/kW	$28/kW
Advantages	• High energy density. • High efficiency. • Long lifetime. • Environmentally friendly.	• High efficiency. • Long lifetime. • Environmentally friendly.
Disadvantages	• In large scale (e.g., grid applications) have short lifetimes and elevated costs. • High raw materials demand is associated with technology. • NMC batteries also require cobalt and nickel, which are more expensive and harmful to the environment. There is also significant concern about shortages in these minerals, which can significantly impact both cost and availability.	• High costs. • Low energy density (high area demand). • Risk of cross-contamination of electrolyte.

3.5 No-Go Alternative

The No-Go alternative assumes that the project is not developed, and the activity does not proceed. The assessment of the No-Go alternative is a requirement when undertaking an EIA process in terms of the NEMA and is also considered a global best practice. The

no-go assessment can provide a baseline scenario against which the project (or its alternatives) can be compared with. The potential opportunity costs in terms of alternative land use income and other supporting social and economic development (i.e., additional electricity supply, job creation, skills development, capital investment arising from the development etc.) in the area would be lost if the status quo persists.

The implications of the “no-go” alternative are as follows:

- Positive:
  - No increase in possible bird mortality and habitat loss;
  - No habitat loss for terrestrial species;
  - Vegetation communities remain as is;
  - No disruption to breeding and foraging habitat for non-avian, non-bat vertebrate fauna;
  - No direct mortalities through entrapment, earthmoving and increased human and vehicle activity;
  - No species displacement;
  - Natural dispersal patterns of species remain as is;
  - No potential disturbance of heritage resources;
  - Continued livestock operations;
  - There will be no change to the current landscape. The existing landscape will remain as is;
  - Undisturbed land remains as is.
- Negative:
  - No opportunity for additional/ alternative electricity supply;
  - No job creations and skills development;
  - Given current state of broader project area and surrounding – mining activities are likely to occur;
  - No change to economic growth in the area and country; and
  - The land will remain unmanaged, and no benefits are derived from the implementation of an alternative/additional land-use.

Most of the positives associated with the No-Go option will only materialise in the unlikely event that no other development takes place on the land parcel, such as mining.

Section 8 of this report further outlines the baseline environmental description to which the No-Go alternative can be equated to as a baseline. **Section 10** also assesses the current impacts present on the project site prior to implementation of the project.

4. PROJECT DESCRIPTION

The proposed Phula PV project will make use of solar PV technology to generate electricity (a maximum output capacity of up to 130MW) from solar energy. The proposed Phula PV project development footprint will cover an area of 184.36 ha of the overall proposed development area of approximately 249 ha layout as presented in **Figure 3-6**.

The Applicant has identified two (2) alternatives for the grid connection infrastructure for the proposed solar facility. However, the EA application for the grid infrastructure will be subject to a separate BA process.

The detailed description of the project development phases is provided in **Table 4-2** below.

4.1 Technology considered for a Solar Energy Facility

SEF makes use of utilises PV technology which utilises the energy from the sun to generate electricity through a process known as the PV effect. This effect refers to photons of light colliding with electrons, placing the electrons into a higher state of energy to create electricity. The PV technology consists of the following components:

4.1.1 Photovoltaic Cells, Modules and Arrays

A PV cell is made of silicone that acts as a semi-conductor used to produce the Photovoltaic Effect. PV cells are arranged in multiples/ arrays and placed behind a protective glass sheet to form a PV panel. Each PV cell is positively charged on one side and negatively charged on the opposite side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electric current (i.e., DC power).

A solar PV module is made up of individual solar cells connected together. A solar PV array is a system made up of a group of individual solar PV modules electrically wired together to form a much larger PV installation (**Figure 4-1**). Monofacial or bifacial panels can be considered for installation.

PV panels are designed to operate continuously between 25 to 30 years, mostly unattended and with low maintenance.

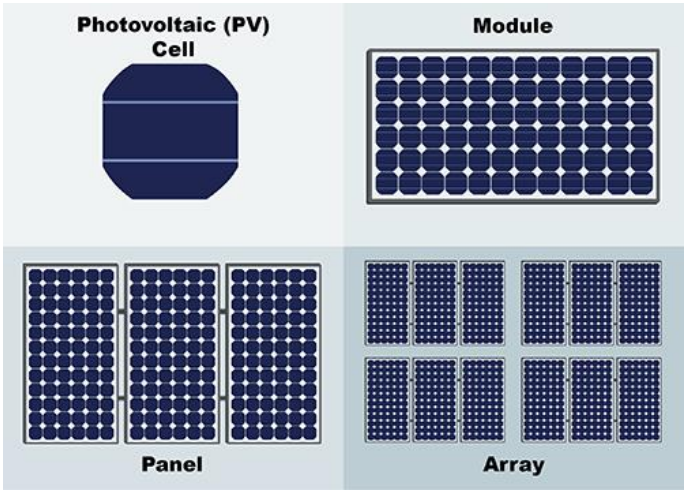


Figure 4-1: Photovoltaic cells, modules, panels and arrays (FSEC, 2014)

4.1.2 Converter and Inverters

Inverters are used to convert the electricity produced by the PV cells from DC into Alternating Current (AC) to enable the distribution of the electricity generated. Numerous inverters will be arranged in several arrays to collect and convert power produced by the proposed PV facility.

4.1.3 Support Structures

PV panels will be fixed to support structures. PV panels will be mounted on either fixed-tilt steel or aluminium structures, or east-west tracking systems. With fixed-tilt support structures, the angle of the PV panels is dependent on the latitude of the proposed development and may be adjusted to optimise for summer and winter solar radiation characteristics.

4.2 Components of the proposed Phula PV facility

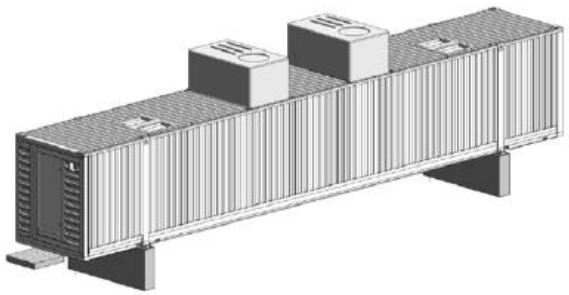
The main technology will be inverter and solar PV generation based. Inverter technology will either be string-type and mounted on or next to the PV structures, or central-type and mounted in containers on concrete foundations.

The proposed Phula PV project site is proposed to accommodate the following infrastructure:

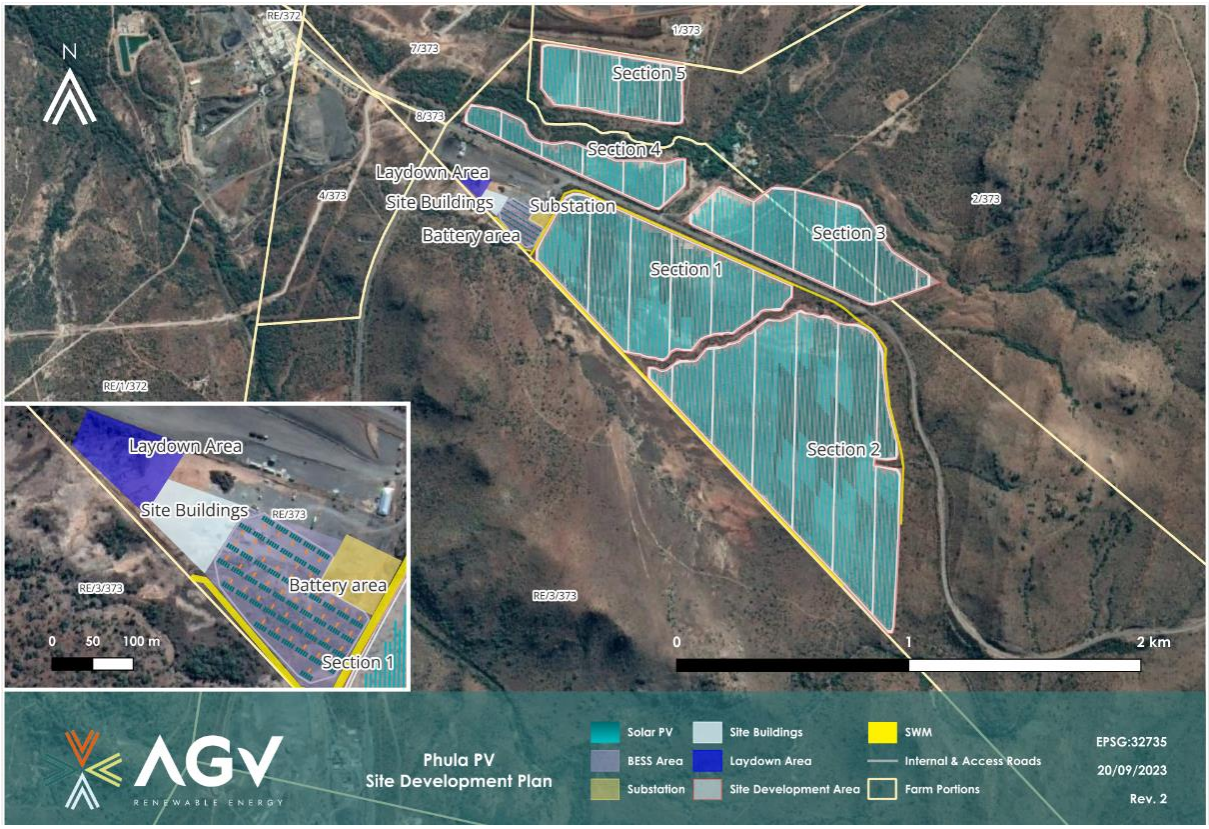
- PV panels mounted on either a single axis tracking or fixed structure;
- Inverters and transformers;
- Low voltage cabling between the PV panels to the inverters;
- Fence around the project development area with security and access control;
- Camera surveillance;
- 33kV cabling between the project components and the facility substation;
- 33/132kV onsite facility substation;
- Battery Energy Storage System (BESS) with a footprint of 2.5 ha;
- Site offices and maintenance buildings, including workshop areas for maintenance and storage as well as parking for staff and visitors;
- Laydown/staging area on-site in front of mounting structures during installation;
- Temporary store area close to site entrance (less than 2ha);
- Access roads (up to 6m wide) and internal distribution roads (up to 5m wide);
- Temporary concrete batching facility; and
- Stormwater management infrastructure.

Table 4-1 below provides a summary of the infrastructure required for the establishment of the proposed Phula PV solar energy facility. The layout plan proposed for the project was developed through an iterative design process (refer to **Section 3.3**).

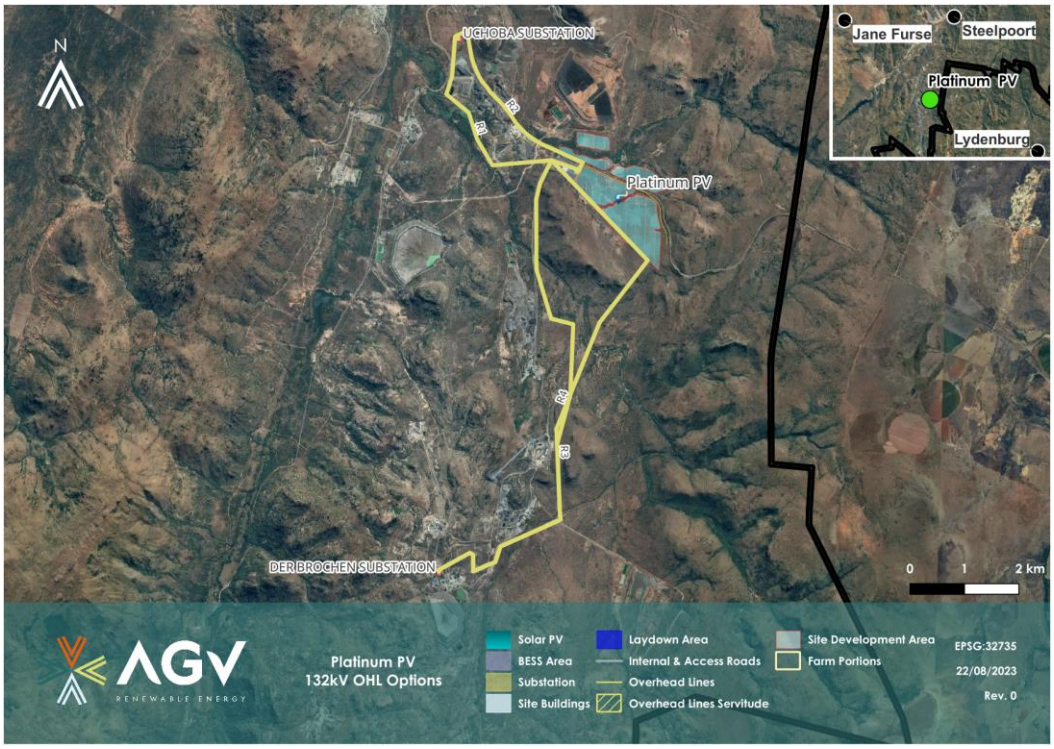
Table 4-1: Details of infrastructure proposed as part of the Phula PV project.

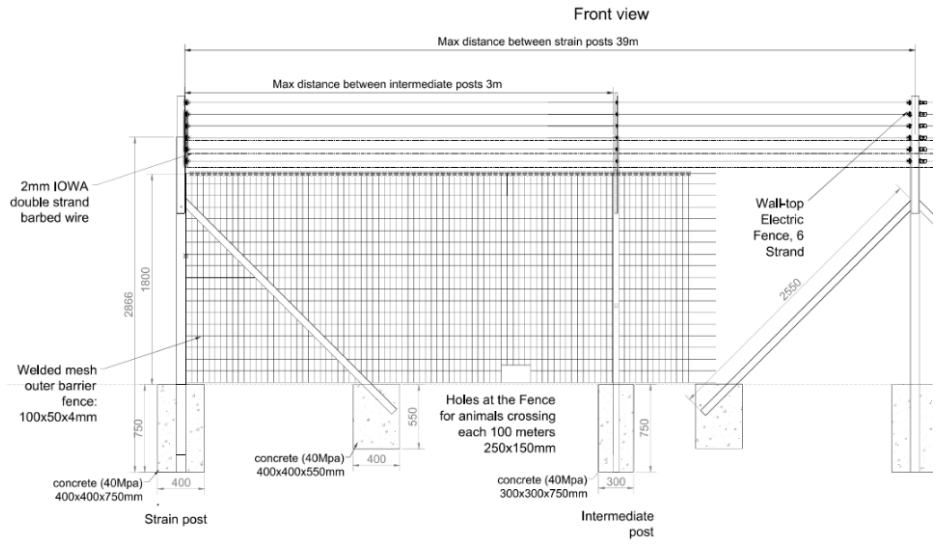
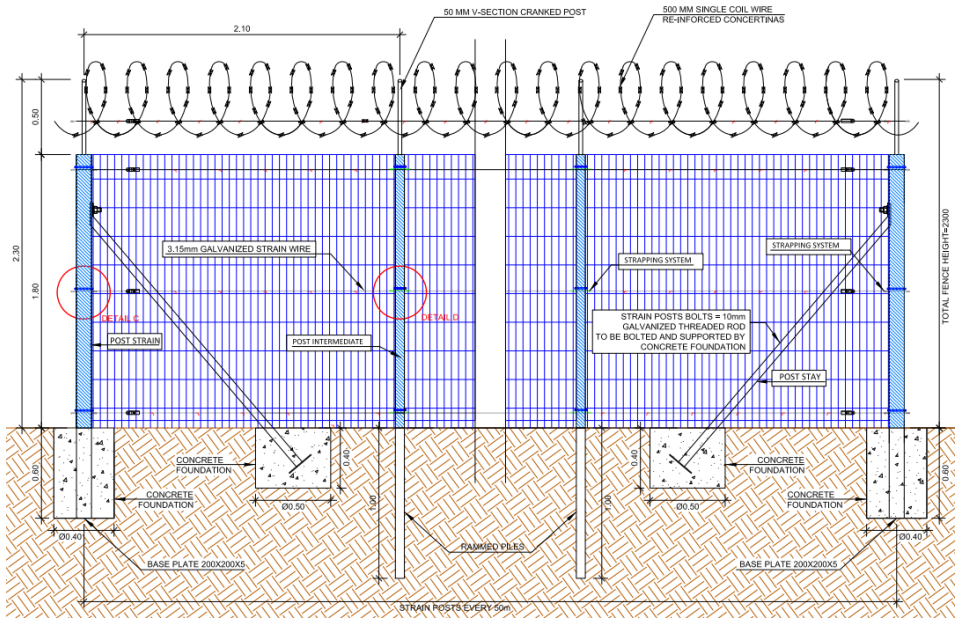
INFRASTRUCTURE	DESCRIPTION / DIMENSIONS
Contracted capacity of PV facility	Up to 130 MW
Technologies	• Solar Photovoltaic (PV) system • PV modules mounted on either a single axis tracking or fixed structure. • Monofacial or Bifacial Panels • Lithium-Ion, Vanadium Redox Flow or similar Batteries
BESS capacity	100 MW / 500 MWh
Onsite substation	33kV cabling between the project components and the facility substation. 33kV/132kV onsite facility substation.
Height of PV modules	3m at highest point above ground level when PV panels are pointing due east or west.
Battery array height	Up to 3.5 metres 
On-site substation and BESS complex area	The proposed facility layout has been revised: A 50m avifauna buffer around the Springkaanspruit, a 38 m biodiversity buffer dividing the main development area into two portions and the conceptual stormwater management infrastructure have informed the layout of the proposed Phula PV facility. Therefore, the revised facility layout makes provision for one on-site substation at the Section 1 (southwestern portion) of the proposed development. The footprint area is approximately 0.6 ha. A BESS area is proposed west of the on-site substation with a proposed footprint area of approximately 2.5 ha. The combined footprint is therefore (approximately) 2.5 ha. A construction laydown / storage area is proposed west of the BESS with a proposed footprint of approximately 0.93 ha.

INFRASTRUCTURE	DESCRIPTION / DIMENSIONS



Development footprints	**FOOTPRINT**	**AREA**	**CENTRAL CO-ORDINATES (DMS)**
	Section 1	44.37 ha	24°56'38.54"S; 30° 8'22.30"E
	Section 2	79.45 ha	24°56'59.56"S; 30° 8'46.97"E
	Section 3	28.53 ha	24°56'31.77"S; 30° 8'48.73"E
	Section 4	12.76 ha	24°56'21.89"S; 30° 8'13.81"E
	Section 5	16.32 ha	24°56'10.79"S; 30° 8'17.82"E
	Laydown area	0.931 ha	24°56'25.39"S; 30° 7'57.36"E
	Site buildings	0.75 ha	24°56'27.65"S; 30° 8'0.00"E
	Substation	0.56 ha	24°56'29.68"S; 30° 8'7.25"E
	Battery Area	2.5 ha	24°56'30.43"S; 30° 8'3.97"E
	Total area	**184.36 ha**	
Laydown and temporary storage area	Laydown/staging area on-site in front of mounting structures during installation. The proposed temporary store area is located west of the proposed BESS area with a footprint of approximately 0.93 ha		
O&M building area	O&M building will be located at the area named 'Site Buildings' near the substation and battery areas or at the western-most side of Section 1. The estimated size of the building is 0.75 ha, excluding parking.		
Width of internal access roads	Access roads (up to 6m wide) and internal distribution roads (up to 5m wide).		

INFRASTRUCTURE	DESCRIPTION / DIMENSIONS
Length of internal access roads	Estimated at approx. 27 km.
Site access	Proposed access roads have been recommended by a transport engineer. These access points consider the various guidelines and policies in terms of the sites location and the provincial roads. Five access points are proposed (depicted on the layout plan Figure 3-6): • Access 1 and 2 – access to the main (southern) facility area • Access 3 – opposite access 2 and this provides access to the northern most area (north of the Springkaanspruit). Access 3 will follow an existing gravel road which traverses the river. It is likely that this will require some works within the river to ensure safe crossing of the river. This may include culverts. If this is required, works within the river will be during the dry period. • Access 4 – this will provide access to the northeastern portion of the facility area – a new access is proposed as the existing access road is too close to Access 2 and 3. • Access 5 – opposite access 1 providing access to the most western portion area of the facility.
Grid connection and proximity (Subject to separate authorisation process)	Grid connection will be one of the following options, as shown by the diagram. • Route 1 between the solar PV site and the Uchoba 132kV Substation running South past Dwarsrivier Mine. • Route 2 between the solar PV site and the Uchoba 132kV Substation running North past Dwarsrivier Mine • Route 3 between the solar PV site and Anglo Mototolo Shaft supply substation, named Eskom Der Brochen Substation. Western line. • Route 3 between the solar PV site and Anglo Mototolo Shaft supply substation, named Eskom Der Brochen Substation. Eastern line.
	
Height of the powerline	Approximately 21 m
Height of substation fencing	Fence height to be between 2.5m and 3m, as per the following: Example 1 (including electric fencing):

INFRASTRUCTURE	DESCRIPTION / DIMENSIONS
	 Example 2 (alternative to electric fence): 
Type of fencing	Welded steel chain link mesh, or welded steel mesh, hot-dip galvanised, or Clear-vu (or similar) fence.

4.3 Services required

The development of the proposed Phula PV project will require the basic services provision such as refuse removal, water and electricity supply during the construction, operational and decommissioning phase. The section below provides the details of the services required for the project and how it will be managed during the project phases.

4.3.1 Waste

4.3.1.1 General waste

Solid waste generated during construction will mainly be in the form of construction material, excavated substrate and domestic solid waste. Cardboard waste will be produced from panel packaging, which will be compacted on site prior to removal. Other wastes include rubber caps on panel edges, wooden pallets, plastic wrapping (all related to the panel packaging). Where possible, waste will be recycled. Non-recyclable solid construction waste will be temporarily stored in skips or other appropriate waste containers to be disposed of at an appropriately licensed waste facility. Any waste and excess material will be removed once construction is complete and disposed of at a suitably licensed waste facility.

The Applicant will meet with the local municipality to determine the availability of services. This will be undertaken subsequent to the EIA process given the fact that the project is proposed to be bid as part of the Department of Mineral Resources and Energy (DMRE) REIPPPP or similar procurement programme, with which there is uncertainty regarding the announcement of the next bidding rounds, confirmation. A binding agreement will be in place for the general waste removal services at the time, as required.

4.3.1.2 Hazardous waste

Anticipated hazardous substances during construction may include paint, grease, petrol or diesel from trucks, cranes, bulldozers etc., and limited amounts of transformer oils and chemicals. Dangerous goods required to be stored during construction (i.e., limited quantities of fuel, oil, lubricants etc.) will be stored in compliance with relevant legislation. Hazardous waste will be appropriately stored and disposed of at a licensed hazardous waste disposal facility by a registered service provider.

4.3.1.3 Effluent and Wastewater

Chemical toilets and conservancy tanks (as required) will be used. These will be serviced regularly, and effluent will be disposed of at a registered wastewater treatment works. All effluent will be maintained and serviced regularly by an appropriate waste contractor. Any other effluent discharged during the construction phase will be collected in sealed containers/tanks and collected by a registered service provider to be disposed of at an approved facility off-site.

The Applicant will meet with the local municipality to determine the availability of services. This will be undertaken subsequent to the EIA process given the fact that the project is proposed to be bid as part of the DMRE REIPPPP or similar procurement programme, with which there is uncertainty regarding the announcement of the next bidding rounds, confirmation. A binding agreement will be in place for sanitation services.

4.3.2 Water supply

Water supply will most likely be sourced from existing boreholes. Based on the evaluation of recovery data, the Flow Characteristic Programme results, and groundwater reserve determination the sustainable yield for the borehole is 6.5 L/s and a total volume of 136 656 m^3/a is available (Milnex CC, 2023). This volume will require a water use licence application and Section 21 Water Use Authorisation (WUA) process[2] in terms of the National Water Act (Act No. 36 of 1998) (NWA) for the proposed Phula PV facility.

[2] Not included in this assessment and subject to an Integrated Water Use Licence Application process in terms of the NWA.

4.3.3 Electricity supply

The Applicant will meet with the local municipality to determine the availability of services. This will be undertaken subsequent to the EIA process. This is due to the fact that the project is proposed to be bid as part of the DMRE REIPPPP or similar procurement programme, with which there is uncertainty regarding the announcement of the next bidding rounds, confirmation. A binding agreement will be put in place for the power supply services. Alternatively, during construction a generator or similar available temporary power source will be utilised.

4.4 Project development phases

The EIA and required licensing and permitting (e.g., WUL) process typically takes approximately1-3 years to complete and if authorised, the Applicant would then prepare the project for submission to the REIPPPP (or similar procurement programmes). Generally, construction is likely to commence no earlier than 1 - 1.5 years after the issuing of the EA for the project. This is, however, project dependent.

The project development phases are discussed in more details in **Table 4-2**.

Table 4-2: Project development phases for the proposed Phula PV project (i.e., construction, operation and decommissioning)

PRE-CONSTRUCTION	
Pre-planning – legal requirements	• The project will need to comply with the relevant legislation which may require several authorisations, permits, or licences to be obtained prior to the commencement of construction i.e., WUL, tree removal permit etc. Details on the legislation relevant to the project is provided in **Section 5** of this report.
Conduct surveys prior to construction	• Including, but not limited to confirmation of the micro-siting footprint (i.e., the precise location of the PV panels, on-site facility substation and the associated infrastructure) and a detailed geotechnical survey. • Undertake walk-though of all areas to be developed. Where protected fauna or flora are present on-site, appropriate permitting for the removal or destruction of these species must be undertaken. Walk-through to include the verification and demarcation of bird nests and heritage resources (if any).
CONSTRUCTION	
Procurement and employment	• The construction phase employment opportunities are short-term and temporary. • The expected construction period is up to 18-months with approximately 250 workers on site at peak (i.e., not at all times). This includes high skilled, medium skilled, and low skilled workers. • Construction period (250 at peak) employment opportunities: ◦ high skilled workers - 10 ◦ medium skilled workers - 20 ◦ low skilled workers – 220
Establishment of access road/s to the site	• Existing access roads will be utilised where possible to minimise impact and will be maintained where required. • Access road/s (up to 6m in wide) to the site and internal distribution roads (up to 5m wide) between project components will be constructed which includes stormwater channels and turning bypass areas. The length of the internal roads will be determined on the final layout dependent on the technical and environmental requirements. • A welded steel chain link mesh, or welded steel mesh, hot-dip galvanised, or Clear-vu (or similar) fence between 2.5m and 3m high will be placed around the project development area with security and access control
Undertake site preparation	• This will include the clearance of vegetation. This will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Establishment of temporary construction laydown areas	• Construction laydown areas for the storage of components. Temporary store area close to site entrance will be less than 2 ha in size.
Transport of components and equipment to and within the site	• The existing access roads will be used to transport all components and equipment required during the construction phase. • Typical civil engineering construction equipment will need to be brought to the project site (e.g., excavators, trucks, graders, compaction equipment, cement etc.), as well as components required for the mounting of the PV support structures, construction of the on-site facility substation and site preparation.
Erect PV panels, construct substation, invertors, and BESS,	• For array installations, vertical support posts will be driven into the ground. The posts will hold the support structures on which the PV panels would be mounted. Brackets will attach the PV modules to the tables. The foundations of the inverter enclosures and transformers will

and connect PV arrays to the substation	be prepared. Wire harnesses will connect the PV panels to the electrical collection systems. Underground cables and overhead circuits will connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure, and ultimately the on-site facility substation. This process also involves the installation of the BESS. The following sequence is conducted for the construction of a substation: ◦ Conduct geotechnical investigation to determine founding conditions. ◦ Conduct a site survey. ◦ Establish the work zone. This includes placing fencing around the site. ◦ Prepare the substation site. This includes vegetation clearance, construction of access roads, site grading and levelling. ◦ Excavate and lay the foundations. ◦ Install the grounding grid. ◦ Build the command building. ◦ Backfill the foundations and substation yard. ◦ Assemble the steel structures. ◦ Install the electrical equipment. ◦ Rehabilitate the disturbed area. ◦ Testing and commissioning of substation. • The PV arrays will connect to the substation via low and medium voltage electrical cables, to be placed underground where feasible.
Establish ancillary infrastructure	• An Operations and Maintenance building, offices, warehouse/workshop and storage area will be required. The establishment of this infrastructure will require vegetation clearance, levelling, and excavation of foundation prior to construction.
Undertake Site Rehabilitation	• Commence with rehabilitation efforts once construction is completed, and all construction equipment is removed. • Access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.
OPERATION	
Procurement and employment	• The construction phase employment opportunities are long-term. However, there are instances where short-term contract opportunities are anticipated. • The operation phase is approximately 35 years with 60 workers (approximately) on site at peak (i.e., not at all times). This includes high skilled, medium skilled, and low skilled workers. • Operation period (60 at peak) employment opportunities: ◦ high skilled workers - 4 ◦ medium skilled workers – 12 ◦ low skilled workers – 46 • Employees that can be sourced from the local municipal area include the low skilled and medium-skilled personnel (such as safety and security staff and certain maintenance crew). Highly skilled personnel may include those recruited from outside the local area where these resources are not available within the area.
Operation and Maintenance	• Full time security, monitoring and maintenance.
DECOMMISSIONING	
Requirements	• Decommissioning the facility at the end of its economic life. • Potential for repowering of the facilities, depending on the condition of the facilities at the time and economic factors.

	• Decommissioning activities to comply with the legislation relevant at the time.
Site preparation	• Confirming the integrity of the access to the site to accommodate the required decommissioning equipment. • Mobilisation of construction equipment.
Disassembly and removal of existing components	• Components to be reused, recycled, or disposed of in accordance with regulatory requirements. • Concrete will be removed and will be covered with soil to a depth sufficient for the re-growth of natural vegetation.
Components to be disposed of or recycled	• Foundation • PV panels • Wire and steel • Any other component of the facility that may not be readily resold or recycled.

5. LEGISLATIVE AND POLICY CONTEXT

Environmental Legislation in South Africa was promulgated with the aim of, at the very least, minimising, and at the most, preventing environmental degradation. The following Policies, Acts and Regulations are applicable to the proposed project:

5.1 National Policy Framework Governing Renewable Energy

Several policies have been developed with the aim of diversifying the electricity generation mix for South Africa, these include:

- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- Renewable Energy White Paper (2003); and
- National Climate Change Response Policy White Paper (2011) / National Climate Change Bill, 2018.

The 2019 National IRP (DMRE, 2019) sets out targets for energy generation from renewable sources. The majority of the additional energy targets set by the IRP will be from renewable sources. The IRP envisions an additional 14 400 MW of power being produced from wind, 6 000MW from PV solar plants, 3 000MW from gas, 2 500MW from hydropower and an additional 1 500MW from coal by 2030. This translates to approximately 15-18% of the country's energy needs being serviced through wind energy by 2030.

The renewable energy targets are acquired through a competitive tendering process called the REIPPPP run by the DMRE. The success of this programme has been internationally recognised, with the United Nations Environment Programme (UNEP) 2014 Report placing South Africa among the top-10 countries in respect to renewable energy investment. The proposed projects align thus with South Africa's national policy direction and contributes to the country being able to meet some of its international climate change obligations. South Africa is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, as well as the recent Convention of the Parties (COP) 21 in Paris 2015, which led to the Paris Agreement which sets the current targets and commitments for the international community with regards climate change.

Recent developments such as the amendment of Schedule 2 of the Electricity Regulation Act (Act 4 of 2006) to extend the limit over which a private power project must apply for a Generation Licence from 1MW to 150MW, and potential streamlining of certain Regulatory requirements, which includes reducing the Regulatory requirements for solar projects in

areas of low and medium environmental sensitivity, also supports new generation capacity of renewable energy at a national level.

5.2 National, Provincial and Municipal Planning Context

The integration of renewable energy is proving to be a solution to power supply constraints and decarbonisation through reduction of the reliance on the combustion of fossil fuels which is the major contributor to Greenhouse Gas (GHG) emissions. Power generation from renewable energy sources provides the country, which is confronting new electricity supply challenges, with a reliable, affordable, and clean energy supply. The renewable energy industry has substantial support in the South African planning context which is detailed in the following national and provincial plans:

- National
  - 2030 National Development Plan (NDP);
  - National Integrated Energy Plan (2016);
  - National IRP for Electricity (2010-2013) and successor, IRP 2019;
  - National Infrastructure Plan;
  - The Department of Environmental Affairs (DEA) Strategic Environmental Assessment (SEA) for the roll-out of large-scale wind and solar development which identifies strategic Renewable Energy Development Zones (REDZs) Phase 1 and 2; and
  - The DEA National Electricity Grid Infrastructure SEA which identifies the strategic Transmission Corridors linked with the REDZ.
- Provincial
  - Limpopo Green Economy Plan (LGEP, 2013);
  - Limpopo Employment Growth and Development Plan (LEGDP) 2009-2014;
  - Limpopo Spatial Development Framework (SDF) (2022); and
  - Subdivision of Agricultural Land Act (Act 70 of 1970).

The LGEP (2013) has proposed that *"the attention of the leadership and citizenry of the province is focused on the Green Economy, as the opportunity for successful accomplishment of the"* LEGDP 2009-2014 objectives.

According to the LGEP (2013), the Limpopo Province has been identified *"as a Climate Change "hot-spot" - building resilient comm unities through green economy thinking, planning and implementation"* in response to the challenges faced.

In terms of future socio-economic development goals, the 2021-22 Integrated Development Plans () of the local municipalities and district are most instructive. The projects fall within the Sekhukhune District Municipality (SDM) and generally align with municipal planning, as detailed in the:

- SDM Draft Integrated Development Plan (IDP) 2023-2024;
- SDM Development Model (One Plan/DDM) 2021/2022;
- SDM SDF (2018); and
- FTLM IDP Revision 2021-2022.

The FTLM IDP (2021-2022) has committed to provide efficient integrated services, radical socio-economic transformation, industrialisation and enabling environment through partnerships for a sustainable development. It highlights the following objectives or mission:

- Accountable through active community participation;
- Economic enhancement to fight poverty, inequality, and unemployment;
- Render accessible, sustainable, and affordable service;
- Municipal transformation and institutional development; and
- Sustainable livelihoods through environmental management.

At the district level, the SDM IDP sets the following strategic objectives:

- Provision of a democratic and accountable government;
- Promotion of inclusive and egalitarian economic transformation;
- Promotion of a safe and healthy environment;
- Fostering of community involvement and stakeholder engagement;
- Strengthening institutional capacity; and
- Promotion of social cohesion.

The proposed Phula PV project is in line with national, provincial and local development plans as it introduces economic development which will:

- create employment opportunities;
- provide additional reliable energy supply;
- reduce GHG emissions;
- create reliable health care infrastructure;
- provide socio-economic development; and
- set a precedent for green energy projects for electricity generation.

5.3 Overview of Relevant Legislation

Table 5-1 provides an overview of the environmental legislation applicable to this proposed Phula PV project. Where deemed necessary, pertinent environmental legislation is further elaborated on in the subsequent sections.

Table 5-1: Summary of relevant environmental legislation applicable to this project

LEGISLATION	COMPETENT AUTHORITY / ORGAN OF STATE	SUMMARY OF RELEVANCE
Constitution of the Republic of South Africa (1996)	The President and National Executive	The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right – a) to an environment that is not harmful to their health or well-being; and 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; and iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.
National Energy Act (Act 34 of 2008)	DMRE	The aim of the National Energy Act is *"to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking*

LEGISLATION	COMPETENT AUTHORITY / ORGAN OF STATE	SUMMARY OF RELEVANCE
		into account environmental management requirements and interactions amongst economic sectors".
National Environmental Management Act (Act 107 of 1998) (NEMA)	DFFE	The NEMA provides the framework for environmental decision-making predominantly though the EIA Regulations (GN No. 362 in the Government Gazette of 8 December 2014, as amended) which serve as the instrument through which development decisions can be made. Specifically, for those developments which trigger certain 'listed activities' identified in GN 327, 325 and 324 (as amended June 2021), that are considered to have potentially detrimental impacts on the environment. Several listed activities (detailed in **Table 5-2**) are triggered by the proposed project and a EA must therefore be sought via a Scoping and Environmental Impact Report (S&EIR) process as per the requirements of the EIA Regulations (GN 326 of 2017, as amended in 2021). This Act also sets out various principles that will be adopted in the S&EIR process e.g., the precautionary principle, duty of care, and polluter pays principle.
National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM:AQA)	SDM	This Act aims to regulate and protect the environment, by "*providing reasonable measures for the prevention of air pollution and ecological degradation, and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto*". Specific to the project are the Regulations pertaining to the control of fugitive noise and dust emissions that may arise from the project activities.
National Environmental Management Waste Act (Act 59 of 2008) (NEM:WA)	FTLM, DFFE	A list of waste management activities that have or are likely to have a detrimental effect on the environment have been published in terms of this Act in GN 921 of 2013. Should any listed activities be triggered, a BA or EIA is required to be undertaken for identified listed activities in support of an application for Waste Management Licences. The proposed project does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921. However, general and hazardous waste should be managed in terms of this act.
National Dust Control Regulations (GN 827 of 2013) (NDCR)	SDM	During construction, there will be localised liberation of dust due to excavations and the hauling of materials around the site. The NDCR prescribes general measures for the control of dust in all areas.
Occupational Health and Safety Act (Act 85 of 1993)	Department of Labour	Provides for the health and safety of persons at work as well as of those persons connected with the use of plant and machinery. Protects persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work and establishes an advisory council for occupational health and safety. Establishes inspection services, and grants powers to inspectors to investigate and obtain information.
National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA)	DFFE/ LEDET	This Act aims for the management of all biodiversity within South Africa. The 2007 Threatened or Protected Species Regulations (GN R150, as amended) provides protection through a permit system as well as through the identification of restricted activities. If required, the relevant permits will be applied for. The Act also provides for duty of care with regards to control of alien species and provides a list of threatened or protected ecosystems and species in one of the following four categories: critically endangered (CR), endangered (EN), vulnerable (VN), protected (species only), and least threatened (LT). A terrestrial ecologist and avifaunal specialist have assessed the impact of the proposed development on the natural biodiversity of the area and address concerns in this regard (see **Section 10** of this report).

LEGISLATION	COMPETENT AUTHORITY / ORGAN OF STATE	SUMMARY OF RELEVANCE
Limpopo Environmental Management Act (Act 7 of 2003)	LEDET	This Act makes provision for the protection and conservation of the environment in the Limpopo Province. It regulates the utilisation of wildlife, as well as the protection of the environment as a whole. It makes provision for a wide variety of matters regarding the environment including protected areas; hunting of wild and exotic animals; the establishment of Wildlife Councils; inland fishing and the protection and aquatic systems; the protection of indigenous plants; the application of CITES; restrictions on development and environmental impact reports; declaration and protection of mountain catchment areas; environmental pollution; and the protection of biodiversity in general.
National Forests Act (Act 84 of 1998), as amended (NFA)	DFFE	There are 47 protected tree species in terms of the NFA that may not be cut, destroyed, damaged or removed unless a permit has been granted by the DFFE. A terrestrial ecologist specialist has assessed the impact of the proposed development on the natural biodiversity of the area and address concerns in this regard (see **Section 10** of this report).
National Heritage Resources Act (Act 25 of 1999) (NHRA)	South African Heritage Resource Agency (SAHRA) and Limpopo Heritage Resources Authority (LIHRA)	In terms of Section 38 of the NHRA, any person who intends to undertake *"any development … which will change the character of a site exceeding 5,000 square metres (m^2) in extent", "the construction of a road powerline, or pipeline…exceeding 300 m in length"* must at the very earliest stages of initiating the development notify the responsible heritage resources authority, SAHRA or the relevant provincial heritage agency, of the proposed development. An archaeological and palaeontological specialist have assessed the impacts of the proposed development relating to the heritage resource (see **Section 10** of this report).
National Water Act (Act 36 of 1998) (NWA)	Department of Water and Sanitation (DWS)	Section 21 of the NWA recognises and defines water uses that require the approval of DWS in the form of a GA or WUL. There are restrictions on the extent and scale of identified activities, determined through the DWS risk assessment matrix, for which GAs apply. There are watercourses that transverse the proposed project site. Triggered water use activities in terms of Section 21 of the NWA may include the following in terms of Section 21 of the Act: (a) Taking water from a water resource (c) Impeding or diverting flows when construction occurs within a watercourse or within the regulated area of a watercourse (500 m of a wetland or 100m from a river). (i) Alteration of the bed or banks of a watercourse of any activities within 500 m of a wetland. The information in the watercourse assessment report must be used in support of any WUL or GA Applications. Consultation with DWS will inform and confirm the exact water uses applicable to the proposed development.
National Road Traffic Act (Act 93 of 1996) (NRTA)	Road Agency Limpopo (RAL)	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. Due to the large size of many of the facility's components will need to be transported via "abnormal loads". Staff will also have to be transported to the site on a daily basis. Access to the site will be via existing roads. South African National Roads Agency SOC Ltd (SANRAL) and the RAL will be provided with an opportunity to comment on the environmental application.
Civil Aviation Act (Act 13 of 2009) (CAA)	South African Civil Aviation Authority (SACAA)	The CAA provides for the control and regulation of aviation within South Africa. It provides additional measures directed at more effective control of the safety and security of aircrafts, airports and the like, and provide for establishment of SACAA with safety and security oversight functions. A visual specialist has assessed the visual impact of the proposed development and provided input with regards to visual intrusion associated with the development (see **Section 10** of this report).

LEGISLATION	COMPETENT AUTHORITY / ORGAN OF STATE	SUMMARY OF RELEVANCE
Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA)	DMRE	In terms of Section 53 of the MPRDA, any person who intends to use the surface of any land in a manner which may be contrary to the objects of the MPRDA or is likely to impede such objects, must apply to the Minister for approval in the prescribed manner. The surrounding area of the project site is dominated by mining, hence the DMRE will be provided with an opportunity to comment on the environmental application.
Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)	Department of Agriculture, Land Reform and Rural Development	Implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas is provided for in the CARA. A terrestrial ecologist specialist has assessed the impact of the proposed development on the natural biodiversity of the area and addressed concerns in this regard (see **Section 10** of this report).
Major Hazard Installation Regulations (Occupational Health and Safety Act, Act 85 of 1993)	Department of Health	The Regulations require all new facilities that will have hazardous materials on site to conduct a risk assessment to indicate their potential to cause major hazardous events. The BESS associated with the Phula PV facility is not listed as Major Hazardous Installation in terms of the regulations.

5.4 The National Environmental Management Act

The NEMA can be regarded as the most important general environmental legislation and environmental decision-making framework in South Africa. This includes the provision of the EIA Regulations (GNR 326, as amended) which serve as an instrument through which development-related decisions are made. In addition, the NEMA provides a framework for environmental law reform and covers three areas, namely:

- Land, planning and development;
- Natural and cultural resources, use and conservation; and
- Pollution control and waste management.

The EIA Regulations are specifically for developments that may trigger listed activities as stipulated in GNR 327, GNR 325 and GNR 324, as amended, which may result in negative impacts on the environment.

5.4.1 EIA Regulations

A S&EIA process is applicable to projects likely to result in significant environmental impacts due to their nature or extent, or activities associated with potentially high levels of environmental degradation, or activities for which the impacts cannot be easily predicted. In comparison, a BA process is undertaken for projects that may result in a lower significant impact or impacts that can easily be mitigated.

The difference between the S&EIA and BA processes relates to the nature of the proposed development in terms of its potential impact on the environment. This is reflected in the level of detail that information is collected in, and the level of interaction with Interested and Affected Parties (I&APs).

This report fulfils the requirements in terms of the EIA Regulations Section 24(5), as prescribed by the NEMA. The proposed Phula PV project triggers listed activities in terms of GNR 324, 325 and 327. Therefore, the proposed project is subjected to a S&EIA process. The list of triggered activities is provided in **Table 5-2** below.

Table 5-2: Triggered EIA listed activities in terms of the 2017 NEMA: EIA Regulations (as amended).

ACTIVITY NO(S):	DESCRIPTION OF LISTED ACTIVITY AS PER EIA REGULATIONS, 2014 AS AMENDED	DESCRIPTION OF THE PORTION OF THE PROPOSED PROJECT TO WHICH THE APPLICABLE LISTED ACTIVITY RELATES.
BASIC ASSESSMENT ACTIVITIES AS SET OUT IN LISTING NOTICE 1		
11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity— outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	A 33/132kV on-site substation is required for the proposed solar PV facility which is located outside of an urban area.
12(ii)(c)	The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	The proposed development area exceeds 100m^2 (~184.36 ha) and is located within the 32m from the edge of the non-perennial watercourses.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;	The proposed development will require the infilling or depositing, or removal of more than 10 cubic meters of material from non-perennial watercourses.
28(ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	The proposed development is considered light industrial area development and will be constructed on land previously used for agriculture and is located outside an urban area.
SCOPING & EIA ACTIVITIES AS SET OUT IN LISTING NOTICE 2		
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs: (a) within an urban area; or (b) on existing infrastructure.	Development of the proposed solar PV facility with electricity output of up to 130MW is located outside of an urban area, and not on existing infrastructure.
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for - (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan	The proposed development will result in the clearance of more than 20 ha of indigenous vegetation (~184.36 ha).

ACTIVITY NO(S):	DESCRIPTION OF LISTED ACTIVITY AS PER EIA REGULATIONS, 2014 AS AMENDED	DESCRIPTION OF THE PORTION OF THE PROPOSED PROJECT TO WHICH THE APPLICABLE LISTED ACTIVITY RELATES.
BASIC ASSESSMENT ACTIVITY(IES) AS SET OUT IN LISTING NOTICE 3		
4(e)(i) (ee)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. e. Limpopo i. Outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	Access roads of up to 6m wide and internal distribution roads of up to 5m wide is proposed. The proposed site is situated outside an urban within a Critical Biodiversity Area 1 (CBA 1)
12(e)(i)(ii)	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 (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) Within critical biodiversity areas identified in bioregional plans; or (iii) On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning	The proposed development will result in clearance of more than 300m^2 of indigenous vegetation. The proposed development area is situated within a Critical Biodiversity Area 1 (CBA 1) and an endangered ecosystem listed in terms of the NEM:BA List of Threatened Ecosystems (2022).
14(c)(e)(i) (ff)	The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. e. Limpopo i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The proposed development exceeds 10m^2 and is situated outside an urban area within a CBA 1 (Limpopo Conservation Plan V2). Additionally, the site is situated within the 32m buffer from the edge of the non-perennial watercourse.

5.4.2 DFFE Screening Tool

The DFFE requires that the Environmental Screening Tool, as per GNR 960 promulgated on 05 July 2019 and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended) is utilised prior to undertaking an application for an EA. The report generated by the tool must be submitted with the EA application. The tool is a geographically based web-enabled application which allows an applicant intending to submit an application for an EA to pre-screen the proposed site for any environmental sensitivities.

The Screening Tool also provides site-specific EIA processes and review information. For example, the tool may identify if an industrial development zone, minimum information requirements, Environmental Management Framework (EMF), or bio-regional plans apply to a specific area.

Some of these documents can then be accessed through the Screening Tool via links for consideration during the pre-screening phase. Further to this, the Screening Tool identifies related exclusions and/or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site.

The Screening Tool report (**Appendix D-11**) for this proposed project is included in the EIA Application Form.

Table 5-3 provides a summary of the specialist assessments identified in terms of the screening tool, best practice principles and responses to each assessment from the project team. The assessment has been undertaken by the specialists (See **Appendix D**).

Table 5-3: Specialist Assessment Themes identified for Phula PV project

SPECIALIST ASSESSMENT IDENTIFIED	SENSITIVITY RATING	CONFIRMATION OF SENSITIVITY RATING	RESPONSE TO IDENTIFIED SPECIALIST ASSESSMENTS	DETAILS OF SPECIALIST
Agricultural	High	**Confirmed:** the study found significant disturbance to the soils in the form of water erosion, quarrying and development activities. In addition, large sections of the site have a very high number of stones and rocks that would prohibit agricultural use.	A Soil and land capability Assessment was undertaken as required in accordance with GN 320 (2020) and other relevant protocols	Konrad Kruger of J&W
Landscape (Solar PV)	Very High	**Disputed**: The viewshed of the site is relatively small due to the mountainous landscape	A Visual Impact Assessment was undertaken as required in accordance with GN 320 (2020) and other relevant protocols	
Archaeological	High	**Disputed**: six (6) heritage resources were identified. However, were observed in secondary contexts and were rated as having low/no heritage significance.	Heritage & Palaeontology Impact Assessment was undertaken as required in accordance with GN 320 (2020) and other relevant protocols.	Wouter Fourie of PGS
Palaeontological	Medium	**Disputed**: The proposed development areas rated as low and Insignificant/Zero in terms of the SAHRIS Palaeosensitivity Map which does not require any further palaeontological studies		

SPECIALIST ASSESSMENT IDENTIFIED	SENSITIVITY RATING	CONFIRMATION OF SENSITIVITY RATING	RESPONSE TO IDENTIFIED SPECIALIST ASSESSMENTS	DETAILS OF SPECIALIST
Terrestrial Biodiversity	Very High	**Disputed**: the proposed site is situated within CBA 1 and consist of medium sensitivity habitant areas, ridge and slope, and Sensitive drainage lines areas. Majority of the site was determined to be of low sensitivity overall.	Terrestrial Biodiversity Impact Assessment was undertaken as required in accordance with GN 320 (2020) and other relevant protocols.	Reuhl Lombard of MENCO
Aquatic Biodiversity	Very High	**Confirmed:** Five (5) watercourses which were classified as non-perennial rivers, with seasonal to intermittent flow (and some with weakly defined riparian zones), were identified within the proposed project site of the Phula PV project. The PES of the non-perennial rivers ranged from Largely Natural to Moderately Modified and all had a High IS (excluding non-perennial river 5).	A Watercourse, and Aquatic Biodiversity Impact Assessments were undertaken as required in accordance with GN 320 (2020) and other relevant protocols	Aquatic Ecology - Reuhl Lombard of MENCO Watercourse Assessment - Kathy Taggart/Sashin Pillay of J&W
Avifauna	Low	**Confirmed:** Of the 116 species recoded on site, two are regionally red-listed: the Martial Eagle is listed as endangered, and the Lanner Falcon as vulnerable. Habitant destruction and disturbance on Martial Eagle and Lanner Falcon was rated as of Low risk.	Avifauna Impact Assessment was undertaken as required in accordance with GN 320 (2020) and other relevant protocols.	Low de Vries of Volant Environmental
Civil Aviation	Low	N/A	There are no major or other types of civil aviation aerodromes. The CAA will be consulted in the S&EIA process should any further studies be required	N/A
Defence	Low	N/A	No military / defence sites in close proximity to the project site	N/A
RFI	Medium	N/A	Parties responsible for operation of the telecommunication tower south-east of project will be included as stakeholders in the PPP	N/A
Geotechnical	N/A	N/A	A desktop Geotechnical Survey has been undertaken. A detailed Geotechnical survey will be undertaken prior to construction which will be informed by infrastructure micro-siting/detailed design and finalisation of the EMPr, which is only completed once preferred bidder status has been obtained.	Richard Puchner of J&W
Socio-Economic	N/A	N/A	A Socio-economic Impact Assessment was undertaken for the facility	Ingrid Snyman of Batho Earth

SPECIALIST ASSESSMENT IDENTIFIED	SENSITIVITY RATING	CONFIRMATION OF SENSITIVITY RATING	RESPONSE TO IDENTIFIED SPECIALIST ASSESSMENTS	DETAILS OF SPECIALIST
Plant Species	Medium	**Confirmed**: High level of plant endemism and several flagged SCCs occurs on-site.	The site was determined to be of medium sensitivity for several SCCs during the scoping, and the field assessment of the area. Sensitive habitats that need to be protected were identified. However, the majority of the site was determined to be of low sensitivity overall. A Terrestrial Biodiversity Assessment in terms of GNR 320 of March 2020 was undertaken and report appended in **Appendix D1.**	Reuhl Lombard of MENCO
Animal Species	High			

5.5 National Heritage Resources Act (Act 25 of 1999) (NHRA)

In terms of the NHRA, any person who intends to undertake "*any development … which will change the character of a site exceeding 5,000 m^2 in extent", and/or "the construction of a road…powerline, or pipeline…exceeding 300 m in length*" must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely SAHRA or the relevant provincial heritage agency.

If heritage resources are identified, licences, etc., may be required to salvage and curate these. In certain instances, heritage resources are only recorded and may then be destroyed once a licence has been granted.

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

This Act aims for the management and conservation of South Africa's biodiversity within the NEMA framework, and the protection of species and ecosystems that warrant national protection. The 2007 Threatened or Protected Species Regulations (GNR 150, as amended) provides protection through a permit system as well as through the identification of restricted activities. If required, the relevant permits will be applied for. As part of the NEMBA implementation strategy, the National Spatial Biodiversity Assessment was developed. The Act also provides for duty of care with regards to control of alien species and provides a listing of threatened or protected ecosystems and species in one of the following four categories: critically endangered (CR), endangered (EN), vulnerable (VU), protected (species only), and least threatened (LT).

6. NEED AND DESIRABILITY

The extensive and rapid roll-out of renewable energy in South Africa is a key economic policy imperative in line with international policy trends, the NDP and IRP. South Africa is currently faced with a considerable shortage of electricity in terms of availability and stability of electricity supply. This has had its toll on industries that are electricity intensive and has prompted these industries to consider change in their reliance on state-provided electricity. South Africa has been experiencing blackouts over the past ~ 15 years. As it currently stands, South Africa is faced with an electricity shortage of up to 6 000 MW and a combination of factors have forced the national power utility, Eskom, to implement load shedding. In July 2022, the President of South Africa announced a plan to address the energy crisis in South Africa and outlined five (5) key interventions:

- Fix Eskom's coal-fired power stations and improve the availability of existing supply;

- Enable and accelerate private investment in generation capacity;
- Accelerate procurement of new capacity from renewables, gas and battery storage;
- Unleash businesses and households to invest in rooftop solar; and
- Fundamentally transform the electricity sector to achieve long-term energy security.

The need for alternative renewable energy sources for electricity has become very apparent in the local and international context. South Africa has a high level of renewable energy potential and with load shedding significantly impacting country's economy, a target set by the government to deploy 11.8 GW of large-scale renewable energy capacity by 2030 is driving market interest for investors, independent power producers (IPP) and international energy companies. This is to ensure the continued uninterrupted supply of electricity.

The South African efforts to pivot to renewable energy will not only ensure reliable, uninterrupted supply of electricity but also help the country's commitment to the net-zero emission target by moving away from coal energy supply. 90% of South Africa's electricity in 2019 was from coal making it Africa's biggest GHG emitter. South Africa has set a net-zero carbon emissions target by 2050 and pioneering a "just transition" deal with developed countries to ease the pain for regions that are economically reliant on coal.

The project would be closely aligned with country development and has the potential to contribute to greater energy supply stability and security to the benefit of local and regional electricity consumers as well as the global net-zero targets. The overall need and desirability of the proposed development, in the context of developing renewable energy generation in South Africa and globally, is considered. In summary renewable energy is desirable as it:

- Creates a more sustainable economy by promoting South Africa's energy policy towards energy diversification.
- South Africa is in the midst of becoming a major exporter of green energy which has the potential to drive industrialisation and establish a new industrial era. Through development of green energy, existing industries can be rapidly decarbonised and the potential to attract industrial development from around the globe is established.
- Reduces the demand on scarce resources indirectly, such as water, by promoting energy generating facilities which are less resource intensive.
- Assists in meeting international commitments to carbon emission targets in line with global climate change commitments.
- Reduces pollution indirectly by using 'cleaner' energy generating mechanisms and reducing the demand on carbon-based fuels.
- Promotes local economic development by creating jobs and promoting skills development.
- Enhances energy security by diversifying generation.
- Enables promotion of the green economy from both an international and national perspective as follows:
    - The Paris Agreement provides a recognised framework of commitments for countries to reduce their emissions and to adapt to the global impacts of climate change. Implementation of the Agreement establishes a global shift towards net-zero emissions development and achievement of the Sustainable Development Goals. Development of green energies, such as those associated with the proposed development, will be essential to meeting the goals of the Paris Agreement, since there are certain portions of the economy whose emissions are difficult to eliminate such as transportation, electricity generation and industry.

- From a national perspective, South Africa has abundant wind and solar resources with ample potential for utility scale wind and solar energy development.

At a more localised level, the SDM aims to improve its socio-economic conditions significantly in the short to medium term due to the challenges it currently faces. A number of these challenges related to addressing the needs of the community while planning for a sustainable future. The IDP indicates that the major challenges currently faced is the high level of poverty, and unemployment. The total number of unemployed people within SDM constitutes 28.17% of the total number of unemployed people in Limpopo Province. Only 4% of the 20 years or older age group in the district have higher education. In addition, the municipality faces a major challenge of old villages without electrification with 28 117 households needing to be electrified, 13 811 households need post connection tests. The only provider of electricity in the region is Eskom which has installed basic infrastructure to provide electricity to the communities. For most part, the rural population has no electricity.

The LGEP (2013) acknowledges that renewable energies, especially solar- and waste/biomass-to-energy initiatives will play an increasingly important role in addressing some of the socio-economic challenges in municipalities. It states that energy security is a major component in the implementation of the LGEP. The LGEP (2013) reveals that Limpopo Province has the potential to develop several tier renewable energy complexes as the province has favourable solar radiation, and abundant land to build concentrated solar plants with generation capacity of not less than 100MW.

In light of the above, the proposed Phula PV facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. This will, in turn, address some of the challenges currently faced. The proposed facility will create contractual and permanent employment opportunities during the construction and operational phases of the project. The proposed facility will help to address the need for increased electricity supply while also providing advanced skills transfer and training to the local and regional communities. The proposed project also addresses substantial economic growth within the FTLM and SDM.

The Applicant considers this area to be highly preferred for the development of a solar energy facility. The site selection and receptiveness are discussed in **Section 3.1.1**. Together with the abovementioned, the project will add value to the local area and to the province at large.

6.1 Need and desirability as per DEA Guideline

The ‘need and desirability’ of the project should be evaluated against the strategic context of the development proposal along with the broader societal needs and public interest. According to the DEA (now DFFE) Guideline on Need and Desirability (DEA, 2017), the concept of ‘need and desirability’ relates to the “nature, scale and location of the development being proposed, as well as the wise use of land”. The concept of ‘need and desirability’ can be explained in terms of the broader meaning of its two components, need primarily referring to ‘time’, and desirability to ‘place’. It is acknowledged that ‘need and desirability’ are interrelated and the two components should be considered in an integrated and holistic manner. The DEA Guideline (DEA, 2017) further states that the need and desirability of an activity should be evaluated against the principles of “promoting justifiable economic and social development" as well as the principles of “securing ecological sustainable development and use of natural resources" as set out in the Bill of Rights in the Constitution. **Table 6-1** outlines the need and desirability of the proposed project in line with the 2017 DEA and 2013 DEA&DP Guidelines.

Table 6-1: Need and desirability of the proposed project (based on the 2017 DEA and 2013 DEA&DP Guidelines)

CONSIDERATION	RESPONSE OR MOTIVATION
NEED	
Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority i.e., is the proposed development in line with the projects and programmes identified as priorities within the IDP?	Yes. Renewable energy projects have been prioritised in strategies at various municipal scales in the area. At a provincial level, the Limpopo Spatial Development Framework (LSDF) aims to promote social, economic and environmental sustainability throughout the province and to ensure that it has relevance to the development needs of all the dispersed urban and rural communities in the Limpopo Province. According to the FTLM IDP, local economy is driven by mining and agricultural activities, and the PV development will be used to supplement electricity requirements for the Tubatse Ferrochrome Smelter. The municipality together with other government sectors are busy with projects to expand the roads, ensuring that there is water to run the mines, sourcing electrical energy to supply the mine and community etc. The plan is set to focus on key economic areas of development anchored on co-ordinating public and private investment in flagship projects focusing on economic drivers related to infrastructural development, small to medium enterprises; agricultural and agro-processing; mining and beneficiation; tourism and destination marketing; manufacturing and value addition; and the green economy in the municipality. The Municipal spatial vision is **"**to create a place of opportunities, in cooperation with the private sector, where the basic needs of all residents are met in a safe, healthy and sustainable environment**".** The applicant has undertaken a detailed investigation of alternative means of meeting the general purpose and requirements of the Municipality. It is expected that the development will contribute to the needs of the local communities to varying extents. Furthermore, the use of the renewable energy for electricity generation is considered safe, healthy and sustainable development, hence in line with the Municipal vision.
Should development, or if applicable, expansion of the town/ area concerned in terms of this land use (associated with the activity being applied for) occur at this point in time?	Yes. The 2019 IRP supports a diverse energy mix and has indicated significant growth targets in terms of wind energy developments. The proposed project is in line with the District Municipality's strategic framework that focuses on investment in green energy sources that will stimulate secondary opportunities for economic growth. The proposed project aligns with national policy direction as well as contributing to South Africa being able to meet some of its international climate change obligations. At present South Africa's power supply is highly constrained. Any downtime (breakdowns or maintenance) may lead to the need for load shedding which has had significant adverse effects for the South African economy as well as the safety and wellbeing of its citizens. There is a strong need for new, low carbon energy generation capacity that can be quickly deployed and linked into the national grid (with wind and solar being suitable options). This strategy is evident in the 2019 IRP.
Does the community/ area need the activity and the associated land use concerned (is it a societal priority)?	Yes. The FTLM SDF and IDP makes mention of green energy opportunities as being one of its visions. Other District and Local Municipal planning documents i.e., SDFs and IDPs, make note of the economic growth and community benefits of green energy developments. The proposed project would also directly benefit the local community. Firstly, by providing a source of income to the landowner of the property on which the project is located and improving the economic viability of the landowner's current farming operations (i.e., mainly low-density grazing). Secondly, the proposed project would also create direct and indirect job opportunities (with associated skills development and transfer) for the community (at local, district/regional and provincial levels). Secondary economic benefits may include an increase in service amenities through an increase in contractors and associated demand for accommodation and other services. A percentage of the operational revenue of the project will be utilised

CONSIDERATION	RESPONSE OR MOTIVATION
	to support local socio-economic development initiatives, due to the requirements in this regard of the REIPPPP or similar procurement programmes. The local municipality will play a strong role in guiding how the funds are utilised, thus ensuring that relevant and pressing needs in the community will be addressed. The proposed development will contribute to South Africa's diversification of energy generation sources and will provide energy delivery with increased reliability and sustainability, contributing to a provincial and national need.
Are there necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Access to the site will be from existing roads in the area with new internal roads to be constructed as part of the development. The Applicant will meet with the local municipality to determine the availability of services (dependent of outcome of bidding or procurement programmes). Water will be sourced from existing boreholes that have been identified and surveyed. Multiple points of water extraction have been defined in the hydrogeological assessment report (Milnex CC, 2023: GEO408). Electrical services required for the construction of the project will be via existing Eskom lines, generators and/or on-site renewable energy installations (e.g., solar panels). Sewage and waste will most likely make use of municipal services. A binding agreement will be in place for services provision or alternatively construct services infrastructure and/or source local services providers to cater for the development
Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placements of services)?	Yes. Although the proposed project is not specifically mentioned in the municipal planning reports, reference is made to renewable energy generation projects and growing this sector within the SDM's jurisdiction. The economic and social benefits associated with employment of renewable energy development are noted in provincial, district and local municipal planning documents, and forms part of the Municipal strategies and policies to create a sustainable municipal area. The proposed development will have little bearing on the infrastructure planning of the municipality. Water will be sourced from existing boreholes. Existing boreholes have been identified and surveyed. Multiple points of water extraction have been defined. Electrical services required for the construction of the project will be via existing Eskom lines, generators and/or on-site renewable energy installations (e.g., solar panels). Sewage and waste will most likely make use of municipal services. Should any other municipal services be required, these will be confirmed and agreed with the municipality prior to commencing (dependant on outcome of bidding or procurement programme). Should the municipality be unable to provide the necessary services, then the applicant (or their appointed contractor) will be responsible for providing the necessary services to the site via use of private service providers.
Is this project part of a national programme to address an issue of national concern or importance?	The proposed development promotes the delivery of reliable and sustainable energy to the national grid and therefore contributes to resolving an issue of national concern. The proposed PV project will reduce reliance on Eskom and as a result alleviate residential, commercial, and industrial electricity supply constraints. The proposed project contributes towards meeting the national energy targets as set by the DMRE IRP while reducing reliance on burning of fossil fuel for electricity generation. The 2019 IRP developed by the DMRE for the 2010 to 2030 period aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*". The final IRP provides for an additional 20,409MW of renewable energy in the electricity mix in South Africa by 2030. Furthermore, the NDP proposes to create 11 million jobs and grow the economy at an average rate of 5.4 % per annum by 2030.

CONSIDERATION	RESPONSE OR MOTIVATION
	In respect of renewable energy, the NDP seeks to ensure that half of the new future generation capacity comes from renewable energy sources. It also recognises the importance of the transition to a low carbon economy. As such the NDP suggests the following (modified from Greening the South African Economy: Scoping the issues, challenges and opportunities, 2016, p. 199): • Supporting carbon budgeting. • Establishing an economy wide price for carbon by 2030 complemented by energy efficiency and demand management interventions. • Support a target of 5 million solar water heaters by 2030. • Implementing zero emission building standards that promote energy efficacy. • Simplifying regulatory regime to encourage renewable energy, regional hydroelectric initiatives and IPPs. • The project will also contribute toward South Africa's transition to low carbon economy and its commitments under the Paris Agreement.
Do location factors favour this land use (associated with the activity applied for) at this place?	Yes. The site is favourable. The site selection and receptiveness are discussed in **Section 3.1.1**. Baseline assessments have been undertaken by specialists as part of the Scoping Phase to allow for the design of appropriate layouts for the project which can be assessed in the EIR Phase. The design of appropriate layouts which avoid environmental sensitivities by the developer demonstrates due consideration of the mitigation hierarchy. Unacceptable locations within the site have been identified through these assessments and the layouts determined have been informed by the findings. Refer to **Section 8** for a description of the baseline environment and **Section 10** for potential impact assessment by the various specialists.
Considering the socioeconomic 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 socioeconomic initiatives (such as local economic development (LED) initiatives), or skills development programmes?	Yes. The project achieves a relatively high degree of compatibility with national strategic planning focused on energy development including of renewable energy. The project aligns with the SDM and FTLM SDF, which promotes the vision of renewable energy technology opportunities. The project also aligns with the FTLM SDF and Land Use Management Scheme objectives which is to promote and facilitate economic development. Considered as a whole, the relevant socio-economic development planning documents recognise the importance of integrated and diversified economic development that makes optimal use of each area's comparative advantages and creates economic opportunities. The concept of renewable energy projects and associated infrastructure are broadly supported provided that the environmental impacts and impacts on other land uses are acceptable.
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	The potential for the proposed developments to negatively impact on the natural, social and economic environments have been recognised. A number of investigative steps have been identified to ensure a good understanding of these potential impacts throughout the project's life cycle. The first step involved a screening exercise undertaken with specialists which resulted in proposed layouts for the proposed Phula PV project that minimised impact to sensitive features as far as possible. The S&EIA Phase have identified measures to minimise and reduce residual environmental or social impacts. These are outlined in the respective specialist studies attached in **Appendix D** and also informed the EMPr and generic substation EMPrs (**Appendix E**) recommended measures which will be applicable to the pre-construction, construction, operational and decommissioning phases of the proposed PV facility to ensure that an environmentally and socio-economically sustainable "cradle to grave" approach is implemented. The EMPrs will be managed and implemented as living documents, to allow the projects to adapt to and accommodate unforeseen environmental and/or social and/or political and/or economic changes and needs.

CONSIDERATION	RESPONSE OR MOTIVATION
What measures were taken to ensure the participation of all interested and affected parties? What measures were taken to 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?	The Public Participation Process required in terms of NEMA has been followed for the Scoping phase and will be undertaken for the EIA phase. Please refer to **Section 7.3** with details of the PPP undertaken to date and for the remainder of the process.
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.	Please refer to **Section 10.2** for information on anticipated potential cumulative impacts. According for the Socio-Economic Study (**Appendix E**) findings, the majority of negative impacts associated with the development are of a low to very low impact class once mitigation measures have been implemented. Employment opportunities in the operational phase of the project is likely to have a moderate (positive) impact on the local socio-economic environment.
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 for the proposed development alternative?)	Yes. As described above, the provincial, district and local strategic planning documents have identified the socio-economic and environmental benefits of the renewable energy developments and promotes investment in this project for growth and development. The proposed use of the natural resources of the area is therefore in line with these planning documents.
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)?	Stakeholder engagement is as an important aspect of sustainable development to ensure that adverse environmental impacts are appropriately addressed and do not result in discriminating distribution of these impacts. For this reason, the PPP has been expanded beyond what is legally required to enable the project team to better incorporate and communicate the views of the I&APs into the proposed development. Please refer to **Section 7.3** and **Appendix D**, which details the public engagement process. National government places significant emphasis on the local economic development initiatives which renewable energy project developers must commit to in their bids. This should ensure that only projects which have made significant commitments to this aspect will be selected as preferred bidders in the REIPPPP (or similar procurement programmes). The DMRE scorecard includes aspects such as job creation, local content, ownership, management control, preferential procurement, enterprise development and socioeconomic development. Among other things, the scorecard should ensure that project developers pay attention to: (1) Setting targets for how much local labour should be used based on the needs of the applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized. (2) Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment. (3) Exploring ways to enhance local community benefits with a focus on Broad-Based Black Economic Empowerment (B-BBEE) and preferential procurement. The following provisional mitigations are proposed in this regard: • The project must comply with the requirements of the REIPPPP (or similar procurement programmes) bidding process which will have stringent requirements with regard to socio-economic development, enterprise development, B-BBEE shareholding etc. • The applicant must establish a communications committee early on in the project to ensure regular feedback from stakeholders.

CONSIDERATION	RESPONSE OR MOTIVATION
	• Community development should be guided by a community needs analysis, drawn up by a third party and based on local socio-economic conditions, a review of planning documents such as the IDP, and discussions with local government and community representatives. Interventions should be planned in collaboration with other energy developers in the area where relevant. • Close liaison with local municipal managers, local councillors and other stakeholders involved in socioeconomic development is required to ensure that any projects are integrated into wider socio-economic development strategies and plans.
What measures were taken to 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?	The PPP required in terms of NEMA is being undertaken as described in **Section 7**. Please refer to **Section 7** and **Appendix D** with details the PPP undertaken to date and proposed for the remainder of the EIA process.
How was a risk-averse and cautious approach applied in terms of socio-economic impacts?	A comprehensive Socio-Economic Baseline and Impact Assessment is being undertaken as part of the EIA process, in addition to the PPP required in terms of NEMA. The specialist will apply the precautionary principle and gaps. noted will be discussed in the EIA. Mitigation measures for any socio-economic will be discussed under in the EIA and noted in detail in the EMPr.
DESIRABILITY	
Is the development the best practicable environmental option (BPEO) for this land/ site?	The dominant land use within the project site boundary is grazing by local community livestock. Although grazing is dominant within the project site on areas which are not earmarked for PV development, it is not considered an economically viable land use. Furthermore, the current state of broader project area and surrounding is mining activities which has far more significant residual impacts. The proposed project would ensure continuation of an economically viable land use as well as electricity supply in the area.
How will this development use and/or impact on non-renewable and renewable natural resources and the ecosystem of which they are part?	The screening process was undertaken in support of the mitigation hierarchy advocated in NEMA to avoid and minimise impacts as the most preferred approach to mitigation. This process and the outputs were collaborative and involved a large multi-disciplinary team of environmental specialists, the EAP, the project engineers and the developer, most of which have extensive knowledge of the area and experience in renewable energy assessments. The potential impacts identified during the Scoping Phase have been assessed and mitigation measures confirmed to further minimise the effect of potential negative impacts and enhance positive impacts to ensure an environmentally sensitive and sustainable project is taken forward (See **Section 10**)
Would the approval of this application compromise the integrity of the existing approved Municipal IDP and SDF as agreed to by the relevant authorities?	No. the proposed development aligns with the Municipal IDPs and SDFs which recognise the need for development through renewable energy and pursues economic development through renewable alternatives and promotion of energy efficiency. No fatal flaws or issues compromising IDPs and SDFs have been raised by municipal representatives to date.
Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g., as defined in Environmental Management Framework (EMF)), and if so, can it be justified in terms of sustainability considerations?	No. Currently there is no EMF adopted by the area. Impact Assessment has been undertaken with the specialists to identify environmentally sensitive areas and to exclude identified No-Go areas from the proposed development footprint (See **Section 10**).

CONSIDERATION	RESPONSE OR MOTIVATION
How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)?	A scoping phase was undertaken to identify sensitive No-Go areas and further assessed during the avoid and/or minimise development (within acceptable limits) within these areas. Two alternative development footprints were assessed, given the significant and unavoidable environmental impacts associated with development area. A mitigated alternative was developed together with inputs watercourse and biodiversity specialists to avoid certain sensitive areas and features as well as the associated buffers, where practically and feasibility possible (See **Section 3.3**). Information on potential impacts and mitigation measures related to natural and cultural areas are available in **Section 10**.
How will the development impact on people's health and wellbeing (e.g., in terms of noise, odours, visual character and sense of place, etc.)?	The project is situated in an area dominated by mining activities. It is therefore unlikely to cause a nuisance (noise, odours, visual impacts) to people. The socioeconomic specialist has considered impacts relating to the influx of workers into surrounding towns and communities during construction phase and the risks for local communities including increases in drug and alcohol use, unwanted pregnancies, prostitution, crime, HIV and TB risks, etc. The specialist is of the opinion that these will be of minor (negative) significance. Associated socio-economic impacts and mitigation measures to reduce the negative impacts are included in **Section 10** of this report and the EMPr.
How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage?	Visual specialists, a palaeontologist and an archaeologist has undertaken the impact assessment investigations. For more detail on potential impacts related to heritage resources and visual impacts, please refer to **Section 8.7** and reports attached in **Appendix D-5** and **Appendix D-6** respectively**.**
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 other planned developments in the area	Terrestrial Biodiversity, Watercourse assessment and Aquatic ecology and Avifauna specialist studies have been completed. The report findings are summarised in **Section 10**. Overall, it is important to consider that the additive cumulative impacts of the PV facility itself are less significant, considering the site is flagged for future mining endeavours which carry higher cumulative and residual impacts to the environment.
Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area	The specialist studies detailing any environmental fatal flaws which would significantly impact of the ecological integrity of the area have been undertaken (refer to **Appendix E**). The significance of the environmental impact identified is outlined on the specialist reports and summarised in **Section 10**.

7. EIA PROCESS APPROACH

7.1 Screening phase

The screening process is intended to achieve the following objectives:

(i) Identify environmental issues that need further study and/or any potential environmental fatal flaws of the proposed project;

(ii) Inform the developer of potential environmental issues that arise from the options identified and need to be addressed further;

(iii) Identify the most desirable options or alternatives for the project concepts from an environmental perspective;

(iv) Advise on any legal environmental requirements; and

(v) Provide recommendations on any further studies to be undertaken.

As part of the screening process, the DFFE environmental screening tool was used to generate a Screening Report, as per GNR 960 promulgated on 05 July 2019 and

Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended). **Table 5-3** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the projects under consideration. The screening tool report is included in **Appendix D-11.**

7.2 Scoping and EIA phase

The S&EIA process with regulated timeframes is illustrated in **Figure 7-1**.

7.2.1 Scoping phase

The Regulatory Scoping Phase and circulation of the CSR for public comment commenced simultaneously with the submission of the application for EA to the DFFE.

Following the project announcement in April 2023, the CSR was released for a 30-day public comment period in May 2023 together with the baseline specialist reports. Comments received during the public review period were consolidated into CRR and addressed in Final Scoping Report (FSR). The FSR was made available on the J&W website while being submitted to DFFE for decision making. The FSR and Plan of Study was accepted by DFFE on 04 August 2023 (see Appendix xx: DFFE Scoping Acceptance Letter).

7.2.2 EIA Phase

Following the acceptance of the FSR, the EAP commenced with the EIA Phase. In this phase the specialists commenced with their impact assessment reports (**Appendix D**). The specialist reports will be refined after the public review of this consultation EIAr, addressing any comments received, if any.

This EIAr together with EMPr and a generic substation EMPr were compiled with consideration of the specialist impact assessment findings. This EIAr was compiled in line with the Appendix 3 of the 2014 EIA Regulations, as amended. The EMPr and Generic EMPr reports are attached in **Appendix E**.

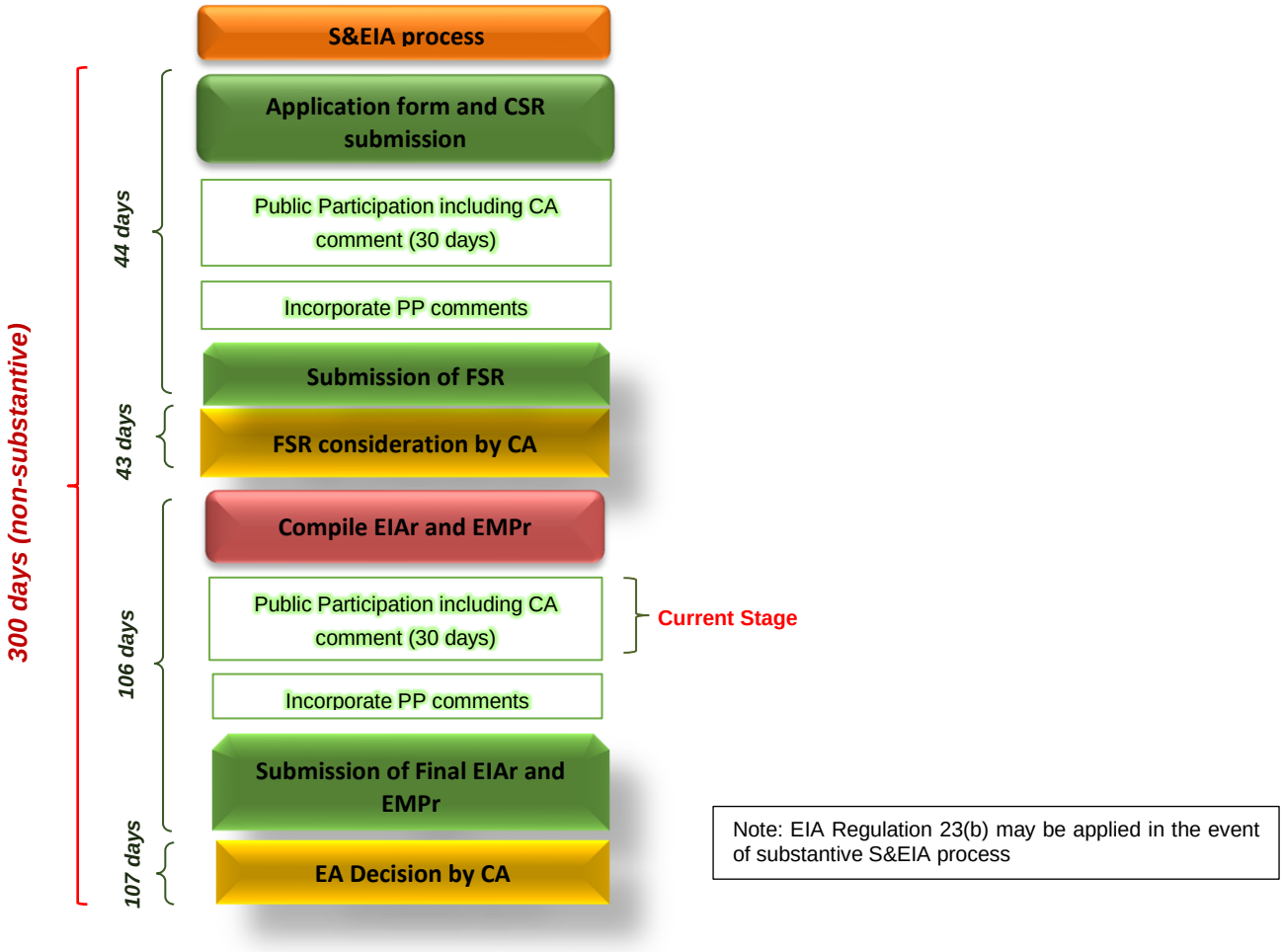


Figure 7-1: S&EIA process as per NEMA Regulations.

The EIA Phase for the proposed project aims to achieve the following:

- Provide a comprehensive assessment of the social and biophysical environments affected by the proposed phases put forward as part of the project (**Section 10**);
- Assess potentially significant impacts (direct, indirect, and cumulative (both positive and negative), where required) associated with all the phases of development (**Section 10**);
- Comparatively assess any alternatives put forward as part of the projects (**Section 10**);
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts (**Section 10**);
- Undertake a fully inclusive public participation process to ensure that I&APs are afforded the opportunity to comment on the proposed project, and that their issues and concerns are addressed and recorded for consideration in decision making (**Section 7**); and
- Provide the relevant CA with sufficient information to make an informed decision.

7.2.3 Decision-making and Appeal Period

The DFFE will make a decision on the project within 107-days (excluding public holidays) of submission of the Final EIAr (inclusive of the EMPrs). The EAP will notify all registered I&APs of the decision and their right to appeal the decision. The notification to registered

I&APs is required within 14 calendar days from the date of the decision. Subsequently I&APs will have a 20-day period from the date of notification of the decision to submit an appeal.

7.3 Public Participation Process

Section 1 of NEMA defines PPP in the context of EA as "*a process by which potential interested and affected parties are given opportunity to comment on, or raise issues relevant to, the application to ensure compliance with these regulations within the prescribed timeframe*". PPP is an iterative two-way process between the Applicant and the EAP, and the I&APs, whether these be individuals, organisations, or organs of state.

The 2014 EIA Regulations (as amended) prescribe minimum PPP requirements to be adhered to as part of an environmental process. The PPP planned as part of the environmental process for the proposed Phula PV project will comply with these requirements and carry out additional steps/tasks over and above the minimum requirements.

One of the additional steps/tasks undertaken during the screening process was to identify key stakeholder groups, source and verify their contact information (as best as possible) which included communications with, amongst others:

- Affected and adjacent landowners (where contact information was available);
- Occupants of the site;
- Relevant district and local municipalities, including ward councillors;
- Relevant national and provincial government departments;
- Relevant national and provincial parastatals and organisations;
- Key stakeholders in renewable energy projects in the area;
- Conservation groups; and
- Other organisations in the area.

The PP report with supporting documentation is included in **Appendix D** and is being updated as the project progresses.

7.3.1 Stakeholder Database

Throughout the process, the database of stakeholders is being kept updated with the most recent information as per the requirements of Regulation 42 of the NEMA: EIA Regulations, as amended. All comments and contributions from stakeholders are being recorded and kept and subsequently submitted together with the final reports to the authorities. The updating of the stakeholder database is predominately undertaken telephonically. The list of stakeholders identified to date is provided in the PP report in **Appendix D**.

7.3.2 Identification and contact with landowners (throughout the project)

As part of the process to identify stakeholders, landowners within the proposed project area and directly neighbouring the site have been identified. A dedicated person has been undertaking most of the consultation work with the landowners to ensure continuity and the building of good relationships. The comments gathered will be included in the CRR to be submitted with the final EIAr.

7.3.3 Public Participation undertaken to date

7.3.3.1 Announcement of the project and pre-application phase

The project was announced to the public by means of the following:

- Electronic distribution of the BID. The document was made available in English on 20 April 2023;
- Placement of English and one additional language (Sepedi) notices on an around the site on 19 April 2023; and
- Notification to landowners via hand delivery of BIDs on 20 April 2023.

7.3.3.2 Announcement of the availability of CSR for comment

The CSR was released for a 30-day public review period by means of the following:

- An advertisement (in English) was published in the *Steelburger News* on 11 May 2023;
- Notifications were compiled and distributed to all I&APs on the stakeholder database on 12 May 2023;
- The notification email with a direct link to access the published CSR for review and comment was sent to stakeholders on 12 May 2023;
- Placement of the CSR together with BID on the J&W website on 12 May 2023; and
- An electronic (USB) and hardcopy of the CSR was couriered to the Ecsal Truck Stop Security Office together with an onsite notice and comment sheets.

All comments received since the announcement of the project during the Scoping Phase are captured in a CRR. The CRR details a full record of issues raised, including responses on how the issues were considered during the scoping process and in finalising the FSR. The CRR will be updated with comments received as the process unfolds.

7.3.3.3 Final Scoping report (FSR) review

The FSR was made available for comment on the J&W website while being submitted to DFFE for decision making. The FSR was accepted on **04 August 2023** (See **Appendix F** with the acceptance letter). Notification of acceptance of the FSR was uploaded on the J&W website for public information.

7.3.3.4 Announcement of the availability of consultation EIAR/EMPrs

The availability of consultation EIAr (including EMPrs) for stakeholder comments will be announced to the public by means of the following:

- Advertisement in the local newspaper published in English in *Steelburger News* on 05 October 2023
- Electronic distribution of a notification letter;
- Bulk SMS;
- Placement of the notification and the consultation reports on J&W website; and
- Where stakeholders do not have access to electronic copies of the documents, a hard copy has been made available at the Escal Truck Stop, in Steelpoort

The EIR and EMPr has been made available for review from 10 October 2023 to 09 November 2023.

All comments received during the public review period will be captured in the CRR. The CRR will be updated continuously. The CRR, at the end of the process, will be presented

to the authorities and stakeholders together with the final reports as a full record of issues raised, and how the issues were addressed during the project.

7.3.4 Public notification of availability of the final reports

Stakeholder comments on the Consultation Reports are integrated into the final reports (including an updated CRR) which will be made available on the J&W website for information purposes, and submitted to the DFFE and other relevant authorities for their consideration. The availability of the final reports will be communicated to stakeholders via email notification and placed on J&W website.

7.3.5 Communicating the decision

Notification of the decision and its availability will be via email notification. The decision will be published on the J&W website and emailed where applicable to all stakeholders. Proof of notification will be available. Registered I&APs will be notified within the regulated 14 days from the date of the decision whereafter I&APs have a 20-day period from the date of notification to submit an appeal. As part of this notification, stakeholders will also be made aware of their right to appeal decisions.

8. DESCRIPTION OF THE RECEIVING ENVIRONMENT

Establishing the baseline environment is a key step in the environmental assessment process. This section covers the environmental baseline conditions which have been extracted from the specialists' reports, , and provides a description of the environment that may be affected by the proposed Phula PV facility. The summary is based on the individual specialist knowledge and experience working in the area, desktop investigations (including studies, EIAs and monitoring reports), data collection, field work undertaken as part of the specialist investigations as well as discussions with various role players, stakeholders and authorities. The specialist reports are included in **Appendix D.**

8.1 Climate

According to (Kleynhans *et al*., 2007), the Eastern Bankenveld (9.02) Ecoregion experiences a Mean Annual Precipitation of between 400 to 1000mm with the rainfall seasonality recorded to occur between early to mid-summer. Mean annual temperatures are recorded at 10ºC to 22ºC with minimum and maximum temperatures in summer ranging between 8ºC and 30ºC and minimum and maximum temperatures in winter ranging between 0ºC to 22ºC. The median annual simulated runoff for the quaternary catchment ranges between 20 to 150mm. **Figure 8-1** shows the climate data.

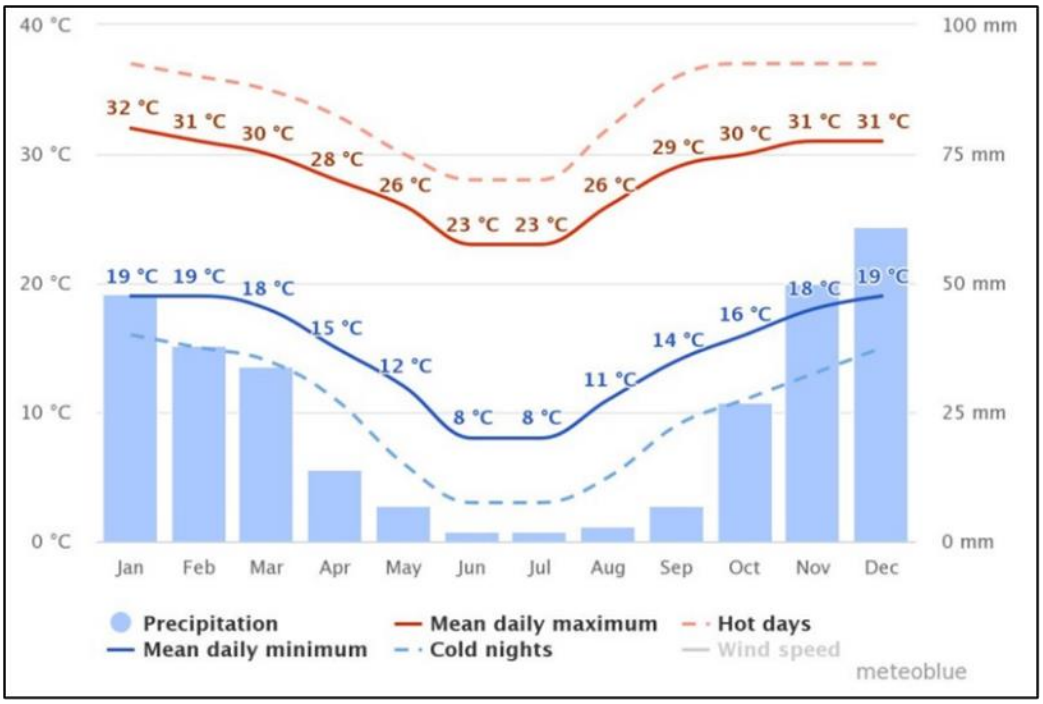


Figure 8-1: Climate data for project sourced from Meteoblue

8.2 Land Characteristics (land-use, geology, soils and land capability)

8.2.1 Current site land-use

The proposed site land use is dominated by grazing (Figure **8-3**). Cattle grazing will continue within the larger farm outside on the areas earmarked for development.

The land use of the study area consists of the following:

- Grazing
- Wilderness

- Waterways
- Disturbed areas
- Industrial areas and paved roads

The landowner also operates a truck stop on the western edge of the site, which is classified as industrial land in this assessment. The surrounding areas are mainly dominated by mining companies that mine platinum and chrome e.g., Lebowa Mine, Dwarsrivier etc. Servicing the mines are several lodges and guesthouses.

8.2.2 Topography

The proposed study area is located in the mountainous terrain south of the town of Steelpoort, within the Groot-Dwarsrivier valley. The terrain in the study area generally drains from east to west from the mountain ridge at 1300 mamsl to the lowest point on the western boundary at 940 mamsl (Figure **8-2**).

The site is located on the midslope terrain unit with several ephemeral drainage lines running through the site as well as one non-perennial stream, the Springkaanspruit, on the northwestern corner of the site.

The slope on site averages between 1 and 5 degrees, with the easternmost section going as steep as 25 degrees in the ridge (based on 20m contours).

A number of non-perennial erosional drainage gulley's, or dongas, run across the site, and originate largely within the site and the immediate surrounding area to the east. The gulley's flow predominantly from east to west, ultimately joining into a single non-perennial stream along the western boundary of the site. The deep erosional drainage gulley's are up to 5m deep as observed in the north-eastern portion of the site where the R577 intersect the site boundary. They are generally shallower moving across the site in a westerly direction. Shallower, large erosional scarring is present within the middle portion of the site. In some areas the gulleys and scarred areas appear to terminate on highly weathered bedrock (J&W, 2023: JW115/23/K135-03-Rev0).

8.2.3 Soils and land capability

Ridges and erosion sheets dominate the area with very few deep soil profiles remaining. The soil forms identified are shown in **Table 8-1** and illustrated in **Figure 8-4**. The project land capability sensitivity is outlined in Figure **8-6**. The soils have been grouped into four main groups including:

- Calcium carbonate soils
- Rocky soils
- Waterways
- Disturbed soils

Table 8-1: Soil forms identified on site

GROUP	FORM	TOPSOIL	SUBSOIL	SUBSOIL	DEPTH (CM)	AREA (HA)
Calcium Carbonate soils	Addo 1110	Orthic	Neocarbonate	Soft Carbonate	60-80	51.6
	Augrabies 1110	Orthic	Neocarbonate		80 - 120	17.5
	Bakwena 1000	Vertic	Soft Carbonate	Lithic	80	1.3

GROUP	FORM	TOPSOIL	SUBSOIL	SUBSOIL	DEPTH (CM)	AREA (HA)
	Brandvlei 1200	Orthic	Soft Carbonate		80	12.2
	Molopo 1100	Orthic	Yellow-brown Apedal	Soft Carbonate	60	26.5
	Olienhout 1200	Orthic	Soft Carbonate	Hard Carbonate	30	30.3
Rocky soils	Glenrosa 1110	Orthic	Lithic		10	20.4
	Mispah 1110	Orthic	Hard Rock		20	45.9
Waterways	Alluvial	Alluvial sand	Hard rock		0 - 10	8.2
	Stream	Non-perennial Water			0	1.1
Disturbed	Witbank 2100	Anthropogenic materials covering undisturbed natural soils			0	14.3
	Cullinan 1000	Large, exposed excavations without backfilling			0	3.8
	Erosion	Large erosion scars due to historical erosive events			10-15	21.1
	Grabouw 1000	Physically disturbed soil – some original horizons remain, but in a disturbed state			20	2.8
	Grabouw 3000	Physically degraded and disturbed due to water actions (water erosion caused by anthropogenic activities)			10 - 20	3
Total						**260**

In terms of the land capability, the site is made up of three main land capability classes (**Figure 8-5**), namely:

- Class III – light cultivation / grazing;
  - Land capability has severe limitations that reduce the choice of plants or require special conservation practices, or both. The limitations restrict the amount of clean cultivation, time of planting, tillage, harvesting and choice of crops. The limitations were:
    - Moderately steep slopes.
    - High susceptibility to water or wind erosion.
    - Very low permeability of the subsoil.
    - Shallow soil depth to bedrock or calcium carbonate hardpan that limit the rooting zone and the water storage.
    - Moderate climatic limitations.
- Class VI – moderate grazing;
  - Soils has severe limitations that make it generally unsuited to cultivation and limit its use largely to pasture and range, woodland or wildlife food and cover. This class has continuing limitations that cannot be corrected including:
    - Steep slope
    - Severe erosion hazard
    - Effects of past erosion
    - Stoniness

- Shallow rooting zone

- Class VII – rocky grazing/wilderness.
  - Soils have limitations that cannot be corrected; in this case very shallow rock, stoniness, very steep slopes and a shallow rooting zone constitute these limitations. Soils that have been disturbed by human activities have also been grouped into this class.

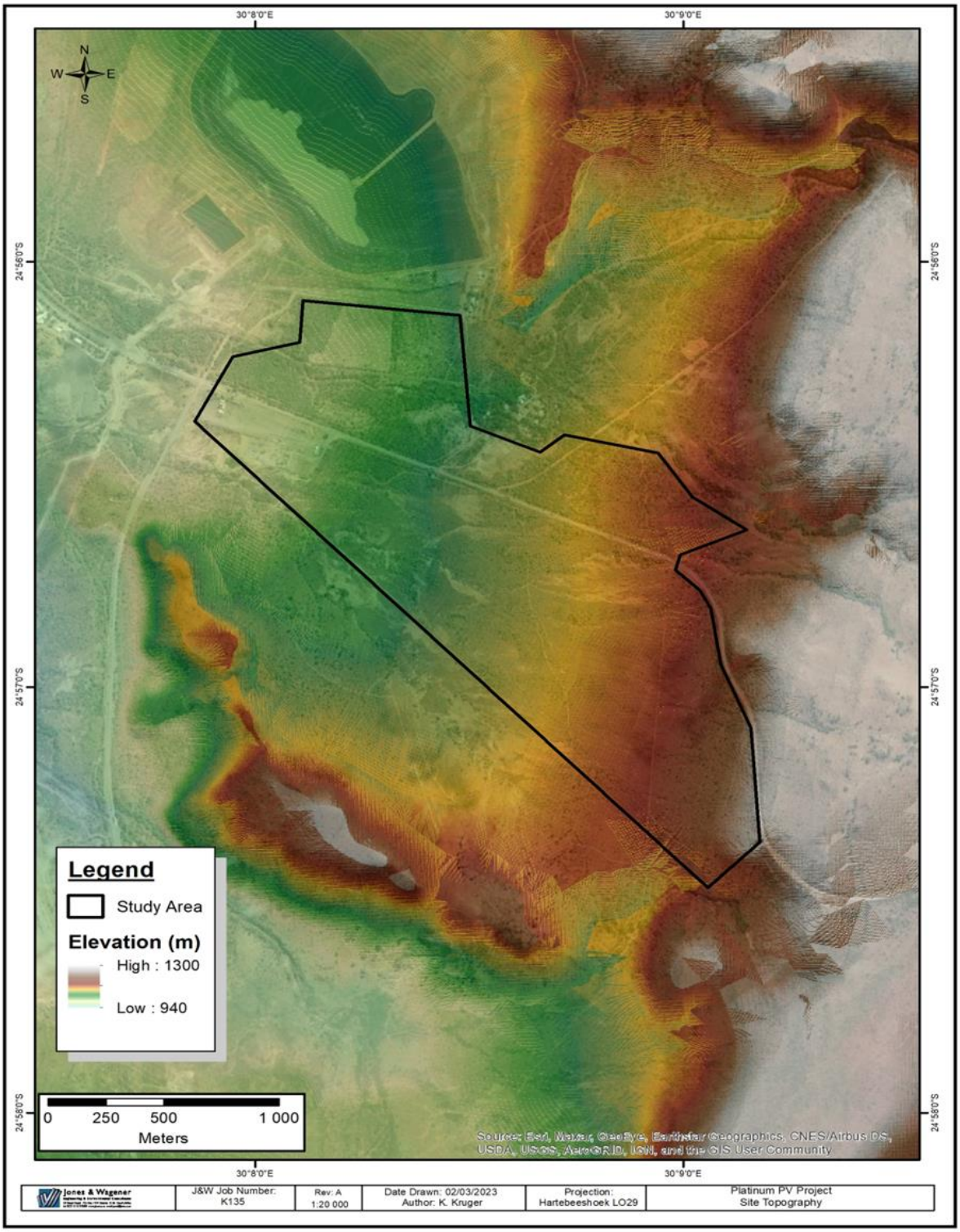


Figure 8-2: Site topography.

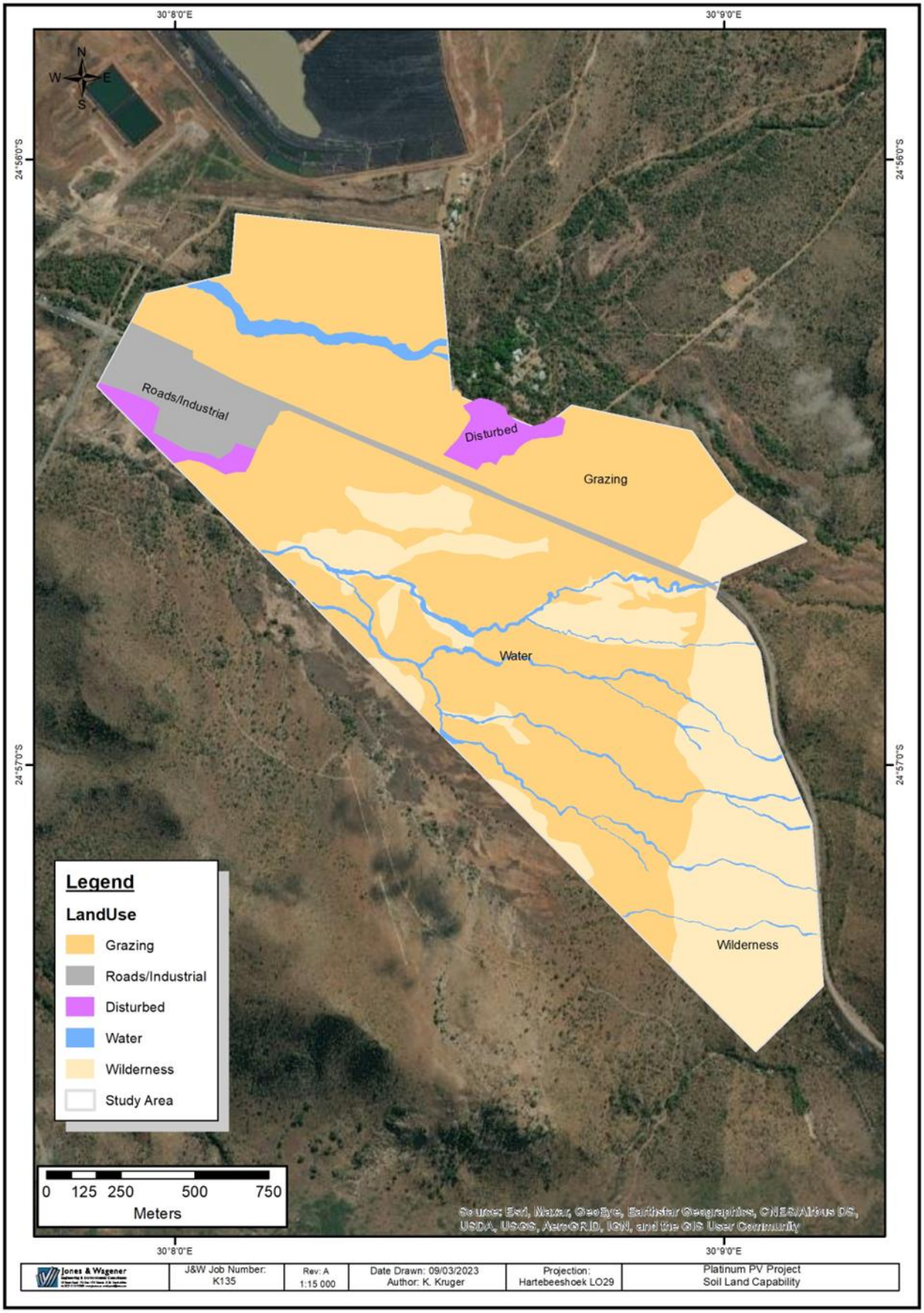


Figure 8-3: Project site land use.

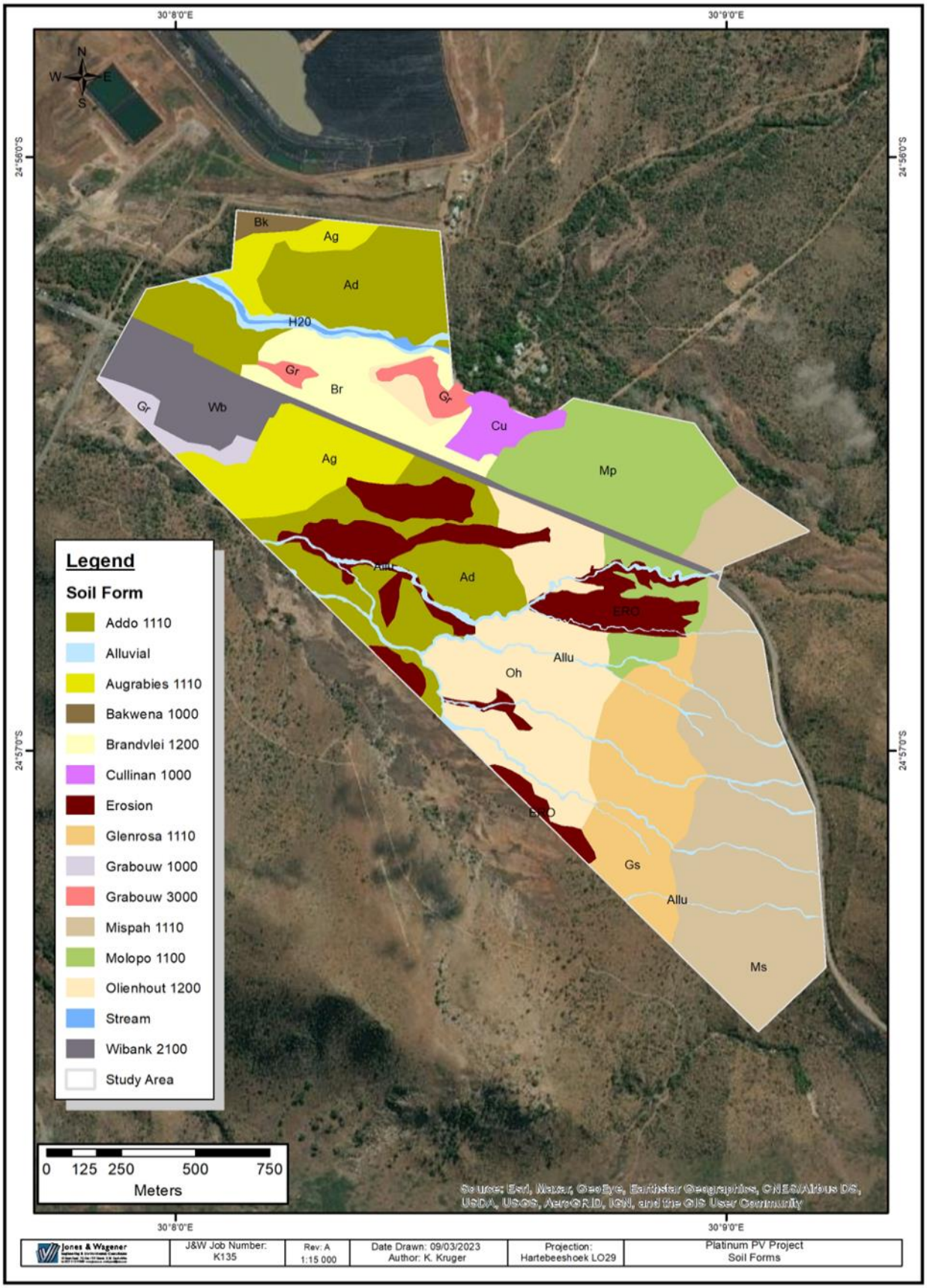


Figure 8-4: Soil Forms identified on site.

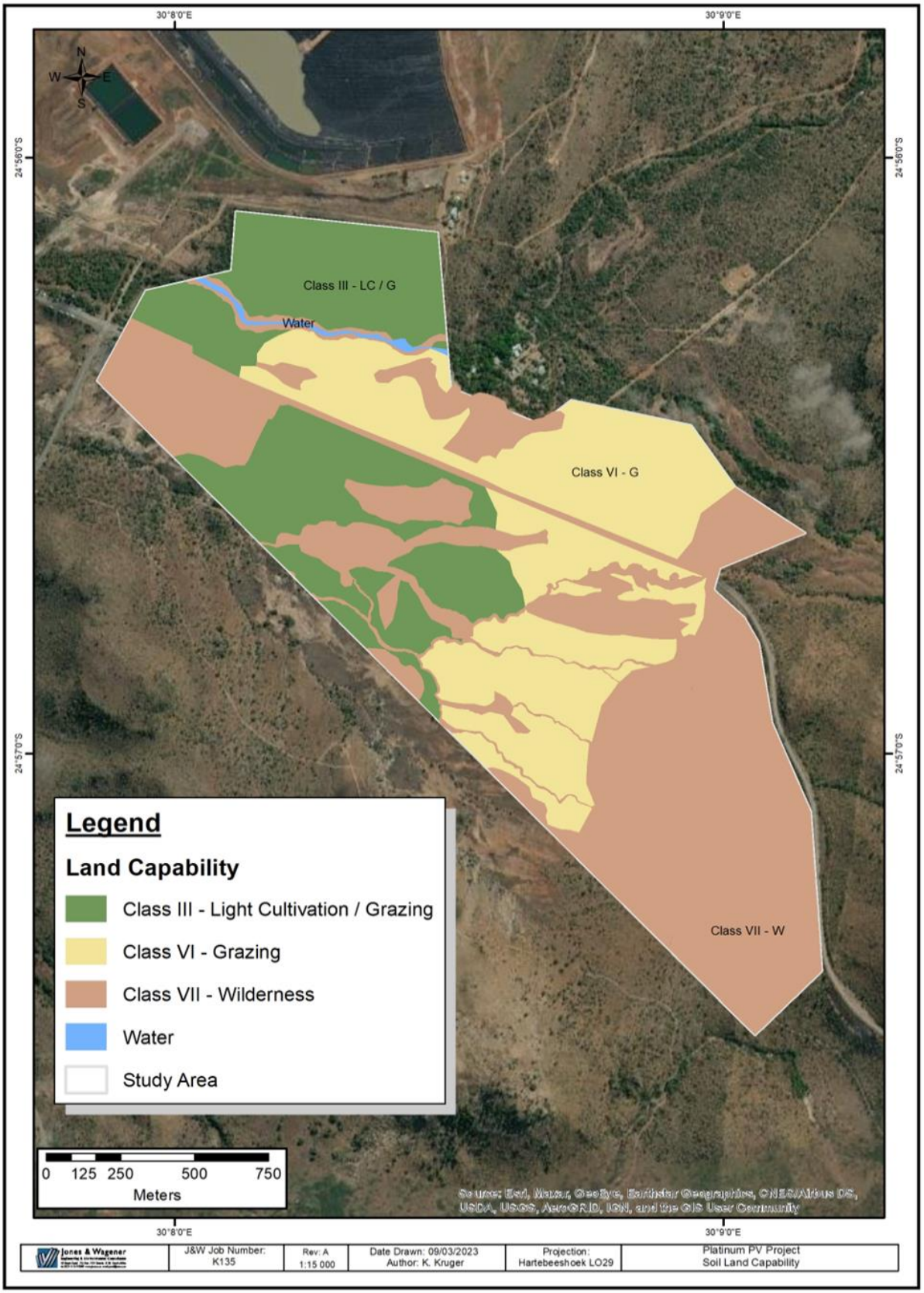


Figure 8-5: Site land capability.

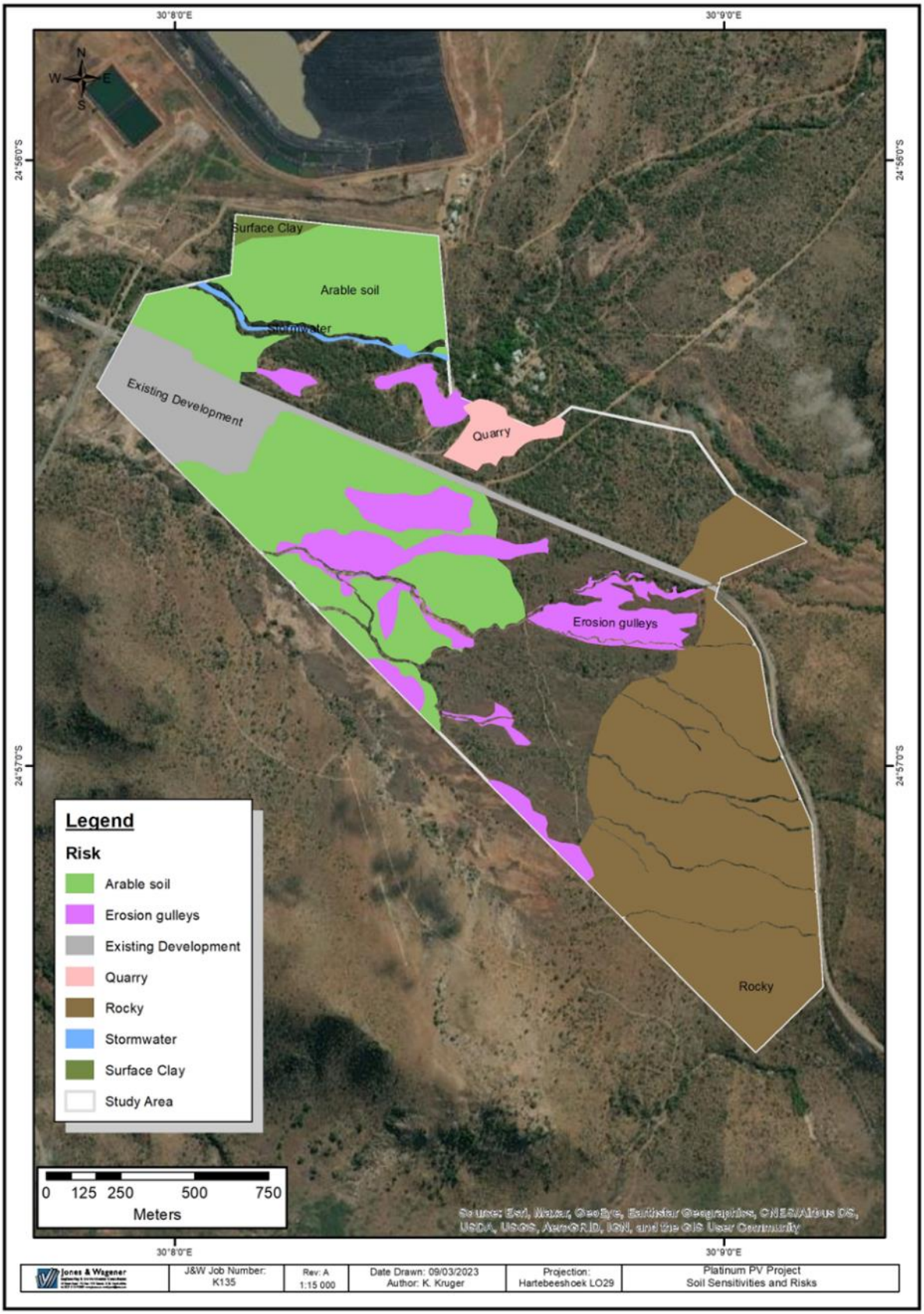


Figure 8-6: Site sensitivity – soil and land capability (J&W, 2023).

8.3 Geology

The baseline geological information provided below is based on the findings of the desktop Geotechnical Assessment undertaken by J&W (2023: JW115/23/K135-03-Rev1).

8.3.1 Regional geology

According to published geological mapping (1:250 000 Geological Map Series 2430 Pilgrim's Rest,1986), the regional bedrock geology comprises igneous rocks belonging to the Rustenburg Layered Suite (RLS) of the Bushveld Complex (**Figure 8-7**). The rocks generally comprise of gabbros and anorthosites of the Vaalian era (around 2060 million years of age) and contain a number of mineralised horizons such as the Merensky Reef and Upper Group chromite seams which are mined for chrome, platinum and other metals.

Although there are no faults shown within the immediate facility of the site, there are a number of Jurassic aged dykes to the east and west of the site. The dykes are all oriented in a general north-northeast to south-southwest orientation and are shown to comprise dolerite. Igneous dyke intrusions are typically associated large scale stress or strain fracturing which also results in brittle faulting.

8.3.2 Site lithology

The geological map shows that almost all of the site, except for a thin band along the south western boundary, is covered by relatively recent Quaternary aged transported deposits, such as alluvium and scree (yellow areas shown in **Figure 8-7**).

The rock mapped along the south-western boundary is shown to comprise pyroxenite belonging to the Shelter Norite sub-suite (Vsn). This rock type is shown to extend roughly in an arc from the south of the site to the northeast and north of the site. Extrapolation of the arc under the site suggests that the transported Quaternary deposits overly the Shelter Norite pyroxenite.

To the south-west, west, northwest and north of the site, the mapped rock is shown to also comprise pyroxenite, but of the Dwars River Subsuite (Vdr). Extrapolation of this arc under the site suggests that the north-western portion of the site has bedrock comprising Dwars River pyroxenite.

A 'ridge' of norite (Vno) is mapped to the northeast of the site and appears to potentially extend in a south westerly orientation below the norther half of the site.

No faults or dykes are shown to be extending into, or within the site boundary on the published map. Lithological contacts are, however, expected at the boundary between the Shelter Norite sub-suite and the Dwars River Subsuite.

Outcome of previous geotechnical studies

Based on geotechnical investigations carried out within the general area, the Quaternary deposits comprise both scree or colluvial soils and alluvial deposits.

The colluvial soils are gravity/sheetwash deposits that were generally characterised by medium dense to dense silty sand. With depth, the sand is described as weakly calcretised. The colluvial soils were occasionally pinhole voided and had a distinct basal pebble marker present in places.

The alluvial deposits were found to comprise both sands and clays. The sands were found to be generally medium dense in consistency and have a collapsible structure. Within the sandy profile, calcretised layers is present to varying degrees forming a very dense material. The clays ranged in consistency from firm to very stiff and were known to be highly expansive causing large moisture changes related to heave / settlement

movements in structures founded on the material. The thickness of the alluvial sands and clays tend to increase toward the middle of river valleys, however, due to the highly variable topography, the thickness of alluvial material is also expected to vary significantly.

Below the transported soils and on the mid slopes of the valleys, the bedrock geology was found to be weathered to varying degrees. The extent of weathering was found to be largely dependent on the rock type. Pyroxenite and chromatite layers are preferentially weathered, whilst norite and anorthosite are more resistant. Preferential weathering was also identified down fault structures where a fractured zone of several metres wide was deeply weathered. The variable weathering depths creates an undulating rock head with variable residual soil thicknesses which may vary considerably over distances of a few metres.

Based on information from the closest geotechnical site investigation that was carried out at the Dwarsrivier Mine for a proposed stockpile (V15/367 – 4542) located near the DCM plant, the site was blanketed with topsoil comprising slightly moist, dark brown, loose to medium dense, silty sand with roots. This extended to a depth of between 0.2m and 0.4m and was underlain by transported material with a horizon of slightly siliceous transported material. The transported material extended between 1.0m and 1.5m and comprised slightly moist, light orange with white speckles, medium dense, slightly pinholed, gravelly silty sand with minor rounded quartz cobbles.

The silica content decreased with depth and was underlain by light orange, slightly moist, medium dense to dense, mostly pinholed, gravelly silty sand. This was encountered to the maximum reach of the Tractor-Loader-Backhoe (TLB) at a depth of between 1.8m and 2.8m. The test pits were terminated in the transported material. Depth to bedrock was not proven. No groundwater seepage was encountered in any of the test pits and the sidewalls of the test pits were stable.

8.3.3 Geological contacts

Geological contacts should be considered in terms of their potential geotechnical and seismological impacts as they are possible planes of weakness, especially along geological unconformities (i.e., geological contacts that have a break in time in an otherwise continuous rock record). Geological contacts may be associated with a relatively well-developed residual soil profile due to preferential weathering along the contact, and weaker rock mass conditions at depth.

8.3.4 Satellite imagery

Large erosion gulleys are visible from satellite images and appear to be deeply incised in the eastern end of the site. However, they appear to be wider and not as deep across the central portion of the site. The wider erosion gullies suggest shallower bedrock across the central portion of the site.

The location and orientation of the rivers reveal the likely location and orientation of geological faults and fractures. These may have been preferentially weathered to greater depths than the surrounding rock. The increase in vegetation density in the northern portion of the site may suggest thicker topsoil and higher ground water table, or a seasonal perched water table.

8.3.5 Aeromagnetic Survey

Aeromagnetic surveys provide additional means of identifying geological variations that are not visible from surface. The variations may be caused by relative changes in the magnetism of different rock types, or changes in rock mineralogy.

Based on the available rendered images of an aeromagnetic survey of the greater area, there are distinct parallel lines of magnetic highs that are oriented in a south/south-west to north/north-east direction outside of the site to the west and east. One of the lineaments appears to traverse across the central portion of the site, albeit the feature is not as distinct as the surrounding highs. The orientation and position of these features is similar to the dolerite dykes evident on the geological map.

Distinct parallel lines of magnetic highs coincide with the dolerite dykes shown on the geological map (**Figure 8-7**). These are mostly external to the site, except for the south-eastern tip of the site, where, if a dyke is present it may weather at a different rate to the surrounding rock, depending on their relative mineralogies.

A slight magnetic high crossing the centre of the site may not be associated with the dykes but could rather be associated with noritic rock (Vno) indicated in a similar location and orientation on the geological map.

Brittle fracture and fault zones are also present in the area and correspond to the major orientations of the dyke sets. Fractures within the bedrock within the site is expected to have a similar orientation.

8.3.6 Seismicity

The seismic hazard map given in SABS 0160 shows the site to be in an area of moderate naturally induced seismicity (**Figure 8-8**). The peak horizontal ground acceleration with a 10% probability of being exceeded in a 50-year period is between 50 - 100cm/s2 (approximately 0,10 - 0,05g). More recent data given by Kijko *et al*. (2022) provides a value of approximately 0,11g.

The site is in an area where the potential for large peak ground acceleration is moderate. As such, it is recommended that the minimum requirements for structural and non-structural components as detailed in Section 5.6.7 of the SABS 0160 Code 9 be adhered too.

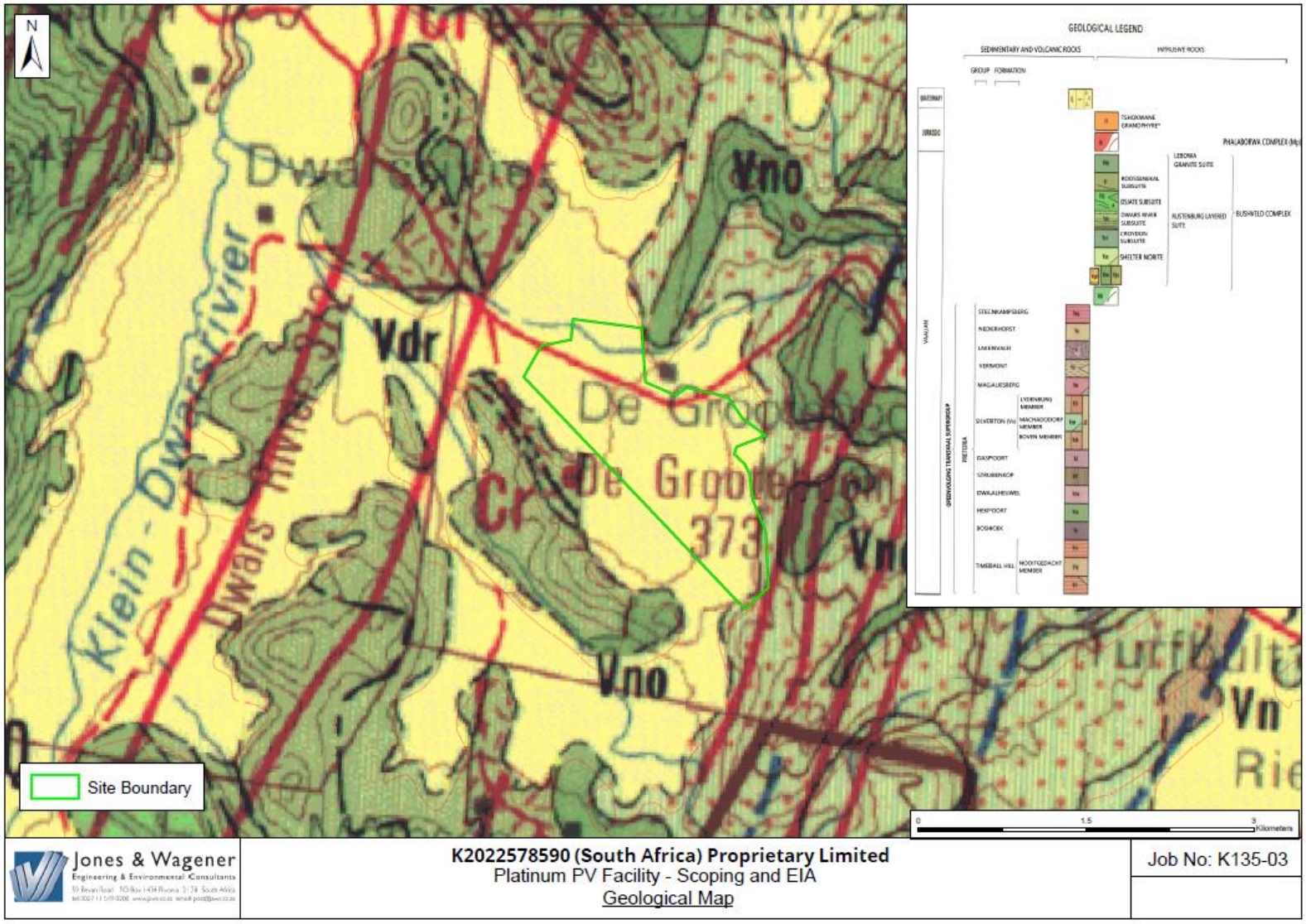


Figure 8-7: Geological Map

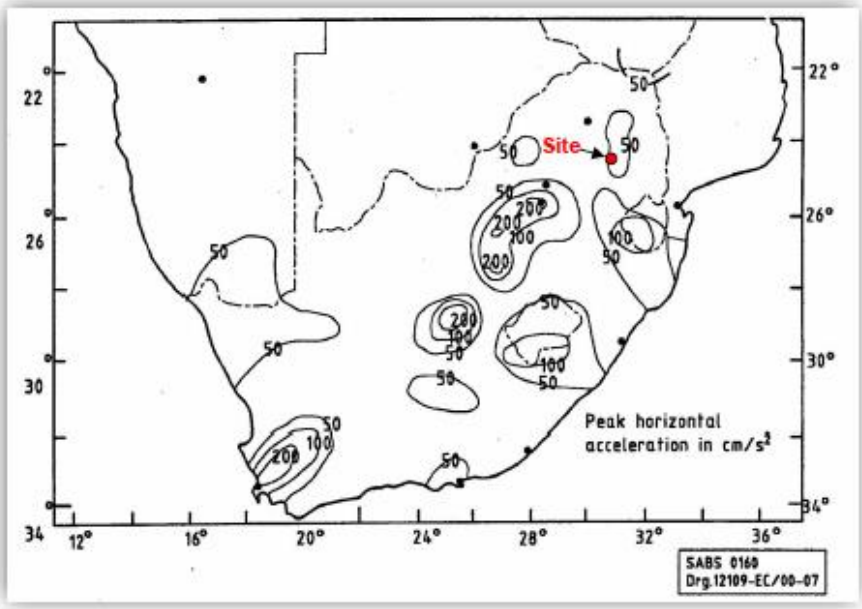


Figure 7a. Seismic hazard map for SA according to SABS 0160.

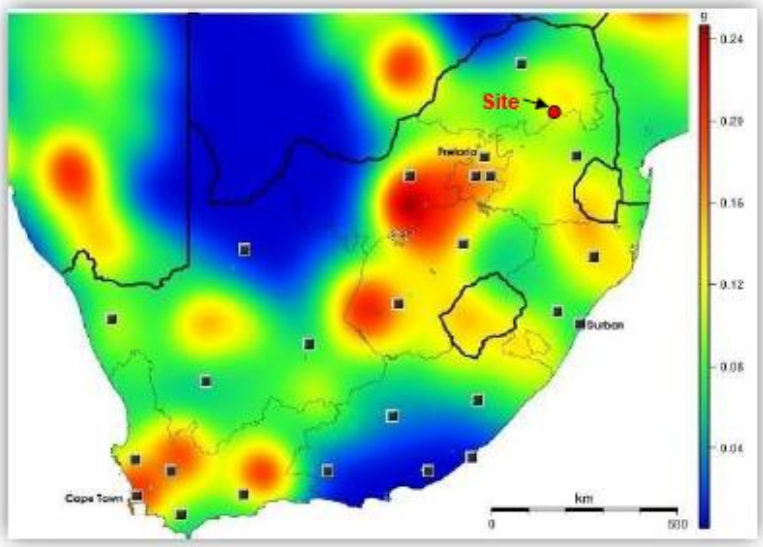


Figure 7b. Peak Ground Acceleration with a 10% probability of being exceeded in 50 years (after Kijko).

Jones & Wagener Engineering & Environmental Consultants 59 Bevan Road PO Box 1434 Rivonia 2128 South Africa tel: 0027 11 519 0200 www.jaws.co.za email:post@jaws.co.za	K2022578590 (SOUTH AFRICA) PROPRIETARY LIMITED Platinum PV Facility - Scoping & EIA Seismic Hazard Maps	ϕ: K135-03 Figure 7

Figure 8-8: Seismic hazard map for SA according to SABS 0160 and Peak Ground Acceleration with a 10% probability of being exceeded in 50 years (after Kijko)

8.4 Watercourses and Aquatic Ecology

The watercourse assessment and aquatic biodiversity assessment was undertaken by J&W and MENCO, respectively.

8.4.1 Catchments and Water Management Areas

The proposed project site is situated within the Olifants-North catchment and the Quaternary catchment B41G **(Figure 8-9**). The B41G catchment is mainly open veld, with agricultural activities taking place and with the border of the catchment being mostly urban areas. It falls within the Olifants Water Management Area (WMA) and within the Steelpoort Sub-Water Management Area (Sub-WMA) as part of the Limpopo Catchment Management Agency (**Figure 8-10**).

Table 8-2: Regional Characteristics of the B41G Catchment

ATTRIBUTE	PROJECT DETAILS
Water Management Area	Olifants
Sub-water Management Area	Steelpoort
Quaternary Drainage Region	B41G
Quinary Catchment	B41G3
Main River	Dwars River
River PES	Class B: Slightly Modified
DWS RQO Catchment PESC	Class D: Largely Modified
Rec. Ecological Category	Class B: Slightly Modified
SANBI PES	Class C: Moderately Modified
FRAI PES	Class C: Moderately Modified
SANBI NFEPA Status	Very High Priority

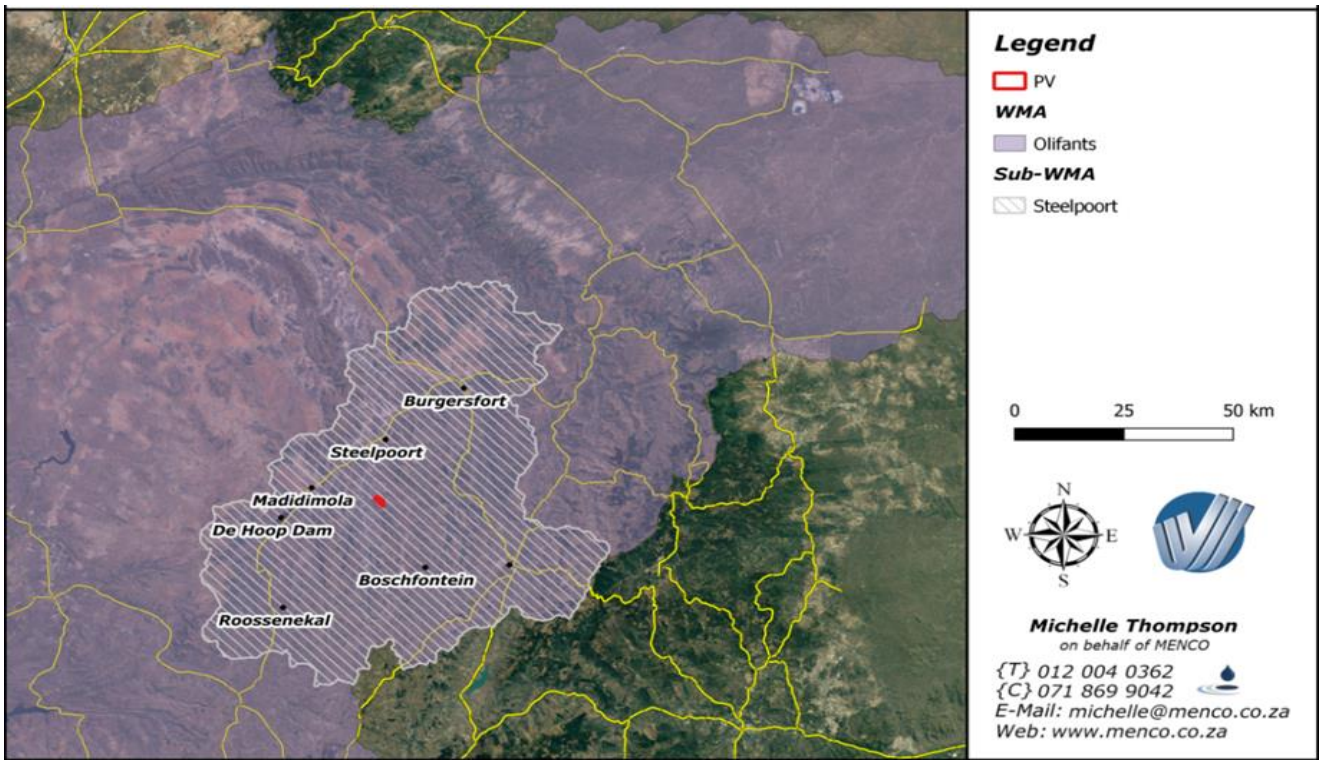


Figure 8-9: Site in relation to Quarternary Catchments (MENCO, 2023)

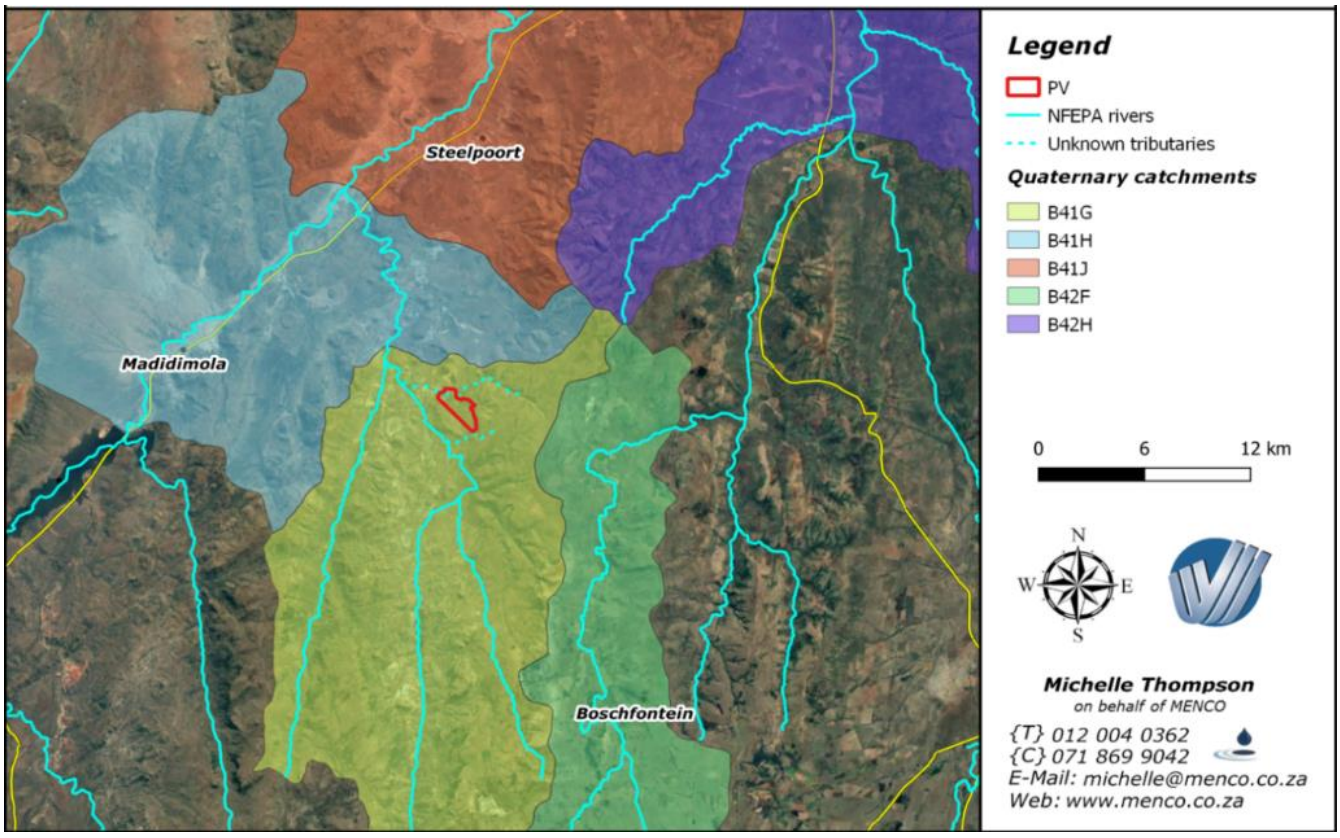


Figure 8-10: WMA's for the Project (MENCO, 2023)

8.4.2 Rivers

The applicable rivers associated with the project is the Dwars River and its associated tributaries. The landowner has indicated that the stream on the northern side, which receives the most water for the project, is called the Springkaanspruit, despite the fact that it has not been officially named. The Dwars River has a NFEPA classification of Class B, slightly impaired, while the Springkaanspruit and unnamed tributaries is not classified. The Dwars River and tributaries are also classified as having low risks to algae, fish and invertebrate pesticides. The flow conditions within the Dwars River are indicative of a perennial River system whereas Springkaanspruit is classified as non-perennial and receives a large volume of its surface water flow through three unnamed tributaries which originates from the elevated hillslopes on the eastern and south-eastern side of the study area.

Springkaanspruit is significantly altered and aligns with the Present Ecological State (PES) established for the catchment. However, the flow and morphological conditions appeared to be mostly natural. The Dwars River is moderately impaired.

There are no natural National Freshwater Ecosystem Priority Areas (NFEPA) wetlands close to the site with the nearest wetland being a channelled valley bottom wetland 2.6 km to the west along the Klein-Dwars River (Figure **8-11**). Several mine dams were identified as NFEPA wetland sites, but these were not considered due to their artificial nature.

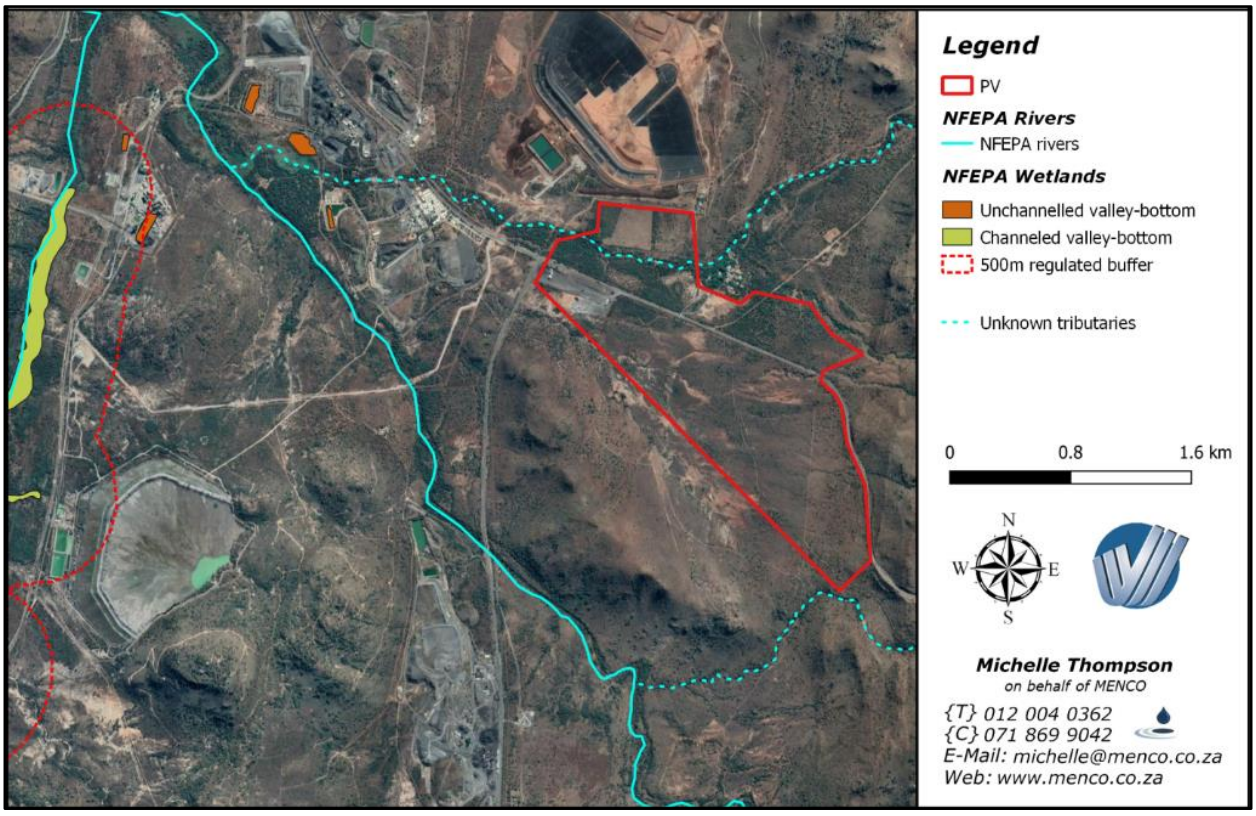


Figure 8-11: NFEPA EcoStatus

8.4.3 Rivers EcoStatus

The ecological status (EcoStatus) of a river refers to its overall condition or health, i.e., the totality of the features and characteristics of the river and its riparian areas, which manifests in its ability to support a natural selection of species.

The ecological importance and sensitivity (EI&S) provides an indication from an ecological perspective of whether a river should receive a high level of protection or not. The following EI&S categories can be assigned to a river:

Table 8-3: Ecological Importance and Sensitivity of Rivers

EI&S CATEGORY	DESCRIPTION
Very High	A high or very high EI&S indicates that there is strong ecological motivation for awarding a high level of protection to the associated river, and such rivers should ideally be maintained in a natural or good river health category
High	
Moderate	A low/marginal or moderate EI&S denotes that a river has relatively lower conservation value and that such a catchment is more suited to development than one where a river has a higher EI&S.
Low/Marginal	

The PES set for the B41G quaternary catchment is a Class D Health category with a Very High EIS. The Recommended or Default Ecological Class (REC or DEC) for the catchment is set at a Class B Health Category, however with the already disturbed and on-going activities taking place in the catchment, it is difficult to foresee that this Health category could be achieved**.**

8.4.4 Watercourse classification and delineation

8.4.4.1 Watercourse classification

The watercourses identified were all classified and delineated as river/riparian features that were predominantly non-perennial in nature, with intermittent flow. No wetlands were identified on the proposed project site. The classification of watercourses identified within the proposed Phula PV site is provided in **Table 8-4**.

Table 8-4: Classification of the watercourses identified within the proposed project site as per Ollis *et al*., (2013)

LOCALITY	LEVEL 2:	LEVEL 3: LANDSCAPE UNIT	LEVEL 4: HGM UNIT TYPE	LEVEL 5°: HYDROLOGICAL REGIME (PERENNIAL VS NON-PERENNIAL)	LEVEL 5B: NON-PERENNIAL SUB-TYPES
Springkaanspruit	DWA Ecoregion (Level 1): Eastern Bankenveld Ecoregion	**Valley floor:** the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the	Non-perennial: does not flow continuously throughout the year, although pools may persist.	Seasonal: with water flowing for extended periods during the wet season/s (generally between 3 to 9 months duration) but not during the rest of the year
Non-perennial river 1		**Slope:** an inclined stretch of ground		Non-perennial: does not flow continuously	Intermittent: water flows for a relatively

LOCALITY	LEVEL 2:	LEVEL 3: LANDSCAPE UNIT	LEVEL 4: HGM UNIT TYPE	LEVEL 5°: HYDROLOGICAL REGIME (PERENNIAL VS NON-PERENNIAL)	LEVEL 5B: NON-PERENNIAL SUB-TYPES
Non-perennial river 2		typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	riparian zone as a unit	throughout the year, although pools may persist.	short time of less than one seasons duration (i.e., less than approximately 3 months), at intervals varying from less than a year to several years
Non-perennial river 3					
Non-perennial river 4					
Non-perennial river 5					

8.4.4.2 Watercourse delineation

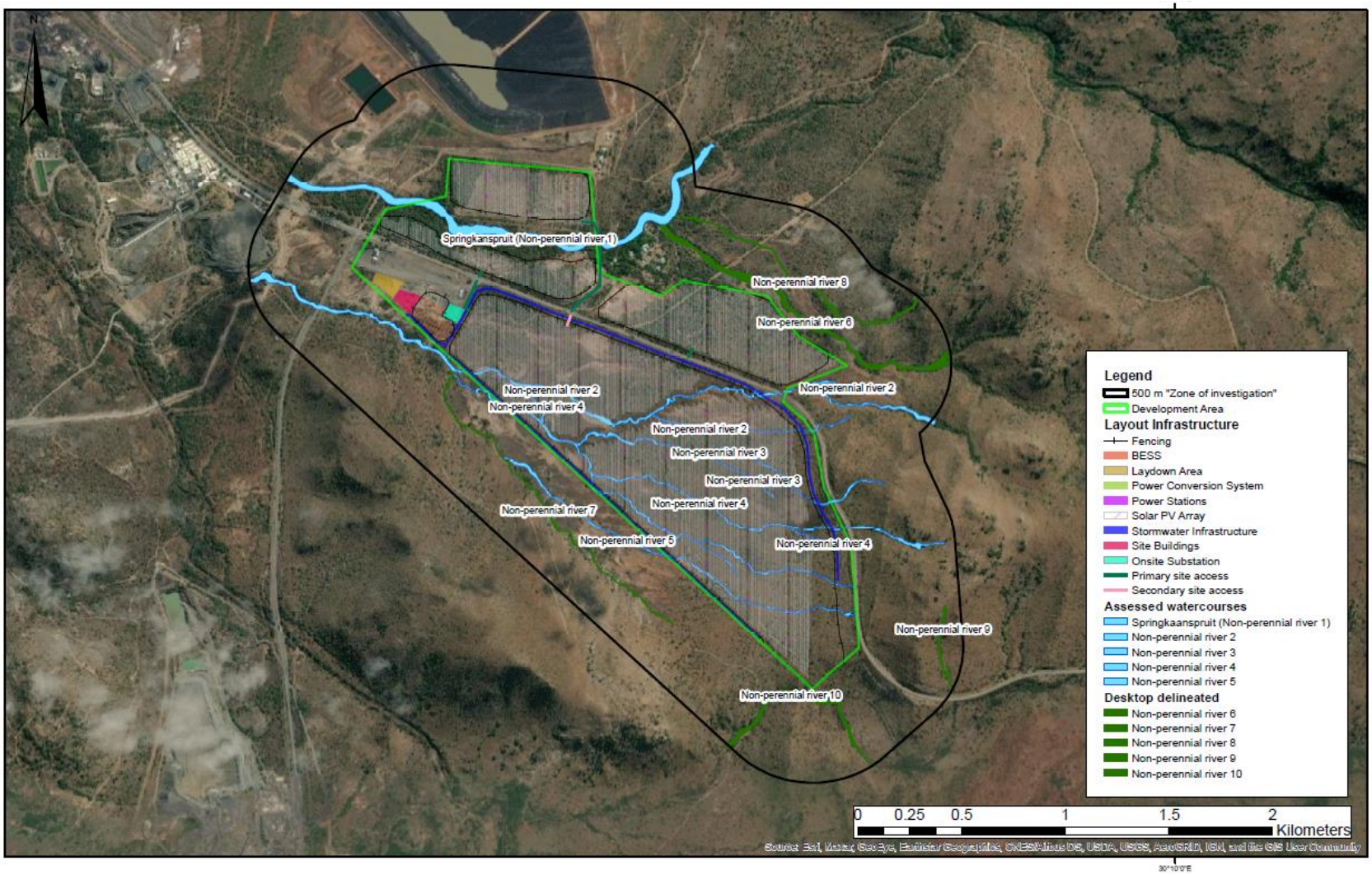
The watercourses within the footprint of the proposed project site were focused on in-detail and delineated in-field, in order to determine their extents, and focus on areas which the development is to avoid / limit their impacts. The watercourses situated within the 500m Regulated Area in terms of GN 509 as it relates to the NWA were considered only at a desktop level with limited in-field verification undertaken. Where necessary, these were delineated primarily using desktop methods with the use of digital satellite imagery, historical aerial imagery and 5m contours. Similarly, in-field verified watercourses were also refined with desktop methods where suitable, in order to improve the accuracy of the delineations. The watercourse delineations were undertaken according to the DWAF (2005) “A practical field procedure for identification and delineation of wetlands and riparian areas”. The watercourse delineation within proposed site is outlined in **Figure 8-12**.

Indicators considered for wetlands as per DWAF (2005) include:

- Terrain units
- Soil Wetness
- Soil Forms
- Vegetation indicators

Similarly, indicators included for river/riparian systems include:

- Topography
- Vegetation
- Alluvial soil



Jones & Wagener Engineering & Environmental Consultants	J&W JOB NUMBER: K135	REV NO Ver 1	DATE DRAWN: 12/09/2023 AUTHOR: S. Pillay	PROJECTION WGS 84	Solar Platinum PV project - Watercourse delineation map

Figure 8-12: Watercourse delineation map depicting the watercourses within the proposed project site

8.4.5 Watercourse Present Ecological State (PES), Ecosystem Services and Importance and Sensitivity

Subsequent to the delineation and classification of the watercourses as non-perennial river/riparian systems, the PES, Ecological service provisioning and EIS of the non-perennial rivers were assessed. This was undertaken using the Index of Habitat Integrity (IHI) assessment (which forms Module G of the River Eco-classification – Manual for EcoStatus Determination) by Kleynhans, *et al*., (2008) in order to assess the PES of the systems, the application of the WET- Ecoservices (Version 2) of Macfarlane *et al*., (2021) to assess the Ecosystem service provisioning of the non-perennial rivers and application of the EIS tool as highlighted by Rountree and Kotze (2013) for the importance and sensitivity, for each of the systems, respectively.

It was noted that only the non-perennial rivers that would be directly/indirectly affected by the proposed Phula PV project within the proposed project site footprint were assessed further as part of this assessment. Additionally, five non-perennial rivers were situated within the 500m zone of investigation. These watercourses were not anticipated to be affected by the proposed Phula PV project and were not assessed further. The five non-perennial river systems that were confirmed within the proposed project site and would be directly affected by the proposed Phula PV project include:

- The Springkaanspruit/ Non-perennial river 1(directly affected);
- Non-perennial river 2 (directly affected);
- Non-perennial river 3 (directly affected);
- Non-perennial river 4 (directly affected);
- Non-perennial river 5 (directly affected).

These are assessed in **Table 8-5** to **Table 8-9**.

Table 8-5: Results of the assessment of the Springkaanspruit (Non-perennial river 1) (JW128/23/K135-02-Rev0)

SPRINGKAANSPRUIT -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
 **Representative photographs of the Springkaanspruit situated towards the northern extent of the proposed project site.**			
SETTING			
Coordinates	24°56'7.68"S; 30° 8'43.77"E	Classification as per Ollis *et al*, (2013)	
HGM Unit Name	Springkaanspruit	Level 1: System	Inland
Regional Vegetation	Sekhukhune Mountain Bushveld	Level 2: Ecoregion	Eastern Bankenveld Ecoregion (9.02)
Riparian Vegetation condition	VEGRAI Assessment: Ecological Category (B/C) – Largely Natural to Moderately Modified	Level 3: Landscape Unit	Valley Floor
		Level 4a: Hydrogeomorphic Unit Type	River
Limpopo C-Plan	Area marked as CBA	Level 5a: Hydrological regime (perennial vs non-perennial)	Non-perennial
		Level 5b: Non-perennial sub-types	Seasonal
PRESENT ECOLOGICAL STATE			
Instream IHI		Riparian IHI	
Hydrology modification	1.0 (Small)	Hydrology modification	0.8 (Small)
Physico-chemical modification	1.0 (Small)	Bank structure modification	1.0 (Small)
Bed modification	0.5 (Small)		
Bank modification	0.8 (Small)	Connectivity modification	1.0 (Small)

SPRINGKAANSPRUIT -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
Connectivity modification	1.0 (Small)		
Overall	80.3% (Largely natural)	Overall	81.5% (Largely natural to moderately modified)

PRIMARY MODIFIERS

Known locally as the Springkaanspruit, this is a non-perennial river that is a tributary of Groot Dwars River. The Springkaanspruit, is noted to flow only periodically within the year, however, in comparison to the other watercourses identified within the proposed project site, the Springkaanspruit is the largest non-perennial river and is considered seasonal compared to the other watercourses which are considered intermittent. During the in-field assessment, the river had sufficient surface flow due to recent rainfall in the region. The primary impacts to hydrology include the seasonality pertaining to the perenniality of the river. Physico-chemical parameters were primarily altered by impacts such as erosion in the catchment, and mining which occurs along the lower extent of the river. Bed and bank modification within the instream and riparian zones are primarily altered by erosion and associated deposition, as well as mining activities. Connectivity modifications are primarily related to erosion and barriers such as roadways along the upper, middle and lower reaches of the river.

ECOSYSTEM SERVICES

Regulating and supporting services

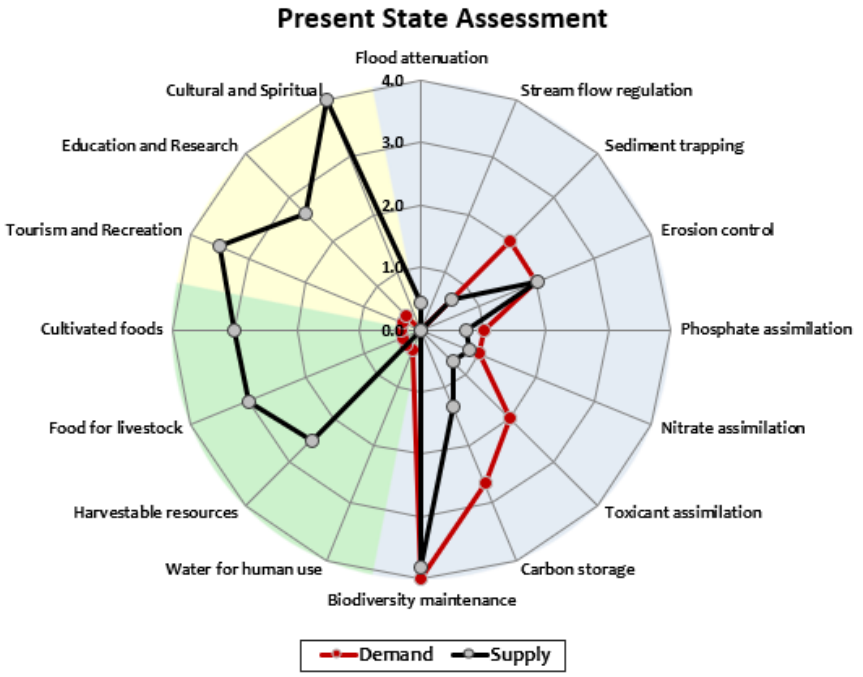
All regulating and supporting services were provided to a very low degree of importance with the exception of carbon storage and erosion control which provided a low and moderately low degree of importance, respectively whilst biodiversity maintenance provided a very high degree of importance with both supply and demand considered very high owing to the presence of plant SCC, potential use by avifauna and mammal SCC and status of vegetation type.

Provisioning services

Provisioning services including water for human use was provided to a very low degree of importance whilst harvestable resources was provided to a low degree of importance and even though supply was considered moderately high, the demand was low. Both cultivated foods and foods for livestock were provided to a moderately low degree of importance and whilst supply for both was considered high, the demand was moderate.

Cultural services

Cultural services including education and research were provided to a low degree of importance with the supply considered moderately high, but the demand considered low. Tourism and recreation was provided to a moderate degree of importance with supply considered high, yet demand considered low. Cultural and spiritual heritage was also noted to be provided to a moderately high degree of importance with a very high supply albeit, a low to no demand. This is strengthened by the fact that the SCC identified along the river have medicinal value and albeit present, are not considered to be harvested to a great degree at present.



SPRINGKAANSPRUIT -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
IMPORTANCE AND SENSITIVITY			
Ecological Importance & Sensitivity	Hydro-functional Importance	Direct Human Benefits	Overall EIS Category
3.00	0.88	2.83	High
Overall EIS discussion	The EIS of the Springkaanspruit is "High" largely due to the presence of SCC (such as *Lydenburgia cassinoides*), potential use by avifaunal and mammalian SCC and sensitivity to changes in floods and flows during the dry season. Additionally, the river provides a diversity of habitat types and breeding and feeding sites. Overall, within the proposed project site, the Springkaanspruit is one of the local natural watercourses that provide flowing water when seasonally available and may also provide migratory habitat and serve as an ecological corridor to biota, relative to other areas in the landscape.		
MITIGATION/MANAGEMENT MEASURES			
It is recommended that the Springkaanspruit and associated 38 m buffer be avoided to prevent impacts on the watercourse. Optimisation of the layout is recommended to accommodate the avoidance of this watercourse. If avoidance is not feasible, the mitigation hierarchy should be followed and the relevant authorisations granted prior to any development.			

Table 8-6: Results of the assessment of the Non-perennial river 2 (JW128/23/K135-02-Rev0)

NON-PERENNIAL RIVER 2 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
			
Representative photographs of Non-perennial river 2, traversing the proposed project site in a north-westerly direction.			
SETTING			
Coordinates	24°56'7.68"S; 30° 8'43.77"E	Classification as per Ollis *et al*, (2013)	
HGM Unit Name	Non-perennial river 2	Level 1: System	Inland
Regional Vegetation	Sekhukhune Mountain Bushveld	Level 2: Ecoregion	Eastern Bankenveld Ecoregion (9.02)
Riparian Vegetation condition	VEGRAI Assessment: Ecological Category (B/C) – Largely Natural to Moderately Modified	Level 3: Landscape Unit	Slope
		Level 4a: Hydrogeomorphic Unit Type	River
Limpopo C-Plan	Area marked as CBA	Level 5a: Hydrological regime (perennial vs non-perennial)	Non-perennial
		Level 5b: Non-perennial sub-types	Intermittent
PRESENT ECOLOGICAL STATE			
Instream IHI		Riparian IHI	
Hydrology modification	1.0 (Small)	Hydrology modification	0.8 (Small)
Physico-chemical modification	1.0 (Small)	Bank structure modification	1.0 (Small)
Bed modification	0.5 (Small)		
Bank modification	0.8 (Small)	Connectivity modification	1.0 (Small)

NON-PERENNIAL RIVER 2 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
Connectivity modification	1.0 (Small)		
Overall	76.3% (Moderately modified)	Overall	78.0% (Largely natural/Moderately modified)

PRIMARY MODIFIERS

Non-perennial river 2 traverses the central portions of the proposed project site. The system is noted to stem from a mountain stream and is conveyed underneath the roadway after which it enters the project site. The in-field assessment indicated no flow, however stagnant pools of water and diffuse "baseflow" was noted. Hydrology was primarily altered by a small increase in surface water that the system may receive as a result of the culverts and stormwater channels that convey the water into the non-perennial river. Physico-chemical parameters would likely only be altered to some degree by increased erosion and turbidity as well as contaminants from roadway runoff. Similarly, the modification of the bed and banks along the riparian zones is primarily owing to the incipient erosion occurring over the years and associated vegetation removal that has occurred as a result. Subsequent deposition of sediment within lower reaches of the channel have also been observed. Connectivity modifications are primarily related to the roadway and culverts (and fence) upgradient, with the steeply incised erosion also a contributing factor.

ECOSYSTEM SERVICES

Regulating and supporting services

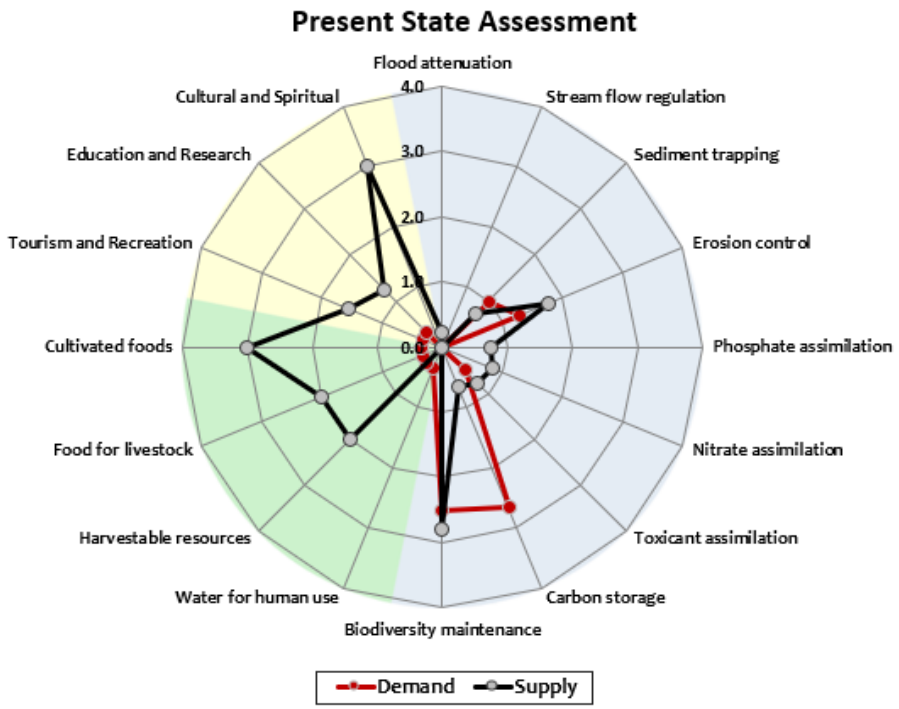
The importance of regulating and supporting services including sediment trapping, phosphate, nitrate and toxicant assimilation and carbon storage, were all provided to a very low degree of importance, with supply and demand considered low for majority. Erosion control was considered to be provided to a low degree of importance with supply and demand both low. Biodiversity maintenance was provided to a moderately high degree of importance from both a supply and demand perspective due to the presence of plant SCC, use by avifaunal and mammalian SCC in the area and status of vegetation type.

Provisioning services

With the exception of cultivated foods which was provided to a moderately low degree of importance, all other provisioning services including water for human use, harvestable resources and food for livestock were provided to a very low degree of importance. Harvestable resources and food for livestock were both supplied to a moderate degree, however, demand was considered low. Similarly, cultivated foods whilst supplied to a high degree, had a low demand.

Cultural services

Tourism and recreation, education and research were provided to a very low degree of importance with a low supply and demand respectively. Cultural and spiritual practices was provided to a moderately low degree of importance and whilst supply was high, the demand was very low.

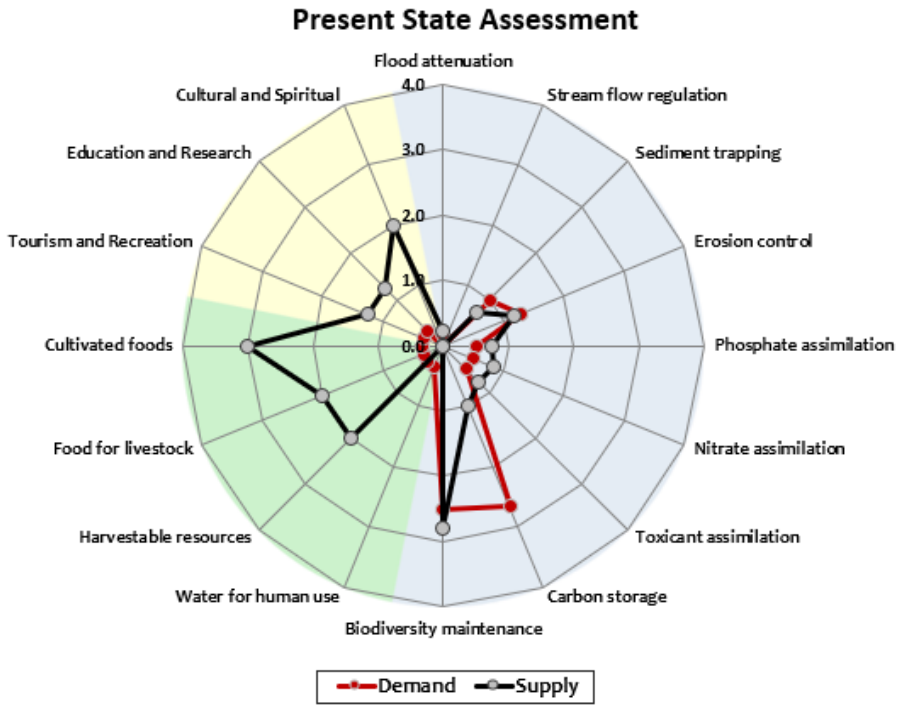


NON-PERENNIAL RIVER 2 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, IS AND MANAGEMENT DISCUSSIONS			
IMPORTANCE AND SENSITIVITY			
Ecological Importance & Sensitivity	Hydro-functional Importance	Direct Human Benefits	Overall EIS Category
2. 33	0.88	1.67	High
Overall EIS discussion	The EIS of Non-perennial river 2 is High due to the presence of SCC (such as *Lydenburgia cassinoides*), potential use by avifaunal and mammalian SCC and changes in floods and flow during dry season. Migration, breeding and feeding habitat is also evident relative to other areas within the landscape.		
MITIGATION/MANAGEMENT MEASURES			
It is recommended that the non-perennial river 2 and associated 38 m buffer be avoided to prevent impacts on the watercourse. Optimisation of the layout is recommended to accommodate the avoidance of this watercourse. If avoidance is not feasible, the mitigation hierarchy should be followed and the relevant authorisations granted prior to any development.			

Table 8-7: Results of the assessment of the Non-perennial river 3 (JW128/23/K135-02-Rev0)

NON-PERENNIAL RIVER 3 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
			
Representative photographs of Non-perennial river 3, situated along the western extent of the proposed project site.			
SETTING			
Coordinates	24°56'59.40"S; 30° 9'5.93"E	Classification as per Ollis *et al*, (2013)	
HGM Unit Name	Non-perennial river 3	Level 1: System	Inland
Regional Vegetation	Sekhukhune Mountain Bushveld	Level 2: Ecoregion	Eastern Bankenveld Ecoregion (9.02)
Riparian Vegetation condition	VEGRAI Assessment: Ecological Category (B/C) – Largely Natural to Moderately Modified	Level 3: Landscape Unit	Slope
		Level 4a: Hydrogeomorphic Unit Type	River
Limpopo C-Plan	Area marked as CBA	Level 5a: Hydrological regime (perennial vs non-perennial)	Non-perennial
		Level 5b: Non-perennial sub-types	Intermittent
PRESENT ECOLOGICAL STATE			
Instream IHI		Riparian IHI	
Hydrology modification	0.5 (Small)	Hydrology modification	1.0 (Small)
Physico-chemical modification	1.0 (Small)	Bank structure modification	1.0 (Small)
Bed modification	0.6 (Small)		

NON-PERENNIAL RIVER 3 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
Bank modification	1.0 (Small)	Connectivity modification	1.5 (Moderate)
Connectivity modification	1.5 (Moderate)		
Overall	83.0% (Largely natural)	Overall	77.6% (Largely natural to moderately modified)
PRIMARY MODIFIERS			
Non-perennial river 3 is located along the western portions of the proposed project site and drains in a north westerly direction. The river, similar to non-perennial river 2, stems from a mountain stream and is conveyed underneath the roadway by culverts. As such, hydrology has undergone a small increase in surface water that will report to the system due to the additional capturing and channelling of stormwater into this system, which is commonly noticed amongst majority of the systems that were visibly connected to mountain streams. Channel bank erosion was noted to be less apparent in this system and less of a contribution to turbidity, with the small modifications in physico-chemical parameters anticipated to differ from reference conditions due to potential runoff from the roadway. The modification of the bed and banks of the riparian zone were largely natural with small alterations from the reference owing to erosion and gravel roadways that have prompted increased sedimentation and runoff as well some degree of vegetation removal and channel straightening. As with the other systems, connectivity has been altered by culverts and erosion as well as the gravel access roads that have occurred within non-perennial river 3.			
ECOSYSTEM SERVICES			
Regulating and supporting services			
Regulating and supporting services all provided to a very low degree of importance with both supply and demand low, with the exception of carbon storage and biodiversity maintenance which were provided to a low and moderately high degree of importance, respectively. The presence of SCC (plant and potential use by avifaunal and mammal SCC) associated with this river has also contributed to the high supply and demand noted for biodiversity maintenance.			
Provisioning services			
Similarly, for provisioning services only cultivated foods provided a moderately low degree of importance with a high supply, albeit low demand. The remaining provisioning services of water for human use, harvestable resources and food for livestock all provided a very low degree of importance and whilst harvestable resources and food for livestock were supplied to a moderate degree, the demand for these were very low.			
Cultural services			

NON-PERENNIAL RIVER 3 -PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS	
All cultural services including tourism and recreation, education and research and cultural and spiritual practices were provided to a very low degree of importance. Supply across all cultural services was moderate to low, however demand was very low.	

IMPORTANCE AND SENSITIVITY			
Ecological Importance & Sensitivity	Hydro-functional Importance	Direct Human Benefits	Overall EIS Category
2.33	0.63	1.33	High

Overall EIS discussion	Non-perennial river 3 displayed a High EIS. Similar to other systems within the proposed project site, the presence of plant SCC (such as *Lydenburgia cassinoides*) within these non-perennial rivers and potential use by mammal and avifaunal SCC have increased the sensitivity of the river. Sensitivity to changes in flood and flow during seasons also influences the systems sensitivity. As with the other non-perennial rivers within the proposed project site, the system also contributes breeding and feeding habitat to biota.

MITIGATION/MANAGEMENT MEASURES
It is recommended that the non-perennial river 3 and associated 38 m buffer be avoided to prevent impacts on the watercourse. Optimisation of the layout is recommended to accommodate the avoidance of this watercourse. If avoidance is not feasible, the mitigation hierarchy should be followed, and the relevant authorisations granted prior to any development.

Table 8-8: Results of the assessment of the Non-perennial river 4 (JW128/23/K135-02-Rev0)

NON-PERENNIAL RIVER 4 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
			
Representative photographs of Non-perennial river 4, situated towards the south-western extent of the proposed project site.			
SETTING			
Coordinates	24°57'3.49"S; 30° 9'3.35"E	Classification as per Ollis *et al*, (2013)	
HGM Unit Name	Non-perennial river 4	Level 1: System	Inland
Regional Vegetation	Sekhukhune Mountain Bushveld	Level 2: Ecoregion	Eastern Bankenveld Ecoregion (9.02)
Riparian Vegetation condition	VEGRAI Assessment: Ecological Category (B/C) – Largely Natural to Moderately Modified	Level 3: Landscape Unit	Slope
		Level 4a: Hydrogeomorphic Unit Type	River
Limpopo C-Plan	Area marked as CBA	Level 5a: Hydrological regime (perennial vs non-perennial)	Non-perennial
		Level 5b: Non-perennial sub-types	Intermittent
PRESENT ECOLOGICAL STATE			
Instream IHI		Riparian IHI	
Hydrology modification	1.0 (Small)	Hydrology modification	1.1 (Small)
Physico-chemical modification	1.0 (Small)	Bank structure modification	1.0 (Small)
Bed modification	0.6 (Small)		
Bank modification	0.8 (Small)	Connectivity modification	1.5 (Small)

NON-PERENNIAL RIVER 4 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
Connectivity modification	1.0 (Connectivity rating)		
Overall	77.2% (Moderately modified)	Overall	77.0% (Moderately modified)

PRIMARY MODIFIERS

Non-perennial river 4 (and associated tributaries) are located along the western extent of the proposed project site. As with the other systems, the system flows underneath the roadway and thus hydrology of the IHI is affected due to increased stormwater runoff anticipated as well as increased hardened surfaces within the catchment such as concreted and gravel access roads. The alteration of physico-chemical characteristics is predominantly anticipated to occur as a result of additional sediment and runoff from the roadway which may include pollutants such as hydrocarbons albeit to a limited degree. Bed and banks of the riparian and instream habitat have mostly been altered by the natural erosion that has occurred, however, anthropogenic impacts such as the gravel access road have exacerbated the erosion and resultant vegetation removal that is noted to occur along the lower reaches of the system, before confluence into non-perennial river 2. Similarly, roadways and culverts within the system have reduced connectivity. This is furthered by the removal of vegetation and channel straightening which has resulted in some alteration of flow and connectivity within the entirety of the river reach.

ECOSYSTEM SERVICES

Regulating and supporting services

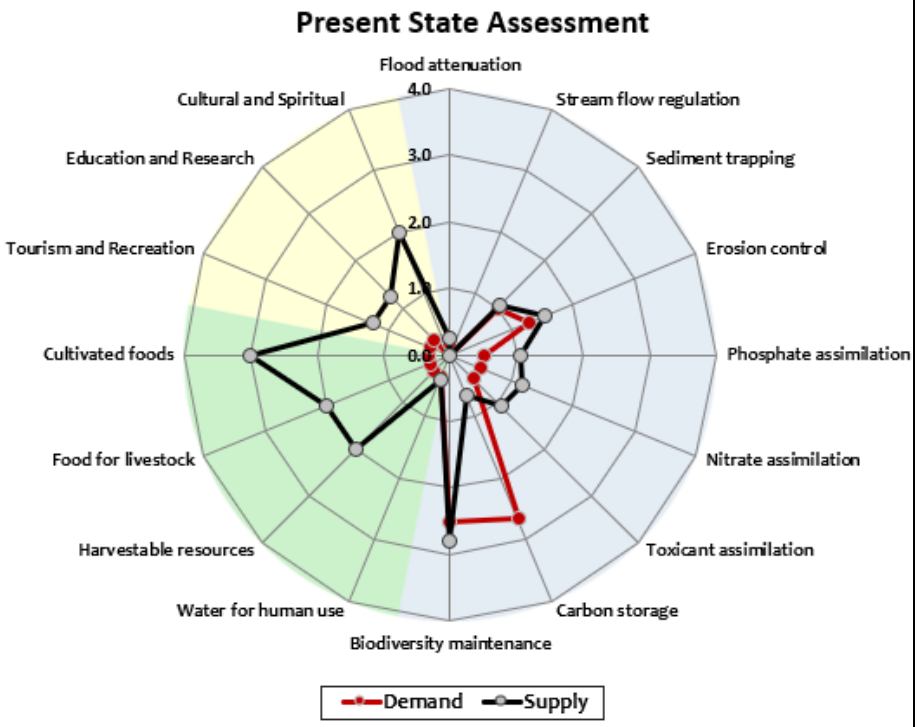
Regulating and supporting services all provided a very low degree of importance with the exception of biodiversity maintenance, which was provided to a moderately high degree of importance, respectively. The regulating services of flood attenuation, streamflow regulation, sediment trapping, phosphate, nitrate and toxicant assimilation and erosion control were all supplied to a low degree, with demand also considered low. Biodiversity maintenance in particular had both a high supply and demand.

Provisioning services

From the provisioning services supplied by this non-perennial river, only cultivated foods was provided to a moderately low degree of importance with a high supply albeit low demand. The remaining provisioning services including harvestable resources and food for livestock both had high supplies albeit low demand whilst water for human use was supplied to a low degree with associated demand also low.

Cultural services

All cultural services including tourism and recreation, education and research and cultural and spiritual practices were provided to a very low degree of importance. Only cultural and spiritual services had a high supply albeit, a very low demand whilst both tourism and recreation had low supply and very low demand.



NON-PERENNIAL RIVER 4 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
IMPORTANCE AND SENSITIVITY			
Ecological Importance & Sensitivity	Hydro-functional Importance	Direct Human Benefits	Overall EIS Category
2.33	0.63	1.50	High
Overall EIS discussion	Non-perennial river 4 displayed a High EIS which was due to the presence of plant SCC (such as *Lydenburgia cassinoides*) within the riparian zone of the channel. This non-perennial river also provides migration feeding and breeding habitat considered to elevate the EIS. The river's sensitivity to changes in floods and flows also plays a role in the overall sensitivity.		
MITIGATION/MANAGEMENT MEASURES			
It is recommended that the non-perennial river 4 and associated 38 m buffer be avoided to prevent impacts on the watercourse. Optimisation of the layout is recommended to accommodate the avoidance of this watercourse. If avoidance is not feasible, the mitigation hierarchy should be followed, and the relevant authorisations granted prior to any development.			

Table 8-9: Results of the assessment of the Non-perennial river 5

NON-PERENNIAL RIVER 5 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
			
Representative photographs of Non-perennial river 5, situated towards the south-western extent of the proposed project site.			
SETTING			
Coordinates	24°57'16.56"S; 30° 9'8.96"E	Classification as per Ollis *et al*, (2013)	
HGM Unit Name	Non-perennial river 5	Level 1: System	Inland
Regional Vegetation	Sekhukhune Mountain Bushveld	Level 2: Ecoregion	Eastern Bankenveld Ecoregion (9.02)
Riparian Vegetation condition	VEGRAI Assessment: Ecological Category (B/C) – Largely Natural to Moderately Modified	Level 3: Landscape Unit	Slope
		Level 4a: Hydrogeomorphic Unit Type	River
Limpopo C-Plan	Area marked as CBA	Level 5a: Hydrological regime (perennial vs non-perennial)	Non-perennial
		Level 5b: Non-perennial sub-types	Intermittent
PRESENT ECOLOGICAL STATE			
Instream IHI		Riparian IHI	
Hydrology modification	0.7 (Small)	Hydrology modification	0.8 (Small)
Physico-chemical modification	1.0 (Small)	Bank structure modification	1.4 (Small to moderate)
Bed modification	0.8 (Small)		
Bank modification	2.0 (Moderate)	Connectivity modification	1.0 (Moderate)
Connectivity modification	2.0 (Moderate)		

NON-PERENNIAL RIVER 5 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
Overall	76.7% (Moderately modified)	Overall	75.4% (Moderately modified)

PRIMARY MODIFIERS

This non-perennial river was characterised by a weakly formed riparian zone and the addition of stormwater conveyed from the roadway. Nonetheless, the non-perennial river traverses the southern extent of the proposed project area and drains north into another system downgradient, eventually confluencing with non-perennial river 2, 3 and 4. Like many of the other watercourses within the proposed project site, the system is altered hydrologically due to the stormwater channelled into it. Erosion and sedimentation have occurred and with the addition of stormwater runoff from the road are collectively anticipated to alter the physico-chemical parameters from the reference. Bed and bank modification has occurred as a result of gravel access roads traversing the system which has resulted in some vegetation removal and channel straightening in certain portions. These impacts have also altered the connectivity to some degree.

ECOSYSTEM SERVICES

Regulating and supporting services

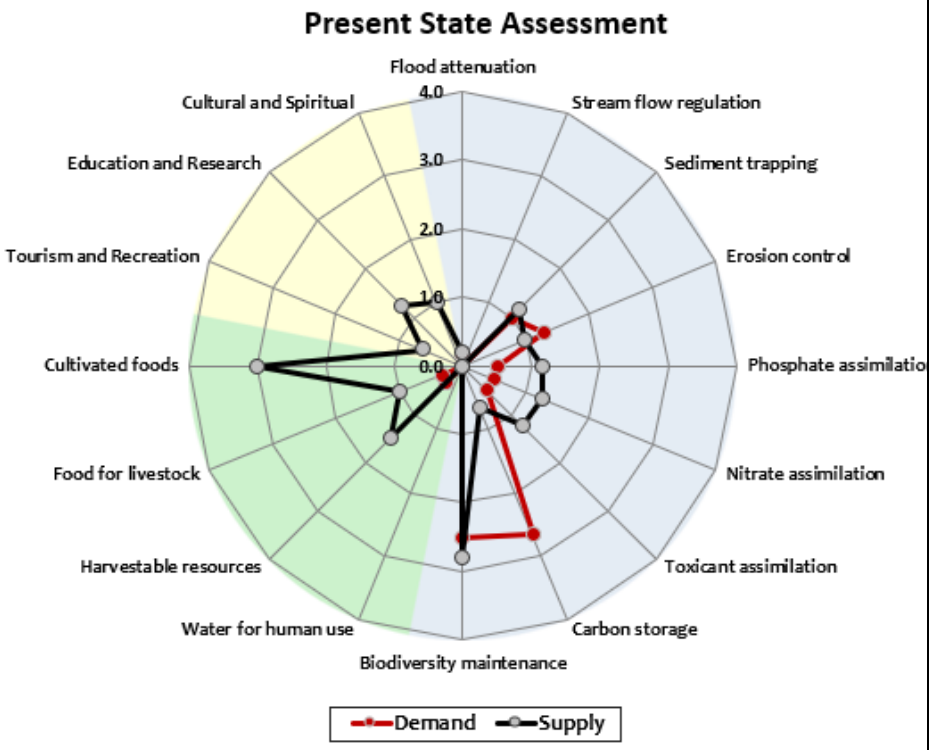
All regulating and supporting services provided a very low degree of importance within the exception of biodiversity maintenance which provided a moderately high degree of importance. With the exception of carbon storage which was supplied to a low degree whilst having a high demand, and biodiversity maintenance which was supplied to a high degree as well as having a high demand, the remainder of the regulating services were supplied to a low degree as well as having a low demand.

Provisioning services

The provisioning services of water for human use, harvestable resources and food for livestock also all provided a very low degree of importance except for cultivated foods which was provided to a moderately low degree of importance. Whilst the supply for cultivated foods was considered high, the demand was noted to be low.

Cultural services

All cultural services including tourism and recreation, education and research and cultural and spiritual practices were provided to a very low degree of importance with both the supply and demand of these services considered low.



NON-PERENNIAL RIVER 5 - PRESENT ECOLOGICAL STATE, ECOSYSTEM SERVICES, EIS AND MANAGEMENT DISCUSSIONS			
IMPORTANCE AND SENSITIVITY			
Ecological Importance & Sensitivity	Hydro-functional Importance	Direct Human Benefits	Overall EIS Category
2.00	0.75	1.33	Moderate
Overall EIS discussion	Non-perennial river 5 indicated a Moderate EIS which was due to the presence of SCC (such as *Lydenburgia cassinoides*), however compared to the other systems the feeding and breeding habitat was not as significant.		
MITIGATION/MANAGEMENT MEASURES			
It is recommended that the non-perennial river 5 and associated 38m buffer be avoided to prevent impacts on the watercourse. Optimisation of the layout is recommended to accommodate the avoidance of this watercourse. If avoidance is not feasible, the mitigation hierarchy should be followed and the relevant authorisations granted prior to any development.			

8.4.6 Aquatic ecology

8.4.6.1 Monitoring sites

For the aquatic ecology, the baseline assessment focused on two habitat sites in the Dwars River and three sites within the Springkaanspruit as well as five sites within the unnamed tributaries of the Dwars River. The Dwars River is considered to be perennial throughout the year and has several white- water rapids throughout its flow. The alluvial flow pattern of the Springkaanspruit has a gradually decreased bank and aquatic vegetation due to natural riverbed erosion occurring. The characteristics of the identified aquatic monitoring sites (**Figure 8-15**) are provided in **Table 8-12** below.

8.4.6.2 Aquatic results

SASS5 and FRAI

An investigation into the aquatic invertebrate composition of a stream gives a decent indication of the short-term biological (biotic) integrity of the system. The Average Score Per Taxon (ASPT) and South African Scoring System (SASS) scores are presented for each stream and river assessed in **Table 8-10**.

Table 8-10: SASS5 Scores

SASS5 SCORES				
SITES	**SASS5**	**ASPT**	**IHAS**	**HEALTH CLASS**
BM1	124	5.2	75	**Class D**
BM2	107	4.9	66	**Class D**
BM3	122	5.1	71	**Class D**
BM6	152	6.6	84	**Class B**
BM7	98	4.9	63	**Class D/E**

Based on the definition of Present State Classes in terms of SASS version 5 (SASS5) scores as presented in Dickens and Graham (2002), the streams linked to the Springkaanspruit are significantly altered compared to the reference score. This aligns with the PES established for the catchment but falls short when compared to the SANBI PES and Recommended Ecological Category (REC), indicating an impaired state.

Using the definition of Present State Classes and SASS5 scores presented in Dickens and Graham (2002), the upstream site within the Dwars River (BM6) is only slightly modified compared to the reference score. This indicates an improved state when compared to the Catchment PES and SANBI PES, while being comparable to the River PES and REC. In contrast, the downstream site (BM7) in the Dwars River is significantly to severely modified and falls into an impaired state when compared to all relevant Health Class parameters.

Higher SASS5 scores were observed in the Springkaanspruit when compared to the obtained ASPT scores. This suggests that the area has a greater diversity of species but slightly lower species sensitivity. However, it should be noted that due to the non-perennial nature of the Springkaanspruit and its alluvial flow pattern, the presence of erosion channels has restricted the availability of marginal and aquatic vegetation. Consequently,

certain sensitive aquatic macro-invertebrate families like *Hydracarina* and some *Odanata* specimens were not observed during the monitoring assessment, leading to a lower ASPT score. For example, only 1 or 2 *Beatidae* specimens were sampled at each of the 3 applicable Springkaanspruit sites, which impacted the overall ASPT scores. Additionally, sensitive *Trichoptera* and other *Ephemeroptera*, which rely on strong water flow conditions, were largely absent due to shallow stream depth and low velocity.

It should be noted that this Spruit is classified as a non-perennial tributary and should not be compared in depth to perennial river systems such as the Dwars River. Considering the lack of visual impacts, good in-situ water quality as well as the current aquatic macro-invertebrate diversity observed the current Health Class obtained for the Springkaanspruit is a good reflection of its current aquatic ecological status.

Taking the Dwars River into account, several alterations in bio-monitoring results could be observed. Very favourable habitat conditions were present at the BM6 site with all of the applicable biotopes being available for sampling purposes. Strong water flowing conditions also occurred with slower well vegetated back waters also present which contributed to a high species diversity occurring. Strong flowing water levels also contributed to mainly sensitive *Ephemeroptera*, *Odanata* as well as *Trichoptera* specimen being found between mostly stones in current which elevated the overall ASPT score to a notable extent. Despite a large impoundment being observed approximately 2km upstream large culvert systems have allowed largely natural River flow conditions to be maintained on a permanent basis. Several fish species were also observed at the BM6 site which correlated to the current Health Class being obtained and is indicative towards a healthy sustainable aquatic ecosystem (**Figure 8-13**).

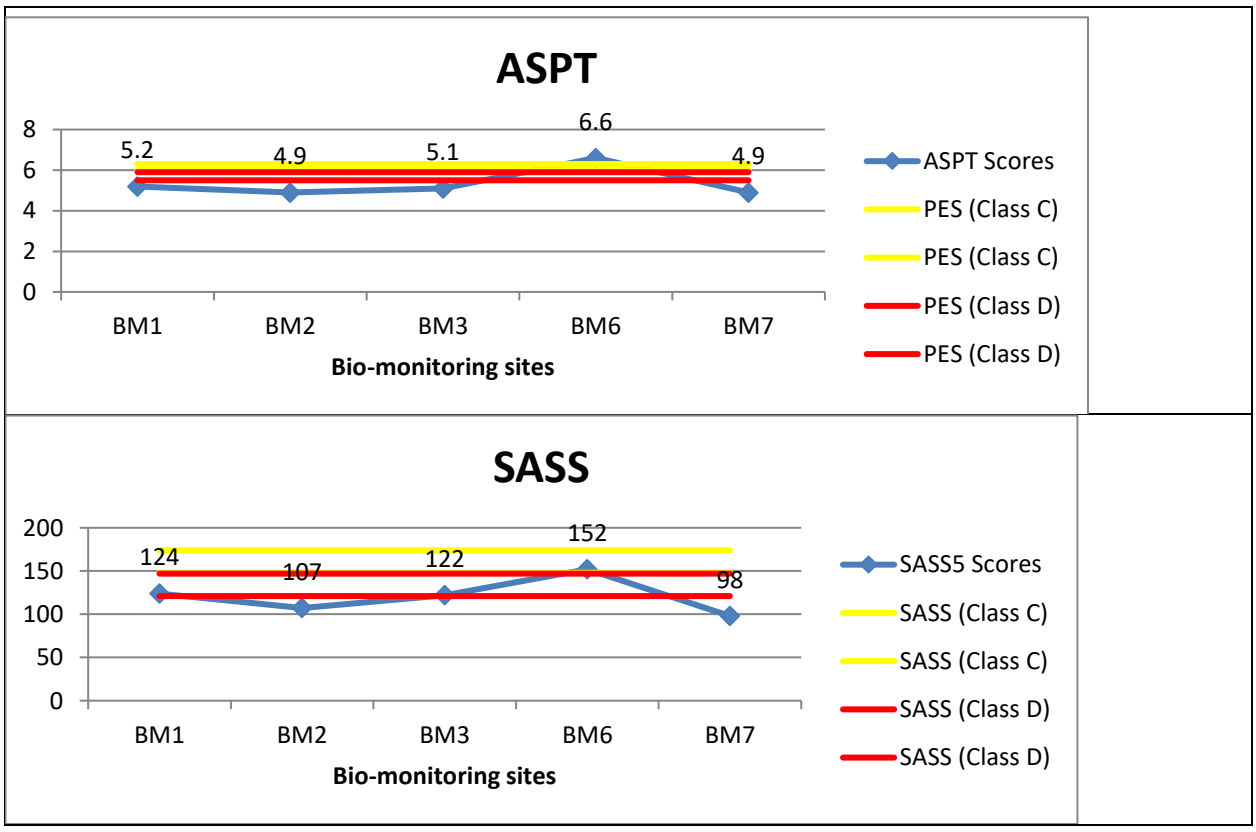


Figure 8-13: Aquatic Ecosystem Classification

In comparison to the BM6 site, the BM7 site was in a much more impaired status with a lack of habitat and biotopes being available for sampling purposes. It should be noted that this site was selected due to no access being available further downstream within the Dwars River. The BM7 site was also situated next to a small mine which has impacted the natural morphological structure of the river system at this site. An impoundment directly upstream of the monitoring site (without any visible culverts) has resulted in the entrapment of soils and sand within the dam-built structure. As a consequence, the natural river channel has been carved out and deepened by irregular flow patterns, leading to a restricted area for bio-monitoring due to the lack of additional sediments. Taking the in-situ data into account, it doesn't seem to be any physio chemical barriers affecting the aquatic ecosystem. Migration patterns of various fish species are, however, impacted on a more serious basis due to a lack of water flow during the dry winter periods. It is recommended that an alternative downstream site be assessed within future bio monitoring events in order to obtain a fair reflection of the current aquatic conditions further downstream.

As part of the overall Ecosystem and PES classification, a desktop analysis was conducted on the B41G quaternary catchment. Data was gathered from (Kleynhans *et al*., 2007). Reference frequency of occurrence of fish species in South Africa with the reference fish species expected to be found within the B41G quaternary catchment is listed within **Table 8-11**. The reference Fish Response Assessment Index (FRAI) data as well as the FRAI: PES indicated that the fish species within the quaternary catchment are rated as a Health Class C indicative towards moderately impaired. Community composition is lower than expected due to loss of some sensitive forms. Basic ecosystem functions predominantly are still unchanged.

During the bio-monitoring assessment, as part of the SASS5 sampling protocols, several fish species were sampled and observed per chance (Figure **8-14**). Three (3) of the four (4) fish species sampled correlated with the reference species expected to be found within the applicable river systems indicative towards an accurate fish Health Class assumption.

Table 8-11: Reference Frequency of Occurance (FROC) fish species for the B41J quaternary catchment

ABBREVIATIONS: REFERENCE SPECIES (INTRODUCED SPECIES EXCLUDED)	SCIENTIFIC NAMES: REFERENCE SPECIES (INTRODUCED SPECIES EXCLUDED)	REFERENCE FREQUENCY OF OCCURRENCE
AMOS	*Anguilla mossambica* (Peters 1852)	3
AURA	*Amphilius uranoscopus* (Pfeffer, 1889)	3
BMAR	*Labeobarbus marequensis* (Smith, 1841)	1
BNEE	*Barbus neefi* (Greenwood, 1962)	1
BPAU	*Barbus paludinosus* (Peters, 1852)	3
BTRI	*Barbus trimaculatus* (Peters, 1852)	1
BUNI	*Barbus unitaeniatus* (Günther, 1866)	1
CGAR	*Clarias gariepinus* (Burchell, 1822)	1
CPAR	*Chiloglanis paratus* (Crass, 1960)	1
CPRE	*Chiloglanis pretoriae* (Van der Horst, 1931)	1
CSWI	*Chiloglanis swierstrai* (Van Der Horst, 1931)	1
LMOL	*Labeo molybdinus* (Du Plessis, 1963)	1
OMOS	*Oreochromis mossambicus* (Peters, 1852)	1
OPER	*Opsaridium peringueyi* (Gilchrist & Thompson, 1913)	1
TSPA	*Tilapia sparrmanii* (Smith, 1840)	1

Figure 8-14: Fish Species observed (MENCO, 2023)

Table 8-12: Characteristics of selected Aquatic Monitoring Sites (MENCO, 2023)

SITE	PHOTOS	CHARACTERISTICS
BM1		Visual Characteristics • River largely undisturbed, recent disturbances related to flooding. • Alluvial flow, non-perennial during winter periods. Habitat Characteristics • Dominated by a sandy substrate with larger rocks also occurring. IHAS Characteristics • Medium water flow with a high diversity of biotopes, mud largely absent with somewhat limited vegetation.
BM2		Visual Characteristics • River level lower with flatter sandy planes occurring. • Alluvial flow, non-perennial during winter periods. Habitat Characteristics • Dominated by a sandy substrate with an elevated flow and small waterfalls over bedrock. • Water levels low restricting aquatic macro invertebrate diversity IHAS Characteristics • Riverbank and marginal vegetation were not connected to the water column. Isolated patches still able to support aquatic life.

SITE	PHOTOS	CHARACTERISTICS
BM3		Visual Characteristics • Lower reaches of Springkaanspruit with changes in geomorphological structure. • Some traces of pollution observed around riverbank. Habitat Characteristics • Less gravel and more mud present. • Dark soils present due to alluvial weathering. IHAS Characteristics • A high diversity of Chironomidae was found which could be indicative towards organic pollution. • Overall, a high diversity of biotopes was available.
BM4		Visual Characteristics • Characterised as a mountain stream. • Small waterfalls are dissected by flat sand banks. • Water levels limited to in-situ data only. Habitat Characteristics • Larger rocks and boulders dissect River channel. • Riverbank mostly covered by reed bed vegetation while several larger trees form a green canopy over its width. IHAS Characteristics • N/A

SITE	PHOTOS	CHARACTERISTICS
BM5		Visual Characteristics • Middle to lower reaches of same mountain stream. • Access was restricted due to no access being available. Habitat Characteristics • Limited water flow available • River surface area mostly consists of bedrock with limited other biotopes. IHAS Characteristics • N/A
BM6		Visual Characteristics • A large impoundment approximately 2km upstream of the bio-monitoring site was observed. • Strong flowing conditions with slower flowing backwater areas. Habitat Characteristics • All applicable biotopes were available making it a perfect bio-monitoring site. IHAS Characteristics • A significant amount of sensitive aquatic macro invertebrate specimen found. • River surface make-up with more than 3 mixes.

SITE	PHOTOS	CHARACTERISTICS
BM7		Visual Characteristics • A large impoundment upstream of the site without any culverts caused an irregular stream depth due to the trapping of sediments. Habitat Characteristics • Additional erosion impacts especially during the wet period when water is released from the impoundment have caused the stream channel to deepen. IHAS Characteristics • Bio-monitoring restricted due to stream depth. • Limited biotopes available included a single rapid as well as limited vegetation.
BM8		Visual Characteristics • Classified as an episodic River that only flows during storm events. Habitat Characteristics • Soil was still moist indicative that surface water flow is available during flash floods. • Plays an important role as a drainage channel/storm water run-off channel during extreme rain events. IHAS Characteristics • N/A

SITE	PHOTOS	CHARACTERISTICS
BM9		Visual Characteristics • Classified as an episodic River that only flows during storm events. Habitat Characteristics • Stream channel impacted by mining activities. • Aggregate material and soil have been dumped directly in the water channel which prohibits any surface water flow from passing through this blockage. IHAS Characteristics • N/A
BM10		Visual Characteristics • Classified as an episodic River that only flows during storm events. Habitat Characteristics • Some indications of bank erosion due to flow nature. • The unnamed tributary is intersected by various culverts throughout its flow to ensure that run-off channel is not compromised. IHAS Characteristics • N/A

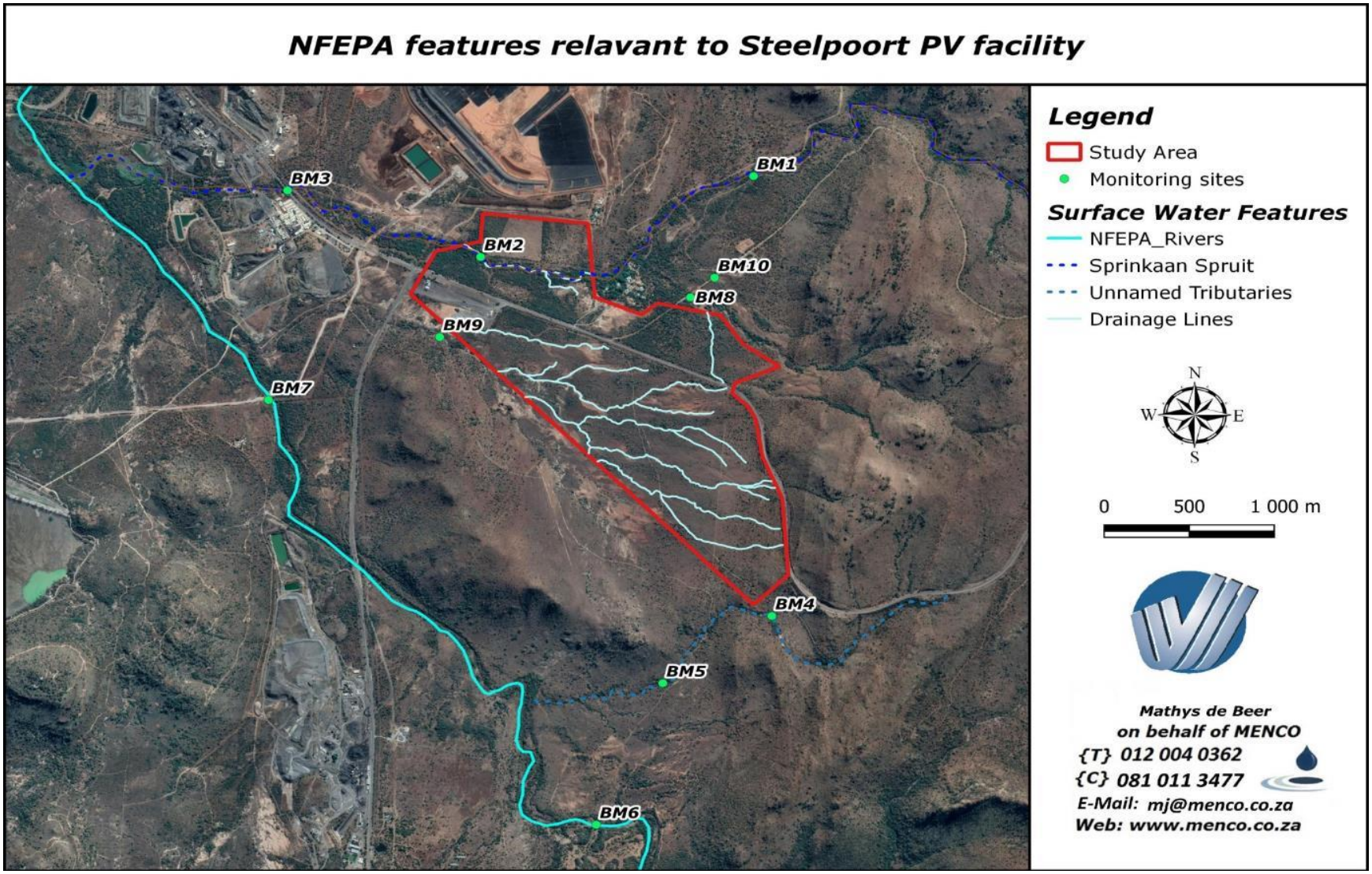


Figure 8-15: Aquatic monitoring sites (MENCO, 2023)

8.4.7 Sensitive aquatic species

Six (6) families of macroinvertebrates were identified during the wet season assessment within these, ten (10) species were recorded at the monitoring sites identified by MENCO. Eight (8) of the applicable sensitive aquatic macro invertebrate specimens were found at the Dwars River site. The recoded sensitive aquatic micro-invertebrates are provided in **Table 8-13** below.

Table 8-13: Sensitive Aquatic Macro invertebrates recorded (MENCO, 2023)

SPECIES	COMMON NAME	IMAGE
Baetidae >2sp	Mayflies	
Aeshnidae	Hawkers & Emperors	
Hydracarina	Mites	
Naucoridae	Creeping water bugs	
Calopterygidae	Damselflies	
Ecnomidae	Caddis flies	
Hydropsychidae >2sp	Caddis flies	

SPECIES	COMMON NAME	IMAGE
Heptageniidae	Flat headed Mayflies	
Perlidae	Stone flies	
Leptophlebiidae	*Prongills*	

8.5 Terrestrial Biodiversity

A terrestrial biodiversity assessment was undertaken by MENCO. The specialist ecological findings are described below, and the report is attached in **Appendix D-1**.

8.5.1 Regional Vegetation

The proposed Phula PV site is situated within the Central Bushveld bioregion of the Savanna biome. The Central Bushveld Bioregion has the highest number of vegetation types in the Savanna biome and covers most of the high-lying plateaus west of the main escarpment from the Magaliesberg in the south to the Soutpansberg in the north. The site falls within the Sekhukhune Mountain Bushveld vegetation unit with the mountainous area 1.5 km to the east classified as Sekhukhune Montane Grassland. The proposed positioning of the site, particularly the eastern portion on the foothills of the Dwars River Mountains, are more representative of an ecotone between these two vegetation units.

Threatened ecosystems at risk of being transformed have been identified and listed as per Section 52 of NEMBA (GN1002 of December 2011, revised GN47526 November 2022), which aims to minimise ecosystem and species extinctions by preventing further degradation and loss of structure, function, and composition of threatened ecosystems (SANBI, 2011). Both vegetation units form part of the Sekhukhune Mountainlands defined by the high-lying norite mountain lands occurring in the Sekhukhuneland Centre of Endemism. The vegetation units relevant to the project site are shown in **Figure 8-16**.

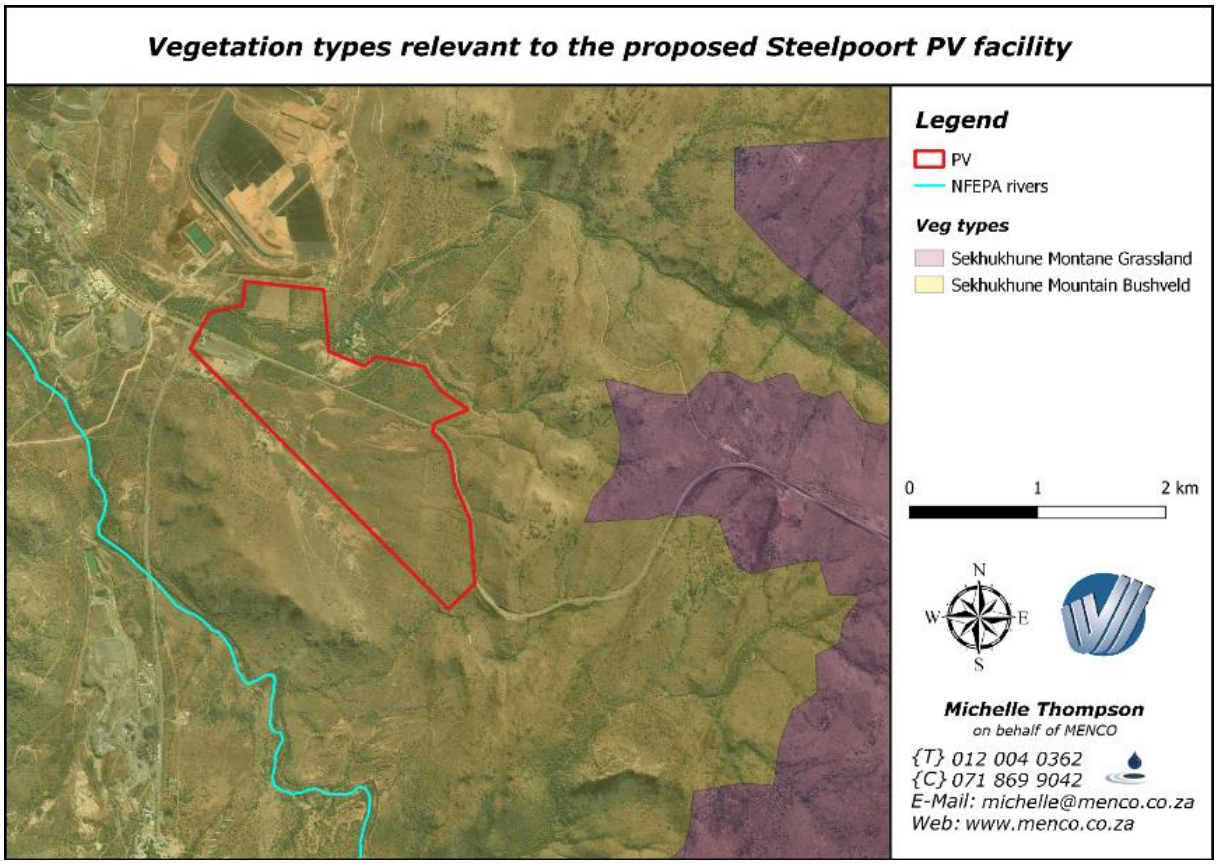


Figure 8-16: Vegetation units relevant to the project.

Please refer to figures below for site photographs of the typical vegetation found in relation to the site (**Figure 8-17** and **Figure 8-18**).

Figure 8-17: Typical vegetation found within the northern portion of the PV development site.

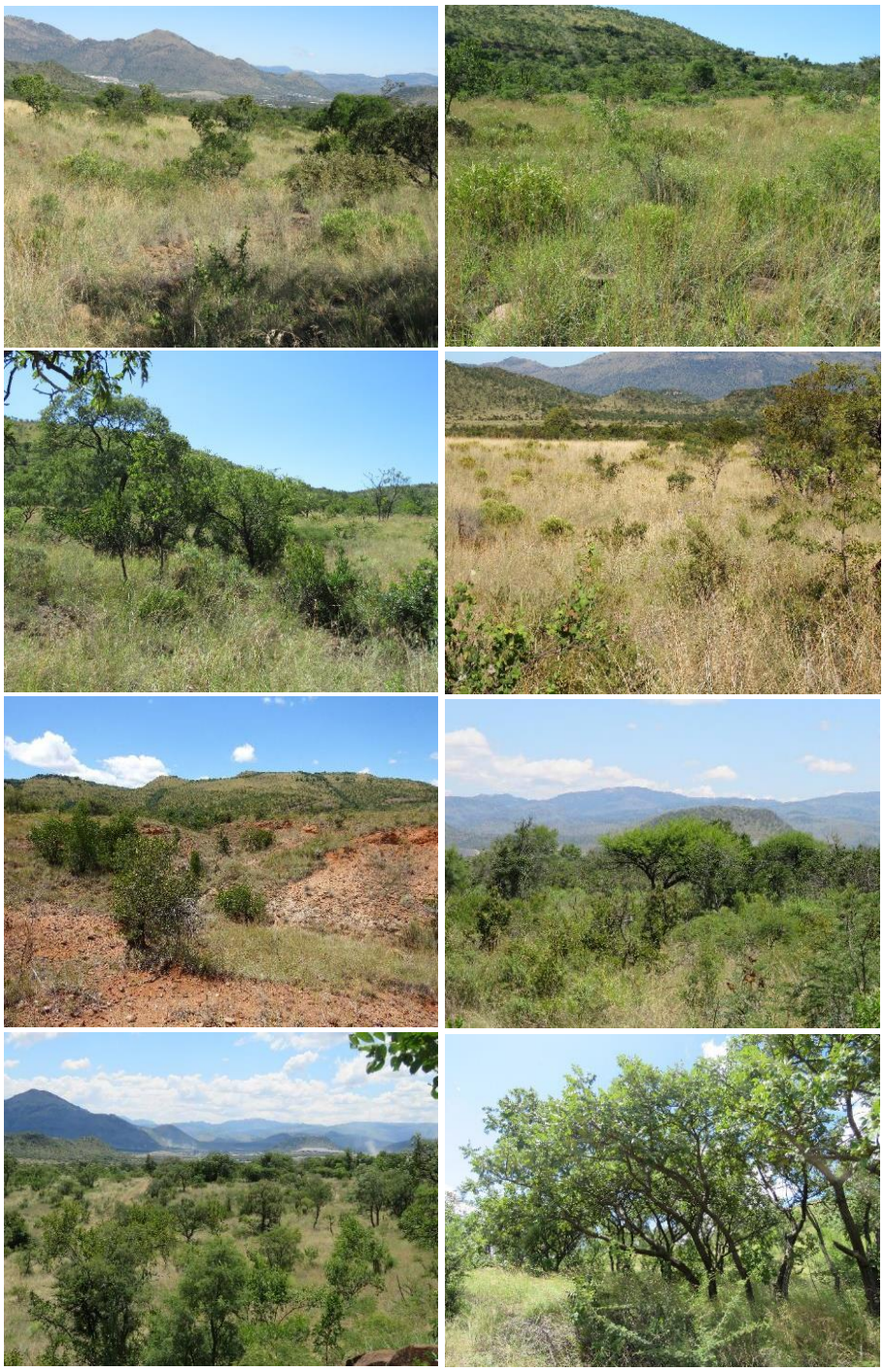


Figure 8-18: Typical vegetation types in the southern portion of the site.

8.5.2 Sekhukhuneland Centre of Endemism

The Sekhukhuneland Centre of Endemism houses in excess of 2200 floral species with two endemic/near endemic genera and over 80 endemic/near endemic species (Siebert, 2001). The greatest endemism occurs on surface rock comprised of norite, pyroxenite and anorthosite (main geological types of the Croydon, Dwars and Dsjate sub-suites) with endemic distribution centred on the quarter degree grids 2430CA and 2430CC. Therefore, with the site located within the 2430CC QDG, it is considered significant in terms of plant endemism.

Extensive mining throughout the area and poor agricultural practices (overgrazing) have led to further degradation of this unique floristic region.

8.5.3 Sekhukhune Mountain Bushveld (SVcb 28)

Sekhukhune Mountain Bushveld is in a summer rainfall region and receives a mean annual precipitation of 609 mm, with a mean annual temperature of 17.5°C and approximately five (5) days where frost is possible annually.

Distributed in the Limpopo and Mpumalanga Provinces at an altitude of 900 m – 1600 m the unit encompasses the undulating hills above the endangered Sekhukhune Plains Bushveld including the steep slopes of the Leolo and Dwars River Mountains, and Thaba Sekhukhune. A number of isolated smaller mountains are also included as well as the small hills in the Steelpoort river valley along the Klip river flowing past Roossenekal.

The habitat is characterised by open to closed microphyllous and broad-leaved savanna on hills and mountain slopes, that form concentric belts parallel to the north-eastern escarpment. Open bushveld, with a high diversity of soil influenced specialists, is often associated with the ultramafic soils on southern aspects. The bushveld of mountain slopes is generally taller than in the valleys, with a well-developed herb layer. The valley vegetation and dry northern aspects are usually dense and thicket-like, with a herb layer dominated by short-lived perennials. Dry habitats house a number of species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on footslopes of clays rich in heavy metals.

The geology of the vegetation type consists of mainly ultramafic intrusive rock of the lower, critical, and main zones of the eastern Rustenberg Layered Suite of the Bushveld Igneous Complex (Vaalian). Soils are predominantly shallow, rocky and clayey with Glenrosa and Mispah soil forms being common, with lime present in low-lying areas. Rocky areas without soil are common on steep slopes. The Dwars River Valley is characterised by prismacutanic horizons with melanic structured diagnostic horizons.

These special substrates, including rare ultramafics, play a major role for the establishment of the unique sekhukhuneland vegetation.

8.5.4 Plants and Species of Conservation Concern

A list of 299 plant species have been recorded in the quarter degree square 2430CC encompassing the project area as a whole, of which eight (8) were listed as SCC.

Sekhukhune bushman's tea (*L. cassinoides*) was common at the site, mainly concentrated along green belts neighbouring drainage lines. Bushveld saffron (*E. transvaalense*) was also present on site but less prolific, and again appeared to be restricted mainly to key drainage lines both near threatened species with declining populations and are listed as protected species. In addition, *Sclerocarya birrea* (Marula), which is also a protected species, was found on site in relatively high densities in the southern eastern portion of the site. They were found at low densities scattered among green belts within the site.

According to the MENCO (2023) Terrestrial Biodiversity Assessment Report, the proposed PV site is located in a medium sensitive area with five (5) SCCs flagged by the Screening Tool Report. **Table 8-14** below indicates the SCCs identified from screening and historical records.

Table 8-14: All SCCs identified from screening and historical records

FAMILY	SCIENTIFIC NAME	IUCN	CRITERIA
Euphorbiaceae	Sensitive species 587	Rare	
Iridaceae	Sensitive species 124	CR	C1
Polygalaceae	*Polygala sekhukhuniensis*	VU	A4c
Araceae	Sensitive species 1167	VU	B1ab(v)
Anacardiaceae	*Searsia batophylla*	VU	A2c
Anacardiaceae	*Searsia sekhukhuniensis*	Rare	
Combretaceae	*Combretum petrophilum*	Rare	
Araceae	*Zantedeschia jucunda*	VU	B1ab(v)+2ab(v)
Celastraceae	**Elaeodendron transvaalense*	NT	A4ad
Celastraceae	**Lydenburgia cassinoides*	NT	B1ab (ii, iii, v)
Hyacinthaceae	*Ledebouria dolomiticola*	VU	D1
* NFA protected tree species			

8.5.5 Alien vegetation species

Alien species are present within the project area, but mainly within bush encroached and *Vachellia karroo*/mixed closed woodland habitat areas. These habitats are of low sensitivity with several alien invasive species present. Alien invasive species such as *Datura ferrox* and *Datura stramonium* are prevalent in the bush encroached area.

8.5.6 Conservation importance

Almost the entirety of the proposed development footprint falls within a Critical Biodiversity Area 1 (CBA1) classified area and briefly bordered to the south by an Ecological Support Area 1 (ESA1) classified area. A small area of the site is classified as an ESA 2 in the north. The ESA2 area has been significantly degraded by cattle grazing pressure and as such is heavily bush encroached with several common microphyllous species. There are no formal protected areas near the development sites nor are there Important Bird and Biodiversity Areas (BirdLife SA, 2015) near to the sites. **Table 8-15** describes the relationship between the project area and the Limpopo Conservation Plan V2. This is also outlined in the **Figure 8-20**.

Table 8-15: Critical conservation areas delineated by Limpopo Conservation Plan V1

STRUCTURE	C-PLAN CRITERIA
PV	Within a CBA1, (majority of site); Bordered to the south by ESA1; ESA2 (Small portion in north); Endangered ecosystem

Ecological Support areas include natural, near-natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support Critical Biodiversity Areas and/or Protected Areas (**Figure 8-20**). There are no formal protected areas near the development sites nor are there Important Bird and Biodiversity Areas (BirdLife SA, 2015) near to the sites.

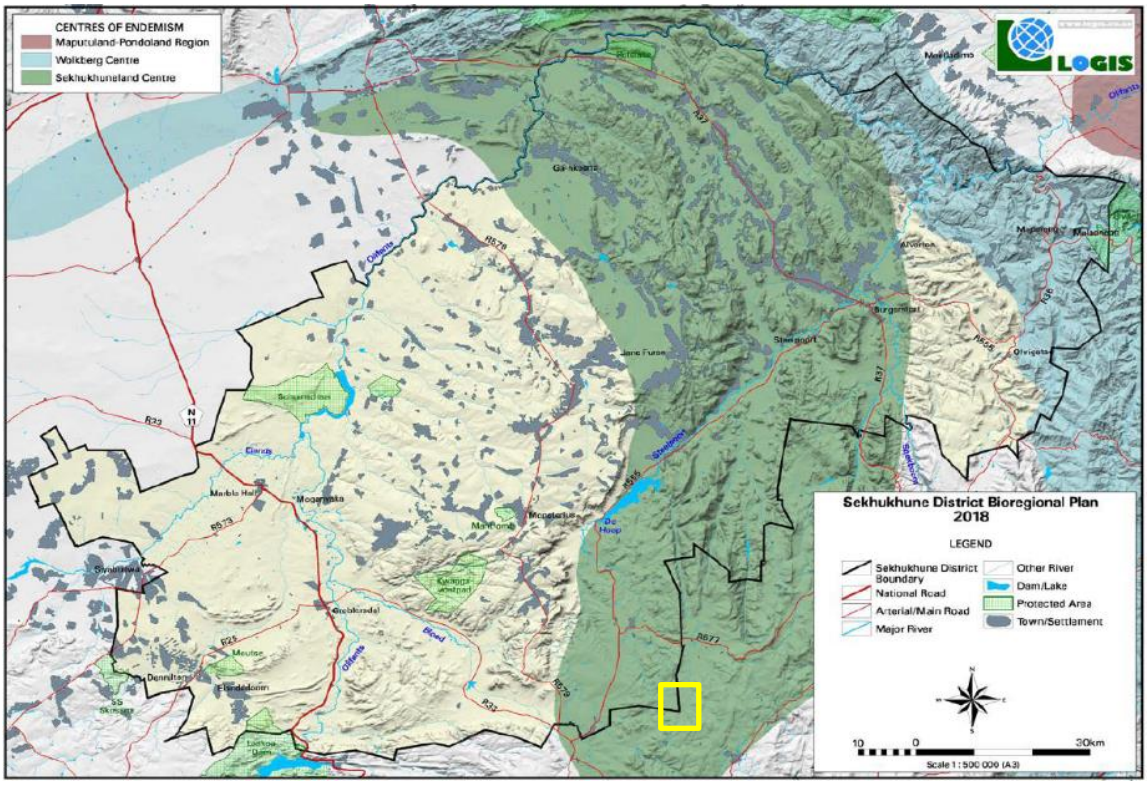


Figure 8-19: Centres of endemism within the Sekhukhune District extracted from the SDBP (2019, Figure 6) with the project site located in the yellow polygon.

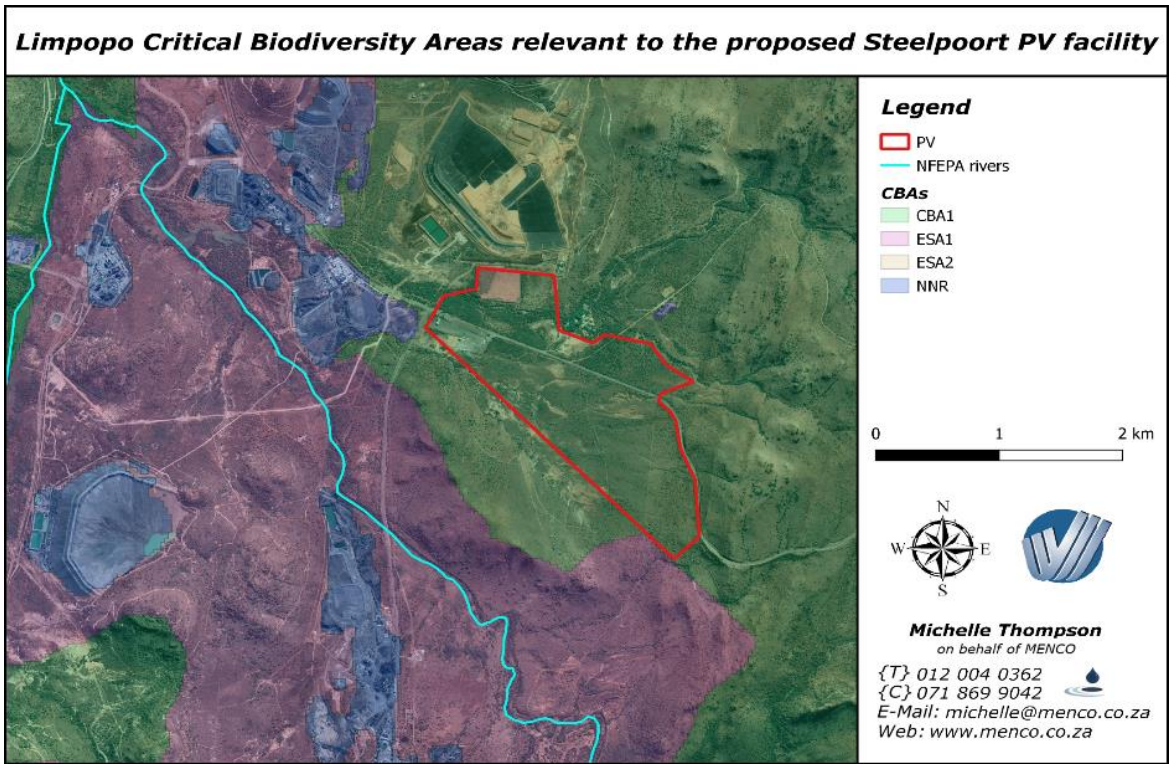


Figure 8-20: Critical Biodiversity Areas for the PV site delineated by the Limpopo Conservation Plan V2.

8.5.7 Habitats of the Phula PV facility area

The proposed site is characterised by the following habitats:

- **Eroded areas:** The soils within the Sekhukhune Mountain Bushveld vegetation are prone to erosion and this was particularly notable in the large wash away areas and eroded dongas present on site. These areas are particularly prevalent in the southern portion of the site. In the northern portion eroded areas are largely a result of human disturbance.
- The eroded areas were characterised by a high proportion of bare earth and very little vegetation. The vegetation present within these areas was dominated by a sparse grass layer of predominantly *Loudetia simplex* together with short *Euclea linearis* shrubs.
- **Bush encroached areas:** This habitat is heavily encroached, and trees and shrubs exhibit stunted growth as a result of heavy grazing pressure from cattle.
- **Degraded woodland:** The habitat is encroached, likely as a result of the heavy grazing pressure from cattle. It is restricted to the north-western corner of the site and was dominated by *Dichrostachys cinerea*, *Bolusanthus speciosus* and *Combretum* species.
- ***Vachellia* karroo/mixed closed woodland:** Habitat to the south of the Springkaanspruit which borders the R577 is characterised by tall closed *Vachellia* karoo and a short layer of *Eragrostis* which to a large extent has been cropped short due to cattle grazing.
- Protected species within this habitat are of least concern but would still require permits to remove.
- **Open woodland green belts:** The open woodland habitat within the site is characterised by an even mix of tall trees and grass dominated areas, with a well-developed shrub layer in denser areas.
- **Ridge and slope:** The ridges and slopes to the east of the site were characterised by a higher species diversity including species with succulence.
- **Grass dominated areas:** This habitat type was delineated by areas where 70% of the plant cover was grass. The grass layer is dominated mostly by *Themeda triandra*, *Loudetia simplex* and in some areas by *Tristachya biseriata* and *Diheteropogon amplectens*. In places the bare earth proportion is comparatively high.
- **Sensitive drainage lines:** This habitat has been delineated to highlight the density of protected *L. cassinoides* along key drainage lines. The habitat is similar to that of the green belts and open woodland areas in terms of species composition with larger more mature trees present.

This abovementioned habitats are shown in **Figure 8-21** and sensitivity ratings outlined in **Table 8-16**.

Table 8-16: Habitat sensitivity ranking (1 = least sensitive and 5 = highly sensitive)

HABITATS	SENSITIVITY RANKING (1 - 5)
Eroded areas	1.5
Bush encroached areas	1
Degraded woodland	1

HABITATS	SENSITIVITY RANKING (1 - 5)
Vachellia karroo/mixed closed woodland	1.5
Open woodland	2
Ridge & Slope	3.5
Grass dominated areas	1.5
Sensitive drainage lines	3

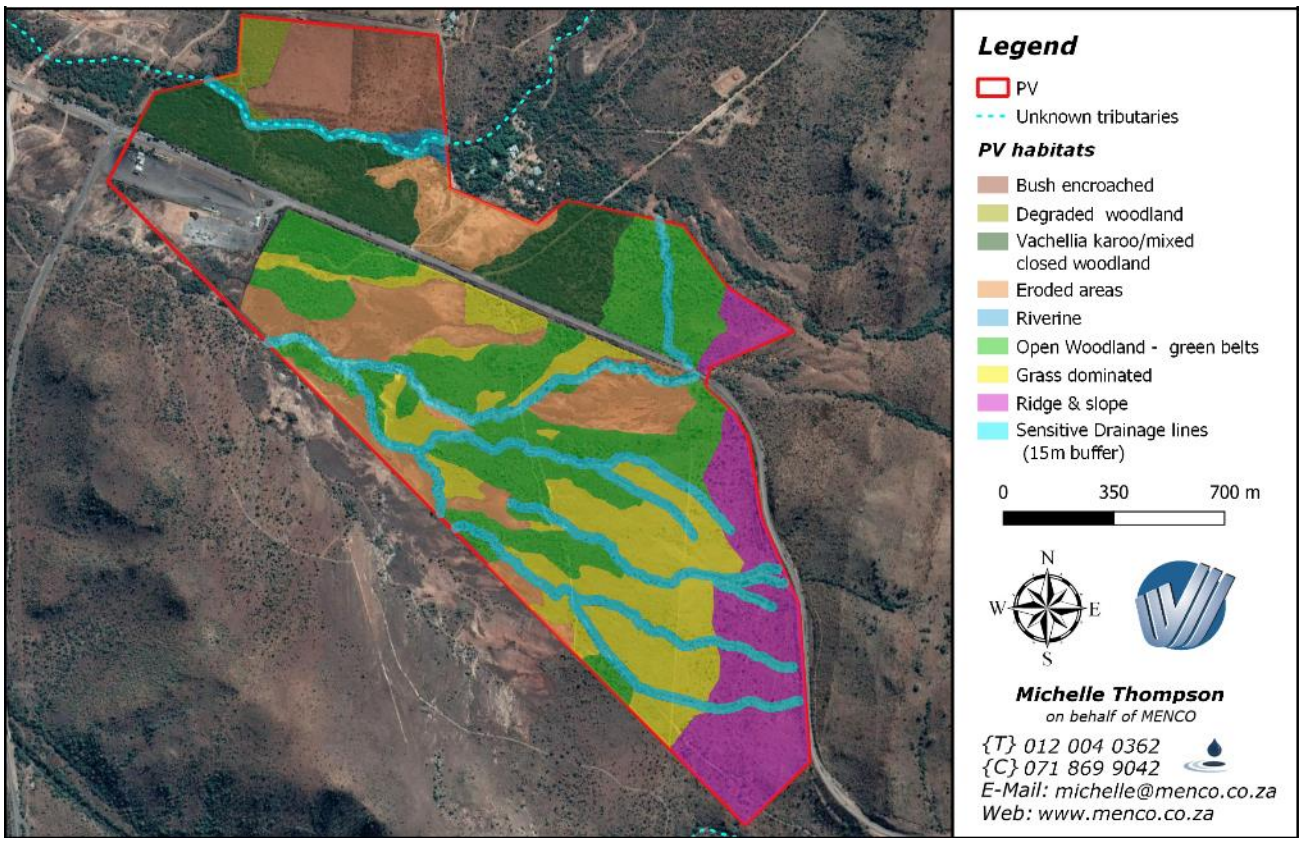


Figure 8-21: Habitat types within the project site

8.5.8 Fauna Diversity

8.5.8.1 Mammals

According to MENCO (2023), little evidence of mammal occupation was found in the southern area in particular. The increased blasting from the neighbouring chrome mine and associated dust pollution has likely played a role in displacing the mammal community. The northern portion of the site appeared to have more mammal activity but was also more heavily impacted by cattle grazing pressure.

Mammal species identified included, Small-spotted genet (Genetta genetta), Scrub hare (Lepus saxatilis), Black-backed jackal (*Lupulella mesomelas*), Common duiker (*Sylvicapra grimmia*), Warthog (*Phacochoerus africanus*), Vervet monkey (*Chlorocebus pygerythrus*) and Chacma baboon (*Papio ursinus*). Leopard spoor was also seen in the drainage lines. Very little rodent activity was observed (very few burrows and grass paths). No tunnel evidence of golden moles was found.

A total sixty-three (63) mammal species have been recorded in the quarter degree grid cells in the vicinity of the project site, of which only four (4) species are listed as a SCC.

8.5.8.2 Reptiles

The project site lies in a reptile diverse region. However, only four (4) species have been previously listed within the Quarter Degree Grid (QDGs) that encompass the site.

Several species were found on site during the field surveys including flap-necked chameleon (*Chamaeleo dilepis*), Nile monitor (*Varanus niloticus*), Ground agama (*Agama aculeata*), Spotted sand lizard (*Pedioplanis lineoocellata*), Rainbow skink (*Trachylepis margaritifera*), Variable skink (*Trachylepis varia*), Boomslang (*Dispholidus typus*) and a shed skin likely belonging to a black mamba (confirmed present pers. comm. Marius Scholtz) or cobra species. No SCCs were recorded during the site visit. However, it was noted that FitzSimons' Flat Lizard does occur on the rocky slopes outside the site itself.

A list of forty-one (41) reptile species have been recorded in the quarter degree square encompassing the project area. None of these species are listed as SCC.

8.5.8.3 Amphibians

Several amphibians have previously been recorded in the QDG cells encompassing or nearby the sites. Limited species recorded includes *Amieta delalandii* and *Ptychadena anchietae*. No amphibian SCCs have been previously recorded within the area, nor were any SCCs found on site. Protection of the drainage lines is likely to conserve a significant portion of the amphibian assemblage.

A list of eighteen (18) amphibian species have been recorded in the quarter degree square encompassing the project area. None of these species are listed as SCC.

8.6 Avifauna

An avifauna assessment was undertaken by Volant Environmental (Pty) Ltd. The specialist baseline findings are described below, and the report is attached in **Appendix D-4.**

8.6.1 Potential bird species in the area

Based on a list of bird species drawn from a single well covered pentad that covers and surrounds the project area, a total of hundred and sixty-seven (167) species have been identified of which eleven (11) species have been identified as Priority Species. Only two species namely Cape Vulture and Lanner Falcon are within the top thirty (30) priority species. Potential priority bird species that could occur on the project area are provided in **Table 8-17** below.

Table 8-17: Priority species that could potentially occur in the Project Area

COMMON NAME	SCIENTIFIC NAME	OVERALL PRIORITY SCORE
Cape Vulture	*Gyps coprotheres*	405
Lanner Falcon	*Falco biarmicus*	300
Black-chested Snake Eagle	*Circaetus pectoralis*	230
Yellow-billed Kite	*Milvus aegyptius*	220
Common Buzzard	*Buteo buteo*	210
Amur Falcon	*Falco amurensis*	210
Brown Snake Eagle	*Circaetus cinereus*	180

COMMON NAME	SCIENTIFIC NAME	OVERALL PRIORITY SCORE
Black-winged Kite	*Elanus caeruleus*	174
Spotted Eagle-Owl	*Bubo africanus*	170
Little Sparrowhawk	*Accipiter minullus*	not ranked
Rock Kestrel	*Falco rupicolus*	not ranked

A list of sixty-one (61) unique avifauna species were identified, of which priority species observed within the project area included Martial Eagle, Yellow-billed Kite, Lanner Falcon, and Common Buzzard.

8.6.2 Important Bird and Biodiversity Areas

There are no Important Bird Areas (IBAs) in the nearby area, with the closest being the Steenkampsberg IBA located ~26km to the south (Figure **8-22**).

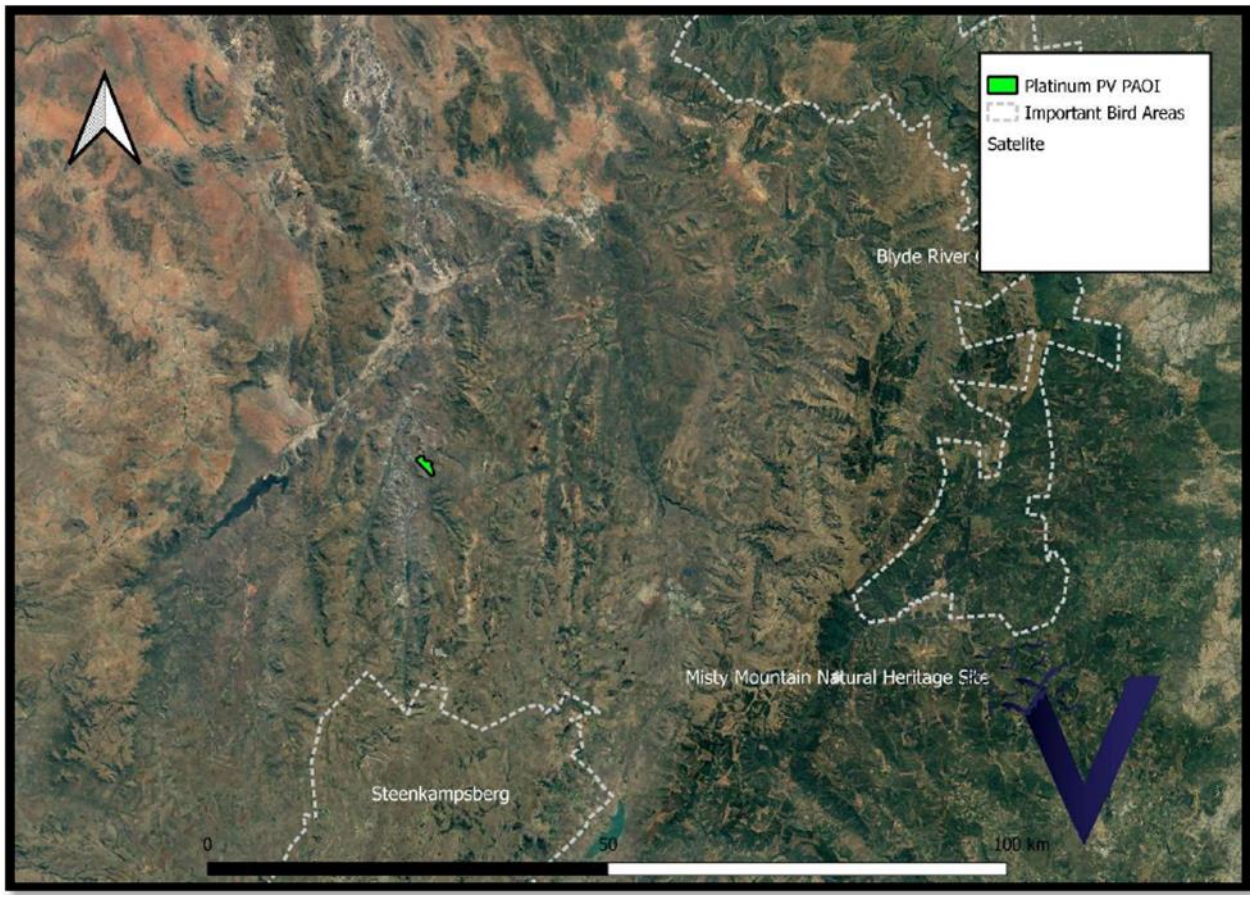


Figure 8-22: Important Bird Areas located near the Project Area.

8.6.3 Sensitive bird areas

One (1) potential sensitive bird area was observed on the project site, which is a non-perennial river (Springkaanspruit). No nests or active roost sites were observed during the avifauna surveys.

8.7 Heritage and Palaeontology

A Heritage and Palaeontology assessment was undertaken by PGS Heritage. The specialist baseline findings are described below, and the report is attached in **Appendix D-5**

8.7.1 Heritage resources

There are no known Stone Age sites present within the study area. Several sites have been recorded in the surrounding regions within Limpopo (Pistorius, 2008; Coetzee, 2017; Pelser *et al*., 2010; Pelser 2017, 2019). The majority of sites mainly date to the Early and Middle Stone Age (MSA) and occur in secondary contexts.

The Early Stone Age is the first phase identified in South Africa's archaeological history. It includes the simple flakes struck from cobbles core and pebble tools; later stages include intentionally shaped hand axes, cleavers, and picks; final or transitional stages have tools that are smaller than the preceding stages and include large blades.

The MSA is the second oldest phase identified in South Africa's archaeological history. It is associated with the flakes, points and blades manufactured by means of the so-called 'prepared core' technique.

8.7.2 Heritage features

The baseline Heritage Impact Assessment (HIA) Report (PGS, 2023) indicates that there are two (2) structures identified immediately adjacent to the study area boundaries. The distribution of the heritage features identified on the old topographic map is shown in **Figure 8-23** below.

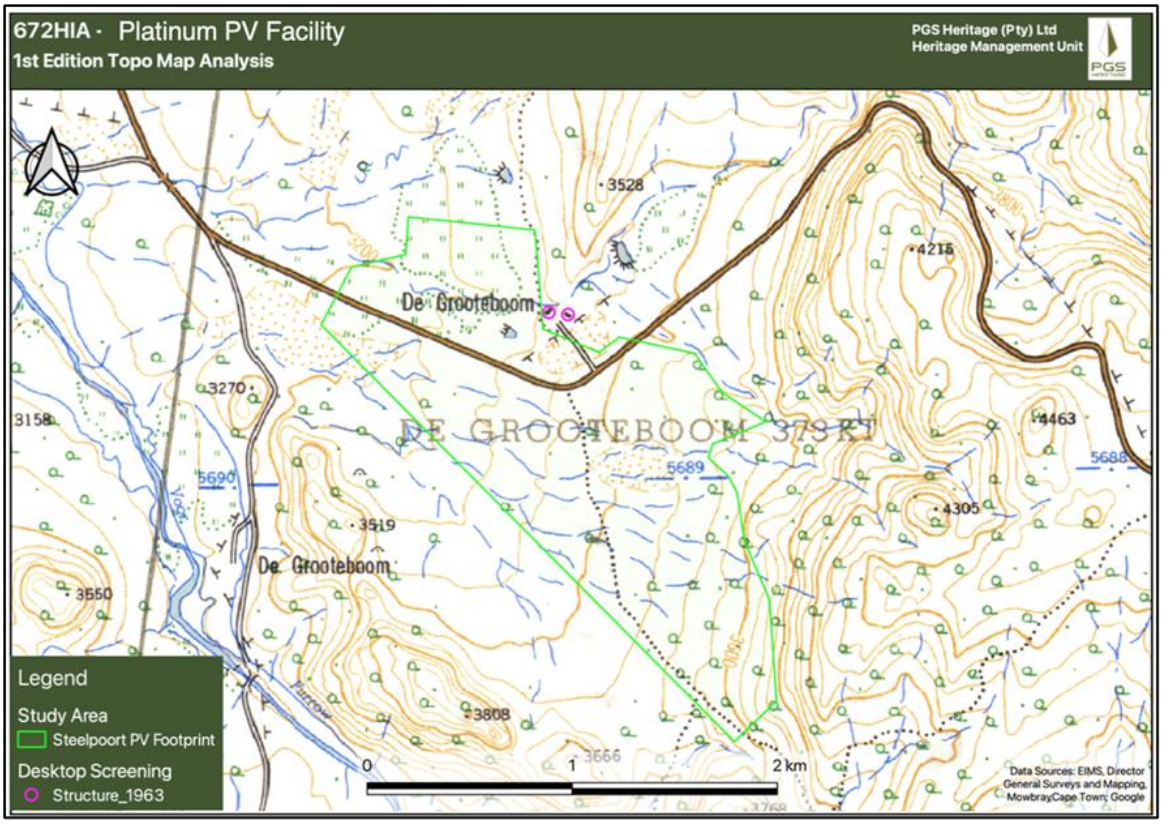


Figure 8-23: Distribution of the heritage features identified on the First Edition of the 2430CC Topographic Map (PGS, 2023)

The fieldwork undertaken by PGS (2023) revealed six (6) heritage resources containing scatters of MSA artefacts that were dense enough to be classified as either find spots or medium-low/low density surface scatters. The MSA layer is well below the present soil surface. It is therefore unlikely that these artefacts were observed in their primary context due to the nature of the environment where artefacts are exposed due to erosion. Additionally, single isolated artefacts were also observed across portions of the study area that had been exposed to erosion. The location of the identified heritage resources is provided in **Table 8-18** and presented in **Figure 8-24** below. These sites are determined to be of low significance.

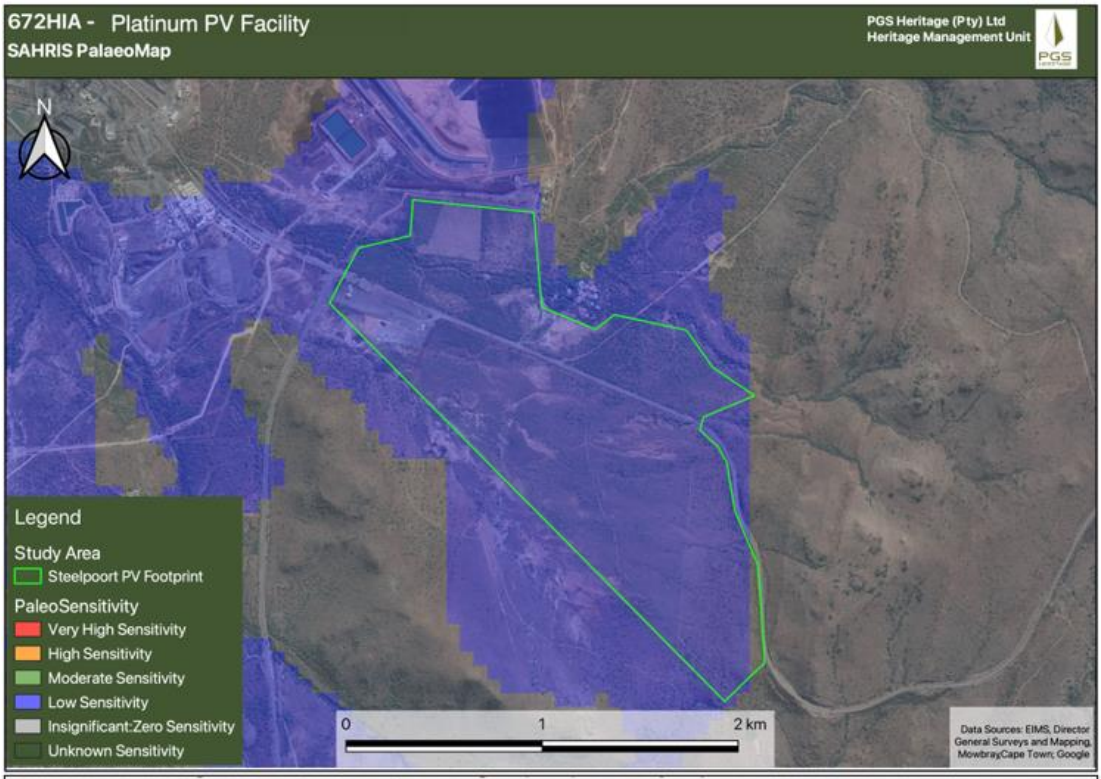
Table 8-18: Location of heritage resources observed on the project site

SITE COORDINATES		
SITE ID	**LATITUDE (DD)**	**LONGITUDE (DD)**
SSP01	-24.94144	30.142
SSP02	-24.94099	30.14381
SSP03	-24.93987	30.14119
SSP04	-24.93976	30.14098
SSP05	-24.93976	30.14121
SSP06	-24.94009	30.14134

Figure 8-24: Identified heritage resources within the proposed development area (PGS, 2023)

8.7.3 Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the palaeontological sensitivity of the proposed development areas is mostly rated as low (blue) and insignificant/zero (grey). No further palaeontological studies are required in terms of the proposed development but a protocol for finds would be required for the low sensitivity areas (SAHRIS website). The palaeontology sensitivity of the proposed site is shown in **Figure 8-25** below.



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

Figure 8-25: SAHRIS Palaeosensitivity Map overlain with the location of the study area.

8.8 Visual

The proposed study area is located in the mountainous terrain south of the town of Steelpoort, within the Groot-Dwarsrivier valley. The slope on site averages between 1° and 5°, with the easternmost section going as steep as 25° in the ridge (based on 20m contours). The visual baseline assessment has found that the viewshed of the site is relatively small due to the mountainous landscape, and the potential visual impact should only affect the surrounding mines and travellers on the tar road. The visual observers are shown in **Figure 8-26**.

8.8.1 Viewshed description

The proposed site viewshed is limited to areas around the site and on the opposite side of the valley. The bulk of the adjacent properties are owned by mining companies that mine platinum and chrome. The main surrounding mining complexes include:

- Thorncliffe;
- Dwarsrivier;
- Two Rivers Platinum;
- Lebowa Mine;
- Magareng Mine;
- Borwa Mine;
- Mototolo;
- Samancor Tweefontein; and
- BCR Mine.

Servicing the mines are several lodges and guesthouses, the closest being the Ecsal Lodge, to the north of the study site. The viewshed of the study area is shown in **Figure 8-27** below.

8.8.2 Landcover

The land cover of the study area is dominated by eroded areas, grassland and woodland. The truck stop has been classified as mining/industrial and no residential structures are found on the proposed site. **Figure 8-28** indicates the landcover within the project area.

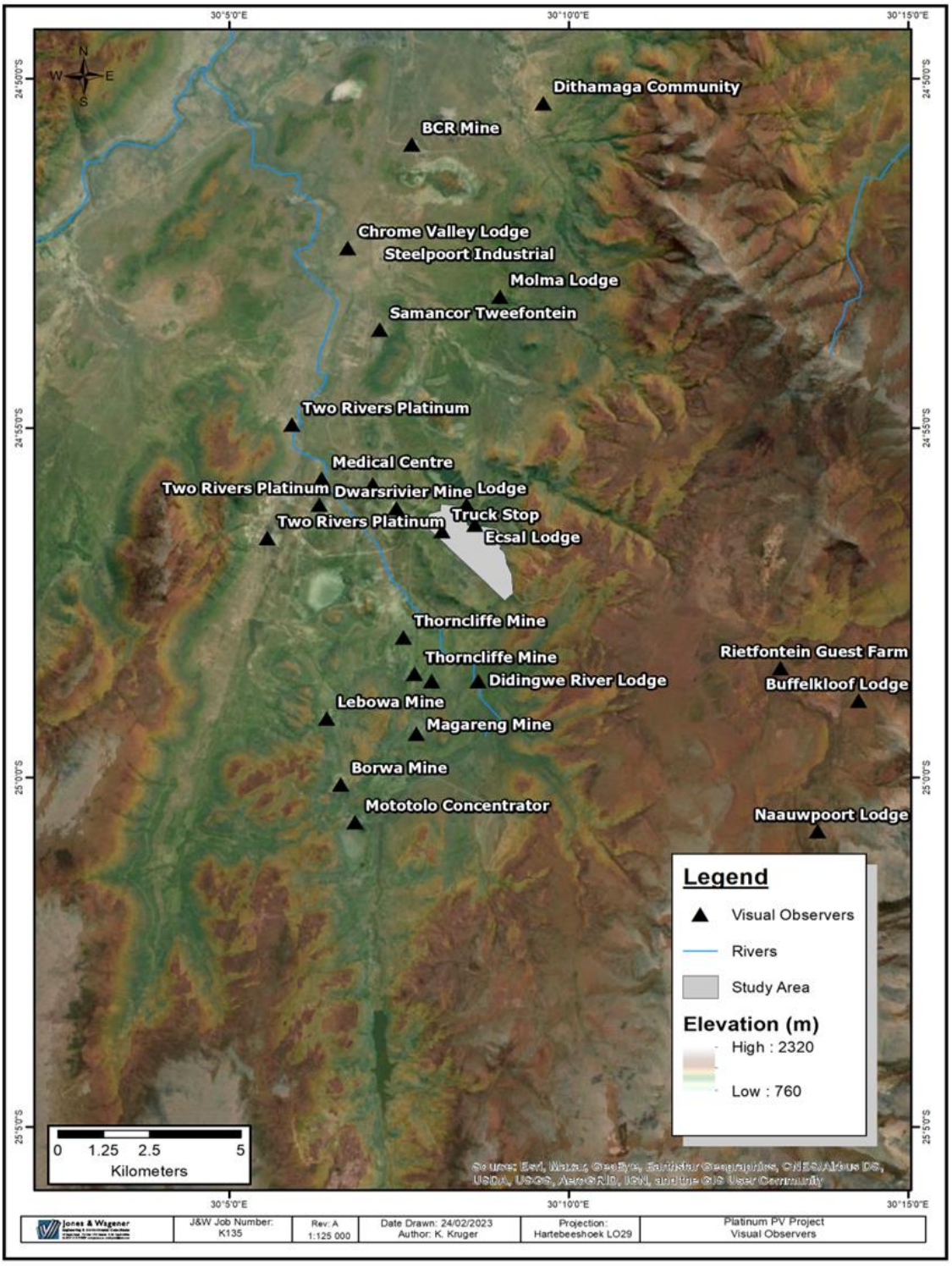


Figure 8-26: Visual observers identified on the project site (J&W, 2023)

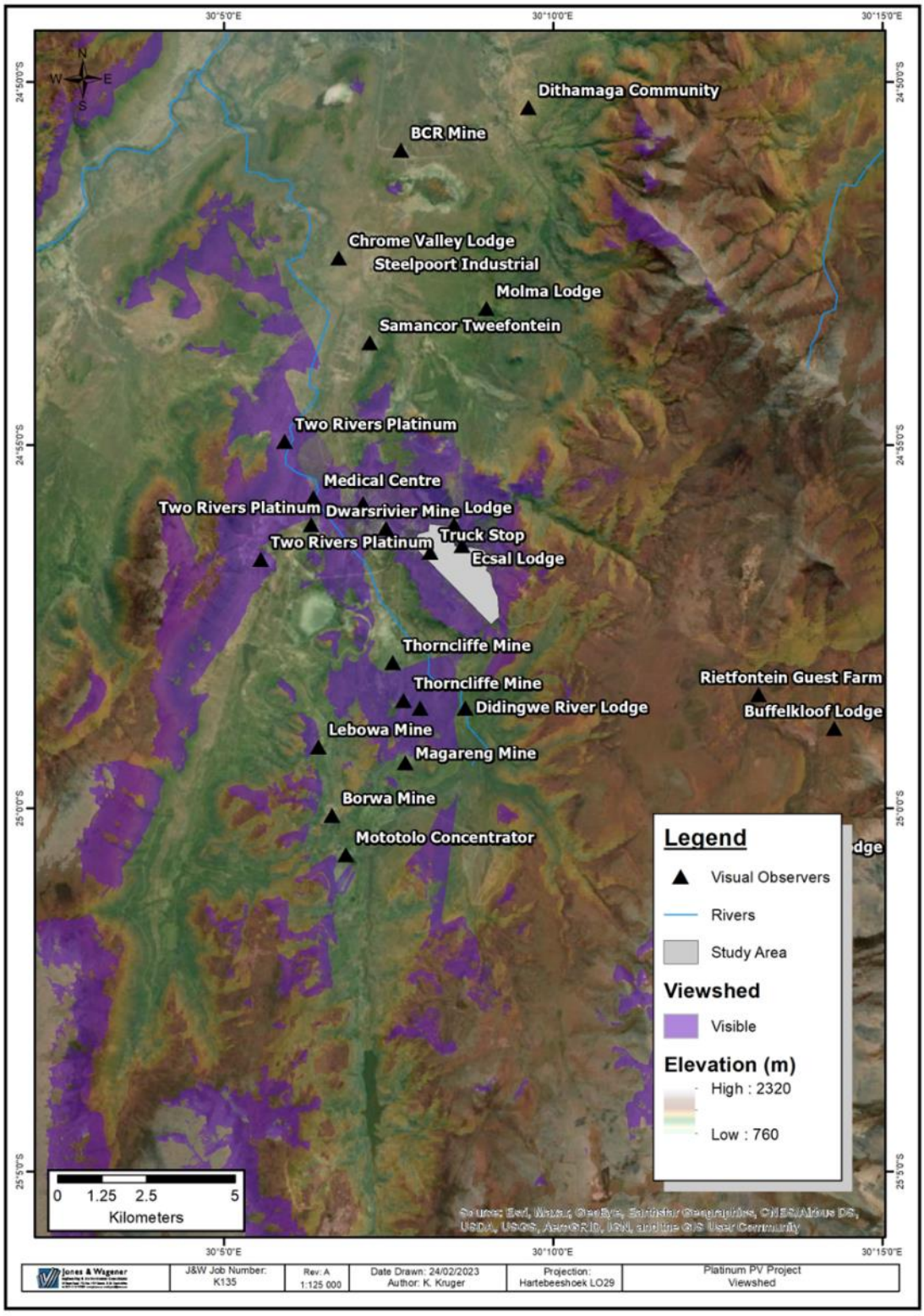


Figure 8-27: Baseline viewshed of the project site (J&W, 2023)

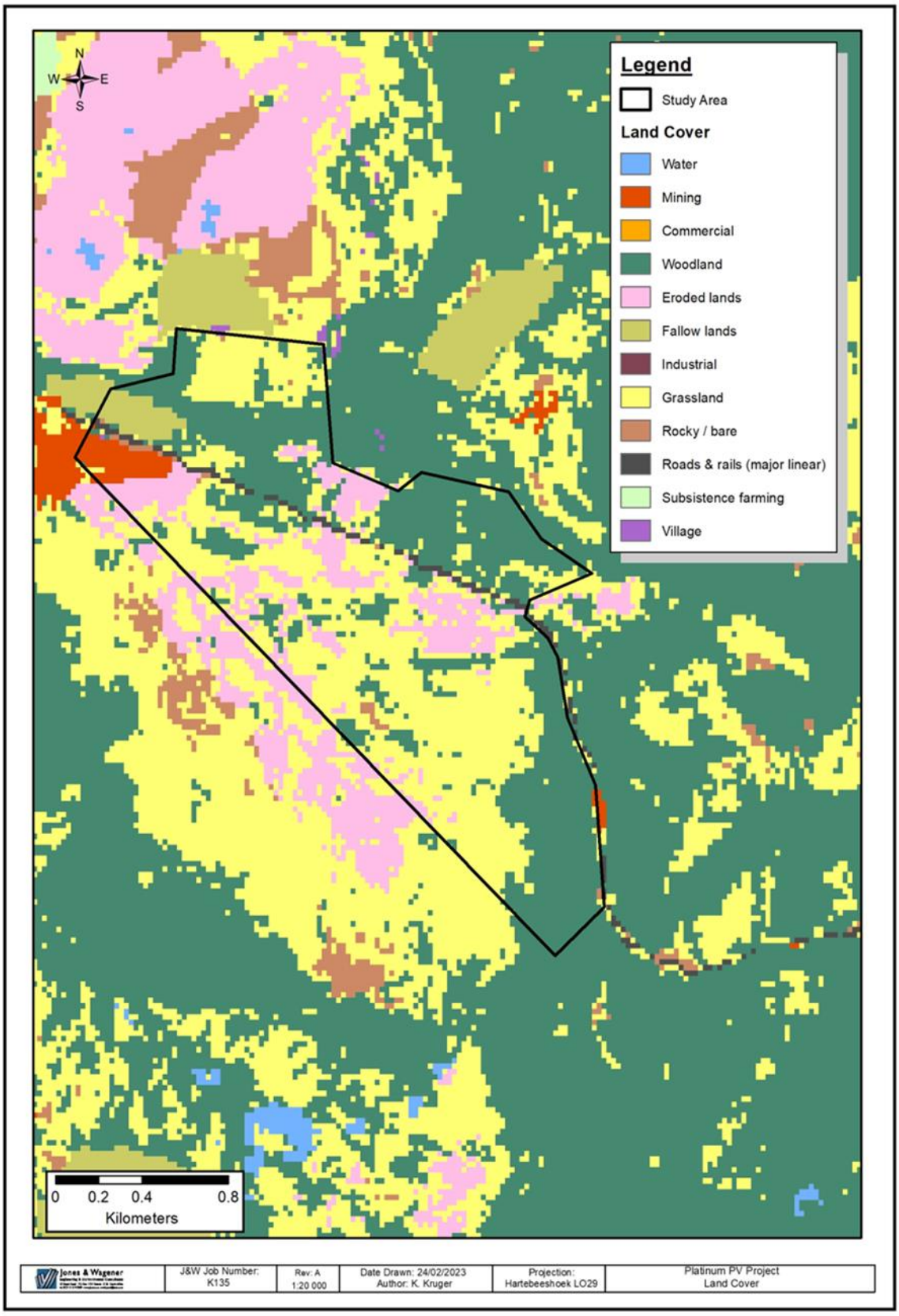


Figure 8-28: Landcover of the project site (J&W, 2023)

8.1 Socio-economic

A socio-economic assessment was undertaken by Batho Earth. The specialist baseline findings are described below, and the report is attached in **Appendix D-8.**

8.1.1 Land use

The SDM Integrated Development Strategy for 2015 until 2025 identified growth sectors to drive economic growth and social development in the District. As part of the strategy, the potential of mining, agriculture and tourism as key contributors to its economy up to the year 2025 were emphasised. Mining activities and associated land-uses in the FTLM form a key part of the strategy. Mining opportunities include the beneficiation of minerals, building of a smelter, and the development of new platinum and chrome mines. Mining constraints include the variation in the price of minerals, and pressure on environmentally sensitive areas (SDM: Draft SDF (2018)).

Large portions of land within the SDM and the FTLM are subject to land claims which influences the land-uses. These land parcels usually fall under traditional authorities and sometimes different claims have been lodged for the same property. Most of these claims are not likely to be easily resolved and need tenure reform rather than restitution. The nature of land claims in the district hampers development and result in shortages of land but can also cause instability amongst communities.

Steelpoort town is characterised by mixed use developments that include heavy engineering enterprises; suppliers to the mines; transport facilities; building material suppliers; distributors/ wholesale, medium density housing and a small retail component. The predominant land-uses surrounding the project site includes mining and related activities, as well as accommodation facilities. The proposed site land-use is dominated by grazing of which the landowner has provided grazing to members of the community and their cattle. The land-use of the project site is shown in Figure **8-3** and visual observers are outlined in **Figure 8-26** above.

8.1.2 Demographics

The proposed project site falls within Ward 27 of the FTLM in Sekhukhune District. Ward 27 covers about 663.7 km^2 area. The ward 27 population is not as densely populated compared to the rest of the FTLM. The percentage of youth under the age of 20 years comprises approximately half of the population sector within the affected ward. The provision of education, health and social services as well as employment creation within the municipality and especially within Ward 27, is thus critical over the long term.

The gender ratio in the province and local municipality indicates a situation where there is a large sector of migrant workers moving out of the area in search of employment. In Ward 27 this is slightly lower compared to the municipal and district statistics.

Table 8-19: Population figures

AREA	POPULATION	PEOPLE PER KM²	NUMBER OF HOUSEHOLDS	% UNDER 20 YEARS AGE GROUP	GENDER
Limpopo	5 799 990	46.1 km²	1 601 083	44%	53% Female
Sekhukhune District	1 169 762	85.7 km²	290 526	45%	53% Female
FTLM	489 902	85.9 km²	125 363	42%	51% Female
Ward 27	12 527	18.9 km²	2 727	48%	48% Female

8.1.3 Education and skills level

In Ward 27, there are lower levels of individuals that have completed their Grade 12 and significantly lower levels of individuals that have a higher education. Overall, the high levels of people with no schooling remain a concern, as well as the limited number of learners that completed their school education.

A lack of sufficient higher education institutions within the local municipality can also be a contributing factor to the low number of graduates in the FTLM.

Table 8-20: Education levels (StatsSA: community survey 2016 and census 2011 for ward-based information)

AREA	NO SCHOOLING	SOME PRIMARY	GRADE 12	HIGHER EDUCATION
Limpopo	14%	9%	28%	6%
Sekhukhune District	16%	8%	26%	4%
FTLM	16%	7%	26%	4%
Ward 27	16%	7%	19%	1%

8.1.4 Employment and sectors

The main sectors of SDM that contribute to the growth of economy are agriculture, mining, and community services. Mining is the biggest contributor in the economy of the District and it is forecasted to grow fastest at an average of 5.64% annually.

Table 8-21 below indicates the employment and income levels within the project area. Ward 27 of the FTLM has a lower level of annual household income, even though there are different mining activities and associated employment opportunities within this area for select individuals. The unemployment rate is high, especially if the categories of “discouraged work-seekers” and “other non-economically active” are considered. The population projections for the year 2030 is lower than the figures obtained during the 2016 community survey.

Table 8-21: Employment Profile (StatsSA: community survey 2016 and census 2011 for ward-based information)

AREA	EMPLOYED	UNEMPLOYED	DISCOURAGED WORK-SEEKER	OTHER NON-ECONOMICALLY ACTIVE	ANNUAL HOUSEHOLD INCOME BELOW R40K
Limpopo	27.4%	17%	6%	49%	70%
Sekhukhune District	20.9%	22%	7%	50%	70%
FTLM	23%	25%	5%	47%	71%
Ward 27	22.1%	32%	3%	43%	65%

8.1.5 Human development and Poverty

In 2018, SDM had a Human Development Index (HDI) of 0.569 compared to the Limpopo Province with an HDI of 0.595 and 0.657 of the National totals as a whole. Though the SDM HDI is low compared to the National HDI, the average annual growth rate for National was 1.65% and this increase is lower than that of SDM (2.48%).

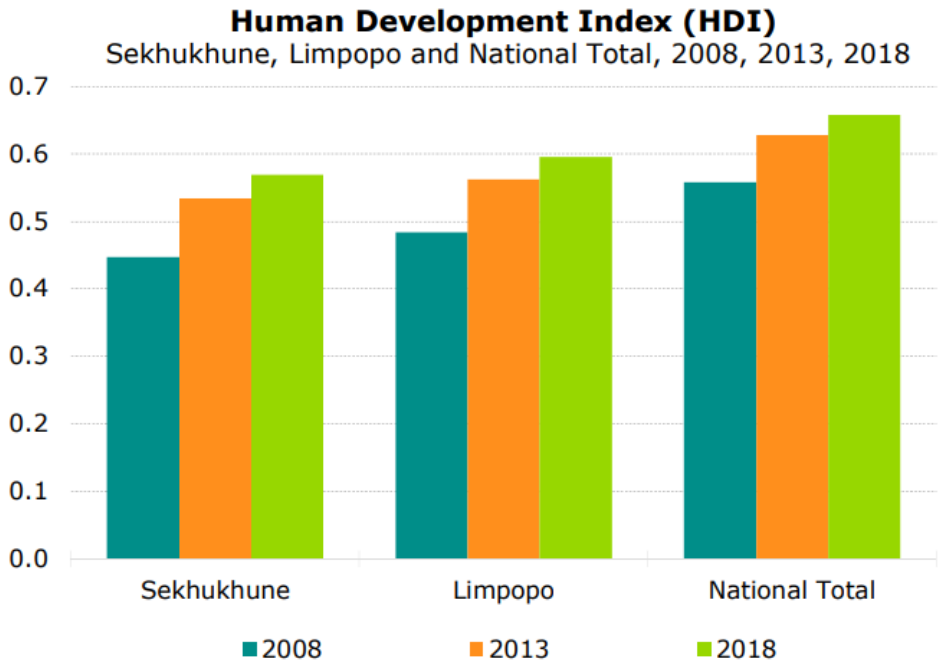


Figure 8-29: Human Development Index (HDI) (SDM IDP, 2020-2021)

With the overall human development gains in SDM, the percentage of people living in poverty has also decreased from 81.83% in 2008 to 74.12% in 2018. The lowest percentage of people living in poverty can be observed in the FTLM with a total of 70.4% living in poverty.

The Municipal housing environment comprises formal and informal dwellings. A number of households are in miserable housing conditions including informal settlements, backyard rental shacks, overcrowded in formal urban houses, and rural areas without proper access to basic services. In addition to this, excessive urbanisation for employment

opportunities as a result of mining activities continues to put pressure on demand of housing.

8.1.6 Health, safety and security

There is an insignificant number of health facilities within the Limpopo Province, especially in SDM, where on average there is one (1) clinic for every 17 000 people and approximately 97 500 persons per hospital. The FTLM which has the highest population in the district has a total of 38 clinics and two hospitals. In Ward 27, the Malekane and Kutullo areas receive a weekly mobile clinic, but all the villages require this service. During the IDP public participation processes, there were numerous requests for additional clinics that also operate at longer hours, as well as mobile clinics throughout the FTLM area (FTLM: IDP: 2022).

With regard to the Human Immunodeficiency Virus (HIV), there are 86 336 people infected with HIV in Sekhukhune, this constitutes 19,04% and 1.21% of people infected with HIV in Limpopo and South Africa, respectively (Source?)

The health of the local residents is further impacted on by air quality impacts associated with various mining activities, the illegal burning of waste, irregular waste removal, and illegal dumping (Source?)

In terms of safety and security, the nearest police stations within the larger study area include: Sekhukhune, Maartenshoop, Burgersfort, Driekop and Tubatse. Types of crime that must be dealt with include burglaries, thefts, car hijackings, sexual crimes, assaults, and murder. As part of the public participation process for the IDP, car hijackings and robberies were listed as a major concern in Ward 27 (FTLM: IDP: 2021-2022).

8.1.7 Basic services delivery

The FTLM can be seen as a water stressed municipality. According to the community survey of 2016, only 22% of households have access to piped water in their yard and 23% used piped water on community stands. Almost all the rural villages in the FTLM still source water from boreholes, rivers, dams and tanks. Sanitation services is a function of the SDM. In the FTLM, 84% of households still rely on the pit toilet system whereas in Ward 27, 78% of the households still make use of pit latrines, with only 4% of these being Ventilated Improved Pit (VIP) latrines.

According to the Community Survey (2016), 82% of households in the FTLM had access to in-house prepaid meters with 10% that had no access to any type of formal electricity provision. These households still rely on candles and paraffin (FTLM: IDP02021- 2022). A large section of the rural areas has no and/or limited access to electricity. The major electricity supply for the Municipality is the Eskom.

In terms of the waste removal, only 10% of the population received a service from the municipality or private company. The majority of households rely on their own dump.

8.1.8 Local economic profile

The FTLM economy is driven by mining and agriculture followed by trade, tourism, manufacturing, general government, community, social and personal services, catering, and accommodation. Mining still presents the largest opportunity in the area and together with the available natural resources in the area can create a potential to develop tourism and thereby diversify the economic base of the municipality (FTLM: IDP: 2021-2022).

The agriculture sector in the FTLM is still emerging and heavily under-invested. Lack of mechanisation makes smallholder farming one of the smallest contributors to the municipality's economic growth.

The manufacturing sector covers the manufacturing of goods, products, and beverages. It also comprises the production, processing and preservation of meat, fish, fruit, vegetables, oils, dairy products, grain mill, starches, tobacco products, textile products, spinning, weaving, petroleum products and nuclear fuel. This sector has a vast potential as a job creator but it is still in its infancy.

With regards to the tourism sector, it was noted that the unique selling benefits of local heritage sites and other tourism facilities in the municipality are not effectively profiled and marketed. The tourism sector is further being overshadowed by mining to the extent that more strategic focus is unevenly invested in the latter at its expense.

In 2017, the mining sector accounted for 43.8% of the Municipality's total Gross Value Added (GVA). The sector that contributes the second most to the GVA of the SDM is the community services sector at 18.2%, followed by the finance sector with 13.7%, while the sector that contributes the least to the economy is the agriculture sector with a contribution 1.67% of the total GVA **(Figure 8-30)**.

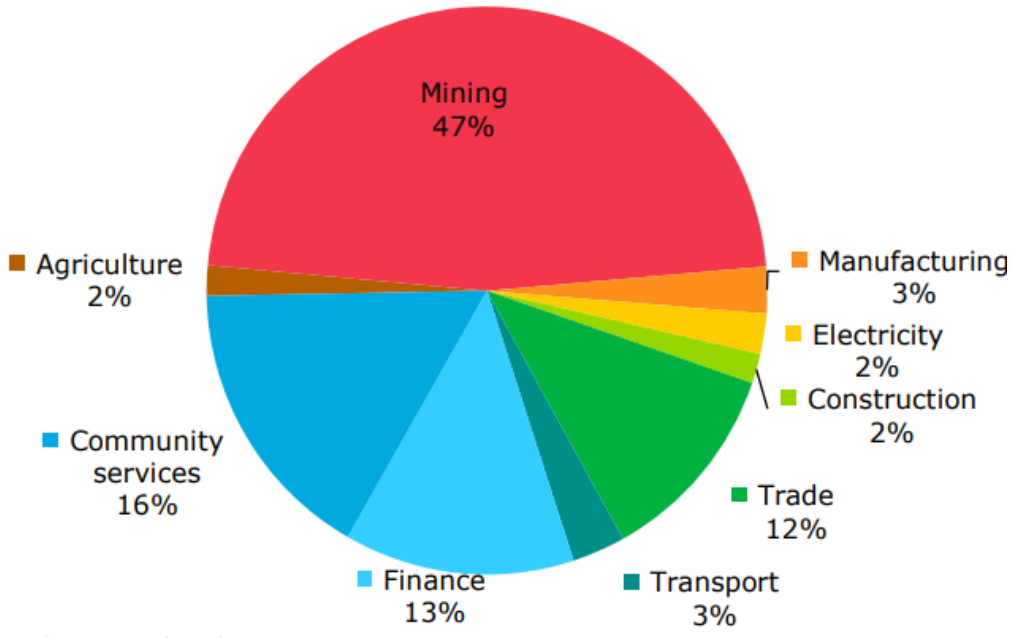


Figure 8-30: Gross Value Added (GVA) by broad economic sector (SDM IDP, 2020-2021)

The sector expected to have highest growth is the mining sector. The sector that is estimated to grow the slowest is the community services sector with an average annual growth rate of 0.75%. The slow growth rate is due to the impact of government reducing the cost of employment and not employing at a larger scale.

The investment opportunities in the FTLM include:

- mining investment;
- land availability;
- tourism;
- funding source from private sector; and

- job creation from infrastructure investment.

9. IMPACT ASSESSMENT METHODOLOGY

Potential environmental impacts will be identified by means of determining what activities will be undertaken as part of the proposed project. Changes in the status quo of an aspect/attribute as a result of the activities being undertaken as part of the proposed development, will indicate a potential environmental impact, be it positive or negative.

In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale; and
- Probability.

A combined quantitative and qualitative methodology will be used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 9-1** below.

Table 9-1: Impact quantitative rating scale

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	Isolated area	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium-term
4	HIGH	Regional / Provincial	Long-term
5	VERY HIGH	Global / National	Permanent

9.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e., the size) of an area affected by atmospheric pollution may be extremely large (1 000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 9-2** below.

Table 9-2: Description of significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

9.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e., will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 9-3**.

Table 9-3: Description of the spatial rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

9.3 Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 9-4**.

Table 9-4: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

9.4 Degree of Probability

The probability or likelihood of an impact occurring will be described, as shown in **Table 9-5** below.

Table 9-5: Description of the degree of probability of an impact occurring.

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

9.5 Quantitative description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description provided above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{SIGNIFICANCE + SPATIAL + TEMPORAL}{3} \times \frac{PROBABILITY}{5}$$

An example of how this rating scale is applied is shown in **Table 9-6**:

Table 9-6: Example of rating scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in **Table 9-7**.

Table 9-7: Impact risk classes

RATING	IMPACT CLASS	DESCRIPTION - NEGATIVE	DESCRIPTION - POSITIVE
0.1 – 1.0	1	Very low	Very low
1.1 – 2.0	2	Low	Low
2.1 – 3.0	3	Moderate	Moderate
3.1 – 4.0	4	High	High
4.1 – 5.0	5	Very high	Very high

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which is considered to be a low impact.

10. IMPACT ASSESSMENT

This chapter serves to assess the significance of the positive and negative environmental impacts associated with the development of the proposed Phula PV Facility. This assessment considers the proposed development and associated infrastructure as outlined in **Section 3**. The preferred development area, activity, technology has been assessed by specialists. As stated on **Section 4.4**, the development will comprise of the following stages:

- **Planning/Pre-Construction** – include the pre-planning activities such as ensuring the relevant legal requirements are met and undertaking of site surveys/specialist studies.
- **Construction** – will include procurement and employment of contractors; site preparation; establishment, access road, construction camps, fencing, laydown areas, office area, stormwater channels and water pipelines, transportation of components/construction equipment to site; erect PV panels, construct substation, invertors, and BESS, and connect PV arrays to the substation; establish ancillary infrastructure and undertaking site rehabilitation.
- **Operation** – will include operation of the facility and the generation of electricity which will be fed into the National grid. The operation phase of the Solar Facility is expected to be in excess of 25 years.
- **Decommissioning** – depending on the economic viability of the plant, the length of the operational phase may be extended. At the end of the plant life, decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. The impacts associated with decommissioning are expected to be similar to those associated with the construction activities.

10.1 Specialist report findings

The specialist studies identified various impacts on the biophysical and socio-economic environment which are anticipated to occur throughout the construction, operation and decommissioning phases of the proposed Phula PV project. Terrestrial Biodiversity

10.1.1 Terrestrial Biodiversity Assessment

The habitat sensitivity has relevance in that the PV facility site lies mostly within a CBA1 classified area, which needs to be maintained in a natural/near-natural state to maximise the retention of ecological processes and biodiversity patterns.

- Protected Plant species identified on site include:
  - *Lydenburgia cassinoides;*
  - *Elaeodendron transvaalense;*
  - *Sclerocarya birrea* (Marula).
- Sensitive habitats identified:
  - Drainage lines; and
  - The ridges and slopes to the east of the site were characterised by a higher species diversity.

Overall, the majority of the site was determined to be of low sensitivity. The site as a whole is already impacted to an extent as a result of the adjacent mining activity, which has

displaced much of the mammal species compliment either through direct impacts of noise and dust, or through the increased human presence and possible illegal hunting activity.

10.1.2 Aquatic Biodiversity

The project area has various ecological characteristics highlighting the sensitivity to degradation. The following high sensitivity areas were delineated:

- a 15 m buffer for the NFEPA Rivers
- an 18 m buffer for the drainage line system

10.1.3 Watercourse Assessment

No wetlands were identified on the proposed project site. The watercourses identified were all classified and delineated as river/riparian features that were predominantly non-perennial in nature, with intermittent flow.

The calculated buffer tool produced a minimum buffer zone of 38 m, from the outer edge of the riparian zone or delineated watercourse, that should be implemented along the non-perennial rivers in order to prevent impacts. This buffer took into account the sensitivity of the vegetation such as *Lydenburgia cassinoides* and *Elaeodendron transvaalense* (variably located in the watercourses) and considered impacts that may occur from the proposed development.

The delineated boundaries of the Springkaanspruit and associated 50 m avifaunal buffer and portions of non-perennial central drainage corridor in the current layout, should be adequately avoided as part of the proposed Phula PV project.

10.1.4 Avifauna Assessment

A total of 116 species of birds were recorded on-site during the screening and pre-construction bird monitoring surveys. Of these 116 species, two are regionally red-listed:

- Martial Eagle is listed as endangered, and
- Lanner Falcon as vulnerable.

No IBAs are located within the project site. The closest IBA is known as the Steenkampsberg IBA situated south of project site, approximately 25km away.

No nests or active roost sites were identified within the project site. The only sensitive feature identified was the non-perennial Springkaanspruit river.

- 50m buffer along riparian zone, considered a no-go area.

10.1.5 Soil and Land Capability Assessment

The site includes waterways that can be prone to flooding, eroded/quarry areas with unstable ground/steep slopes, clay rich areas and areas already developed. Existing impacts to the soils on site include the truck stop, offices, the guest lodge, borrow pits and the erosion scars.

Large sections of the site have been disturbed by a combination of human activities, totalling some 45ha (17.3% of the site). Soils on site are rocky, calcium carbonate enriched or eroded with some soils fit for use as arable land. However, areas of arable soil are not sufficient to sustain a profitable cultivation operation.

The land capability and use that dominates the project area is grazing. At present the cattle grazing the land have been relocated to other parts of the farm and can therefore continue in addition to the proposed development.

10.1.6 Visual Impact Assessment

The viewshed of the site is relatively small due to the mountainous landscape. The sense of place on the study site is largely natural and rural with isolated development. The visual absorption capacity ranges from high to none depending on the vegetative cover. The current visual impact includes the truck stop, offices, the guest lodge, borrow pits and the erosion scars.

10.1.7 Socio-Economic Assessment

The area and land-uses surrounding the proposed site is characterised by mining related activities and infrastructure, as well as mining associated activities. Areas with natural veld occur to the south and southeast of the development. In view of the fact that large scale mining activities are already undertaken in the area, the proposed land-use associated with the PV facility is seen to be acceptable with the surrounding land-uses in the area.

From a socio-economic perspective, the overall impacts on the sense of place are likely, but are not considered to be significant due to the low population density to the south and east of the site, the location of homesteads to the facilities thereby limiting the number of permanent observers, the number or road users, as well as the overall positive association made with regards to PV facilities in general as cleaner and greener resources with its limited negative impact on the bio-physical environment.

10.1.8 Heritage Impact Assessment

The fieldwork conducted for the evaluation of the possible impact of the proposed development, has revealed the presence of six (6) heritage resources.

Since the six (6) find spots/low density surface scatters were observed in secondary contexts, they were rated as having low heritage significance/no heritage significance.

10.1.9 Desktop Geotechnical Assessment

No sensitive features identified. However, cognisance will need to be made of the likely highly variable thickness of transported and residual soils, and depth to bedrock across the site for construction purposes.

10.2 Impact Assessment ratings

The impacts identified by specialists were further assessed, in terms of the methodology outlined in the **Section 9**. This is outlined in **Table 10-1** to **Table 10-3** below.

For each impact assessed, a rating in terms of magnitude, significance, spatial extent, and probability, is given (when applicable). Subsequently, mitigation measures have been proposed to reduce or avoid negative impacts and enhance positive impacts throughout the project development cycle. These mitigations were also incorporated in the EMPr to ensure that they are implemented during the various phases of the proposed project.

10.2.1 Cumulative impacts

Cumulative impacts are concerned with a development's contribution to the overall impact to the surrounding environment within the context of the existing and potential developments of a similar nature in a defined region. The most important concept related to cumulative impacts is that of the level of acceptable change to an environment. Should the impact of a proposed development lead directly to the sum of impacts of all developments of a similar nature causing an acceptable level of change to be exceeded in the surrounding area, the cumulative impact can be considered to be of concern. If the impact of the development being assessed does not cause acceptable level to be exceeded, then the cumulative impact is not significant.

In terms of the DFFE's SA Renewable Energy EIA Application Database (REEA) there are no solar developments or related development with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area. The cumulative assessment of the potential impacts associated with the proposed Phula PV facility is an assessment of the impacts associated with the development considering all similar impacts or surrounding land uses, as identified in **Figure 8-26** within set boundaries in relation to the surrounding environment. Cumulative impact assessment associated with the development were assessed by the specialist (**Table 10-1** to **Table 10-3**). It is important to consider that the additive cumulative impacts of the PV facility itself are less significant, considering mining activities and that the site is flagged for future mining endeavours which carry higher cumulative and residual impacts to the environment.

10.2.2 Impact assessment rating for the pre-construction /construction phase

Table 10-1: Impact assessment rating for the pre-construction/ construction phase

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
TERRESTRIAL BIODIVERSITY											
Vegetation clearing	Loss of SCC due to vegetation clearing	**NEGATIVE IMPACT**: Habitat destruction, ecosystem fragmentation, habitat degradation	• All vegetation will need to be cleared for the development of the PV facility infrastructure (no-go areas excluded). Several sensitive areas containing high numbers of SCC floral species will be lost however areas of avoidance have been identified and will protect limited numbers and subpopulations of SCCs. This includes the ridge and slope areas in the southeastern portion as the main drainage line in the south. • SCCs which fall in other habitat types such as *P. sekhukhuniensis* will be lost. However, this species was relatively common and will likely recolonise the site as it prefers disturbed areas. Where these SCCs naturally re-establish during the operational phase they should be allowed to persist. In addition, road verges and berms should be capped with topsoil to allow for natural vegetation to establish. • An independent suitably qualified scientist is to be appointed as an Environmental Control Officer (ECO) to oversee works as well as monitor the re-establishment of lost SCCs within the site and proposed stormwater infrastructure.	Significance	0	**NO IMPACT**	5	**VERY HIGH**	5	**VERY HIGH**	4	**MODERATE**
				Spatial	0		3		4		2	
				Temporal	0		5		5		4	
				Probability	0		5		5		4	
	Heavy machinery and increased vehicle movement	**NEGATIVE IMPACT:** Exposure of soil to wind and rain could result in erosion and sedimentation of drainage lines, tributaries and rivers as a result of increased erosion potential. Soil compaction	• A suitable SWMPwill need to be implemented to control the water runoff within the site and prevent erosion and sedimentation build up within drainage lines. This will need to consider the sensitive drainage line identified as an avoidance area. • Stormwater channels should be natural as far as possible to create additional natural habitat and provide suitable corridors for amphibian and other faunal species. In addition, a V-drain and paddock system should be implemented to allow for sediment trapping and natural succession. This should be a focus to connect the Ridge/slope area with the sensitive drainage line identified in the southern portion of the site. • Flow dissipation measures to be installed at the lower extremities of the stormwater system. • Berms built for flood protection of the PV facility, should be sown with naturally occurring grass. • Bulk of vegetation clearing and earthworks to be completed at the end of the dry season to reduce erosion from water runoff. • In PV areas, compacted soil to be ripped and tilled following construction and sown with natural grasses such as *Cynodon dactylon*, which will stabilise the highly erodible soils (grass height: 400mm). Note: Without re-seeding, grass heights will exceed 1 m should the site be allowed to revegetate naturally. Re-seeding will allow the establishment of invertebrate communities and will allow the grass to produce seed which will improve the ecological functionality, as grass will not need to be cut.	Significance	1	**VERY LOW**	5	**HIGH**	5	**HIGH**	2	**LOW**
				Spatial	1		3		4		2	
				Temporal	1		5		5		3	
				Probability	2		4		4		4	
Vegetation clearance & Site flattening	Stormwater diversion around site	**NEGATIVE IMPACT:** Changes in microclimate and hydrology can affect the behaviour and distribution of local fauna and flora.	• Sensitive areas (i.e., drainage line and ridge/slope area) to be avoided to maintain ecological functionality and provide refugia for species no longer able to survive in areas to be transformed. • Inclusion of hybrid stormwater system will create additional habitat for faunal and floral establishment and persistence.	Significance	0	**NO IMPACT**	3	**MODERATE**	3	**MODERATE**	1	**VERY LOW**
				Spatial	0		3		4		2	
				Temporal	0		3		4		2	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
		Habitat may no longer be suitable for certain species to survive.		Probability	0		4		4	2	
	Loss of Connectivity	**NEGATIVE IMPACT:** Loss of faunal movement corridor due to homogenisation of habitat and removal of drainage corridors	• Strict implementation of "No access" to the identified sensitive areas (i.e., drainage line and ridge/slope area). Create connectivity between ridge/slope and drainage line, as well as connectivity between the drainage line and adjacent habitats downstream, through effective natural stormwater channels/paddocks and bioretention ponds. Please also refer to the fencing mitigations above to improve connectivity	Significance	0	NO IMPACT	5	VERY HIGH	5	3	LOW
				Spatial	0		3		4	3	
				Temporal	0		5		5	4	
				Probability	0		5		5	3	
Increase in construction personnel to the project site and heavy vehicle movement.	Faunal mortality	**NEGATIVE IMPACT:** Increased roadkill, potential increased illegal hunting	• An independent, suitably qualified scientist to be appointed as an ECOto oversee works especially when working in and around the site. • Implementation and enforcement of strict speed limits. • Working at night should be avoided. • Restrict all movement to designated sensitive areas earmarked for avoidance. These must be clearly demarcated as "No Access" areas. • No harvesting of plants, plant material, animal or surface water may be allowed. • This must include environmental education on the "No Access" and sensitive areas as well as protected species. • Following construction, the site must be cleared of all possible polluting materials and all temporary structures must be removed and responsibly disposed of.	Significance	2	MODERATE	2	MODERATE	2	1	VERY LOW
				Spatial	3		3		3	2	
				Temporal	3		3		3	3	
				Probability	4		5		5	2	
	Floral SCC poaching and/or destruction	**NEGATIVE IMPACT:** Increased poaching of medicinal plants or destruction of protected species		Significance	2	MODERATE	2	MODERATE	3	1	VERY LOW
				Spatial	3		3		3	2	
				Temporal	3		3		3	3	
				Probability	4		5		5	2	
Construction of the PV facility	Increased noise	**NEGATIVE IMPACT:** Increased noise may affect behaviour and distribution of fauna	Existing noise from adjacent Chrome mine blasting and operation as well as the road noise from the R577 already impacts the site. Construction of the PV facility is unlikely to have a major additive effect on this. • Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. • Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. • Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised. • Use of vehicle horns should be minimised where possible. • Restrict construction and operational activity to daylight working hours.	Significance	3	HIGH	4	MODERATE	4	3	MODERATE
				Spatial	3		3		4	3	
				Temporal	4		2		4	2	
				Probability	5		5		5	4	
	Establishment, spread and propagation of alien invasive species	**NEGATIVE IMPACT:** Activities related to the construction and maintenance of the PV facility can cause the spread and establishment of alien invasive species	An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. Further: • Alien invasive plant (AIP) material should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan will need to be applied broadly to the entire footprint to effectively reduce alien invasive species and prevent their recolonisation of cleared areas	Significance	2	LOW	4	HIGH	4	3	LOW
				Spatial	3		3		4	1	
				Temporal	4		4		4	3	
				Probability	3		5		5	4	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING			RATING POST MITIGATION (RESIDUAL IMPACT)
Heavy machinery and vehicle movement	Spillages and Leakage of harmful substances	**NEGATIVE IMPACT:** Heavy machinery can result in spillages of harmful substances and potential contamination of surface water with hydrocarbons	• A suitable storm water management plan must be implemented to control the water runoff and potential pollution into water sources. This will need to consider the sensitive drainage line to be avoided. • Vehicles to be adequately maintained and fitted with drip trays when left standing. It is advisable that spill kits are available on site.	Significance	1	**VERY LOW**	3	**LOW**	4	**MODERATE**	2	**VERY LOW**
				Spatial	1		1		4		1	
				Temporal	1		3		3		1	
				Probability	1		3		4		2	
Fencing	Impeding faunal movement corridors	**NEGATIVE IMPACT:** Loss of ecological connectivity. Loss of faunal movement corridor due to habitat fragmentation from fencing	• It is foreseen that the entire site be fenced off from the R577. This will isolate the site completely and will prohibit faunal movement through the site. This can be mitigated by fencing off only the independent PV areas with clamber proof fencing while allowing for semi-permeable fencing options along the site borders and drainage lines, should it be necessary. This will maintain the connectivity between the drainage line and ridge/slope area and adjacent external habitats. • Upstream and downstream ends of drainage lines to be left open/fenced with high permeability fencing. • Semi-permeable fencing options should be considered for internal fencing to allow movement of small mammals and reptiles through the site.	Significance	0	**VERY LOW**	4	**MODERATE**	4	**HIGH**	2	**LOW**
				Spatial	1		3		4		2	
				Temporal	1		3		4		3	
				Probability	1		5		5		4	
Construction	Destruction of habitat	**NEGATIVE IMPACT**: Partial destruction or complete removal of habitat which may make the affected area unavailable to avifauna	• Impact is inevitable and ease of mitigation is low	Significance		**NO IMPACT**	4	**MODERATE**	4	**MODERATE**	4	**MODERATE**
				Spatial			1		1		1	
				Temporal			4		4		4	
				Probability			5		5		5	
	Disturbance and displacement of avifauna	**NEGATIVE IMPACT:** Disturbance from increased noise and both human and vehicle traffic may impact breeding and foraging success for local avifauna	• Impact is inevitable and ease of mitigation is low	Significance		**NO IMPACT**	2	**LOW**	2	**LOW**	2	**LOW**
				Spatial			3		3		3	
				Temporal			2		2		2	
				Probability			4		4		4	
AVIFAUNA												
Construction	Destruction of habitat	**NEGATIVE IMPACT**: Partial destruction or complete removal of habitat which may make the affected area unavailable to avifauna	• Impact is inevitable and ease of mitigation is low the following mitigation is however recommended: • Fence designs utilized for the construction of the development site, should be highly visible to birds and be regularly tensioned to reduce the risk of bird entanglements and collisions. The use of barbed or razor wires must be avoided so far as possible. • Care should be taken to avoid the propagation or introduction of weeds and alien plant species during the construction and operational phases. • Minimise the impact on the environment as far as possible during the construction phase by implementing sound environmental practices. • Any bird fatalities recorded on-site during the construction and operational phases should be documented in detail and reported to an avifaunal specialist for advice on any appropriate mitigation measures.	Significance		**NO IMPACT**	4	**MODERATE**	4	**MODERATE**	4	**MODERATE**
				Spatial			1		1		1	
				Temporal			4		4		4	
				Probability			5		5		5	
	Disturbance and displacement of avifauna	**NEGATIVE IMPACT:** Disturbance from increased noise and both human and vehicle traffic may impact breeding and foraging success for local avifauna		Significance		**NO IMPACT**	2	**LOW**	2	**LOW**	2	**LOW**
				Spatial			3		3		3	
				Temporal			2		4		4	
				Probability			4		3		3	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA		RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
WATERCOURSE												
Site preparation and clearing of the entire Phula PV project footprint (including contractor camps and installation of infrastructure including laydown of foundations, support structures and mountings for solar panels and inverter) and access roads (excluding the no-go areas).	<u>The Springkaanspruit and 50 m buffer</u>: • Removal of vegetation within the Phula PV development footprint and disturbance of soil; • Creation of access roads to facilitate contractor laydown areas and construction activities including access to mounting solar panels and ancillary infrastructure; • Movement of construction vehicles upgradient and along non-perennial rivers; • Stripping and stockpiling of topsoil and sub-soil upgradient and adjacent to non-perennial rivers; • *Grading and earthworks for internal access roads; • Laydown of contractor camps, including temporary offices and ablution facilities upgradient of the non-perennial rivers.	**<u>NEGATIVE IMPACT</u>** • Increased unvegetated and bare areas upgradient of the non-perennial rivers, potentially increasing erosion, sediment laden runoff and deposition into the rivers; • Potential for increased AIPproliferation along the riparian zone of the non-perennial rivers as a result of disturbance to areas upgradient and adjacent; • Deterioration of surface water quality within the remaining non-perennial rivers as a result of sedimentation and potential leaks and spills from machinery and equipment upgradient and adjacent to the non-perennial rivers. • Potential for increased likelihood of dust generation into the non-perennial rivers; • Increased surface runoff due to compact and hardened surfaces in catchment.	• An ECO must be appointed in order to ensure all water related aspects are adequately mitigated for the construction phase of the Phula PV development. • The non-perennial river 1 (Springkaanspruit) and associated 50 m avifaunal buffer and the central drainage corridor, which have been avoided as part of the Phula PV project development layout, should be cordoned-off to prevent access to this area, by people or vehicles, during the construction phase. • Sediment traps must be installed to prevent sediment, from the upstream cleared areas, entering the remaining river systems. • The construction activities are to be undertaken during the dry season. • The laydown of the contractor camp is to be located outside of the delineated boundaries of non-perennial rivers 1, 2 and 4, (as specified), with no other camps to be erected. • For the solar PV panels the construction impacts must be limited to the clearing of soil for the foundations only. • Areas which are to be cleared of vegetation, including contractor laydown areas, must remain within the designated footprints and be as small as possible. • Only vehicles, equipment and personnel that have been authorised should be allowed within the construction areas. Additionally, vehicles must be regularly maintained and ensure they are in good working order which will largely reduce spills and leakages that may occur. Where vehicles are kept on site, they should ensure drip trays are placed underneath stored vehicles to ensure no runoff and contamination into groundwater and watercourses. • Establishment of indigenous vegetation and a variation of habitat types within artificial channel, at the intersection of the artificial channel and the non-perennial system 2, as well as adequate measures to ensure dissipation and attenuation of flow to provide natural pools of water and facilitate sediment control. • Exposed soil/ soil stockpiles associated with the Phula PV project, upgradient of the remaining non-perennial rivers should be protected (e.g., use of bunds) in order to limit erosion and sedimentation to the rivers adjacent and downgradient. • Stockpiled soil should not exceed 2 m in height. • The time at which soil is exposed is limited as far as possible which will prevent both transported and air-borne sediment from entering into the non-perennial rivers. • Excavation of pits for the foundation of solar panels and support structures may result in loose sediments within the landscape, specifically if construction activities are undertaken during the wet season or subject to intense rainfall events (if applicable). Sediment traps can be created by pegging an appropriate geotextile that can be held down by cobbles/boulders or a similar mitigation measure such as a geotextile wrapped hay bales, which spans the work area. • During excavation of the foundations to facilitate support structures, soil must be stockpiled upgradient of the excavated pits, ensuring that mixture of the lower and upper layers of the excavated soil should be kept to a minimum.	Significance		**NO IMPACT**	3	**MODERATE**	3	**LOW**	2	**LOW**
				Spatial				3		2		2	
				Temporal				2		2		2	
				Probability				4		3		3	
	<u>Non-perennial rivers 2-5:</u> • Removal of riparian vegetation within the Phula PV development footprint, associated with the non-perennial rivers; • Movement of construction vehicles within the non-perennial rivers;	**<u>NEGATIVE IMPACT</u>** • Loss of non-perennial streams • Loss of riparian vegetation, including SCC located along and within the non-perennial rivers; • Loss of breeding, feeding and migratory habitat and refugia for biota that may utilise the non-perennial rivers;		Significance		**NO IMPACT**	4	**HIGH**	3	**MODERATE**	3	**MODERATE**
				Spatial			3		2		2	
				Temporal			5		4		4	
				Probability			5		5		5	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA		RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
	• Filling, grading and levelling of topsoil and sub-soil within the non-perennial rivers; • Creation of access roads to facilitate contractor laydown areas and subsequent construction activities; • Mixing and casting of concrete within the non-perennial rivers to facilitate foundations for mounting and support structures; • Installation of solar panels including mounting of rods into foundations within graded portions of the non-perennial rivers.	• *Loss and alterations of the natural hydrological and geomorphological regimes within these non-perennial rivers; • Deterioration of surface water quality within the downstream non-perennial rivers as a result of sedimentation and potential leaks and spills from machinery and equipment upgradient and adjacent to the remaining non-perennial rivers.	These soils must be used to close off the excavated pits, immediately after installation of the support structures. • Implement and maintain an AIP management programme, during the construction and operational phase of the Phula PV project. With regards to concrete mixing on site: • Any concrete can be toxic to freshwater habitat and associated biota. Proper handling and disposal is imperative to minimise discharges into the non-perennial rivers situated adjacent and downgradient. High alkalinity associated with cement can thus affect and contaminate soils, surface and ground water. • The following recommendations should be adhered to when aiming to minimise cement related impacts on freshwater environment: ◦ Fresh concrete should not be mixed near the proximity of the remaining non-perennial rivers and associated buffer zones, as applicable. ◦ The mixing of cement should be undertaken within the construction camp and may not be mixed on bare soil. ◦ Mixing of concrete is also to be strictly undertaken within a lined, bound or bunded portable mixer with the consideration of using ready mix concrete. ◦ A batter board or other suitable impermeable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing. ◦ Washout areas should be designated outside of the confines of the remaining non-perennial rivers and wash water should be treated on-site or discharged to a suitable sanitation system ensuring that wash water is not released directly into the rivers or the artificial stormwater diversion. ◦ Any cement bags must be disposed of in the demarcated hazardous waste receptacles. ◦ Concrete spillage outside of the areas of application must be promptly removed and taken to a suitably licenced waste disposal site.							
Stormwater management for Phula PV project.	Implementation of artificial stormwater channels within the Phula PV project.	**NEGATIVE IMPACT** • Possible Increase in flood peaks and velocity; • Possible Increase in flow volumes; • Potential increase in erosion and sedimentation in the downstream watercourses.		Significance Spatial Temporal Probability		**NO IMPACT**		3 3 4 5	**HIGH**	3 2 4 4	**MODERATE**	3 2 3 4	**MODERATE**
Site clearance and soil movement	Due to the size of the area assessed and the current vegetation cover, the possibility of encountering heritage features in un-surveyed areas does exist.	**NEGATIVE IMPACT** Destruction of unidentified heritage resources	• Implement the Chance Find Procedure in case previously unidentified culturalheritage finds are uncovered during construction.	Significance Spatial Temporal Probability		**NO IMPACT**		2 1 5 3	**LOW**	1 1 5 2	**LOW**	1 1 5 3	**VERY LOW**
SOIL AND LAND CAPABILITY													
Site preparation and construction earthmoving	Soils and land capability	**NEGATIVE IMPACT** Direct soil loss / excavation	• Ensure all current agricultural (grazing) practices can continue on the remainder of the property and that no current agricultural jobs are lost. • Only clear areas required for the proposed project. • Ensure that vegetative cover is retained as far as possible. • Avoid the Springkaanspruit and associated buffers.	Significance Spatial Temporal Probability	4 1 4 5	**MODERATE**		3 1 3 5	**LOW**	3 2 3 3	**MODERATE**	3 1 3 4	**LOW**

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
		NEGATIVE IMPACT • Increased soil erosion from vegetation clearing. • Contamination from hydrocarbon / chemical spills/leaks • Compaction of soils through vehicle movement	• Manage stormwater is such a way that water flow concentration is avoided to dissipate the potential erosive forces. • Limit permanently cleared areas as far as possible. • If soils are excavated for the footing placement, ensure that the soil is utilised elsewhere for rehabilitation/road building purposes. • Limit vehicle movement to dedicated access roads as far as possible. • If dust entrainment becomes a visible issue, consider addressing through use of a water cart (if water availability allows). If water is too scarce, consider chemical treatments on roads to avoid dust. • Keep a stakeholder register of all impacts to track issues that require further mitigation. • Ensure all heavy machinery is contained within the lay-down areas when not in use and regularly serviced to avoid hydrocarbon leaks. • Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling areas. • Ensure that construction waste is regularly collected and contained within the laydown areas. • Burying of any waste including domestic waste, empty containers on the site should be strictly prohibited and all waste must be removed to an approved disposal site. • Undertake annual inspections of site condition to ensure any areas of erosion is identified and repaired prior to the next rainy season.	Significance	4		3		3		3	
				Spatial	1		1		2		1	
				Temporal	4		2		3		3	
				Probability	5	**MODERATE**	4	**LOW**	5	**MODERATE**	4	**LOW**
VISUAL												
Site preparation and construction earthmoving	Visual	**NEGATIVE IMPACT** Direct visual impact Change in sense of place	• Only clear areas required for the proposed project. • Ensure that large trees are retained as far as possible, especially along the perimeter of each of the development sections and the R577 tar road. • Limit vehicle movement to dedicated access roads as far as possible. • If dust entrainment becomes a visible issue, consider addressing through use of a water cart (if water availability allows). If water is too scarce, consider chemical treatments. • Keep a stakeholder register of all impacts to track issues that require further mitigation. • Ensure all heavy machinery is contained within the lay-down areas when not in use and regularly serviced to avoid smoke. • No fires permitted on site. • Ensure that construction waste is regularly collected and contained within the laydown areas and not creating a visual impact. • Burying of any waste including domestic waste, empty containers on the site should be strictly prohibited and all waste must be removed to an approved disposal site. • Limit night-time lighting to avoid light pollution of nearby lodges and guest houses, unless it is required for security purposes.	Significance	2		4		4		3	
				Spatial	1		3		3		3	
				Temporal	4		2		2		2	
				Probability	5	**MODERATE**	5	**MODERATE**	5	**MODERATE**	5	**MODERATE**
SOCIO-ECONOMIC												
Construction Activities including people movement,	Socio-Economic Environment	**POSITIVE IMPACT:** Employment Creation	• Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the unskilled category, from the local communities.	Significance			3		3		3	
				Spatial		**NO IMPACT**	4	**MODERATE+**	4	**MODERATE+**	4	**MODERATE+**
				Temporal			2		2		2	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)
employment and intrusions			• Procurement should be focused within the municipal areas and district if such materials, services and equipment are available. • Make use of any existing databases of available workers and include the legal local representatives, local municipalities and other legally established community structures in the process	Probability			4		4	5	
		NEGATIVE IMPACT: Inflow of workers and jobseekers	• Communication efforts concerning job creation opportunities at the PV facility should refrain from creating unrealistic expectations. Job opportunities must be clearly communicated. • Contractors must ensure that workers have sufficient accommodation. Outside contractors are likely to be housed in Steelpoort, Mashishing, Burgersfort and other urban areas where there is availability. Existing accommodation facilities on the farm De Grooteboom can also be utilised. • The workers are expected to be transported to site on a daily basis. • Employment of unskilled individuals, that will form the bulk of the construction workforce, from the local communities will limit the need for additional temporary accommodation	Significance		NO IMPACT	4	MODERATE	4	LOW	3	LOW
				Spatial			4		4	3	
				Temporal			2		2	1	
				Probability			4		3	4	
		POSITIVE IMPACT: Local and Regional Economic Benefits	• Direct and indirect spin-offs from employment to be enhanced through local procurement. • Procurement should be focused within the municipal areas and district if such materials, services and equipment are available. • The project proponent and contractors should create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMME's during the construction process of the PV facility	Significance		NO IMPACT	3	LOW +	4	MODERATE +	3	MODERATE +
				Spatial			3		4	4	
				Temporal			2		2	2	
				Probability			3		4	4	
		NEGATIVE IMPACT: Community Safety	• Fencing of the property, lighting, cameras, and 24-hour security to be installed and implemented to improve security at and around the site. In addition to these measures, • No accommodation facility / construction camp to be erected on site. Temporary workers to be transported to and from the site on a daily basis. • Temporary traffic calming measures to be implemented at construction site entrance. Mitigation measures of the Traffic Impact Assessment to be implemented. • Develop and implement a Health and Safety Plan according to Safety, Health, Environment and Quality (SHEQ) best practices for the construction phase. Limit safety risks through design considerations, location of infrastructure and precautionary construction management principles	Significance		NO IMPACT	2	LOW	3	LOW	2	VERY LOW
				Spatial			3		3	2	
				Temporal			2		2	1	
				Probability			4		3	3	
		NEGATIVE IMPACT: Health risks	• Develop and implement a Health and Safety Plan according to SHEQ best practices for the construction phase. • Maximise the employment of locals. • Contractors, sub-contractors and construction workers must be trained in health and safety policies, environmental awareness and emergency preparedness	Significance		NO IMPACT	2	LOW	2	LOW	2	VERY LOW
				Spatial			4		4	3	
				Temporal			1		2	1	
				Probability			3		3	2	
		NEGATIVE IMPACT: Visual Impact and Sense of Place	• The mitigation measures of the Visual Impact Assessment must be implemented. • The design and specific positioning of the PV facility should aim to minimise the possible negative visual impact of the facility on the surrounding property owners e.g., panel mounts should have the lowest height	Significance		NO IMPACT	3	MODERATE	3	LOW	3	LOW
				Spatial			3		2	2	
				Temporal			2		3	3	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING			RATING POST MITIGATION (RESIDUAL IMPACT)
			practically possible, reflections from the panels must be minimised, design of administrative buildings should blend in with surrounding environment, lighting pollution at night must be avoided. • Concurrent rehabilitation to be undertaken that could include re-vegetation of construction and/or rehabilitated areas underneath or adjacent to panels, and the removal of alien vegetation species. • Environmental management of the construction site must adhere to environmental regulations and strive towards international best practice	Probability			4		3		3	
		NEGATIVE IMPACT: Intrusions including people movement, traffic movement, dust and noise	• Existing accommodation facilities, if available, on the farm De Grooteboom can be utilised for some workers. This will minimise the need for transportation. • Mitigation measures of the Traffic Impact Assessment to be implemented. Traffic calming measures can be implemented at the construction site entrance. Vehicles must be in good working order and drivers have to keep to speed limits to limit safety risks and minimise noise and dust pollution created by heavy vehicle movement. Upgrading of road surfaces at site entrance. Construction of entrance that adheres to all road safety regulations and standards. • Environmental management of the construction site must adhere to environmental regulations and strive towards international best practice. • Mitigation measure of the Noise Impact Assessment to be implemented.	Significance		**NO IMPACT**	3	**MODERATE**	3	**LOW**	3	**LOW**
				Spatial			4		4		3	
				Temporal			2		2		1	
				Probability			4		3		3	

10.2.3 Impact assessment rating for the operation/maintenance phase

Table 10-2: Impact assessment rating for the operation/maintenance phase

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
TERRESTRIAL BIODIVERSITY												
PV maintenance	Erosion from panel Washing	**NEGATIVE IMPACT:** Washing of panels will contribute to the erosion and sedimentation of watercourses	• This should be considered when implementing a suitable stormwater management plan (see previous Stormwater management mitigations in Impact mitigation 2 & 3)	Significance	0	**NO IMPACT**	2	**MODERATE**	3	**MODERATE**	1	**VERY LOW**
				Spatial	0		3		4		2	
				Temporal	0		3		4		2	
				Probability	0		4		4		2	
	Establishment, spread and propagation of alien invasive species	**NEGATIVE IMPACT:** Activities related to the maintenance of the PV facility can cause the spread and establishment of alien invasive species	An effective Alien Invasive Awareness and Management Programme should be established, focusing on the identification and removal of pervasive invasive species. Further: • AIPmaterial should be removed from the site to reduce the potential for re-establishment. • Ongoing management as part of the alien invasive management programme. • The Alien Invasive Management Plan (Appendix B of the EMPr) will need to be applied broadly to the entire footprint to effectively reduce alien invasive species and prevent their recolonisation of cleared areas.	Significance	2	**LOW**	4	**HIGH**	4	**HIGH**	3	**LOW**
				Spatial	3		3		4		1	
				Temporal	4		4		4		3	
				Probability	3		5		5		4	
	Visual impact	**NEGATIVE IMPACT**: Operation of PV facility, the reflective surfaces and operational light Pollution may cause Disorientation affecting the behaviour and distribution of fauna. Light pollution from safety and security lighting infrastructure creates glare off panels and increased light pollution, disrupting nocturnal species' behaviour and natural rhythms, such as migration patterns or hunting behaviour.	• The need for artificial lighting should be minimised. • Should it be necessary, lighting at the PV facility should have appropriate shielding or make use of downward directional fixtures with low intensity lighting. • Illumination of adjacent habitats should be avoided.	Significance	1	**VERY LOW**	3	**LOW**	3	**MODERATE**	1	**VERY LOW**
				Spatial	1		2		4		1	
				Temporal	1		3		4		1	
				Probability	3		3		4		4	
	PV Washing & Maintenance	**NEGATIVE IMPACT:** Chemicals used in the cleaning of the PV panels or in the maintenance of the facility (herbicides, pesticides, anti-reflective coating) can leach into soil and drainage areas. Chemicals may also have direct effects on terrestrial organisms or disrupt ecological processes	• Environmentally friendly cleaning products advised for the maintenance of PV panels should it be required. • Chemical use for the control of vegetation growth to be done in accordance with recommended guidelines. • All chemical products to be safely stored in accordance with Best Practice Guidelines.	Significance	0	**NO IMPACT**	3	**LOW**	3	**MODERATE**	2	**VERY LOW**
				Spatial	0		1		4		1	
				Temporal	0		2		3		2	
				Probability	0		3		4		2	
AVIFAUNA												
Operation and Maintenance	Fatality of birds during operations	**NEGATIVE IMPACT**: Avifauna are at risk of electrocution, collisions and	• Impact is very likely to occur and ease of mitigation is low however the following mitigation measures are recommended:	Significance			3	**MODERATE**	3	**LOW**	3	**LOW**
				Spatial			3		3		3	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
		entanglement with associated infrastructure on site	• The best practice guidelines recommendation of at least one year of operational phase monitoring should be followed. • Reactive management for bird electrocutions is recommended. Any electrocutions occurring on substations or associated infrastructure should be documented in detail and reported to an avifaunal specialist for the relevant mitigation measures. • If any bird activity (e.g., breeding or roosting) occurs which impedes on the operations of the project, a detailed report must be documented and presented to an avifaunal specialist for consultation on the relevant mitigation measures. Both current and any new nest sites, especially of species of conservation concern, should be managed in accordance with the relevant environmental legislations. • The use of rodenticides should be avoided both on-site and around any infrastructure associated with the con toxic nature of these rodenticides carries an unnecessary secondary poisoning risk to predatory avifauna, especially owls and species prone to scavenging. • Any bird fatalities recorded on-site during the construction and operational phases should be documented in detail and reported to an avifaunal specialist for advice on any appropriate mitigation measures.	Temporal			2		2		2	
				Probability			4		3		3	
WATERCOURSE												
Operation and maintenance of Phula PV Plant.	<u>The Springkaanspruit and 50 m buffer:</u> • Potential maintenance activities such as cutting of grass and cleaning of surface area underneath the solar panels; • Movement of vehicles, machinery and personnel to facilitate maintenance activities; • Increased catchment hardening from operation of internal roads.	**<u>NEGATIVE IMPACT</u>** • Increased sediment laden runoff, potential smothering of vegetation and disturbance to biota within the non-perennial river as a result of periodic maintenance activities undertaken upgradient; • Potential spillage and ingress of hydrocarbons from maintenance vehicles; *Potential for altered water quality as a result of sedimentation and elevated turbidity associated with maintenance activities. • Increased surface runoff due to compact and hardened surfaces in catchment.	• Implementation, of the stormwater management plan; • Any stormwater that forms part of the Phula PV project must not be concentrated and it should be ensured that flows remain diffuse at the outlets of any culverts. This can be achieved by installing dissipators to reduce flow before entry into the downgradient landscape, specifically non-perennial river 2 and portions downgradient outside the proposed project site; • The BESS and substation are recommended to be regularly inspected to ensure no leakages and spills occur which should be immediately reported to the environmental manager if identified. It is recommended that an emergency spill kit and contingency plan is put in place in the event of any spills of hydrocarbons occur so as to reduce ingress at the confluence of the non-perennial rivers downgradient; • Establish vegetation on the ground underneath the solar panels with indigenous grasses in order to reduce sedimentation that may occur from bare, exposed areas; • Any maintenance vehicles used must be in good working order and ensure there are no spills or leaks occurring whilst undertaking maintenance work. Drip trays are recommended to be placed underneath maintenance vehicles when they are parked; • Should erosion be noted at the base of the support structures, this may potentially impact on the non-perennial rivers situated adjacent. These areas must be adequately rehabilitated by infilling and stabilising/plugging erosion gullies, resurfacing disturbed areas and revegetating these areas with suitable indigenous vegetation; • The movement of maintenance vehicles along internal access roads should be minimised to what is essential for the completion of the necessary maintenance activities and should not be allowed to drive indiscriminately through the surrounding areas or within the associated buffers of the Springkaanspruit and the remaining sections of non-perennial river 2 and 4; • Sufficient separation of clean and dirty water systems should be undertaken with specific mention to areas associated with the BESS and laydown areas. Dirty water cannot be released to the downstream environment unless a WUL has been obtained and the conditions in the WUL adhered to.	Significance		NO IMPACT	3	MODERATE	2	LOW	2	LOW
				Spatial			2		2		2	
				Temporal			4		3		3	
				Probability			4		3		3	
	<u>Non-perennial rivers 2-5:</u> • Operation of Phula PV plant within the footprint of the non-perennial rivers.	**<u>NEGATIVE IMPACT</u>** Complete loss of non-perennial systems and associated eco-system services		Significance		NO IMPACT	4	HIGH	4	MODERATE	4	MODERATE
				Spatial			3		2		3	
				Temporal			5		4		4	
				Probability			5		4		4	
Operation of the BESS and site buildings	<u>All activities are located outside the Springkaanspruit and</u>	**<u>NEGATIVE IMPACT</u>** • Increased sediment laden runoff, potential smothering of		Significance		NO IMPACT	2	LOW	2	VERY LOW	2	VERY LOW
				Spatial			2		1		1	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
	non-perennial river 2 and 4 and associated buffers: • Maintenance activities such as cutting of grass and cleaning of area surrounding the BESS and site buildings; • Movement of vehicles, equipment and personnel associated with maintenance of the BESS and site buildings; • Use of conservancy/septic tanks or portable toilets.	vegetation and disturbance to biota within the non-perennial rivers as a result of periodic maintenance activities undertaken upgradient; *Potential spillage and ingress of hydrocarbons from maintenance vehicles; • Potential for altered water quality as a result of sedimentation and elevated turbidity associated with maintenance activities and potential for spills from plant area and dirty water areas; • Increased runoff and erosion as a result of hardened surfaces within the catchment; • Loss of surface water to downstream catchment as a result of the separation of clean and dirty water systems		Temporal			3		2		2	
				Probability			3		2		2	
Operation of roads	All activities located outside the Springkaanspruit and portions of non-perennial river 2 and 4 and associated buffer: • Increased catchment hardening from operation of internal roads; • Maintenance associated with roads such as cleaning and refurbishment; • Maintenance of culverts.	**NEGATIVE IMPACT** • Increased surface runoff and flood peaks from hardened surfaces; • Alteration to the pattern, timing and movement of water within the landscape; • Increased risk of erosion and sedimentation into the rivers; • Potential deterioration of water quality from sedimentation, spills and leaks from vehicles and machinery.		Significance		**NO IMPACT**	3	**LOW**	2	**VERY LOW**	3	**VERY LOW**
				Spatial			3		2		2	
				Temporal			3		2		2	
				Probability			3		2		2	
Operation of stormwater management for Phula PV project.	Operation of artificial stormwater channels within the Phula PV project.	**NEGATIVE IMPACT** • Increase in flood peaks and flow velocity within the catchment; • Turbulent flows, erosion and sedimentation in the downstream watercourses; • Smother of vegetation and increased AIPs within channel.		Significance		**NO IMPACT**	3	**HIGH**	3	**MODERATE**	3	**MODERATE**
				Spatial			3		3		3	
				Temporal			4		4		4	
				Probability			5		4		4	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
SOIL AND LAND CAPABILITY												
Site operations **Presence of operational Solar PV units**	Soils and land capability	**NEGATIVE IMPACT** As for construction phase (Soil and Land Capability)	• Same as construction phase (Soil and Land Capability)	Significance	4	**MODERATE**	3	**MODERATE**	3	**MODERATE**	3	**LOW**
				Spatial	1		1		2		1	
				Temporal	4		3		3		3	
				Probability	5		5		5		4	
VISUAL												
Site operations **Presence of operational Solar PV units, BESS and Substation**	Visual	**NEGATIVE IMPACT** • Direct visual impact • Change in sense of place. • Glare/reflection from panels	• Same as construction phase () • Ensure solar panels selection considers less reflective surfaces where possible. • Ensure vegetation is allowed to establish where possible to avoid bare surfaces. • Avoid bare metal surfaces / roofs where possible. • Avoid clearing of shrubs and trees adjacent to the boundaries of the development to assist with visual screening	Significance	3	**MODERATE**	4	**HIGH**	4	**HIGH**	3	**MODERATE**
				Spatial	1		3		3		3	
				Temporal	4		3		3		3	
				Probability	5		5		5		5	
SOCIO-ECONOMIC												
Operation and maintenance of PV Facility	Socio-Economic Environment	**POSITIVE IMPACT:** Employment Creation	• Maximise the employment of locals where the required skills are available. • Skills development and on-site training would be imperative to enhance capacity building and equipping employees with transferable skills. • Develop a database of goods and services that could potentially be outsourced to the local community as part of the PV facility operation. • Establish supply links with localised suppliers.	Significance		**NO IMPACT**	3	**MODERATE+**	4	**HIGH+**	4	**HIGH+**
				Spatial			4		4		4	
				Temporal			3		3		3	
				Probability			4		5		5	
		NEGATIVE IMPACT: Population influx	• Suitable accommodation facilities would be required for the employees and their families. • Incorporate the additional need for housing as part of the municipality's overall planning strategy. • Maximise the employment of locals where the required skills are available.	Significance		**NO IMPACT**	4	**LOW**	3	**LOW**	3	**LOW**
				Spatial			4		3		3	
				Temporal			2		1		1	
				Probability			3		3		3	
		POSITIVE IMPACT: Local and Regional Economic Benefits	• Project proponent to commit to enterprise and socio-economic development by committing a percentage of their revenue to these types of developments. • Socio-economic development programmes to be based on a collaborative and inclusive approach. • Develop a local procurement plan. • Environmental management of the project site must adhere to environmental regulations and strive towards international best practice	Significance		**NO IMPACT**	3	**LOW+**	4	**MODERATE+**	4	**MODERATE+**
				Spatial			3		4		4	
				Temporal			3		3		3	
				Probability			3		4		4	
		NEGATIVE IMPACT: Land-use Impacts	• If any legitimate land claim with regards to the property is legally settled in future, it must be dealt with accordingly.	Significance		**NO IMPACT**	3	**LOW**	2	**VERY LOW**	2	**VERY LOW**
				Spatial			2		2		2	

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
			• The layout of the PV facility on the farm must be positioned to avoid any negative impacts on future mining activities.	Temporal			1		1		1	
				Probability			3		2		3	
		NEGATIVE IMPACT: Community Safety	• Environmental management of the project site must adhere to environmental regulations and strive towards international best practice. • Develop and implement a Health and Safety Plan according to SHEQ best practices for the operational phase. • Limit safety risks through implementing safety and security measures. • Develop a Fire Management Strategy and Plan	Significance		NO IMPACT	2	LOW	2	LOW	2	VERY LOW
				Spatial			3		3		3	
				Temporal			3		1		1	
				Probability			3		3		2	
		NEGATIVE IMPACT: Health risks	• Environmental management of the project site must adhere to environmental regulations and strive towards international best practice. • An Occupational Health and Safety, Community Security and Emergency Preparedness and Response Plan must be compiled. • Contractors, sub-contractors and the permanent workforce must be trained in health and safety policies, environmental awareness and emergency preparedness	Significance		NO IMPACT	2	LOW	2	LOW	2	VERY LOW
				Spatial			3		3		3	
				Temporal			3		1		1	
				Probability			3		3		2	
		NEGATIVE IMPACT: Visual Impact and Sense of Place	• Lighting fixtures to be installed to have the minimum disturbances off-site. • Panel heights to be as low as possible to still be economically feasible to provide maximum output. • The design of administrative buildings should blend in with surrounding environment	Significance		NO IMPACT	3	MODERATE	2	LOW	3	LOW
				Spatial			3		3		3	
				Temporal			3		3		3	
				Probability			4		3		3	
		NEGATIVE IMPACT: Intrusions including people movement, traffic movement, dust and noise	• Site entrances to adhere to all road and safety regulations. Traffic calming measures can be implemented at site entrances. • Dust pollution mitigation to be implemented on site for vehicles travelling on local gravel roads. • Environmental management of the project site must adhere to environmental regulations and strive towards international best practice	Significance		NO IMPACT	3	LOW	3	LOW	2	VERY LOW
				Spatial			3		2		2	
				Temporal			1		1		1	
				Probability			3		3		3	

10.2.4 Impact assessment rating for the decommissioning phase

Table 10-3: Impact assessment rating for the decommissioning phase

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
AVIFAUNA												
Decommissioning	Disturbance and displacement of avifauna	**NEGATIVE IMPACT:** Disturbance from increased noise and both human and vehicle traffic may impact breeding and foraging success for local avifauna	• Impact is inevitable and ease of mitigation is low	Significance		**NO IMPACT**	2	**LOW**	2	**LOW**	2	**LOW**
				Spatial			3		3		3	
				Temporal			2		2		2	
				Probability			4		4		4	
WATERCOURSE												
Decommissioning of infrastructure	Soils and land capability	**NEGATIVE IMPACT** As for construction	• Same as the construction phase (Soil and land capability)	Significance	4	**MODERATE**	3	**MODERATE**	3	**MODERATE**	2	**LOW**
				Spatial	1		1		2		1	
				Temporal	4		3		3		3	
				Probability	5		5		5		5	
		POSITIVE IMPACT Re-establishing grazing land where possible	• Ensure the disturbed footprints are returned to land that can support grazing practices and per the current farming practices. • If bare areas are apparent, re-seed with indigenous seed mix relevant to the study area. • Ensure all compacted footprints are ripped 150mm deep (where rocks allow).	Significance	4	**MODERATE**	2	**LOW +**	2	**LOW +**	2	**LOW+**
				Spatial	1		1		2		2	
				Temporal	4		3		3		3	
				Probability	5		3		3		4	
VISUAL												
Decommissioning of infrastructure	Visual	**NEGATIVE IMPACT** Direct visual impact	• Same as the construction phase (Visual)	Significance	3	**MODERATE**	4	**MODERATE**	4	**MODERATE**	3	**MODERATE**
				Spatial	1		3		3		3	
				Temporal	4		2		2		2	
				Probability	5		5		5		5	
		POSITIVE IMPACT Re-establishing grazing land where possible	• Ensure the disturbed footprints are returned to land that can support grazing practices and per the current farming practices. • If bare areas are apparent, re-seed with indigenous seed mix relevant to the study area	Significance	3	**MODERATE**	4	**MODERATE +**	4	**MODERATE +**	2	**HIGH +**
				Spatial	1		3		3		2	
				Temporal	4		4		4		3	
				Probability	5		4		4		5	
SOCIO-ECONOMIC												

ACTIVITY	ASPECT	IMPACT	MITIGATION	CRITERIA	RATING PRIOR TO PROJECT (INITIAL IMPACT)		RATING PRIOR TO MITIGATION (ADDITIONAL IMPACT)		CUMULATIVE RATING		RATING POST MITIGATION (RESIDUAL IMPACT)	
Decommissioning Activities including people movement, job losses and intrusions	Socio-Economic Environment	**NEGATIVE IMPACT:** Job losses	• Replace technology and infrastructure with newer technology and infrastructure to extend the life of the facility. • The project proponents must develop mechanisms to assist employees, prior to the retrenchment date, and in the transition phase after closure of the facility. This can include offering portable skills development programmes during the operational phase, and by providing assistance in accessing available and suitable jobs with other PV facilities or companies. • Focus on non-core related local supply links during the operational phase to facilitate easier transitioning of local suppliers to other industries.	Significance		NO IMPACT	4	HIGH	4	LOW	3	MODERATE
				Spatial			4		3		4	
				Temporal			4		2		4	
				Probability			4		3		3	
		NEGATIVE IMPACT: Community Safety	• Safety controls and measures must be put in place to avoid unauthorised entry to the site. • Develop and implement a Health and Safety Plan according to SHEQ best practices for the decommissioning phase.	Significance		NO IMPACT	2	LOW	3	LOW	2	VERY LOW
				Spatial			3		3		2	
				Temporal			2		2		1	
				Probability			4		3		3	
		NEGATIVE IMPACT: Health risks	• Recycling or refurbishment of materials and panels • Discarding of materials must be sufficiently dealt with in a feasible and environmentally sound way. Safe disposal of all types of material (wires, invertors, racking systems, fencing) • Develop and implement a Health and Safety Plan according to SHEQ best practices for the decommissioning phase. • Toxic Characteristic Leaching Procedure (TCLP) tests can be undertaken on panels to determine how and where panels can be disposed of at a landfill	Significance		NO IMPACT	2	LOW	2	LOW	2	VERY LOW
				Spatial			4		4		3	
				Temporal			1		2		1	
				Probability			3		3		2	
		NEGATIVE IMPACT: Intrusions including people movement, traffic movement, dust and noise	• Vehicles must be in good working order and drivers have to keep to speed limits to limit safety risks and minimise noise and dust pollution created by heavy vehicle movement. • Environmental management of the site must adhere to environmental regulations and strive towards international best practice. • Mitigation measure of the Noise Impact Assessment to be implemented.	Significance		NO IMPACT	3	MODERATE	3	LOW	3	LOW
				Spatial			4		4		3	
				Temporal			2		2		1	
				Probability			4		3		3	
		NEGATIVE IMPACT: Loss of Infrastructure and Electricity Supply	• Replace technology and infrastructure with newer technology and infrastructure to extend the life of the facility.	Significance		NO IMPACT	4	HIGH	4	HIGH	4	HIGH
				Spatial			4		4		4	
				Temporal			4		4		4	
				Probability			4		4		4	
		NEGATIVE IMPACT: Visual Impact and End land-use	• Site rehabilitation to be undertaken. • Environmental management of the rehabilitation process must adhere to environmental regulations and strive towards international best practice. • Ensure a feasible and publicly acceptable end-use or restore land to its natural state.	Significance		NO IMPACT	4	LOW	3	LOW	3	LOW
				Spatial			2		2		2	
				Temporal			4		4		4	
				Probability			3		3		3	

11. MITIGATION MEASURES

The recommended environmental management measures for the proposed activities are documented in **Table 10-1** to **Table 10-3** for all the development phases of the project. These management measures are also outlined in the EMPr to ensure compliance throughout the project implementation phases, appended to this report (see **Appendix E**).

The EMPr provides details on the implementation of the management measures (timeframes, as well as roles and responsibilities) required to mitigate or reduce impacts identified. The monitoring and auditing programme is also outlined on the EMPr. This provides an assessment of the success of mitigation measures implementation as well as compliance and allows for continual improvement and remedy.

12. ENVIRONMENTAL IMPACT STATEMENT

12.1.1 Impact Assessment Summary

The environmental impact statement summarises the key findings of the EIA. Information gathered as part of the EIA process, recommendations by specialists and the EAP are summarised and presented as a combined and informed opinion of the environmental impacts associated with the project.

12.1.2 Specialists concluding statements

Independent specialists undertook baseline studies on the footprint of the study site which was used to identify environmental sensitivities that informed the development layouts. The specialists than undertook impact assessments on the final development layout. The identified environmental sensitivity areas/features are detailed in **Section 10.1**. From the specialist impact assessments undertaken, **Table 12-1** provides the specialist key findings and concluding statements based on the preferred Phula PV facility layout.

Table 12-1: Specialists concluding impact statements

SPECIALIST STUDY	KEY FINDINGS AND CONCLUDING STATEMENTS
Terrestrial Biodiversity	• The habitat sensitivity has relevance in that the PV facility site lies mostly within a CBA1 classified area, which needs to be maintained in a natural/near-natural state to maximise the retention of ecological processes and biodiversity patterns. • In terms of the impacts of the proposed PV facility, thirteen broad impact categories are relevant. If unmitigated, two of the impacts are rated as Very High, three as High, five as Moderate and three as Low. Should the proposed mitigatory measures be followed, these impact ratings are expected to be decreased to one High Impact, two Moderate impacts, four Low impacts, and six Very Low impacts. • Crucial to the mitigation is the avoidance of identified key sensitive habitats which have been omitted from the final proposed layout and implementation of a hybrid (natural and engineered channels) stormwater management plan to ensure ecological connectivity within and around the site. • Overall, Phula PV facility site comprises of sensitive areas some of which can effectively be avoided as well as areas that are generally of low sensitivity, despite the CBA1 area classification. • No fatal flaws were identified and the Phula PV project should be allowed to continue, and as such be granted authorisation with inclusion of recommended mitigation measures into the EMPr and EA process.
Aquatic Biodiversity	• No NFEPA wetlands found on-site. • No sensitive features apart from the drainage channels and River systems were identified on-site. The site-based buffer zone tool indicates that a final 15 m buffer for the Springkaanspruit and a 18m buffer for the

SPECIALIST STUDY	KEY FINDINGS AND CONCLUDING STATEMENTS
	Unnamed Tributary system is appropriate for the protection of the ecosystem services provided by the water resource systems. These areas thus serve as the only no-go areas on site where construction activities are prohibited. • The proposed Phula PV Project construction is regarded as a low-risk impact on the associated aquatic features, should the construction and development of the plant occur outside of the delineated sensitivities features and buffer zones. • The cumulative impact associated with the construction and operation of the Solar PV Facility, is likely to be of low/moderate significance prior to the implementation of mitigation measures and of low significance after implementation of mitigation measures, provided the Solar PV Facility and associated infrastructure avoid areas of high sensitivity. • Taking the impact assessment results, sensitive areas on-site, site sensitive buffers, aquatic biodiversity indicators as well as the no-go areas into account, it is clear that the additional construction of the solar plant on the property will have a low impact on the receiving aquatic ecosystem especially if the mitigation measures and recommendations as set out in the specialist report is adhered to. • Overall, the aquatic biodiversity assessment correlates with the DFFE screening tool findings indicating Very High sensitivity. The ecological indicators being used in the aquatic biodiversity assessment accurately reflect the health and functioning of the aquatic ecosystem. As such, the specialist concluded that it is expected that the aquatic ecosystem should remain in the current state after the development took place due to the low impact expected.
Watercourse Assessment	• Based on the watercourse assessment and considering the current layout, the majority of the activities associated with the construction and operational phase for the Phula PV project were considered to have a Moderate to Low impact on the watercourses with the successful implementation of all mitigation measures recommended. It should be noted that if all mitigation measures outlined in the report are not implemented, the impact/risk ratings will need to be re-assessed and will likely result in significantly higher scores. • It is recommended that the delineated boundaries of the Springkaanspruit and associated 50 m avifaunal buffer and non-perennial river and the associated 38 m buffer as included in the current layout, should be adequately avoided as part of the proposed Phula PV project. Additionally, the implementation of the detailed stormwater management plan and associated artificial stormwater channels that are to be implemented to guide the Phula PV project must provide adequate measures to ensure that clean and dirty water are separated, that sufficient flow is maintained and diverted to the downstream watercourses, that the artificial channels are designed to promote the establishment of indigenous vegetation and a variation of habitat types, and that the riparian corridor and flow regime associated with the Central Drainage Corridor, is maintained. Adequate measures to ensure dissipation and attenuation of flow within the artificial channels, to provide natural pools of water and facilitate sediment control is also recommended. These measures will ensure the maintenance of an ecological corridor to allow movement of aquatic and terrestrial species as well as provide adequate breeding, feeding, migratory and refuge habitat within these channels and prevent erosion and scouring to downgradient watercourses. Dissipation structures must also be implemented where the stormwater measures enter the natural system downstream of the site and where runoff from the panels may result in erosion of the Springkaanspruit. From a watercourse perspective, it is important that the eco-system services provided by the systems lost, are taken into consideration when applying the proposed mitigation measures. Ecosystem services provided by the systems include the provision of an ecological corridor, habitat for the movement of aquatic species and erosion protection in a highly erosive environment. If all mitigation measures are successfully implemented, the project may be considered feasible, subject to any recommendations and approval from DWS, the custodians of water resources within the country
Avifauna Assessment	• A total of 116 species were recorded and thus confirmed as occurring on-site. Three of these species are listed regionally as that of conservation concern, namely Martial Eagle (Endangered), Lanner Falcon (Vulnerable), and European Roller (Near threatened) • Overall, the site was rated as of Low Sensitivity for avifauna, which aligns with the results obtained by the DFFE screening tool. • No fatal flaws were discovered during the site sensitivity assessment and pre-construction monitoring period and all associated impacts identified for this development were of Moderate or Low significance

SPECIALIST STUDY	KEY FINDINGS AND CONCLUDING STATEMENTS
	after mitigation. It is recommended that the authorisation of the proposed development, and that the specialist recommendations outlined in avifauna report are fulfilled.
Soil and Land Capability	• The potential cultivatable soils are too small an area to be economically utilised. The impacts identified are within the acceptable norms for the type of development, and the applicant has avoided all sensitivities as far as reasonably possible. By limiting the vegetative clearing, managing stormwater and ensuring the current grazing practices can continue on the remainder of the property, the residual impact can be mitigated to a LOW impact. • It is the opinion of the specialist that the proposed solar PV development can be authorised considering the mitigation measures recommended in the report are considered for inclusion in the EMPr and any associated authorisation
Visual Assessment	• The visual absorption capacity ranges from high to none depending on the vegetative cover. • The impacts identified are within the acceptable norms for the type of development, and the applicant has avoided all sensitivities as far as reasonably possible. By limiting the vegetative clearing, the impact can be mitigated to a medium impact. • It is the opinion of the specialist that the proposed solar PV development can be authorised considering the mitigation measures recommended in the report are considered for inclusion in the EMPr and any associated authorisation.
Heritage Assessment	• The HIA concluded that archaeological resources identified within the study area are of low heritage significance and with the implementation of recommended mitigation measures, the overall impact on heritage resources will be reduced to acceptable levels during the activities of the project. • If heritage resources are discovered during site clearance, construction activities that may impact the find must stop, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.
Socio-economic Assessment	• There are not fatal flaws prohibiting the Phula PV Facility project from proceeding. • From a socio-economic perspective, it is recommended that the environmental authorisation be approved, provided that mitigation measures recommended in this report are strictly implemented and monitored based on relevant standards
Desktop Geotechnical	• A review of available published geological maps, data and geotechnical reports closest to the site suggested that there are no fatal flaws or excessive geotechnical risks associated with the proposed Phula PV project. However, cognisance will need to be made of the likely highly variable thickness of transported and residual soils, and depth to bedrock across the site.

12.1.3 Overall Environmental Impact Statement and Reasoned Opinion by the EAP

The need and desirability associated with the development of utility-scale solar PV is driven by several factors, including environmental, economic, and social factors. Additionally, this includes reducing dependence on fossil fuels and enhancing energy security and resilience against electricity supply disruptions. The solar PV sector has also become a major source of employment in many regions, from manufacturing and installation to operation and maintenance.

An impact assessment was undertaken for the development of the proposed Phula PV facility by relevant specialists to determine the impact of the proposed development on the environment. Specialists identified sensitive features/areas within the development area provided by the applicant which were considered to be of terrestrial and aquatic biodiversity critical importance. Through integration of the specialist's sensitivity data, as well as the consideration of the technical aspects and land availability for this development, the Applicant designed a layout plan to avoid key sensitive areas and features identified onsite, as far as possible, but that will keep the proposed development

viable. Two (2) alternatives have been considered for the proposed Phula PV project during the iterative design process.

- **Alternative 1:** Implementation of engineered stormwater management measures and minimal avoidance of sensitive areas;
- **Alternative 2 (Preferred):** Avoid certain key sensitive areas and features as well as the associated buffers, where practically and feasibly possible. In addition, to include the implementation of the stormwater management measures which will ensure maintenance and stability of the aquatic biodiversity, and strategically allow for continued habitat connectivity.

The Watercourse and Terrestrial Biodiversity specialists, respectively, have indicated that the project may initially result in negative impacts on the environment. However, the implementation of the recommended mitigation measures and engineered and naturalised (hybrid) stormwater management measures will reduce the impacts to an acceptable level.

All significant project and cumulative impacts associated with the proposed Phula PV Facility have been identified and sufficient mitigation, management and monitoring measures have been prescribed. These are included in the implementation EMPr (**Appendix E**).

Overall, the potential project and cumulative impacts identified are rated as High to Moderate and can be mitigated to Moderate to Low by measures described in this report (**Section 10**). From a socio-economic perspective, the positive benefits of the proposed project outweigh the potential negative impacts that may occur. In addition, considering the inherent mining dominated land use of the broader project area, the development of the proposed Phula PV project generally has less significant residual impacts. Specialists have agreed that the development may proceed provided that the recommended mitigation measures stipulated are included in the EMPr and implemented. Monitoring of the impacts as per the EMPr should also be conducted to determine if any corrective actions are required.

The specialist mitigation measures and recommendations presented in Section **10.2** of this report and the EMPr (**Appendix E**) are designed to address specific environmental concerns identified during the EIA process and feasibility of the project.Therefore, the layout illustrated in **Figure 3-6** can be considered the final layout for approval.

Considering the above, it is the opinion of the EAP, that the proposed project has an acceptable impact on the surrounding environment and subsequently ensures the optimal utilisation of resources, provided that the project details in this report remain unchanged and mitigation measures set out in this report and in the EMPr are implemented and audited.

13. ASSUMPTIONS AND KNOWLEDGE GAPS

In accordance with the EIA Regulations, the knowledge gaps, adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information must be identified.

The following assumptions and limitations, related to the available field data and assessment, apply to the following components:

- The S&EIR documentation aims are to provide sufficient information required to promote a reasonable understanding of the risks/impacts/issues associated with the project and its associated activities, how best to mitigate or manage these and to present this in a manner that allows the CA to reach a responsible and informed decision.
- The information provided by the Applicant is accurate and no information that could change the outcome of the EIA process has been withheld or obscured.
- This report is based on the most up to date information available, both in terms of project description (from the Applicant) and specialist findings.
- The scope of this investigation is limited to assessing the environmental and social impacts associated with the proposed Phula PV project in line with the requirements of the NEMA.
- It is assumed that other relevant authorisations and permits for the proposed development would be managed separately. Therefore, while information obtained from this process may inform other permits/authorisations, the report has not been compiled in order to fulfil the content requirements of other permits/authorisations.
- The information provided by the specialists is accurate, sufficient and unbiased.
- The exact solar panel specifications are not known at this stage and hence the maximum number of panels to be constructed and the maximum MW of energy to be exported by the Facility has been clearly defined and a “worst-case scenario” in this regard has been assessed. This is in line with the precautionary principle.
- Any limitations and gaps in knowledge that have been encountered by the specialists are identified in their respective assessments (**Appendix D**).
- The developer has identified alternatives for the grid connection infrastructure for the proposed Phula PV solar facility and the EA application for the grid infrastructure will be subjected to separate BA process.
- Should any future infrastructure or expansion triggering activities not included during this EIA process be proposed on the study area, a separate EA application process will be undertaken with the relevant CA.

14. RECOMMENDATIONS

The proposed Phula PV facility will require an EA with a validity of ten (10) years. The following conditions are recommended for inclusion in the authorisation:

- Alternative 2 (**Figure 3-6**) of the site layout alternatives is preferred from an environmental and technical perspective and is therefore considered final and recommended for approval as part of the EA.
- The recommended engineered and naturalised (hybrid) stormwater management measures should be considered and implemented and should ensure that the system caters for connectivity of sensitive areas within the site.
- Authorisation in terms of the NWA must be obtained before construction commences.
- Other relevant and required permits required should be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site, cutting down of any protected trees and removal of SSC;
- An effective Alien Invasive Awareness and Management Programme should be established. This plan should be updated and continue for the duration of the project.
- Promote the re-establishment of SCCs in development areas where possible (under and between panels, road verges, berms and stormwater infrastructure).
- The chance find protocol for heritage resources outline in the HIA should be adhered to.
- The recommended aquatic monitoring programme should be implemented. Bio-monitoring must be conducted once during the wet summer period and once during the dry winter period in order to mitigate any seasonable variability effects. Surface water assessments be included within the bio-monitoring programme.

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APPENDIX A

EAP DETAILS AND DECLARATION

APPENDIX B

MAPS

APPENDIX C

PUBLIC PARTICIPATION REPORT

APPENDIX D

SPECIALISTS REPORTS

APPENDIX D- 1:

TERRESTRIAL BIODIVERSITY ASSESSMENT REPORT

APPENDIX D- 2:
AQUATIC BIODIVERSITY ASSESSMENT REPORT

APPENDIX D- 3:
WATERCOURSE ASSESSMENT REPORT

APPENDIX D- 4:
AVIFAUNA ASSESSMENT REPORT

APPENDIX D- 5:

HERITAGE IMPACT ASSESSMENT REPORT

APPENDIX D- 6:
VISUAL IMPACT ASSESSMENT REPORT

APPENDIX D- 7:
SOILS AND LAND CAPABILITY ASSESSMENT REPORT

APPENDIX D- 8:
SOCIO-ECONOMIC ASSESSMENT REPORT

APPENDIX D- 9:
DESKTOP GEOTECHNICAL ASSESSMENT REPORT

APPENDIX D- 10:
SPECIALISTS DETAILS AND DECLARATION REPORT

APPENDIX D- 11:

DFFE SCREENING TOOL REPORT

APPENDIX D- 12:
SITE VERIFICATION REPORT

APPENDIX E

EMPR AND GENERIC EMPR

APPENDIX F

DFFE CORRESPONDENCE

APPENDIX G

ADDITIONAL SUPPORTING DOCUMENTS

APPENDIX G- 1:
SERVICES PROVISION LETTERS

APPENDIX G- 2:

PROOF OF WULA APPLICATION