Phefumula Emoyeni One (Pty) Ltd

PHEFUMULA EMOYENI ONE WIND ENERGY FACILITY (UP TO 550MW)

Draft Environmental Impact Assessment Report

DFFE Reference Number: 2025-02-0015

2025-02-0015
APRIL 2025

CONFIDENTIAL

Phefumula Emoyeni One (Pty) Ltd

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Draft Environmental Impact Assessment Report

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CONFIDENTIAL

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GENERAL SITE INFORMATION

Technical details of the proposed Phefumula Emoyeni One Wind Energy Facility	
Location of the Site	Approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province
Farm Portions	The WEF will be located over 93 farm portions
Central coordinates of the site and activity location	26°21'31.02"S; 29°46'49.38"E
Total Site Extent	Approximately 33 660ha
Design Specifications	
Capacity	Up to 550MW
Number of Turbines	Up to 76 turbines (Between 6MW and 15MW each)
Turbine Hub Height	Up to 200m
Rotor Diameter	Up to 200m
Tip Height	Up to 300m
Permanent hard standing area	Approximately 75m x 120m
Foundation	Each turbine will have a foundation of approximately up to 40m^2 – excavation up to 6m deep, constructed of reinforced concrete to support the mounting ring. Once tower established, footprint of foundation is covered with soil.
Three IPP Portion Onsite Substations and Battery Energy Storage System (BESS)	▪ Each IPP onsite Substation and BESS will have a total footprint of up to 10ha in extent. ▪ Each 33kV/132kV onsite collector substation (IPP portion) will have a footprint of approximately 5ha. • The substation will consist of a high voltage substation yard to allow for multiple up to 132kV feeder bays and transformers, control building, telecommunication infrastructure, access road, etc. ▪ Each BESS will have a footprint of approximately 5 ha • Export Capacity of up to 200MW • Total storage capacity 800MWh • Storage capacity of up to 6-8 hours • The BESS will be housed in containers • Battery types to be considered: Solid State Batteries as the preferred (Lithium Ion) and Redox Flow Batteries as the alternative (Vanadium Redox).

Operation and Maintenance (O&M) Building Infrastructure	O&M building infrastructure will be required to support the functioning of the WEF and for services required by operations and maintenance staff. The O&M building infrastructure will be near the onsite substation and will include 3 O&M offices of approximately 1.5ha each adjacent to each collector Substation. Each O&M Building will include: ▪ Operations Building; ▪ Workshop and Stores Area ▪ Refuse area for temporary storage of waste; and ▪ Conservancy tank to service the ablution facilities.
Three Construction Camp Laydown Areas	Each Construction Camp Laydown Area will include: ▪ Temporary laydown or staging area -Typical area 3ha each (150m x 20. ▪ Laydown area could increase to 30ha for concrete towers, should they be required. ▪ Sewage: septic and/or conservancy tanks and portable toilets. ▪ Temporary concrete batching plant & yard of approximately 7ha, comprising amongst others, a concrete storage area, batching plant, electrical infrastructure and substation, generators and fuel stores, gantries and loading facilities, offices, material stores (rebar, concrete, aggregate and associated materials), mess rooms, workshops, laydown and storage areas, sewage and toilet facilities, offices and boardrooms, labour mess and changerooms, mixers, water and settling tanks, pumps, silos and hoppers, a laboratory, parking areas, internal and access roads - Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The maximum height of the silo will be 20m.
Access Roads	▪ The Project site can be accessed easily via the N11 national road which runs along the eastern boundaries of the site. ▪ There are existing roads that go through the land parcels to allow for direct access to the project development area. ▪ Internal and access roads with a width of between 8m and 10m, which can be increased to approximately 12m on bends. The roads will be positioned within a 20m wide corridor to accommodate cable trenches, stormwater channels and bypass /circles of up to 20m during construction. Length of the internal roads will be approximately 60km.
Associated Infrastructure	▪ 33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical. ▪ Cabling between turbines, to be laid underground where practical. ▪ Laydown and crane hardstand areas (approximately 75m x 120m).

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1 INTRODUCTION

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Phefumula Emoyeni One (Pty) Ltd (Phefumula) (a private special purpose company to be incorporated), to undertake an Environmental Impact Assessment (EIA) to meet the requirements under the National Environmental Management Act (Act 107 of 1998) (NEMA), for the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) and its associated infrastructure, located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa (**Figure 1-1**).

The proposed development is subject to a Scoping and EIA (S&EIA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 2 and 3 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this S&EIA Process is the national Department of Forestry, Fisheries and Environment (DFFE).

An application for Environmental Authorisation (EA) in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and associated Environmental Impact Assessment (EIA) Regulations, 2014, as amended, was submitted on 15 April 2024 to the Department of Forestry, Fisheries and Environment (DFFE) (Reference: 14/12/16/3/3/2/2545). During the course of the public participation process, undertaken for the Draft Environmental Impact Assessment (EIA) Report, various concerns and objections were raised by various registered Interested and Affected Parties (I&APs) with regards to the sensitivity of the biodiversity in the area, particularly the high avifaunal sensitivity. These comments included the request for additional studies. In light of the comments noted above, a decision was made to allow the previous application to lapse such that additional investigations could be undertaken.

WSP Group Africa (Pty) Ltd (WSP) is applying for the re-submission of application for EA for the proposed project in terms of Regulation 21(2) of GNR 326. The Approval of the Scoping Report was received on 17 July 2024 and is still valid.

All registered Interested and Affected Parties (I&APs) were informed of WSP's intent to re-submit the application for EA for the proposed project in terms of Regulation 21(2) of GNR 326 via email on 29 October 2024. A new DFFE reference number will be provided for this re-submission.

It must be noted that an application for Strategic Infrastructure Project (SIP) Status as been submitted for the Phefumula Emoyeni One WEF. The DFFE will be notified should SIP status be awarded.

1.1 PURPOSE OF THIS REPORT

The Scoping and EIA (S&EIA) process is an interdisciplinary procedure to ensure that environmental and social considerations are included in decisions regarding projects. Simply defined, the process aims to identify the possible environmental and social effects of the proposed Phefumula Emoyeni One WEF and how those impacts can be mitigated.

This Draft environmental impact report (DEIR) aims to provide stakeholders with information on the proposed development including location, layout and technological alternatives, the scope of the environmental assessment and key impacts identified in the environmental assessment, and the consultation process undertaken through the EIA process.

1.2 BACKGROUND INFORMATION

The proponent is proposing the development of the Phefumula Emoyeni One WEF in Mpumalanga. The facility consists of the following distinct projects referred to as:

- Phefumula Emoyeni One WEF (up to 550MW)); and
- Up to 400kV Grid Connection and Main Transmission Substation (MTS) (DFFE Ref: 14/12/16/3/3/2/2596).

The focus of this Draft Environmental Impact Report is the proposed Phefumula Emoyeni One WEF (up to 550MW) project.

The proposed project will be applied for under a Special Purpose Vehicle (SPV), and the Project Applicant is therefore Phefumula Emoyeni One (Pty) Ltd. The WEF will be located over 93 farm portions.

In order for the proposed project to proceed, it will require an Environmental Authorisation (EA) from the Competent Authority (CA) (i.e., the National Department of Forestry, Fisheries and Environment, (DFFE)).

1.3 KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Phefumula Emoyeni One (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the WEF and associated infrastructure. **Table 1-1** provides the relevant details of the project proponent.

Table 1-1 - Details of Project Proponent

Proponent:	Phefumula Emoyeni One (Pty) Ltd
Company Registration	2013/165056/07
Contact Person:	Peter Carl Venn
Postal Address	PO Box 639, Northlands, Johannesburg, Gauteng, 2116
Telephone:	+27 83 689 3063
Email:	peter.venn@seritigreen.com

1.3.2 COMPETENT AUTHORITY

Section 24C(2)(a) of NEMA stipulates that the Minister of Forestry, Fisheries and the Environment ("the Minister") must be identified as the CA if the activity has implications for international environmental commitments or relations. GN 779 of 01 July 2016 identifies the Minister as the CA for the consideration and processing of environmental authorisations and amendments thereto for activities related to the Integrated Resource Plan (IRP) 2010 – 2030.

As the proposed WEF is related to the IRP, the CA is the DFFE, which was confirmed during the Pre-Application Meeting held on 24 October 2023. **Table 1-2** provides the relevant details of the competent authority on the Project.

Table 1-2 - Competent Authority

Aspect	Competent / Commenting Authority	Contact Details
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Mmamohale Kabasa Integrated Environmental Authorisations Email: MKabasa@dffe.gov.za DFFE Ref: 14/12/16/3/3/2/2545

1.3.3 COMMENTING AUTHORITY

The following commenting authorities have been identified, to date, for this application:

- Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected areas;
- Department of Water and Sanitation (DWS);
- Vaal Water Management Area (WMA) Authority;
- Department of Agriculture, Land Reform and Rural Development (DALRRD);
- South African Heritage Resource Agency (SAHRA);
- Department of Mineral Resources and Energy (DMRE);
- Mpumalanga Heritage Resources Authority (MHRA);
- Mpumalanga Tourism and Parks Agency (MTPA);
- Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Department of Defence (SA Army) (DD);
- Astronomy Management Authority (AMA);
- South African Weather Services (SAWS);
- South African National Roads Agency Limited (SANRAL);
- Mpumalanga Department of Public Works, Roads and Transport;
- Gert Sibande District Municipality;
- Msukaligwa Local Municipality.

Refer to the Stakeholder Engagement Report (SER) in **Appendix F** for a full list of commenting authorities.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP Group Africa (Pty) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the S&EIR processes for the development of the Project. The CV of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-3** details the relevant contact details of the EAP. In order to adequately identify and assess potential environmental impacts, a number of specialists will support the EAP.

Table 1-3 - Details of the Environmental Assessment Practitioner

Environmental Assessment Practitioner (EAP)	WSP Group Africa (Pty) Ltd
Contact Person:	Ashlea Strong
Postal Address:	Building 1, Maxwell Office Park, Magwa Cres, Midrand, 1685
Telephone:	011 361 1392
Fax:	011 361 1381
E-mail:	Ashlea.Strong@wsp.com
Qualifications:	▪ Masters in Environmental Management, University of the Free State ▪ B Tech, Nature Conservation, Technikon SA ▪ National Diploma in Nature Conservation, Technikon SA
EAPASA Registration Number:	EAPASA (2019/1005)

Statement of Independence

Neither WSP nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any business, financial, personal, or other interest that could be reasonably regarded as being capable of affecting their independence. WSP has no beneficial interest in the outcome of the assessment.

1.3.5 SPECIALISTS

Specialist input was required in support of this application for EA. The details of the specialists are provided in **Table 1-4** below. The specialist declarations are included in **Appendix C**.

Table 1-4 - Details of Specialists

Assessment	Name of Specialist	Company	Sections in Report
Agriculture	Johann Lanz	Independent	Section 7.1.5 Section 9.3 Section 11.2.1 **Appendix G-8**
Avifauna	Albert Froneman	AfriAvian Environmental	Section 7.2.6 Section 9.5 Section 10.3 **S**ection11.2.3 **Appendix G-4**

Assessment	Name of Specialist	Company	Sections in Report
Bats	Caroline Lotter	Inkululeko Wildlife Services (Pty) Ltd	Section 7.2.5 Section 9.4 Section 10.4 Section 11.2.4 **Appendix G-5**
Aquatic Biodiversity	Stephen van Staden and Paul da Cruz	Scientific Aquatic Services (SAS) (Pty) Ltd	Section 7.1.6 Section 9.2 Section 10.2 Section 11.2.2 **Appendix G-2**
Terrestrial Biodiversity (including Animal and Plant species themes)	Andrew Zinn	Hawkhead Consulting	Section 7.2.1, 7.2.2, 7.2.3 Section 9.7, 9.8, 9.9, Section 10.5, 10.6, 10.7 Section 11.2.5, 11.2.6,11.2.7 **Appendix G-3**
Geotechnical	Heather Davis	WSP Group Africa (Pty) Ltd	Section 7.1.4 Section 9.10 Section 10.8 Section 11.2.8 **Appendix G-1**
Heritage and Palaeontology	Jaco van der Walt / Marion Bamford	Beyond Heritage Consulting / Marion Bamford Consulting	Section 7.3.3 Section 9.11 Section 10.9 Section 11.2.9 **Appendix G-11**
Socio-economic	Stephen Horak	WSP Group Africa (Pty) Ltd	Section 7.3.5 Section 9.14 Section 10.13 Section 11.2.12 **Appendix G-7**
Traffic	Iris Wink	iWink Consulting	Section 7.3.2 Section 9.15

Assessment	Name of Specialist	Company	Sections in Report
			Section 10.14 Section 11.2.13 **Appendix G-9**
Visual	Johan Bothma	WSP Group Africa (Pty) Ltd	Section 7.3.5 Section 9.16 Section 10.15 Section 11.2.14 **Appendix G-6**
Noise	Kirsten Collett	WSP Group Africa (Pty) Ltd	Section 7.1.2 Section 9.12 Section 10.10 Section 11.2.10 **Appendix G-10**
SHE Risk	Debra Mitchell	ISHECON cc	Section 7.3.7 Section 9.13 Section 10.12 Section 11.2.11 **Appendix G-12**

1.4 IMPACT ASSESSMENT TERMS OF REFERENCE

The 2014 Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, identifies the proposed Phefumula Emoyeni One WEF development as an activity being subject to an S&EIR process due to the applicability of the EIA Listing Notices 1 and 2 (GNR 983 and 984, as amended). For the project to proceed, it will require an Environmental Authorisation (EA) from the DFFE.

WSP has been appointed as the independent EAP to carry out the S&EIR process in accordance with the EIA Regulations, 2014, as amended in 2017.

The Scoping Process has been completed and involved consultation with interested and affected parties and the drafting of the Plan of Study (PoS) for EIA, which culminated in the submission of a Final Scoping Report (FSR) to the DFFE. The DFFE acceptance of the FSR and authorisation to proceed with the EIR was received on **17 July 2024** (**Appendix D)**. This draft EIR is due to be submitted to the DFFE on **11 April 2025**.

This draft EIAR will be_made available for public comment from **11 April 2025 to 16 May 2025.**

As defined in Appendix 3 of GNR 982, as amended, the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine the—
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
- Degree to which these impacts-
  - Can be reversed;
  - May cause irreplaceable loss of resources, and
  - Can be avoided, managed or mitigated;
- Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- Identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

Public participation is a requirement of the S&EIR process; it consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed Project. The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable Proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions

1.5 OBJECTIVES OF THE S&EIA PROCESS AS PER THE PROCEDURAL FRAMEWORK

The S&EIR process consists of various phases with associated timelines as defined in GNR 982. The process can generally be divided into four main phases, namely, (i) a Pre-application Phase, (ii) an

Application and Scoping Phase, (iii) an Impact Assessment Phase (**current phase**) and (iv) Authorisation and Appeal Phase.

The main objectives of the phases can be described as follows:

- Pre-Application Phase (**Completed**):
  - Undertake consultation meetings with the relevant authorities to confirm the required process, the general approach to be undertaken and to agree on the public participation plan;
  - Identify stakeholders, including neighbouring landowners/residents and relevant authorities;
- Application and Scoping Phase (**Completed**):
  - Compile and submit application form to the CA and pay the relevant application fee;
  - Compile a DSR describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase;
  - Develop draft terms of reference for the specialist studies to be undertaken in the Impact Assessment Phase; and
  - Inform stakeholders of the proposed project, feasible alternatives and the S&EIR process and afford them the opportunity to register and participate in the process and identify any issues and concerns associated with the proposed project.
  - Incorporate comments received from stakeholders during the DSR comment period;
  - Should significant amendments be required, release the updated DSR for an additional 30-day comment period to provide stakeholders with the opportunity to review the amendments as well as provide additional input if required; and
  - Submit the FSR, following the consultation period, to the relevant authorities, in this case the DFFE, for acceptance/rejection.
- Impact Assessment Phase (**Current – through re-application**):
  - Continue to inform and obtain contributions from stakeholders, including relevant authorities, stakeholders, and the public and address their relevant issues and concerns;
  - Assess in detail the potential environmental and socio-economic impacts of the project as defined in the DSR;
  - Identify environmental and social mitigation measures to avoid and/or address the identified impacts;
  - Develop and/or amend environmental and social management plans based on the mitigation measures developed in the Environmental Impact Assessment Report (EIAR);
  - Submit the EIAR and the associated EMPr to the CA to undertake the decision-making process;
  - The DFFE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
  - Notify all registered stakeholders of the decision and right to appeal.
- Authorisation and Appeal Phase;
  - The DFFE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
  - Notify all registered stakeholders of the decision and right to appeal.

1.6 IMPACT ASSESSEMENT REPORT STRUCTURE

Table 1-5 cross-references the sections where the legislated requirements as per Appendix 3 of GNR 982 of 2014 can been located within the EIR.

Table 1-5 - Legislated Report Requirements as detailed in GNR 982

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
(a)	Details of	
	the EAP who compiled the report; and	Section 1.3.4 **Appendix A**
	the expertise of the EAP, including a Curriculum Vitae	**Appendix A**
(b)	The location of the activity, including-	
	The 21-digit Surveyor code for each cadastral land parcel;	Section 4.1
	Where available, the physical address and farm name	Section 4.1
	Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property.	N/A
(c)	A plan which locates the proposed activities applied for at an appropriate scale, or, if it is-	
	A linear activity, a description of the corridor in which the proposed activity or activities is to be undertaken; or	N/A
	On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A
(d)	A description of the proposed activity, including-	
	All listed and specified activities triggered and being applied for;	Section 6.1
	A description of the associated structures and infrastructure related to the development;	Section 4.3
(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 6
(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4.5
(h)	A full description of the process followed to reach the proposed development footprint within the approved site, including-	
	Details of the development footprint alternatives considered;	Section 5
	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 3.4 **Appendix F**
	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	**Appendix F**

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
	The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.	Section 9
	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 3.3
	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 9
	The possible mitigation measures that could be applied and level of residual risk;	Section 9
	If no alternative development locations for the activity were investigated, the motivation for not considering such; and	Section 5
	A concluding statement indicating the preferred alternative development location within the approved site.	Section 11.3
(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-	
	A description of all environmental issues and risks that were identified during the environmental impact assessment process; and;	Section 9
	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 9
(j)	An assessment of each identified potentially significant impact and risk, including-	
	Cumulative impacts;	Section 10
	The nature, significance and consequences of the impact and risk;	Section 8
	The extent and duration of the impact and risk;	Section 9
	The probability of the impact and risk occurring;	Section 9
	The degree to which the impact and risk can be reversed;	Section 9
	The degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 9
	The degree to which the impact and risk can be mitigated.	Section 9
(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section **11.2**

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
(l)	An environmental impact statement which contains-	
	A summary of the key findings of the environmental impact assessment:	Section **11**
	A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Section 8.2
	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section **11**
(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Section **11**
(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 5
(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section **11.3**
(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 3.5
(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section **11.3**
(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	N/A
(s)	An undertaking under oath or affirmation by the EAP in relation to-	
	The correctness of the information provided in the report;	**Appendix B**
	The inclusion of comments and inputs from stakeholders and I&APs;	**Appendix B**
	The inclusion of inputs and recommendations from the specialist reports where relevant; and	**Appendix B**
	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	**Appendix B**
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	N/A
(u)	An indication of any deviation from the approved scoping report, including the plan of study, including-	N/A
	any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	N/A

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	a motivation for the deviation	N/A
(v)	Any specific information required by the competent authority; and	N/A
(w)	Any other matter required in terms of section 24(4)(a) and (b) of the Act	N/A

2 SCOPING PHASE SUMMARY

2.1 PROCEDURAL PROCESS

The application form was compiled and submitted to the DFFE on **15 April 2024** with the (Draft Scoping Report) DSR. The application form was acknowledged on **02 May 2024**.

The DFFE reference number allocated to this application is 14/12/16/3/3/2/2545. This reference number will appear on all official correspondence with the authorities and the public regarding the Proposed Project. A copy of the acknowledgement of receipt of the application is included in the SER.

The DSR was released for public review from **12 April 2024 to 14 May 2024**. Subsequently the scoping report was finalised and submitted to the DFFE on **31 May 2024** for their review and approval. The submission of the final scoping report was within 44 days of receipt of the application by the DFFE as required by GNR 982.

The approval of the FSR and the PoS for the EIA was received on **17 July 2024**, is still valid, and is included in **Appendix D.**

During the course of the public participation process, undertaken for the Draft EIA Report, various concerns and objections were raised by various registered Interested and Affected Parties (I&APs) with regards to the sensitivity of the biodiversity in the area, particularly the high avifaunal sensitivity. These comments included the request for additional studies. In light of the comments noted above, a decision was made to allow the previous application to lapse such that additional investigations could be undertaken.

WSP Group Africa (Pty) Ltd (WSP) is applying for the re-submission of application for EA for the proposed project in terms of Regulation 21(2) of GNR 326

All registered Interested and Affected Parties (I&APs) were informed of WSP's intent to re-submit the application for EA for the proposed project in terms of Regulation 21(2) of GNR 326 via email on 29 October 2024. A further notification will be circulated on 11 April 2025.

2.2 AUTHORITY CONSULTATION

A virtual pre-application meeting was held on **24 October 2023** with the DFFE to discuss the proposed Phefumula Emoyeni One WEF project. The minutes of the meeting are included in **Appendix E.1.**

In addition, WSP notified a number of commenting authorities of the Proposed Project via a notification letter, these included:

- Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected areas;
- Department of Water and Sanitation (DWS);
- Vaal Water Management Area (WMA) Authority;
- Department of Agriculture, Land Reform and Rural Development (DALRRD);
- South African Heritage Resource Agency (SAHRA);
- Mpumalanga Heritage Resources Authority (MHRA);

- Mpumalanga Tourism and Parks Agency (MTPA);
- Department of Mineral Resources and Energy (DMRE);
- Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Department of Defence (SA Army) (DD);
- Astronomy Management Authority (AMA);
- South African Weather Services (SAWS);
- South African National Roads Agency Limited (SANRAL);
- Mpumalanga Department of Public Works, Roads and Transport;
- Gert Sibande District Municipality;
- Msukaligwa Local Municipality; and
- Chrissiesmeer Protected Environment.

WSP received comments on the DSR from the DFFE on **09 May 2024**, and approval of the FSR on **17 July 2024**. The comments and responses are included in Section 3 of the SER (**Appendix F**).

2.3 STAKEHOLDER CONSULTATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Networking with local business owners, non-governmental agencies, community based organisations, and local council representatives;
- Field work in and around the project area;
- Advertising in the press;
- Placement of community notices;
- Completed comment sheets; and
- Attendance registers at meetings.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the proposed Project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level).

A list of stakeholders captured in the project database is included in Appendix A of the SER.

2.3.1 STAKEHOLDER NOTIFICATION

2.3.1.1 Direct Notification

Notification of the proposed Project was issued to potential and existing Stakeholders, via direct correspondence (i.e., site notices, emails, SMSs, etc.) on **12 April 2024**. Proof of notification is included in the SER (**Appendix F**).

Notification of the re-application of the project will be issued to potential and existing Stakeholders, via direct correspondence (i.e., site notices, emails, SMSs, etc.) on **11 April 2025**. Proof of notification will be included in the Final SER.

2.3.1.2 Newspaper Advertisements

In accordance with the requirements of GNR 982, as amended, the proposed Project was advertised in one local newspaper and one regional newspaper. The purpose of the advertisement was to notify the public about the proposed Project and to invite them to register as stakeholders. A copy of the advertisements and proof of placement of the 2024 advertisement has been included in SER (**Appendix F**). The advertisement publication details are provided in **Table 2-1**. The proof of placement of the 2025 advertisement will be included in the Final SER.

Table 2-1 – Dates on which the adverts were published

Newspaper	Publication Date	Language
Highvelder/Hoevelder	11 April 2024.	Afrikaans and isiZulu
The Star	11 April 2024.	English
Highvelder/Hoevelder	11 April 2025.	Afrikaans and isiZulu
The Star	11 April 2025	English

2.3.1.3 Site Notices

The official site notices were erected as per GNR 982, as amended, on the boundary fence of the proposed site. In addition, general project notices, announcing the proposed Project and inviting stakeholders to register, were placed at various locations in and around the Project area on **12 April 2024**. Proof of placement is included in the SER (**Appendix F).** A second round of site notices for the re-application will be placed at various locations in and around the Project area on **11 April 2025**. Proof of placement is included in the Final SER.

2.3.1.4 Availability of the Draft Scoping Report

The Draft Scoping Report was made available for public review for a period of at least 30 days from **12 April 2024 to 14 May 2024** at the venues as follows:

- Ermelo Public Library;
- Thusiville Public Library;
- Hendrina Public Library;
- Bethal Public Library; and
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).
- Datafree Website (https://wsp-engage.com/)

The Draft Report was also be made available to Commenting Authorities via a One Drive link. In order to ensure maximum participation of all I&APs, reports were shared on the Datafree website.

Proof of placement of the Draft Report is provided in the SER.

2.3.1.5 Availability of the Final Scoping Report

The FSR was submitted to the DFFE on 31 May 2024 for review and decision-making. Registered I&APs were notified of the submission on 31 May 2024 and the FSR was made available for their information on the WSP website (https://www.wsp.com/en-ZA/services/public-documents).

2.4 SUMMARY OF IMPACT SIGNIFICANCE SCREENING

This section provides an overview of the likely significance of various impacts during the construction phase (**Table 2-2**), operational phase (**Table 2-3**) and decommissioning phase (Table **2-4**) as documented in the FSR, in the form of an impact screening tool which was based on two criteria, namely, probability and consequence (outlined in **Section 3.3**). This tool was used to determine whether any additional assessment may be required in the EIA phase. Impacts were refined (where applicable) and assessed during the EIA phase.

Table 2-2: Construction Phase Impacts

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Noise and Vibrations	Noise Emissions	Negative	3	1	Low
Geology	Soil Erosion	Negative	2	2	Low
	Disturbance of Fauna and Flora	Negative	3	2	Medium
	Oil Spillages from Heavy Plant	Negative	2	2	Low
	Slope Stability	Negative	2	2	Low
	Seismic Activity	Negative	1	3	Low
	Groundwater	Negative	2	1	Very Low
Soils, Land Capability and Agricultural Potential	Soil erosion	Negative	4	3	High
	Soil compaction	Negative	3	3	Medium
	Soil contamination	Negative	3	3	Medium
Aquatic Systems	Site clearing and associated impacts (i.e. sedimentation, Dust generation).	Negative	3	2	Medium
	Taking of water from a watercourse for construction purposes	Negative	3	2	Medium
	General Construction activities	Negative	2	2	Low
	Cement mixing / batching (construction).	Negative	2	2	Low
	Development of internal access roads.	Negative	3	3	Medium
	Underground cabling installed between turbines and internal substations.	Negative	3	2	Medium
	Development of power lines associated with the 33kV internal power system.	Negative	2	2	Low
	Development of Substations.	Negative	2	2	Low
	Development of BESS infrastructure.	Negative	2	2	Low

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination.	Negative	5	3	High
Waste Generation	Generation of General Waste	Negative	3	2	Medium
	Generation of Hazardous Waste	Negative	3	2	Medium
	Sanitation Waste	Negative	3	2	Medium
Terrestrial Biodiversity	Direct loss and disturbance of natural habitat	Negative	4	3	High
	Establishment and spread of alien and invasive species.	Negative	3	2	Medium
	Direct loss of flora SCC	Negative	3	4	High
	Loss and fragmentation of fauna habitats.	Negative	3	3	Medium
	Soil erosion and sedimentation of drainage features.	Negative	3	2	Medium
	Injury, mortality and disturbance of fauna SCC.	Negative	3	2	Medium
Avifauna	Noise pollution and environmental disruption from construction activity	Negative	3	2	Medium
Bats	Roost disturbance or destruction	Negative	2	3	Medium
	Destruction, degradation, and fragmentation of and displacement from foraging habitat	Negative	4	3	High
Visual and Landscape	Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	Negative	3	2	Medium
	Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	Negative	3	2	Medium
Heritage and Cultural Resources	Disturbance to known Cultural Resources	Negative	3	2	Medium
	Chance Find of Cultural Resources	Negative	3	2	Medium
Palaeontology	Chance Find of Palaeontological resources	Negative	3	1	Low
Traffic	Increase in development trips for the duration of the construction/ phase; associated noise and dust pollution. Possible damage to road surfaces by construction vehicles.	Negative	3	2	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Socio-Economic	Job Creation	Positive	2	3	Very high
	The influx of Job Seekers	Negative	3	3	Medium
	Procurement from Local Businesses	Positive	3	3	Medium
	Loss of Farmlands	Negative	3	3	Low
	Income for Affected Landowners	Positive	3	3	Medium
	Community Health, Safety, and Security	Negative	3	3	Low
	Environmental Health	Negative	3	3	Low
Climate Change	Greenhouse Gas Emissions	Negative	2	1	Very Low
	Climate Risks & Vulnerabilities	Negative	2	1	Very Low

Table 2-3: Operational Phase Impacts

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Noise and Vibrations	Acoustic impacts on surrounding sensitive receptors.	Negative	4	3	High
Soils, Land Capability and Agricultural Potential	Enhanced agricultural potential through increased financial security for farming operations.	Positive	3	3	Medium
	Prevention of crop spraying by aircraft over land occupied by turbines.	Negative	4	3	High
	Interference with farming operations.	Negative	4	3	High
Aquatic Systems	Operation of Substations.	Negative	2	2	Low
	Operation of BESS infrastructure.	Negative	2	2	Low
Waste Generation	Generation of General Waste.	Negative	3	2	Medium
	Generation of Hazardous Waste.	Negative	3	2	Medium
	Sanitation Waste.	Negative	3	2	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Terrestrial Biodiversity	Loss and fragmentation of fauna habitats.	Negative	3	3	Medium
	Injury, mortality and disturbance of fauna SCC.	Negative	2	2	Low
	Establishment and spread of alien and invasive species.	Negative	2	2	Low
	Vibrations from operating turbines causing disturbance of fauna SCC.	Negative	2	3	Medium
Avifauna	Habitat transformation resulting from the wind turbines and associated infrastructure.	Negative	3	3	Medium
	Bird mortality and injury resulting from collisions with the wind turbines.	Negative	3	2	Medium
	Electrocution of priority species on the on-site sub-stations and internal 33kV network.	Negative	3	3	Medium
	Collisions of priority species with the internal 33kV network.	Negative	3	3	Medium
Bats	Bat fatalities from collision and barotrauma, and population declines.	Negative	4	3	High
	Decline or loss of bat ecosystem services.	Negative	2	2	Low
Visual	Reduction in visual resource value due to presence of visually intrusive wind turbines and other project infrastructure in the landscape.	Negative	4	3	High
	Glare due to sunlight reflection from smooth surface, and flicker from painted blades.	Negative	4	3	High
	Light pollution at night due to turbine safety and project site security lighting.	Negative	3	3	High
Social	Job Creation	Positive	4	3	High
	An influx of Job Seekers	Negative	3	3	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Procurement from Local Businesses	Positive	3	3	Medium
	Community Health, Safety and Security	Negative	2	2	Low
	Environmental Health	Negative	2	2	Low
	Energy Generation	Positive	4	3	High
Climate Change	Reduced GHG Emissions	Positive	4	3	High
	Contribution of cleaner energy to the National Grid	Positive	4	3	High
Traffic	Slight increase in trips due to transport of permanent staff to site; irregular periodical maintenance.	Negative	2	2	Low

Table 2-4 – Decommissioning Phase

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Noise and Vibrations	Noise Emissions	Negative	3	1	Low
Geology	Soil Erosion	Negative	2	2	Low
	Disturbance of Fauna and Flora	Negative	3	2	Medium
	Oil Spillages from Heavy Plant	Negative	2	2	Low
	Slope Stability	Negative	2	2	Low
	Seismic Activity	Negative	1	3	Low
	Groundwater	Negative	2	1	Very Low
Soils, Land Capability and Agricultural Potential	Soil erosion	Negative	4	3	High
	Soil compaction	Negative	3	3	Medium
	Soil contamination	Negative	3	3	Medium
Aquatic Systems	Site clearing and associated impacts (i.e. sedimentation,Dust generation).	Negative	3	2	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Taking of water from a watercourse for construction purposes	Negative	3	2	Medium
	General Construction activities	Negative	2	2	Low
	Cement mixing / batching (construction).	Negative	2	2	Low
	Development of Internal access roads.	Negative	3	3	Medium
	Underground cabling installed between turbines and internal substations.	Negative	3	2	Medium
	Development of power lines associated with the 33kV internal power system.	Negative	2	2	Low
	Development of Substations	Negative	2	2	Low
	Development of BESS infrastructure	Negative	2	2	Low
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination	Negative	5	3	High
Waste Generation	Generation of General Waste	Negative	3	2	Medium
	Generation of Hazardous Waste	Negative	3	2	Medium
	Sanitation Waste	Negative	3	2	Medium
Terrestrial Biodiversity	Direct loss and disturbance of natural habitat	Negative	4	3	High
	Establishment and spread of alien and invasive species.	Negative	3	2	Medium
	Direct loss of flora SCC	Negative	3	4	High
	Loss and fragmentation of fauna habitats.	Negative	3	3	Medium
	Soil erosion and sedimentation of drainage features.	Negative	3	2	Medium
	Injury, mortality and disturbance of fauna SCC.	Negative	3	2	Medium
Avifauna	Noise pollution and environmental disruption from construction activity	Negative	3	2	Medium
Bats	Roost disturbance or destruction	Negative	2	3	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Destruction, degradation, and fragmentation of and displacement from foraging habitat	Negative	4	3	High
Visual and Landscape	Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	Negative	3	2	Medium
	Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	Negative	3	2	Medium
Heritage and Cultural Resources	Disturbance to known Cultural Resources	Negative	3	2	Medium
	Chance Find of Cultural Resources	Negative	3	2	Medium
Palaeontology	Chance Find of Palaeontological resources	Negative	3	1	Low
Traffic	Increase in development trips for the duration of the construction/ phase; associated noise and dust pollution. Possible damage to road surfaces by construction vehicles.	Negative	3	2	Medium
Socio-Economic	Job Creation	Positive	2	3	Very high
	The influx of Job Seekers	Negative	3	3	Medium
	Procurement from Local Businesses	Positive	3	3	Medium
	Loss of Farmlands	Negative	3	3	Low
	Income for Affected Landowners	Positive	3	3	Medium
	Community Health, Safety, and Security	Negative	3	3	Low
	Environmental Health	Negative	3	3	Low
Climate Change	Greenhouse Gas Emissions	Negative	2	1	Very Low
	Climate Risks & Vulnerabilities	Negative	2	1	Very Low

Table 2-5: Initial Cumulative Impacts

Receptor	Description	Nature	Probability	Consequence	Significance (Before Mitigation)
Noise and Vibrations	Cumulative Noise Emissions	Negative	4	3	High

Receptor	Description	Nature	Probability	Consequence	Significance (Before Mitigation)
Soils, Land Capability and Agricultural Potential	Cumulative Agricultural Impacts	Negative	4	3	High
Geology	Soil Erosion	Negative	2	2	Low
	Disturbance of Fauna and Flora	Negative	3	2	Medium
	Oil Spillages from Heavy Plant	Negative	2	2	Low
	Slope Stability	Negative	2	2	Low
	Seismic Activity	Negative	1	3	Low
	Groundwater	Negative	2	1	Very Low
Biodiversity	Cumulative impacts on biodiversity	Negative	4	3	High
Avifauna	Cumulative Collision impacts	Negative	4	3	High
	Cumulative Electrocution Impacts	Negative	4	3	High
Bats	Cumulative impact on bats on the Mpumalanga Highveld from expanding and intensifying anthropogenic forms of land-use in the region	Negative	3	4	High
Visual	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially alter the sense of place and visual character of the area	Negative	4	3	High
	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially exacerbate visual impacts on visual receptors	Negative	4	3	High
Social	Cumulative impact on sense of place	Negative	3	3	Medium
	Cumulative impact on local service and accommodation	Negative	3	2	Low
	Cumulative impact on local economy	Positive	3	3	Medium

Receptor	Description	Nature	Probability	Consequence	Significance (Before Mitigation)
Traffic	Further increase in development trips during the construction phase if surrounding projects will be constructed at a similar time as the Phefumula Emoyeni One WEF.	Negative	4	3	Medium

3 EIA PROCESS

3.1 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with DFFE and subsequently completing the appropriate application form as well as the submission and registration of the application for EA with the DFFE. A virtual pre-application meeting was held on **24 October 2023** with the DFFE to discuss the proposed Phefumula Emoyeni One WEF project. The minutes of the meeting (inclusive of the proposed public participation plan) are included in **Appendix E.1**.

Due to the decision to allow the previous application to lapse, a second pre-application meeting was requested on 07 February 2025. The reference number 2025-02-0015 was allocated to the request, however the request for the pre-application meeting was denied on 24 February 2025. The email received is included in **Appendix E.2.**

The original application to the DFFE was submitted on the **15 April 2024**. The DFFE confirmed receipt of this application on **02 May 2024** and allocated the following reference number to the application - **14/12/16/3/3/2/2545** – however this reference number is no longer valid.

However, application form for the re-application process will be submitted on 11 April 2025. The following pre-application reference number 2025-02-0015 has been provided, however a new DFFE reference is still to be issued.

3.2 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping. The specialist teams undertook site investigations, between **March 2023** and **June 2024**, and again between **January and March 2025** to identify sensitive features on site that informed the sensitivity mapping (see **Section 8**) for the proposed project.

3.3 IMPACT ASSESSMENT METHODOLOGY

3.3.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed Project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 3-1.**

Table 3-1 – Impact Assessment Criterion and Scoring System

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
Impact Significance Rating					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

3.3.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 3-1** below.

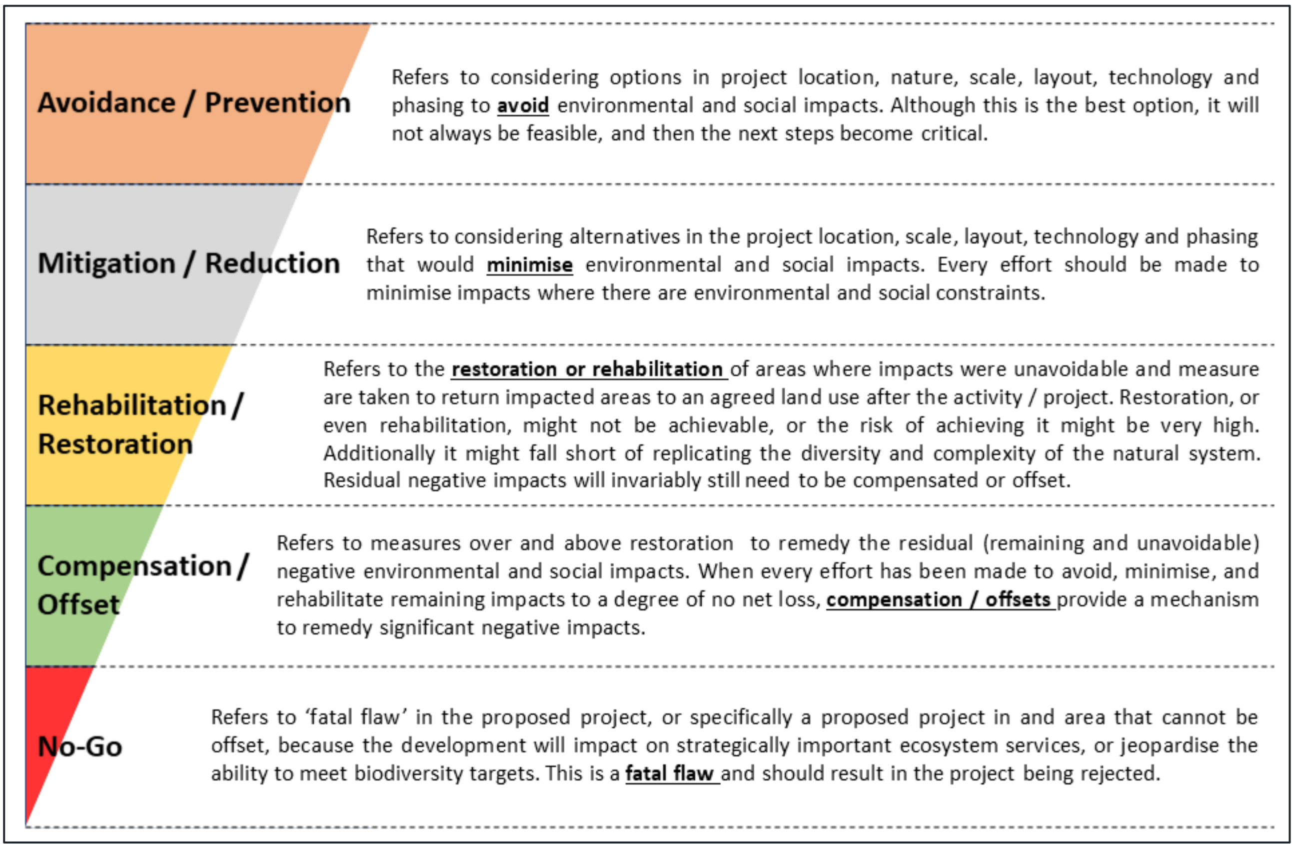


Figure 3-1 - Mitigation Sequence/Hierarchy

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

3.4 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement (public participation) is a requirement of the S&EIA process. It consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed Project. The objectives of the stakeholder engagement process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed Project, including the scale and nature of the existing and proposed activities;

- Identify viable proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed Project, issues, and solutions.

A SER has been included in **Appendix F** detailing the proposed Project's compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

3.4.1 STAKEHOLDER IDENTIFICATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Advertising in the press;
- Placement of community notices; and
- Completed comment sheets.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the proposed Project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level).

A list of stakeholders captured in the project database is included in the SER in **Appendix F**.

3.4.1.1 Availability of the Draft Environmental Impact Assessment Report

The proposed WEF underwent scoping phase, and a draft EIR was submitted to DFFE on 13 September 2024 for commenting. Upon receipt of comments, it was noted that additional studies were required. As such, the application was left to lapse to allow further investigations to take place. The additional investigations took place between January and March 2025.

The DEIR is therefore being resubmitted and will be made available for public review for a period of at least 30 days from **11 April 2025 to 16 may 2025**, at the venues as follows:

- Ermelo Public Library;
- Thusiville Public Library;
- Hendrina Public Library;
- Bethal Public Library; and
- WSP website (https://www.wsp.com/en-ZA/services/public-documents).
- Datafree Website (https://wsp-engage.com/)

The Draft Reports will also be made available to Commenting Authorities via a One Drive link. In order to ensure maximum participation of all I&APs, reports will be shared on the Datafree website. Proof of display will be included in the Final EIA report.

3.5 ASSUMPTIONS AND LIMITATIONS

GENERAL ASSUMPTIONS AND LIMITATIONS:

- The EAP hereby confirms that they have undertaken to obtain project information from the client that is deemed to be accurate and representative of the project.
- Site visits have been undertaken to better understand the project and ensure that the information provided by the client is correct, based on site conditions observed.
- The EAP hereby confirms their independence and understands the responsibility they hold in ensuring all comments received are accurately replicated and responded to within the EIA documentation.
- The comments received in response to the public participation process, are representative of comments from the broader community.

AGRICULTURAL POTENTIAL:

- There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

FRESHWATER ECOLOGICAL ASSESSMENT:

- All freshwater ecosystems associated with the proposed Phefumula Emoyeni One WEF and within 500 m in fulfilment of GN4167, were and delineated using various desktop methods including the use of topographic maps, digital satellite imagery, and aerial photographs. Desk-based delineations were subject to ground-truthing where feasible which allowed for refinement of the delineations of the freshwater ecosystems upon completion of the freshwater assessment;
- The current iteration of the proposed development layout represents the third revision that has been presented to specialists for assessment. At the time of undertaking of the EIA phase fieldwork in March 2024, the first version of the layout which indicated proposed turbine locations and access roads was utilised as the basis on which to identify freshwater ecosystem reaches for in-field verification and assessment. The layout was revised again in late 2024 and fieldwork was undertaken in February 2025 to assess new proposed crossings of wetlands and wetlands located within a certain minimum distance of turbine locations;
- The layout provided for assessment does not indicate the position of certain proposed infrastructure including underground cabling, Battery Energy Storage System (BESS) infrastructure, construction laydown and construction camp locations and Operational and Control Buildings. As such the impact of these infrastructural components on the freshwater has been unable to be assessed as part of this report, and as part of the impact rating matrix and DWS risk assessment matrix. Once provided for assessment the DWS risk assessment matrix will need to be updated to include these components.
- A key recommendation made in this report in this context is that a detailed walkdown by a freshwater specialist must be undertaken prior to the start of construction in order to assess, make recommendations for micro-siting of and provide sign off of these infrastructure components as well as the final turbine locations and internal road alignments.
- Due to the absence of significant differences in landuse impacts, twinned with the high degree of homogeneity in wetland characteristics across the study area, individual wetland units have not been individually assessed in terms of the determination of PES, EIS, ecoservices and RMO / REC. Accordingly the study area was broken up into three sub-areas according to the respective quaternary catchment in which the study area is located. Different wetland hydrogeomorphic

(HGM) units within each catchment component were collectively assessed. As many valley bottom wetlands share channelled and unchannelled characteristics within the same wider reach, valley bottom wetlands were collectively assessed. Lastly although a small number of depression wetlands exist in the study area, these were not assessed to be at risk of impact from the proposed development and thus were not included in the detailed assessment of wetlands;

- During the site assessment undertaken in February 2025, access to certain properties in the study area which are government-owned was denied by the inhabitants of those properties. Accordingly the proposed road crossings on those properties has been unable to be assessed in the field. However, this is not considered a fatal flaw and the assessment of wetlands downstream of the proposed crossings was able to be used to extrapolate the delineation and detailed assessment of these wetlands;
- This report does not report on a related, but separate component of the project relating to the grid connection-related power line and substation infrastructure;
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater ecosystems will need to be surveyed and pegged according to surveying principles and with survey equipment;
- The delineations as presented in this report are regarded as the best estimate of the boundaries based on desk-based delineation with limited ground truthing based on the site conditions present during the scoping-phase site assessment;
- Wetland, riparian, and terrestrial ecosystem zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater ecosystem boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
- With regards to data sources used to provide background information on the sensitivity of the assessed areas, it is important to note that although all data sources provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the proposed Phefumula Emoyeni One WEF's actual site characteristics at the scale required to inform the environmental authorisation and water use authorisation processes;
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the existing activities have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of aquatic, riparian, and wetland ecology; and
- The only activities which were assessed were the Phefumula Emoyeni One WEF and identified freshwater ecosystems within 500 m thereof that may be impacted by the development footprint. All other activities located outside these boundaries that may intercept/create other potential impacts were not considered.

AVIFAUNA IMPACT ASSESSMENT

- The Southern African Bird Atlas Project (SABAP) 2 data is regarded as an adequate indicator of the avifauna which could occur at the Project Site, and it is further supplemented with data collected during the on-site surveys.
- The focus of the study was on the potential impacts of the proposed WEF on wind energy priority species.

- Priority species for wind developments were identified from the updated list of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Ralston-Paton et al., 2017; Retief et al., 2012).
- Despite the growing body of peer reviewed literature investigating the collision risks of birds with wind turbines and overhead power lines in South Africa, relevant information for many individual species remains limited. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- The assessment of impacts is based on the baseline environment as it currently exists at the Project Site.
- Conclusions drawn in the study are based on experience of the specialists on the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The Broader Area is defined as the area encompassed by the 12 SABAP2 pentads where the project is located.
- The Project Site is defined as all the affected land parcels where the development will be located.

BATS MONITORING AND IMPACT ASSESSMENT:

- Not all buildings on site were surveyed; this would have required considerable professional time.
- It should be noted that not all cave and (especially old) mine tunnel locations are necessarily known in the region.
- Information on bat migration in South Africa is limited.

TERRESTRIAL ANIMAL IMPACT ASSESSMENT:

- Field work was conducted in January 2024. The timing of the field survey covered the mid-wet season period. During this period, fauna presence and activity across the Mpumalanga Highveld are generally high, as summer aligns with the breeding periods of many fauna species. Seasonality was therefore not considered a limiting factor with respect to assessing the character of on-site fauna communities;
- Notwithstanding the above, it is possible that certain rare, cryptic, migrating, aestivating or transient fauna species may not have been present and/or observed during the field survey;
- The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species; and
- Given the difficulty of fully sampling and characterising the abundance and distribution of fauna species in the study area during the short period of time allocated to field work, the baseline descriptions were qualitative.

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT:

- The field survey was conducted in January 2024. The timing of the field survey coincided with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas. It was noted that sufficient rain had fallen prior to the field survey, and vegetation was actively growing and flowering. During this period, there is also increased activity levels amongst many fauna species. Conditions at this time were therefore optimal to assess vegetation condition, general flora species composition and the character of the on-site fauna community. Seasonality was therefore not considered a study limitation;
- Notwithstanding the above, it is possible that certain herbaceous taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey;
- It is also possible that certain rare, cryptic, migrating, aestivating or transient fauna species may not have been present and/or observed during the field survey;
- The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species; and
- Mapping of habitat units was conducted manually at a desktop-level, using available aerial imagery, coupled with field observations and supplementary spatial datasets. It must be noted that agricultural landscapes are dynamic and subject to ongoing farming activities. It is thus possible that the character of individual habitat patches may change over time.

TERRESTRIAL PLANT IMPACT ASSESSMENT:

- The field survey was conducted in January 2024. The timing of the field survey thus coincided with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas. It was noted that sufficient rain had fallen prior to the field survey, and vegetation was actively growing and flowering. Conditions at this time were therefore optimal to assess vegetation condition and flora species composition. Seasonality was therefore not considered a study limitation;
- Notwithstanding the above, it is possible that certain herbaceous taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey; and
- Mapping of habitat units was conducted manually at a desktop-level, using available aerial imagery, coupled with field observations and supplementary spatial datasets. Agricultural landscapes are dynamic and subject to ongoing farming activities. It is thus possible that the character of individual habitat patches may change over time.

GEOTECHNICAL IMPACT ASSESSMENT:

- As no site walkover has been completed, there is a degree of uncertainty associated with the data revived as conditions may have changed since data sources were created. The uncertainty, however, is considered acceptable for the purposes of the desktop assessment.

PALAEONTOLOGY

- The study area was subjected to a field survey as is required for the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area and the authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the subsurface nature of fossil deposits, the possibility exists that some fossils were not visible on the land surface because of the cover of Quaternary sands and soils.

- Previous assessments by Bamford (2022 and 2023) concluded that based on the fossil record and confirmed by site visits, there were NO FOSSILS of the *Glossopteris* flora even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.

HERITAGE IMPACT ASSESSMENT:

- The authors acknowledge that the brief literature review is not exhaustive of the literature of the area.
- Due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of graves and other cultural material cannot be excluded. This limitation is successfully mitigated with the implementation of a Chance Find Procedure (CFP) and monitoring of the study area by the Environmental Control Officer (ECO).
- The report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys.
- Field data were recorded by handheld GPS and Mobile GPS applications. It must be noted that during the process of converting spatial data to final drawings and maps the accuracy of spatial data may be compromised. Printing or other forms of reproduction might also distort the spatial distribution in maps. Due care has been taken to preserve accuracy
- The study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components will be highlighted through the public consultation process if relevant. This process is facilitated by the EAP and if not done this can be considered a significant limitation and as a potential Project risk. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.
- Project infrastructure located within cultivated areas could not be accessed due to the transformed nature of the area and was assessed on a desktop level

NOISE IMPACT ASSESSMENT:

- The turbine specifications provided are assumed to be representative of what will be installed in reality.
- The turbine locations provided are assumed to be an accurate representation of where these will be located in reality.
- Identification of sensitive receptors is based on a desktop assessment, and it is assumed that all key receptors have been included.

SAFETY HEALTH AND ENVIRONMENTAL RISK ASSESSMENT:

- The study proceeded based on the assumption that redox flow batteries (typically vanadium) would most likely be installed within a building and solid-state batteries (typically lithium) would be installed in containers. Flow batteries can also be installed in containers, but the building option has been chosen in order to highlight possible major differences between technologies.

SOCIAL IMPACT ASSESSMENT:

- The information provided by the applicant is up to date and accurately represents the project.
- It is assumed that the indicated project site is technically suitable for the proposed project.
- The secondary data is assumed to reflect the local social context accurately.

TRAFFIC IMPACT ASSESSMENT:

- The study is based on the project information provided by the client.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000 mm, total maximum width 4 300 mm and total maximum length 10 500 mm. It is envisaged that for this project, the inverter, transformer, and switchgear will be transported to site in containers on a low bed truck and trailer. A mobile crane and the transformer transport are the only abnormal load envisaged for the site. The crane will be utilised for offloading equipment, such as the transformers.
- Maximum vertical height clearances along the haulage route are 5.2 m for abnormal loads.
- If any elements are manufactured within South Africa but not on-site, these will be transported from their respective manufacturing centres, which would be either in the greater Cape Town area, Johannesburg, or possibly Pinetown/Durban and Port Elizabeth.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- The total number of turbines to be constructed for Phefumula Emoyeni One WEF is estimated to be up to 88.
- The final access points are to be determined during the detailed design stage. Only recommended access points at conceptual level can be given at this stage.
- Projects in the vicinity of the site to be considered as cumulative impacts.
- A 24-months construction period is assumed with 48% of the construction period dedicated to site prep and civil works.

VISUAL IMPACT ASSESSMENT:

- The final locations of individual project components, specifically the locations of individual wind turbines, O&M building, substation, BESS, access roads, and temporary batching plants may not have been finalised yet, and the findings of this visual impact assessment (VIA) are based on the most recent available layout and project development description. Further refinement of the layout may still be possible, whereby the locations of individual project components could be further adjusted based on technical and practical considerations. However, these limited variations are not expected to have a material impact on the outcomes or recommendations of this VIA.
- Similarly, the selection of specific technologies has not been finalised in all instances. However, in most cases the specific choice of technology is not expected to materially influence the findings of the impact assessment, as the height and location of individual turbines are expected to be the most determining factor during the visual impact assessment.
- Artificial landforms and structures, such as berms, stockpiles, buildings, and even tall vegetation will all impact the level of visibility of individual project components. However, given the limited development within the study area the influence of these elements during the viewshed analysis to be conducted during the impact assessment phase is expected to be limited.

- Determining the value, quality and significance of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. The value of a visual resource is partly determined by the viewer and is influenced by that person's socio-economic, cultural, and individual background, and is even subject to fluctuating and intangible factors, such as emotional mood and appreciation of "sense of place".
- This situation is compounded by the fact that the conditions under which the visual resource is viewed can change dramatically due to natural phenomena, such as weather conditions and seasonal change. Visual impact cannot therefore be measured simply and reliably, as is for instance the case with water, noise, or air pollution.
- It is therefore not possible to conduct a visual assessment without relying to some extent on the expert opinion of a qualified consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of VIA, on which findings are based.
- The graphic representation of the wind turbines superimposed into photos of the existing landscape is conceptual in nature only and is meant to illustrate the visual appearance of the project development, rather that convey technical or engineering aspects of the project. The locations of individual turbines within the landscape are approximate only, based on the preliminary layout, and may be further adjusted based on the final project layout. The appearance of the turbines may differ from what is depicted based on specific turbine technology and other factors.

4 PROJECT DESCRIPTION

This section provides a description of the location of the project area and the site location alternatives considered for the project. The descriptions encompass the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management. This section also considers the need and desirability of the project in accordance with Appendix 1 of GNR 326.

4.1 SITE LOCATION

The proposed Phefumula Emoyeni One WEF will have a project area of approximately 33 660 hectares (ha). Within this project area the extent of the buildable area will be subject to finalization based on technical and environmental requirements.

The proposed Phefumula Emoyeni One WEF is located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa (**Figure 4-1**).

The details of the property associated with the proposed Phefumula Emoyeni One WEF, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 4-1** . There are 95 affected farm portions. These 93 farm portions were assessed by the specialists.

The co-ordinates of the cadastral land parcels are included in **Table 3-2**.

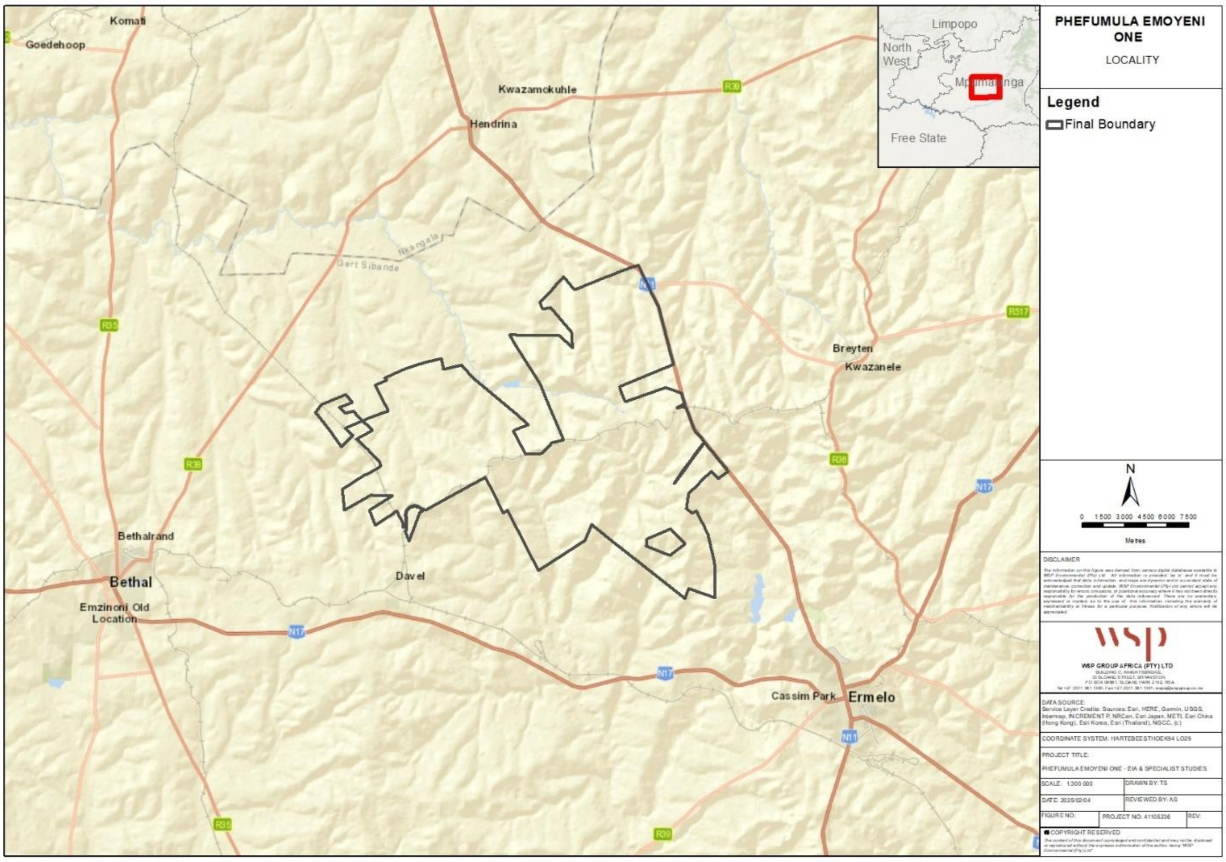


Figure 4-1 - Phefuluma Emoyeni Locality Map

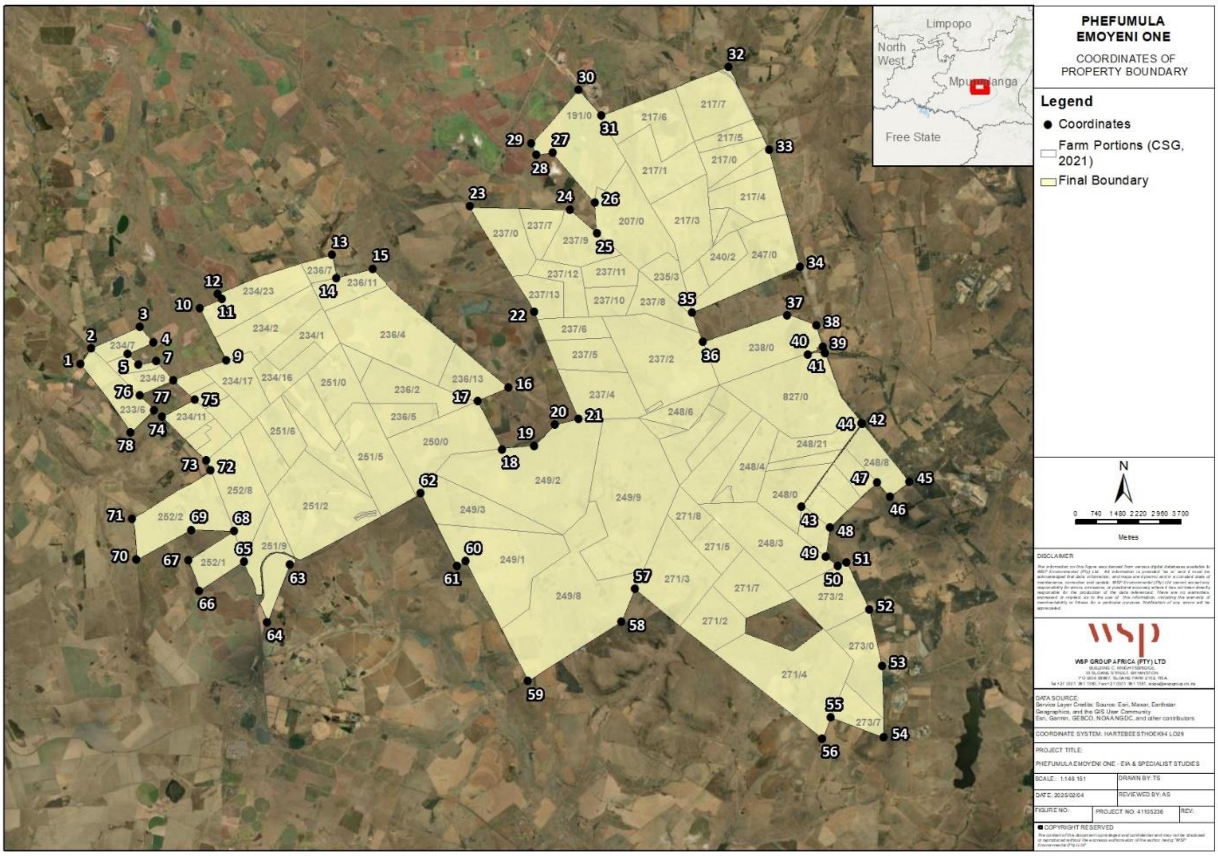
Table 4-1 - Phefumula Emoyeni One WEF Affected Farm Portions

Farm Name and Number	Portion	21 Digit Surveyor General Code of Each Cadastral Land Parcel
GROBLESHOEK 191 IS	0	T0IS00000000019100000
ISRAEL 207 IS	0	T0IS00000000020700000
BOSMANSKRANS 217 IS	0	T0IS00000000021700000
BOSMANSKRANS 217 IS	1	T0IS00000000021700001
BOSMANSKRANS 217 IS	3	T0IS00000000021700003
BOSMANSKRANS 217 IS	4	T0IS00000000021700004
BOSMANSKRANS 217 IS	5	T0IS00000000021700005
BOSMANSKRANS 217 IS	6	T0IS00000000021700006
BOSMANSKRANS 217 IS	7	T0IS00000000021700007
BOSMANSKRANS 217 IS	8	T0IS00000000021700008
BOSMANSKRANS 217 IS	9	T0IS00000000021700009
VAALBANK 233 IS	6	T0IS00000000023300006
KUILFONTEIN No. 234-IS	1	T0IS00000000023400001
KUILFONTEIN No. 234-IS	2	T0IS00000000023400002
KUILFONTEIN No. 234-IS	7	T0IS00000000023400007
KUILFONTEIN No. 234-IS	8	T0IS00000000023400008
KUILFONTEIN No. 234-IS	9	T0IS00000000023400009
KUILFONTEIN No. 234-IS	11	T0IS00000000023400011
KUILFONTEIN No. 234-IS	12	T0IS00000000023400012
KUILFONTEIN No. 234-IS	14	T0IS00000000023400014
KUILFONTEIN No. 234-IS	15	T0IS00000000023400015
KUILFONTEIN No. 234-IS	16	T0IS00000000023400016
KUILFONTEIN No. 234-IS	17	T0IS00000000023400017
KUILFONTEIN No. 234-IS	21	T0IS00000000023400021
KUILFONTEIN No. 234-IS	22	T0IS00000000023400022
KUILFONTEIN No. 234-IS	23	T0IS00000000023400023

Farm Name and Number	Portion	21 Digit Surveyor General Code of Each Cadastral Land Parcel
BOSMANSHOEK NO. 235 - IS	3	T0IS00000000023500003
WITBANK NO. 236 - IS	2	T0IS00000000023600002
WITBANK NO. 236 - IS	4	T0IS00000000023600004
WITBANK NO. 236 - IS	5	T0IS00000000023600005
WITBANK NO. 236 - IS	7	T0IS00000000023600007
WITBANK NO. 236 - IS	10	T0IS00000000023600010
WITBANK NO. 236 - IS	11	T0IS00000000023600011
WITBANK NO. 236 - IS	13	T0IS00000000023600013
NOOITGEDACHT 237 IS	2	T0IS00000000023700002
NOOITGEDACHT 237 IS	7	T0IS00000000023700007
NOOITGEDACHT 237 IS	9	T0IS00000000023700009
NOOITGEDACHT 237 IS	10	T0IS00000000023700010
NOOITGEDACHT 237 IS	11	T0IS00000000023700011
NOOITGEDACHT 237 IS	13	T0IS00000000023700013
ORPENSKRAAL 238 IS	2	T0IS00000000023800002
GELIKSDRAAI No. 240 -IS	1	T0IS00000000024000001
GELIKSDRAAI No. 240 -IS	2	T0IS00000000024000002
KRANSPOORT 248 IS	0	T0IS00000000024800000
KRANSPOORT 248 IS	3	T0IS00000000024800003
KRANSPOORT 248 IS	8	T0IS00000000024800008
KRANSPOORT 248 IS	9	T0IS00000000024800009
KRANSPOORT 248 IS	10	T0IS00000000024800010
KRANSPOORT 248 IS	11	T0IS00000000024800011
KRANSPOORT 248 IS	12	T0IS00000000024800012
KRANSPOORT 248 IS	13	T0IS00000000024800013
KRANSPOORT 248 IS	21	T0IS00000000024800021

Farm Name and Number	Portion	21 Digit Surveyor General Code of Each Cadastral Land Parcel
KRANSPOORT 248 IS	22	T0IS00000000024800022
TWEEFONTEIN 249 IS	1	T0IS00000000024900001
TWEEFONTEIN 249 IS	2	T0IS00000000024900002
TWEEFONTEIN 249 IS	3	T0IS00000000024900003
TWEEFONTEIN 249 IS	8	T0IS00000000024900008
TWEEFONTEIN 249 IS	9	T0IS00000000024900009
VOORZORG 250 IS	0	T0IS00000000025000000
NOOITGEDACHT 251 IS	0	T0IS00000000025100000
NOOITGEDACHT 251 IS	2	T0IS00000000025100002
NOOITGEDACHT 251 IS	5	T0IS00000000025100005
NOOITGEDACHT 251 IS	6	T0IS00000000025100006
NOOITGEDACHT 251 IS	7	T0IS00000000025100007
NOOITGEDACHT 251 IS	9	T0IS00000000025100009
NOOITGEDACHT 251 IS	10	T0IS00000000025100010
NOOITGEDACHT 251 IS	11	T0IS00000000025100011
SPION KOP 252 IS	1	T0IS00000000025200001
SPION KOP 252 IS	2	T0IS00000000025200002
DRIEHOEK No. 273- IS	1	T0IS00000000027300001
DRIEHOEK No. 273- IS	3	T0IS00000000027300003
DRIEHOEK No. 273- IS	7	T0IS00000000027300007
SPITSKOP 276 IS	59	T0IS00000000027600059
SPITSKOP 276 IS	68	T0IS00000000027600068
UITZIGT 450 IS	4	T0IS00000000045000004
UITZIGT 450 IS	23	T0IS00000000045000023
KRANSPOORT 827 IS	0	T0IS00000000082700000

Table 4-2 - Co-ordinate Points of the Cadastral Land Parcels



Point	Longitude	Latitude
1	29° 36' 30.930" E	26° 20' 28.224" S
2	29° 36' 44.472" E	26° 20' 10.448" S
3	29° 37' 46.471" E	26° 19' 45.909" S
4	29° 38' 3.823" E	26° 20' 3.789" S
5	29° 37' 31.069" E	26° 20' 16.497" S
6	29° 37' 45.379" E	26° 20' 29.083" S
7	29° 38' 6.762" E	26° 20' 24.455" S
8	29° 38' 28.935" E	26° 20' 46.667" S
9	29° 39' 35.851" E	26° 20' 23.104" S
10	29° 39' 2.349" E	26° 19' 24.172" S
11	29° 39' 30.331" E	26° 19' 13.221" S
12	29° 39' 24.879" E	26° 19' 7.371" S

Point	Longitude	Latitude
13	29° 41' 49.073" E	26° 18' 22.296" S
14	29° 41' 55.046" E	26° 18' 48.250" S
15	29° 42' 40.257" E	26° 18' 37.896" S
16	29° 45' 33.046" E	26° 20' 52.865" S
17	29° 44' 54.243" E	26° 21' 7.983" S
18	29° 45' 25.343" E	26° 22' 2.001" S
19	29° 46' 7.039" E	26° 21' 58.806" S
20	29° 46' 32.568" E	26° 21' 34.662" S
21	29° 47' 1.791" E	26° 21' 28.271" S
22	29° 45' 59.499" E	26° 19' 16.707" S
23	29° 44' 42.966" E	26° 17' 27.466" S
24	29° 46' 49.828" E	26° 17' 28.979" S
25	29° 47' 24.374" E	26° 17' 56.190" S
26	29° 47' 20.597" E	26° 17' 20.836" S
27	29° 46' 26.928" E	26° 16' 24.019" S
28	29° 46' 6.342" E	26° 16' 26.992" S
29	29° 46' 0.629" E	26° 16' 13.630" S
30	29° 47' 0.006" E	26° 15' 12.702" S
31	29° 47' 28.358" E	26° 15' 41.821" S
32	29° 50' 9.465" E	26° 14' 45.019" S
33	29° 51' 1.101" E	26° 16' 19.232" S
34	29° 51' 41.481" E	26° 18' 32.079" S
35	29° 49' 24.794" E	26° 19' 25.488" S
36	29° 49' 38.726" E	26° 19' 59.422" S
37	29° 51' 25.695" E	26° 19' 26.687" S
38	29° 52' 1.753" E	26° 19' 39.007" S
39	29° 52' 10.082" E	26° 20' 3.247" S

Point	Longitude	Latitude
40	29° 51' 52.240" E	26° 20' 12.739" S
41	29° 52' 13.833" E	26° 20' 11.067" S
42	29° 52' 34.683" E	26° 21' 0.688" S
43	29° 53' 0.004" E	26° 21' 29.222" S
44	29° 51' 45.184" E	26° 23' 6.916" S
45	29° 53' 2.657" E	26° 21' 32.064" S
46	29° 54' 1.835" E	26° 22' 37.299" S
47	29° 53' 36.860" E	26° 22' 54.353" S
48	29° 53' 20.476" E	26° 22' 38.115" S
49	29° 52' 21.367" E	26° 23' 29.733" S
50	29° 52' 16.238" E	26° 24' 3.466" S
51	29° 52' 31.496" E	26° 24' 14.361" S
52	29° 52' 42.241" E	26° 24' 9.680" S
53	29° 53' 12.166" E	26° 25' 3.531" S
54	29° 53' 29.174" E	26° 26' 8.395" S
55	29° 53' 31.006" E	26° 27' 28.948" S
56	29° 52' 24.249" E	26° 27' 7.059" S
57	29° 52' 14.037" E	26° 27' 31.302" S
58	29° 48' 15.264" E	26° 24' 41.763" S
59	29° 47' 58.070" E	26° 25' 19.155" S
60	29° 46' 0.518" E	26° 26' 27.595" S
61	29° 44' 39.802" E	26° 24' 10.765" S
62	29° 44' 29.440" E	26° 24' 16.388" S
63	29° 43' 37.579" E	26° 22' 56.701" S
64	29° 40' 57.639" E	26° 24' 16.511" S
65	29° 40' 29.515" E	26° 25' 21.761" S
66	29° 39' 58.933" E	26° 24' 12.927" S

Point	Longitude	Latitude
67	29° 39' 3.340" E	26° 24' 46.143" S
68	29° 38' 48.955" E	26° 24' 11.894" S
69	29° 39' 47.034" E	26° 23' 38.499" S
70	29° 38' 52.712" E	26° 23' 36.802" S
71	29° 37' 43.688" E	26° 24' 11.647" S
72	29° 37' 38.025" E	26° 23' 24.553" S
73	29° 39' 16.809" E	26° 22' 29.455" S
74	29° 39' 11.262" E	26° 22' 17.876" S
75	29° 38' 14.737" E	26° 21' 28.219" S
76	29° 38' 55.632" E	26° 21' 8.035" S
77	29° 37' 45.715" E	26° 21' 3.818" S
78	29° 38' 5.524" E	26° 21' 20.218" S
79	29° 37' 35.628" E	26° 21' 46.305" S
81	29° 51' 36.661" E	26° 24' 51.036" S
82	29° 50' 35.818" E	26° 25' 14.473" S
83	29° 50' 34.950" E	26° 25' 31.517" S
84	29° 51' 35.723" E	26° 25' 51.471" S
85	29° 52' 13.204" E	26° 25' 25.229" S
86	29° 41' 10.891" E	26° 24' 10.756" S
87	29° 40' 40.310" E	26° 24' 1.416" S
88	29° 40' 20.845" E	26° 24' 18.924" S
89	29° 40' 22.710" E	26° 24' 50.902" S
90	29° 40' 15.543" E	26° 24' 50.310" S
91	29° 40' 20.116" E	26° 25' 0.608" S
92	29° 40' 25.057" E	26° 24' 51.237" S
93	29° 40' 28.526" E	26° 24' 8.262" S
94	29° 40' 54.270" E	26° 24' 4.425" S

Point	Longitude	Latitude
95	29° 41' 5.168" E	26° 24' 13.183" S

4.2 WIND ENERGY POWER GENERATION PROCESS

Wind power is the conversion of wind energy into a useful form of energy, such as electricity, using modern and highly reliable wind turbines. Wind Power is non-dispatchable, meaning that for economic operation, all the available output must be taken when it is available.

Wind turbines, like windmills, are mounted on a tower to harness wind energy at an increased level above the ground where wind is faster and less turbulent. The kinetic energy of the wind is used to turn the blades of the turbine to generate electricity. Wind turbines can operate at varying wind speeds, with the amount of energy the wind transfers to the rotor depending on the density of the air, the rotor area and the wind speed.

The electricity generated by the wind turbines is passed through the step-up transformer and then transmitted via either underground or overhead cables to a central substation, which connects the wind energy facility to a high voltage network. Wind turbines are designed to operate automatically with minimal maintenance for approximately 20-25 years.

Figure 4-2 illustrates the following main components of a wind turbine:

- The rotor consists of three blades which are attached to a hub. The blades collect energy from the wind and converts the wind energy into rotational shaft motion/energy to turn the generator;
- The nacelle houses the equipment at the top of the tower as well as a gearbox, a generator that converts the turning motion/mechanical energy of the blades into electricity and coupling and brake;
- The tower supports the nacelle and rotor and allows the blades to be distanced safely off the ground so as to reach the stronger winds found at higher elevations;
- Turbine step-up transformer which can be indoor or outdoor, depending on the turbine model whose function is to increase the voltage capacity of the electricity generated by the turbine to a higher, grid-equivalent.
- The foundation unit ensures the stability of the turbine structure.

Figure 4-2 - Illustration of the main components of a wind turbine

4.3 PROJECT INFRASTRUCTURE

The proposed Phefumula Emoyeni One WEF will be developed with a capacity of up to 550 megawatts (MW). The key components are outlined in **Table 4-3** and indicated in **Figure 4-4** below.

Table 4-3 – Proposed project infrastructure

Technical details of the proposed Phefumula Emoyeni One Wind Energy Facility		Associated listed activities
Farm Portions	The WEF will be located over 93 farm portions	Listing Notice 1: GNR 983: Activity 11(i) Listing Notice 1: GNR 983 Activity 30 Listing Notice 3: GNR 985 Activity 12(f)(i)(ii)

Technical details of the proposed Phefumula Emoyeni One Wind Energy Facility		Associated listed activities
Central coordinates of the site and activity location	26°21'31.02"S ; 29°46'49.38"E	Listing Notice 1: GNR 983 Activity 30
Total Site Extent	Approximately 33 660ha	Listing Notice 1: GNR 983 : Activity 12(ii)(a)(c) Listing Notice 1: GNR 983 Activity 30 Listing Notice 2: GNR 984 Activity 15(i) Listing Notice 3: GNR 985 Activity 12(f)(i)(ii)
Design Specifications		
Capacity	Up to 550MW	Listing Notice 1: GNR 983: Activity 11(i) Listing Notice 2: GNR 984 Activity 1(a)
Number of Turbines	Up to 76 turbines (Between 6MW and 15MW each)	Listing Notice 1: GNR 983: Activity 11(i)
Turbine Hub Height	Up to 200m	Listing Notice 2: GNR 984 Activity 1(a)
Rotor Diameter	Up to 200m	Listing Notice 2: GNR 984 Activity 1(a)
Tip Height	Up to 300m	Listing Notice 2: GNR 984 Activity 1(a)
Permanent hard standing area	Approximately 75m x 120m	Listing Notice 1: GNR 983 Activity 30
Foundation	Each turbine will have a foundation of approximately up to 40m^2 – excavation up to 6m deep, constructed of reinforced concrete to support the mounting ring. Once tower established, footprint of foundation is covered with soil.	Listing Notice 1: GNR 983 Activity 30 Listing Notice 3: GNR 985 Activity 12(f)(i)(ii)
Three IPP Portion Onsite Substations and Battery Energy Storage System (BESS)	▪ Each IPP onsite Substation and BESS will have a total footprint of up to 10ha in extent. ▪ Each 33kV/132kV onsite collector substation (IPP portion) will have a footprint of approximately 5ha. • The substation will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, access road, etc.	Listing Notice 1: GNR 983: Activity 11(i) Listing Notice 1: GNR 983 Activity 14 Listing Notice 1: GNR 983 Activity 30 Listing Notice 2: GNR 984 Activity 9(a)(b)(c)(d) Listing Notice 3: GNR 985 Activity10(f)(i)(cc)(ee))(hh)

Technical details of the proposed Phefumula Emoyeni One Wind Energy Facility		Associated listed activities
	▪ Each BESS will have a footprint of approximately 5ha • Export Capacity of up to 200MW • Total storage capacity 800MWh • Storage capacity of up to 6-8 hours • The BESS will be housed in containers. • Battery types to be considered: Solid State Batteries as the preferred (Lithium Ion) and Redox Flow Batteries as the alternative (Vanadium Redox).	
Operation and Maintenance (O&M) Building Infrastructure	O&M building infrastructure will be required to support the functioning of the WEF and for services required by operations and maintenance staff. The O&M building infrastructure will be near the onsite substation and will include 3 O&M offices of approximately 1.5ha each adjacent to each collector Substation. Each O&M Building will include: ▪ Operations Building; ▪ Workshop and Stores Area ▪ Refuse area for temporary storage of waste; and ▪ Conservancy tank to service the ablution facilities.	Listing Notice 1: GNR 983 Activity 28(ii) Listing Notice 1: GNR 983 Activity 30
Three Construction Camp Laydown Areas	Each Construction Camp Laydown Area will include: ▪ Temporary laydown or staging area - Typical area of 3ha each (150m x 200m). ▪ Laydown area could increase to 30ha for concrete towers, should they be required. ▪ Sewage: septic and/or conservancy tanks and portable toilets. ▪ Temporary concrete batching plant & yard of approximately 7ha, comprising amongst others, a concrete storage area, batching plant, electrical infrastructure and substation, generators and fuel stores, gantries and loading facilities, offices, material stores (rebar, concrete, aggregate and associated materials), mess rooms, workshops, laydown and storage areas, sewage and toilet facilities, offices and boardrooms, labour mess and changerooms, mixers, , water and settling tanks, pumps, silos and hoppers, a laboratory, parking areas,	Listing Notice 1: GNR 983 Activity 30

Technical details of the proposed Phefumula Emoyeni One Wind Energy Facility		Associated listed activities
	internal and access roads - Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The maximum height of the silo will be 20m.	
Access Roads	▪ The Project site can be accessed easily via the N11 national road which run along the eastern boundaries of the site. ▪ There are existing roads that go through the land parcels to allow for direct access to the project development area. ▪ Internal and access roads with a width of between 8m and 10m, which can be increased to approximately 12m on bends. The roads will be positioned within a 20m wide corridor to accommodate cable trenches, stormwater channels and bypass /circles of up to 20m during construction. Length of the internal roads will be approximately 60km.	Listing Notice 1: GNR 983 Activity 19 Listing Notice 1: GNR 983 Activity 24(ii) Listing Notice 1: GNR 983 Activity 30 Listing Notice 1: GNR 983 Activity 48(i)(a)(c) Listing Notice 1: GNR 983 Activity 56(i)(ii) Listing Notice 3: GNR 985 Activity 4(f)(i)(cc)(ee) Listing Notice 3: GNR 985 Activity 14(ii)(a)(c)(f)(i)(dd)(ff) Listing Notice 3: GNR 985 Activity 18(f)(i)(cc)(ee) Listing Notice 3: GNR 985 Activity 23(ii)(a)(c)(f)(i)(cc)(ee)
Associated Infrastructure	33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical. Cabling between turbines, to be laid underground where practical. Laydown and crane hardstand areas (approximately 75m x 120m).	Listing Notice 1: GNR 983: Activity 11(i) Listing Notice 1: GNR 983 Activity 30

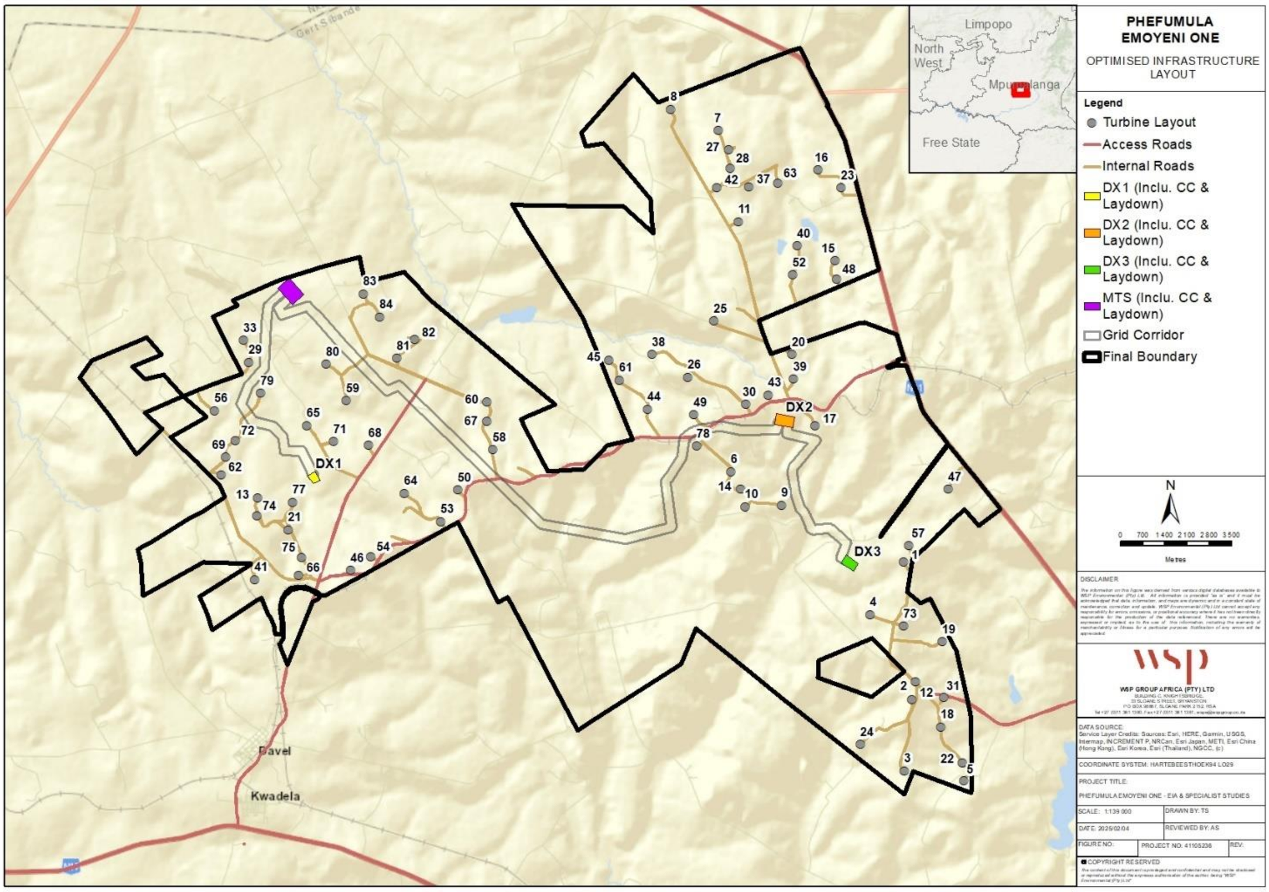


Figure 4-3 - Phefumula Emoyeni One Infrastructure (Optimised Layout – 76 Turbines)

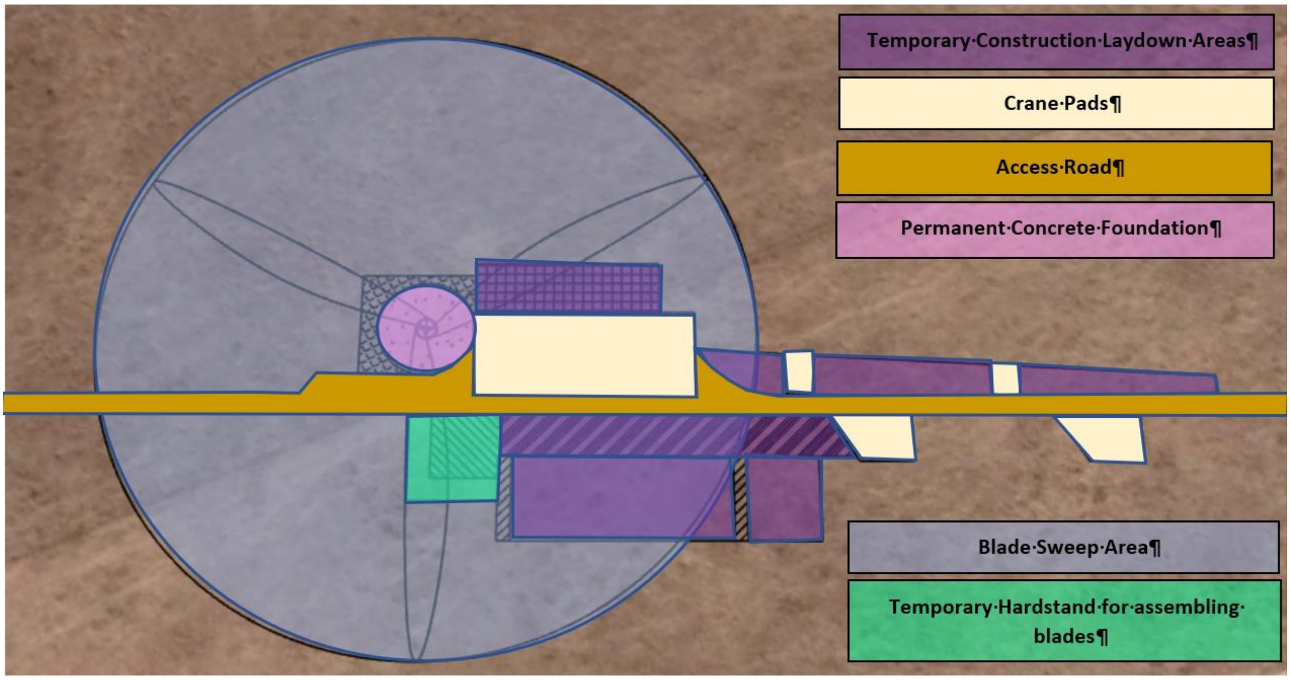


Figure 4-4 - Typical Turbine Hard Standing Requirements (illustration purposes only)

4.4 GENERAL CONSTRUCTION ACTIVITIES

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 4-4.**

Table 4-4 - Construction Activities

Activity	Description
Site preparation and establishment	Site establishment will include clearing of vegetation and topsoil at the footprint of each turbine, for laydown area and access routes. The temporary laydown area will be constructed, including establishment of the construction camp (temporary offices, storage containers, concrete batching plant etc). Site establishment will also entail the installation and/or connection of services (sanitation, electricity, etc).
Transport of components and equipment to site	Bulk materials (aggregate, steel etc.), infrastructure components (blades, tower sections etc), lifting and construction equipment (excavators, trucks, compaction equipment etc.) will be sourced and transported to site via suitable National and provincial routes and designated access roads. The infrastructure components may be defined as abnormal loads in terms of the Road Traffic Act (Act 29 of 1989) due to their large size and abnormal lengths and loads for transportation. A permit may be required for the transportation of these loads on public roads.
Excavation and earthworks	Subject to the determination of founding specifications, earthworks will be required. This is likely to entail: ▪ Excavation of foundation holes to a depth of approximately 6m and pouring of concrete foundations of approximately 500 – 650m^3 from the batching plant. Concrete foundations will be constructed at each turbine location.

Activity	Description
	■ Levelling of the construction camp area, substation area, and O&M building area, and excavation of foundations prior to construction. ■ Excavation of trenches for the installation of underground cables.
Construction of wind turbines, onsite substation and BESS	A large lifting crane(s) will be required to lift the turbine sections (nacelle, blades) into place. The lifting crane/s will be brought on site and will be required to move between the turbine sites. Cranes of varying sizes may be required depending on the size of the components. Three IPP onsite substations will be constructed on the site. The wind turbines will be connected to the IPP onsite substation via underground or overhead (if required) up to 33kV electrical cables. The BESS will typically require the placement of multiple containers to house the BESS components, which will be brought to sight pre-assembled.
Establishment of ancillary infrastructure	Ancillary infrastructure will include construction site office, temporary laydown area and workshop area for contractor's equipment.
Rehabilitation	Once all construction is completed on site and all equipment and machinery has been removed from the site, the site will be rehabilitated.

4.5 NEED AND DESIRABILITY

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh-largest coal producer in the world, with approximately 77% of the country's electricity generated from coal. This large dependence on coal and its use has also resulted in a variety of negative impacts on the environment, including the contribution to climate change. South Africa is also the highest emitter of greenhouse gases in Africa; attributed to the country's energy-intensive economy that largely relies on coal-based electricity generation.

Renewable energy development is regarded as an important contribution to meeting international and national targets of reducing reliance on fossil fuels, such as coal, which contribute towards greenhouse gas emissions and resultant climate change. The need and desirability of the proposed Phefumula Emoyeni One WEF has been considered from an international, national, and regional perspective.

The Needs and Desirability Guidelines, in terms of the EIA Regulations, Government Notice 792 of 2012, as amended, highlights the need to consider how the proposed project may impact ecosystems and biological diversity; pollution; and renewable and non-renewable resources. It should also consider how the development may affect or promote justifiable economic and social development. The Need and Desirability is assessed in **Table 4-5** and **Table 4-6** respectively.

Table 4-5 Part 1 - Need

Question	Response
Is the land use associated with the activity being applied for considered within the timeframe intended by the existing approved Strategic Development Framework (SDF) agreed to be the relevant environmental authority?	There is no SDF associated with the projects area of influence (AOI). The AOI is located within an area with known environmental constraints as outlined in the Mpumalanga Biodiversity Sector Plan (MBSP) and Section 8 below. It must be noted that every effort has been implemented to ensure the avoidance of environmental constraints as far as

Question	Response
Should the development, or if applicable, expansion of the town/area concerned in terms of this land use occurs here at this point in time?	possible. The land within the AOI is currently utilised for Agricultural purposes.
Does the community/area need the activity and the associated land use concerned? This refers to the strategic as well as local level.	South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh-largest coal producer in the world, with approximately 77% of the country’s electricity generated from coal. This large dependence on coal and its use has also resulted in a variety of negative impacts on the environment, including the contribution to climate change. South Africa is also the highest emitter of greenhouse gases in Africa; attributed to the country’s energy-intensive economy that largely relies on coal-based electricity generation. Renewable energy development is regarded as an important contribution to meeting international and national targets of reducing reliance on fossil fuels, such as coal, which contribute towards greenhouse gas emissions and resultant climate change. The need and desirability of the proposed Phefumula Emoyeni One WEF has been considered from an international, national, and regional perspective
Are the necessary services with adequate capacity currently available (at the time of application) or must additional capacity be created 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 placement of the services and opportunity cost)?	The site is situated in an area that has limited service delivery by the municipality. The development is not included in the infrastructure planning for the Local Municipality. However, it is anticipated that there will be limited to no implication on the infrastructure planning of the municipality with specific reference to the provision of services.
Is the project part of a national programme to address an issue of national concern or importance?	The proposed project does form part of a national programme. The National Development Plan (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030. The NDP also outlines the need to increase electricity production by 2030, with 20 000 MW of electricity capacity generated from renewable sources to move to less carbon-intensive electricity production. The Plan also envisages that South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. The proposed Phefumula Emoyeni One WEF will contribute to the Just Energy Transition (JET) in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The

Question	Response
	proposed WEF aims towards the aforementioned national energy targets of diversification of energy supply and the promotion of clean energy. Wind and solar energy developments contribute to reduced emissions and subsequently climate change whilst promoting industrial development and job creation. The proposed Phefumula Emoyeni One WEF will also aid in overcoming the power shortages that are currently faced in the country

Table 4-6 Part 2 - Desirability

Question	Response
Is the development the best practicable environmental option for this land/site?	Despite the site being located in an area with known environmental constraints, the site is located in an area identified to be optimal for energy production and grid interconnection. See Section 5.1 for an outline of why the site was selected. During the layout optimisation sensitive environments have been avoided as far as possible. This process is outlined in Section 5.2. Mitigation measures have been recommended by the specialists where necessary and these have been included in the impact assessment section of this DEIAR as well as the DEMPr.
Would the approval of this application compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities?	No, the approval of this application would not compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities.
Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g., as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	The MBSP is a spatial tool which serves to provide such information to end-users and guide decision making to ensure that the biodiversity objectives are achieved. The MBSP is based on an objective planning approach which considers national and provincial biodiversity targets while trying to avoid conflict with competing land uses. Both terrestrial and freshwater biodiversity priority areas are identified in the MBSP, either as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). The MBSP Handbook presents the map products and explains how they were developed, and how and when they should be used. It describes the ecosystems and important biodiversity features of Mpumalanga and presents a set of land-use guidelines and other tools that can be used to effectively conserve Mpumalanga’s biodiversity as part of living landscapes that combine multiple land-uses.

Question	Response
	The environmental sensitivities outlined in the MBSP as well as other identified by the relevant specialists have been taken into consideration. This process has been outlined in Section 5.2 and Section 8. Further to this a layout optimisation process took place to ensure that sensitive environments are avoided. Mitigation measures have been recommended by the specialists where necessary and these have been included in the impact assessment section of this DEIAR as well as the DEMPr.
Do location factors favour this land use at this place? (this relates to the contextualization of the proposed land use on this site within its broader context).	This location was identified based on the following factors: ▪ Identify potential sites based on: • Wind energy resource analysis; • Grid connection availability and feasibility; • Competition in the area; and • Environmental sensitivity. ▪ Land securement entails securing a critical mass of land to make the project commercially viable through option to lease agreements (1-2 years). ▪ Preliminary Assessment and Validation: • Validation of wind models via ground up monitoring protocols (usually Met masts and SODARs) (1-2 years). • Commencement of baseline bird and bat monitoring for a 1 year period. ▪ Bankable Feasibility Assessment: • Permitting: EIA, WULA, etc. ▪ Wind Resource in Mpumalanga • The wind farm site was selected based on grid and wind capacity. In addition to this there is a process to get land approval from landowners which takes some time. • Notwithstanding other requirements, wind farms require a strong wind resource. • Mpumalanga does not have a uniform wind resource across the province. • This resource is found at higher hub heights (150m plus) ▪ The SA energy supply market remains dominated by coal, but the energy crisis coupled with the country's "Just Energy Transition" plans; solar and wind energy have become valuable alternative sources of energy. ▪ Potential power station decommissioning in the near to medium-term.

Question	Response
How will the activity of the land use associated with the activity being applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The proposed development is subject to a S&EIA Process in terms of the NEMA (as amended) and Appendix 2 and 3 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this S&EIA Process is the national DFFE. The impact on sensitive and cultural areas is detailed in Section 8 and Section 9 of this report. Mitigation measures have been recommended by the specialists where necessary and these have been included in the impact assessment section of this EIAR as well as the EMPr.
How will the development impact on people's health and well-being? (E.g. In terms of noise, odours, visual character and sense of place, etc.)?	Based on the impact assessment, the impacts will range from very low to medium with the implementation of mitigation measures. The specialist studies undertaken during the DEIA Phase assessed the potential impacts and provided recommendations to be included in the EMPr. The findings of this S&EIR process and associated Specialist studies conclude that there are no fatal flaws associated with the Proposed Project. Negative environmental impacts associated with the proposed Phefumula WEF can be mitigated to acceptable levels. It is therefore the opinion of the EAP that the project can proceed, and that all the listed mitigation measures and recommendations are considered by the DFFE.
Will the proposed activity or the land use associated with the activity being applied for, result in unacceptable opportunity costs	No
Will the proposed land use result in unacceptable cumulative impacts?	No unacceptable cumulative impacts have been identified. The cumulative impacts are outlined in Section 10.

4.5.1 INTERNATIONAL PERSPECTIVE

The proposed Project will align with internationally recognised and adopted agreements, protocols, and conventions. This includes the Kyoto Protocol (1997) which calls for countries internationally to reduce their greenhouse gas emissions through cutting down on their reliance on fossil fuels and investing in renewable energy technologies for electricity generation. The proposed Phefumula Emoyeni One WEF will therefore add capacity to the energy sector and generate electricity without greenhouse gas emissions and meet international requirements in this regard.

South Africa is also signatory to the United Nations' Development Programmes' (UNDP) Sustainable Development Goals (SDGs), particularly SGD 7 relating access to affordable, reliable and sustainable energy which is crucial to achieving many of the Sustainable Development Goals, therefore SDG 7 among the other goals specifically aligns with this project. The proposed WEF qualifies as a clean technology that will generate up to 550MW of affordable energy to contribute to South Africa's energy mix.

The project will also greatly contribute to the countries' efforts to reduce their carbon emissions and play their role as part of the Paris Climate Accord. The Paris Agreement is a legally binding international treaty signed by 196 countries at the COP 21 in Paris, on the 12th of December 2015 to combat climate change. The goal of the Paris Accord is to limit global warming to well below 2 degrees Celsius, compared to industrial levels to avoid catastrophic natural disasters which are driven by the global temperature increase. Therefore, to achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate-neutral world by 2050. This project will aid in the efforts towards a Just Energy Transition (JET) in accordance to recently signed Political Declaration between SA, USA, UK, EU, Ireland, etc.

The authorization of the Project will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the Greenhouse gases concentrations in the atmosphere.

4.5.2 NATIONAL PERSPECTIVE

The South African Government, through the IRP, has set a target to secure 17 800 MW of renewable energy by 2030. This is an effort to diversify the country's energy mix in response to the growing electricity demand and promote access to clean sources of energy.

The National Development Plan (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030. The NDP also outlines the need to increase electricity production by 2030, with 20 000 MW of electricity capacity generated from renewable sources to move to less carbon-intensive electricity production. The Plan also envisages that South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.

The authorisation of the Phefumula Emoyeni One WEF will further align with South Africa's National Climate Response White Paper which outlines the country's efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the greenhouse gases concentrations in the atmosphere.

The proposed Phefumula Emoyeni One WEF will contribute to the Just Energy Transition (JET) in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The proposed WEF aims towards the aforementioned national energy targets of diversification of energy supply and the promotion of clean energy. Wind and solar energy developments contribute to reduced emissions and subsequently climate change whilst promoting industrial development and job creation.

The proposed Phefumula Emoyeni One WEF will also aid in overcoming the power shortages that are currently faced in the country. In 2023, South Africa witnessed its longest recorded hours of load shedding, with the power being off for 6 800 hours of the year. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPP and lifting the independent power generation threshold to 100MW, but it is still expected that the country will undergo more load shedding. Over the years the construction of Wind facilities has become cheaper, and less time-consuming. Thus, acting as a faster and more efficient method of meeting the ever-growing demand for electricity in the country.

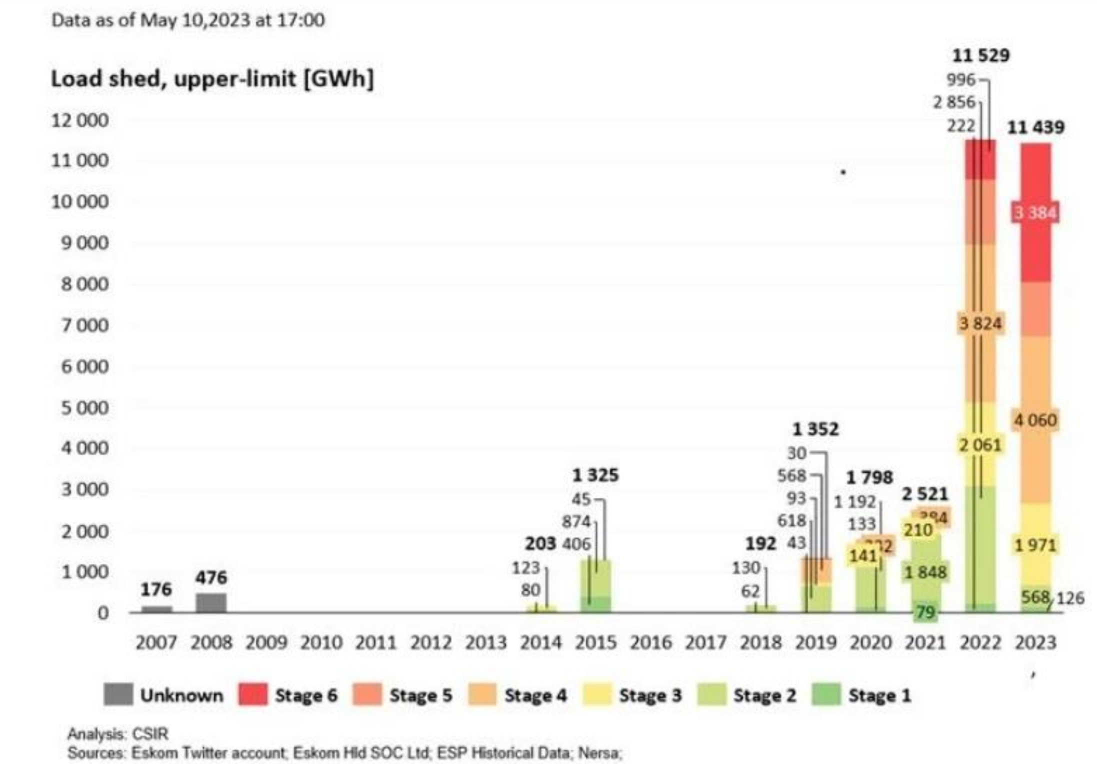


Figure 5 1: Load shedding hours over the years in South Africa

In addition, the Council for Scientific and Industrial Research (CSIR) reported that renewable energy assisted in relieving pressure on the constrained South African power system during load shedding. This indicates that renewable energy is a key factor in ensuring that the country does not face further load shedding in the future.

4.5.3 REGIONAL AND LOCAL PERSPECTIVE

Just Energy Transition

The Just Transition is described as the transition towards a low-carbon and climate-resilient economy that maximizes the benefits of climate action while simultaneously improving the welfare of the workers and their communities.

The project will pave the way for the Just Energy Transition in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. South Africa is the seventh-largest coal consumer in the world and the leading African carbon emitter, with 435.9 million metric tons of carbon emitted in 2022. South Africa heavily relies on coal to fire up 30 000 MW of electricity, which serves an estimated 80% of the country's energy needs.

Coal power stations and the coal mining industry play a vital component in the economic and social components of the local Mpumalanga economy. Shifting to a low carbon economy will thus need to offset or exceed the benefits being realized by fossil fuels in the province. Thus, a key factor to ensuring the success of the Just Energy Transition is not only to focus on the transition from fossil fuels to renewable energy resources but to simultaneously ensure the Just Transition of jobs and skills.

The transition towards renewable energy will improve the socio-economic conditions of the Msukaligwa Local Municipality. The Msukaligwa Local Municipality recorded an unemployment rate of 36.1% in 2021/22, with the majority of its employed in the mining and agricultural sectors. The Project will aid in solving two of the leading challenges faced by most municipalities in the country, namely the cost of electricity and lack of adequate employment opportunities. The Project will be one of the first large-scale wind energy facilities being developed in Mpumalanga. The developer foresees this project as being one of main the catalysts to realizing a true Just Energy Transition for Mpumalanga. As various career opportunities are presented by the wind industry, these are divided into four pillars that are aligned with the value chain. These four pillars are project development, component manufacturing, construction, and operation and maintenance as shown in **Figure 4-5.**

Figure 4-5 shows that the wind industry will create job opportunities throughout the supply chain. The wind industry will contribute to the Just Energy Transition in South Africa to ensure that there are no job losses but rather job transfers and skill exchange. For these opportunities to arise, renewable energy projects need to be approved in Mpumalanga to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

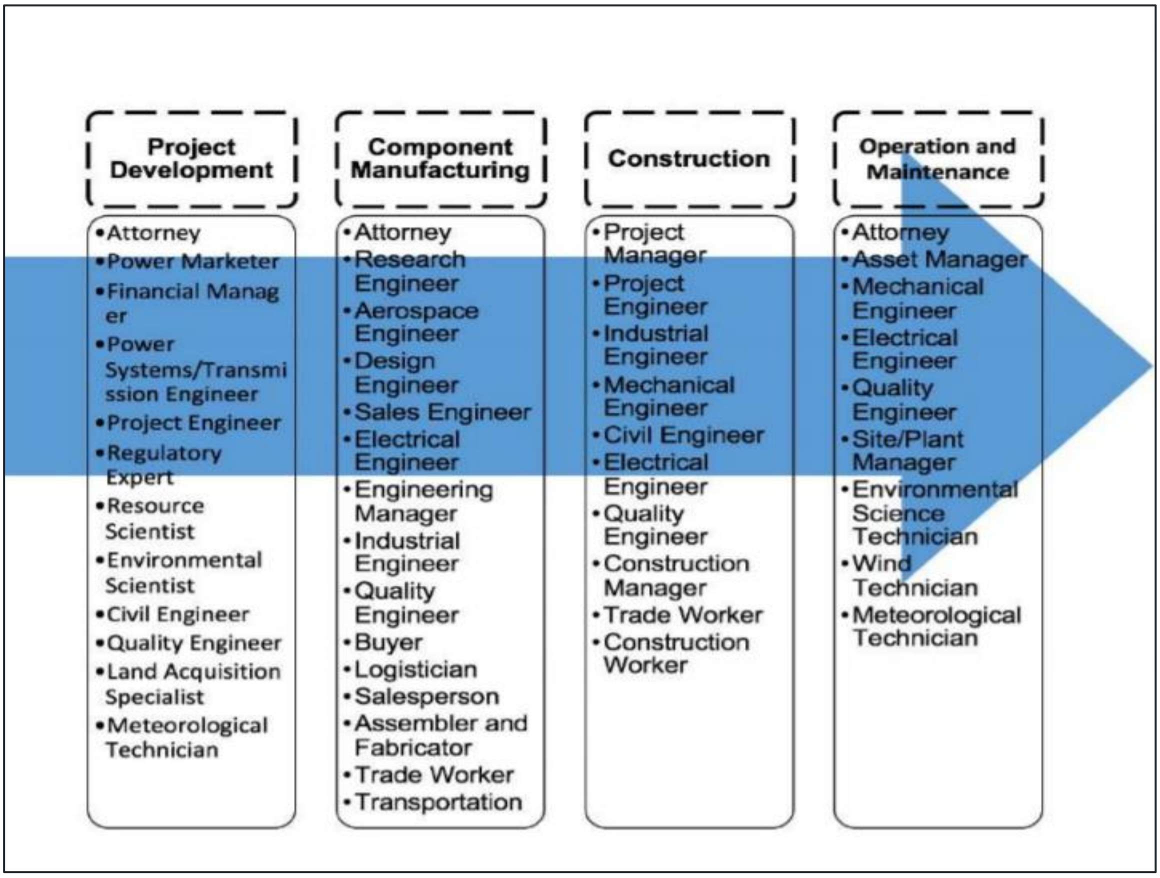


Figure 4-5: Career Opportunities presented by the Wind Industry (Source: https://www.res4africa.org/wp-content/uploads/2020/09/RES4Africa-Foundation-A-Just-Energy-Transition-in-South-Africa.pdf)

Multiple Land Use

Unlike opencast coal mining, the Project facilitates multiple land use functions within the development area. As wind turbines are spread out across the development area this allows multiple land use functions such as operating the wind farm in tandem with agricultural activities or even underground coal mining. This will boost the economic activities in the area which will in turn increase job opportunities in the area and help improve the local community's welfare without jeopardizing the environment. Furthermore, the multiple land use allows for the creation of multiple streams of income which assures landowners economic security.

Desirability of the Project Site

As mentioned previously, four of Eskom's coal-fired power stations have been targeted for decommissioning in the short term: Komati, Camden, Grootvlei, and Hendrina. Eskom is looking to decommission 10 500MW by 2030 and 35 000MW by 2050. Simultaneously Eskom has been looking at options for repurposing these power stations with the core aims of reusing existing power transmission infrastructure, developing new generation capacity, providing ancillary services, and mitigating socio-economic impact. The proposed Phefumula Emoyeni One WEF, is ideally located close to the Camden Power Station to help Eskom achieve its diversification goal.

4.5.4 CONSISTENCY WITH NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) PRINCIPLES

Table 4-7 outlines the Phefumula Emoyeni WEF project's consistency with the NEMA Principles.

Table 4-7 - Consistency of the Phefumula Emoyeni WEF and the EIA Process with the NEMA principles

NEMA Principles	Discussion
(2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.	Although all the specialists undertake their studies from a sustainability point of view, this principle was specifically upheld by specialists undertaking the studies within the social environment such as, Visual Impact, Heritage and palaeontology, Geotech, biodiversity impact. All studies included the assessment of impacts that either directly or indirectly affect people and their living environment. The Phefumula Emoyeni WEF project aims to demonstrate a technology that could improve access to electricity that has a lower climate change impact than conventional power generation technologies such as coal-fired power.
(3) Development must be socially, environmentally and economically sustainable.	All studies were required to uphold the principle of sustainable development. The Phefumula Emoyeni WEF will be constructed, operated and decommissioned according to the Environmental Management Policies and Systems that apply to it.
(4) (a) Sustainable development requires the consideration of all relevant factors including the following:	
(i) That the disturbance of ecosystems and loss of biological diversity are avoided, or,	All specialist studies have included recommendations and mitigation measures that encourage the minimisation or avoidance of the disturbance of ecosystems, in particular a

NEMA Principles	Discussion
where they cannot be altogether avoided, are minimised and remedied;	number of buffer zones surrounding sensitive wetlands have been imposed. These mitigation measures have been included along with other more generic specifications in the Environmental Management Programme (EMPr). The Phefumula Emoyeni WEF will adhere to the EMPr developed for its construction and operation.
(ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;	All specialist studies have included recommendations and mitigation measures that encourage the minimisation or avoidance of pollution and degradation of the study area due to construction and operational activities. These mitigation measures have been included along with other more generic specifications are included in the EMPr. The Phefumula Emoyeni WEF shall adhere to the EMPr developed for its construction and operation.
(iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;	The Heritage Impact Assessment and Palaeontology Impact Assessment investigated this principle. No heritage features were identified to be affected by the facility and mitigation and management measures have been recommended for use in the event that heritage sites or artefacts are discovered during the construction period. The Phefumula Emoyeni WEF shall adhere to the EMPr developed for its construction and operation.
(iv) that waste is avoided or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;	In the event that a specialist study found waste to be an issue, mitigation measures have been imposed. These mitigation measures have been included along with other more generic specification in the EMPr. The Phefumula Emoyeni WEF shall adhere to the EMPr developed for its construction and operation.
(v) that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;	The project is part of a renewable energy development, The Phefumula Emoyeni Grid will connect to the Phefumula Emoyeni One WEF to the national grid. This is seen to be more efficient than other power generation technologies. On a project level the EMPr includes specifications which outline the wise use of non-renewable resources on site during both construction and operational phases. The Phefumula Emoyeni WEF will adhere to the EMPr developed for its construction and operation.
(vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;	Renewable energy sources represent the most benefits to the environment. The Phefumula Emoyeni WEF will connect to the national grid. This renewable energy development will make use of wind energy. The layouts of the WEF and the grid (which is part of a separate EA process) connection layout have both been optimised during the course of the process to ensure that sensitive areas have avoided as far as practically possible. These sensitive areas include areas such as CBA irreplaceable, CBA optimal, intact grasslands, wetland buffers, avifauna sensitivities and bat buffers etc.

NEMA Principles	Discussion
	The Phefumula WEF shall also adhere to the EMPr developed for its construction and operation.
(vii) that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and	Undertaking any project based on new technology could be considered risky. It can be said that a “Cautious approach” is being followed as the proposed grid impact assessment requires close scrutiny of certain aspects.
(viii) that negative impacts on the environment and on people’s environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.	The EIA process in itself is a tool that is utilised to ensure that impacts on the environment and on people’s rights are anticipated. Where a specialist study identified a negative impact, mitigation measures have been proposed in order to either prevent or minimise the impact. These mitigation measures have been included along with other more generic specifications in the EMPr. The Phefumula WEF shall adhere to the EMPr developed for its construction and operation.
(4) (b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.	The EIA and all specialist studies have been undertaken taking best practise principles into consideration. The integration of the studies was ensured by specialist interaction during the study period and the integration of their findings. The construction, operation and decommissioning of the Phefumula Emoyeni WEF project will be undertaken in recognition of the need for a holistic approach to environmental management.
(4) (c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.	All studies were required to uphold the principle of sustainable development.
(4) (d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.	All studies were required to uphold the principle of sustainable development. The project in totality will benefit the community both regionally and locally. The project will give greater certainty in terms of the ability to provide present and future needs for electricity to all sectors of the populations including those that may have been disadvantaged by unfair discrimination. Locally communities may benefit from aspects such as job creation particularly within the construction phase.
(4) (e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.	The EIA addressed impacts throughout the life cycle of the development from construction to decommissioning. All specialist studies were also required to uphold the principle of sustainable development. The EMPr and the auditing processes as required by Seriti’s Environmental Management System will ensure that these responsibilities are up held throughout the projects’ life cycle.

NEMA Principles	Discussion
(4) (f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.	A comprehensive Public Participation Process is being undertaken. I&APs have been given the opportunity to comment on the EIA. Public input will continue through to the construction, operational and decommissioning stages of the project through the provisions that have been made in the EMPr to appoint a community liaison officer, whose duties must include communication regarding environmental issues.
(4) (g) Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge. Including traditional and ordinary knowledge.	The comments and queries from I&APs have all been either taken into account or responded to within the studies undertaken. Communication will continue through to the construction, operational and decommissioning stages of the project through the provisions that have been made in the EMPr to appoint a community liaison officer.
(4) (h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.	The Social Impact Assessment recommends that a community wellbeing is promoted through the project. The EMPr has up held this recommendation. All contractors and operators involved in the Phefumula Emoyeni Grid shall adhere to the EMPr developed for its construction and operation.
(4) (i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.	The EIA assesses the advantages and disadvantages of the project. The social and environmental impacts of the project have similarly been identified, studied assessed and mitigation measures proposed.
(4) (j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.	This is up held in the EMPr where the required Occupational Health and Safety specifications are dealt with. The Phefumula Emoyeni WEF shall adhere to the EMPr developed for its construction and operation.
(4) (k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.	All documentation compiled as a result of the EIA process has been made available for public comment and scrutiny, as per legal requirements and best practice. Communication will continue through to the construction and operational stages of the project through the provisions that have been made in the EMPr to appoint a community liaison officer.
(4) (l) There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.	The EIA process makes allowance for discussion between different authorities at local, provincial and national levels. Intergovernmental coordination on this project includes co-operation between the DFFE, MTPA and MDARDLEA.
(4) (m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.	The Public Participation Process endeavoured to ensure that conflict between organs of state was minimised throughout the project duration.

NEMA Principles	Discussion
(4) (n) Global and international responsibilities relating to the environment must be discharged in the national interest.	All specialist studies have endeavoured to up hold this principle. The Phefumula Emoyeni WEF will be constructed, operated and decommissioned according to the Environmental Management Policies and Systems that apply to it.
(4) (o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.	The Phefumula Emoyeni WEF will connect the Phefumula Emoyeni one WEF to Grid the national grid. The provision of electricity is seen to be in the public interest. All specialist studies have endeavoured to up hold this principle. The Phefumula Emoyeni WEF will be constructed, operated and decommissioned according to the Environmental Management Policies and Systems that apply to it.
(4) (p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.	This principle is upheld in the EIA as it will be the responsibility of Seriti Green to ensure that pollution control and rehabilitation are undertaken. In addition to this the relevant contractors appointed will be responsible for the development of method statements to ensure the minimisation of all impacts and will be responsible for their own areas of disturbance.
(4) (q) The vital role of women and youth in environment management and development must be recognised and their full participation therein must be promoted.	The Public Participation Process has endeavoured to include the participation of all role-players including women and youth in this project. Communication with the public (Including women and the youth) will continue through to the construction and operational stages of the project through the provisions that have been made in the EMPr to appoint a community liaison officer. Employment equity will also be an important part of the Phefumula Emoyeni WEF project moving forward in terms of providing work to local communities and to Previously Disadvantaged Individuals (including women).
(4) (r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.	This principle has been upheld in this EIA. The design of the layout of infrastructure on the Phefumula Emoyeni WEF site has required extensive liaison with specialists regarding issues such as buffer zones and the various mitigation measures that may be required. The layouts of the WEF (which is part of a separate EA process) and the grid connection layout have both been optimised during the course of the process to ensure that sensitive areas have avoided as far as practically possible. These sensitive areas include areas such as CBA irreplaceable, CBA optimal, intact grasslands, wetland buffers, avifauna sensitivities and buffers etc. The Phefumula Emoyeni WEF shall adhere to the EMPr developed for its construction and operation.

5 PROJECT ALTERNATIVES

The EIA Regulations of 2014 (as amended) require that the S&EIA process must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives could be considered including different locations, technology types, and project layouts. At the scoping level the evaluation of alternatives is provided at a high level in the absence of detailed environmental comparators for each alternative; due to the two-staged nature of the S& EIA process it is more suitable to identify and describe the potential alternatives on a high-level basis within scoping, and to perform a more detailed analysis of alternatives (with environmental comparators) in the EIA phase of the project. As such, the S&EIA will holistically assess the impacts and risks of each alternative in a comparative way, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

5.1 SITE ALTERNATIVES

The selection of the Phefumula Emoyeni One WEF site is the outcome of a feasibility assessment by the proponent, which inter alia served to identify site options that would be optimal for energy production and grid interconnection. The Phefumula Emoyeni One WEF site was selected because it is strategically located due to the following factors:

- Proximity to the Eskom grid – The proposed wind energy facility requires connection to the Eskom grid to transmit the generated electricity. The Project site was selected after the investigation of several power stations in Mpumalanga. The Project site was selected due to its proximity to the National Grid which will have sufficient capacity to allow the Project to connect to it. A new Main Transmission Substation will be built (forms part of the grid EIA) and will have a loop in loop out into the existing 400kV line.
- Land Availability and Landowner Support – The availability of land is a key feasibility criterion in the site selection process. The project site is of a suitable land size for the proposed development. The land available for the development of the Phefumula Emoyeni One WEF extends approximately 36 600ha, providing a substantial amount of land for the development of an up to 550MW WEF. The proponent has secured sufficient land for the development of the proposed WEF with landowners within the respective cadastral portions comprising the development footprint, indicating their support and willingness for the project to proceed to development via entering into agreement with the developer. After intensive studies around the province, through analysing the aforementioned factors, it was determined that this site has the most ideal conditions for the Project.
- Strategic Approach – Four of Eskom's coal-fired power stations are targeted for decommissioning in the short term. These include the Komati, Camden, Grootvlei, and Hendrina power stations. These power stations range between 50 - 60 years of age. According to the 2019 IRP, over an 11-year period Eskom are expected to decommission over 11GW of its coal fired capacity. Power generated from the WEF can therefore be used to replace a portion of the generation capacity lost from the decommissioned power stations, and also help replace some of the jobs that would have been potentially lost due to the decommissioning of the power plants.
- Road and labour pool accessibility – The Project site can be accessed easily via the tarred N11 national road which runs along the eastern boundary of the site. The N17 runs along the southern part of the project footprint, and the R38 to the western part.

- Topography - The surrounding landscape has a rolling hill topography which is suitable for the development of a wind project. The Project site itself is located on a flat high lying landscape that has the highest wind resource within the immediate area.
- Competition - With regards to renewable energy facilities, there is minimal competition in the area. Should the project proceed, it will be the second WEF in and around the Ermelo/Hendrina area and will act as one of the pioneering developments and open opportunities for other renewable developments. It will also serve as a large-scale case study for wind resource in the province, showing that commercially viable wind energy facilities are suitable for certain parts of Mpumalanga Province.

The site is considered suitable for the reasons provided. The investigation of an alternative site is not currently proposed.

There is no site alternative for the Phefumula Emoyeni One WEF.

5.2 LAYOUT ALTERNATIVES

5.2.1 PRELIMINARY LAYOUT ALTERNATIVE (ALTERNATIVE 1)

The preliminary layout identified up to 135 turbine positions and associated main WEF components and was proposed during the Scoping phase. The preliminary layout is illustrated in **Figure 5-1.**

Due to the nature of the project area, the specialists were requested to identify the sensitive areas within the study area. These sensitive areas were overlaid and utilised to revise the layout accordingly. The results of the scoping phase sensitivity mapping overlain by the preliminary layout are illustrated in **Figure 5-2** and **Figure 5-3**.

This layout has been adjusted to accommodate the specialist recommendations and it is no longer preferred.

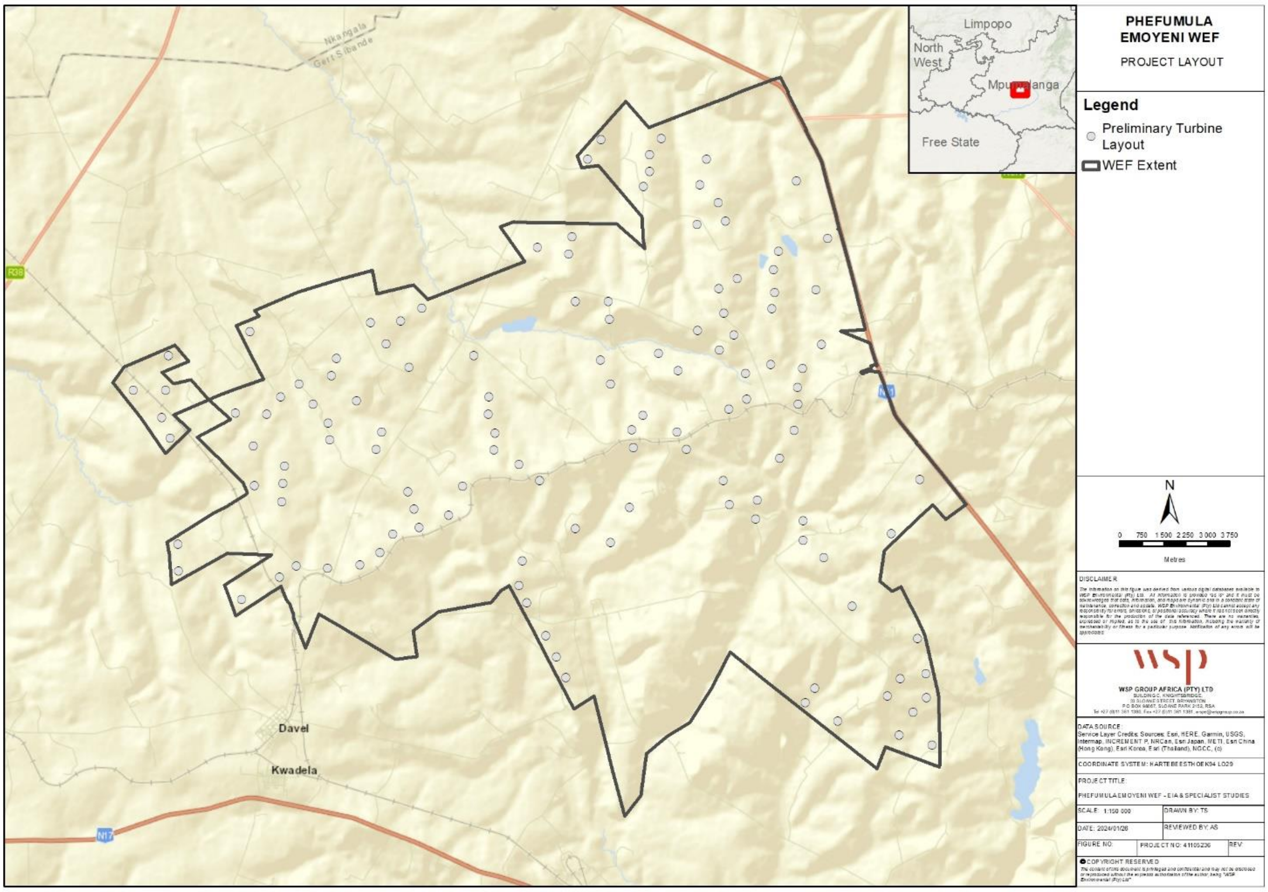


Figure 5-1 - Phefumula Emoyeni One WEF Preliminary Layout (135 Turbines)

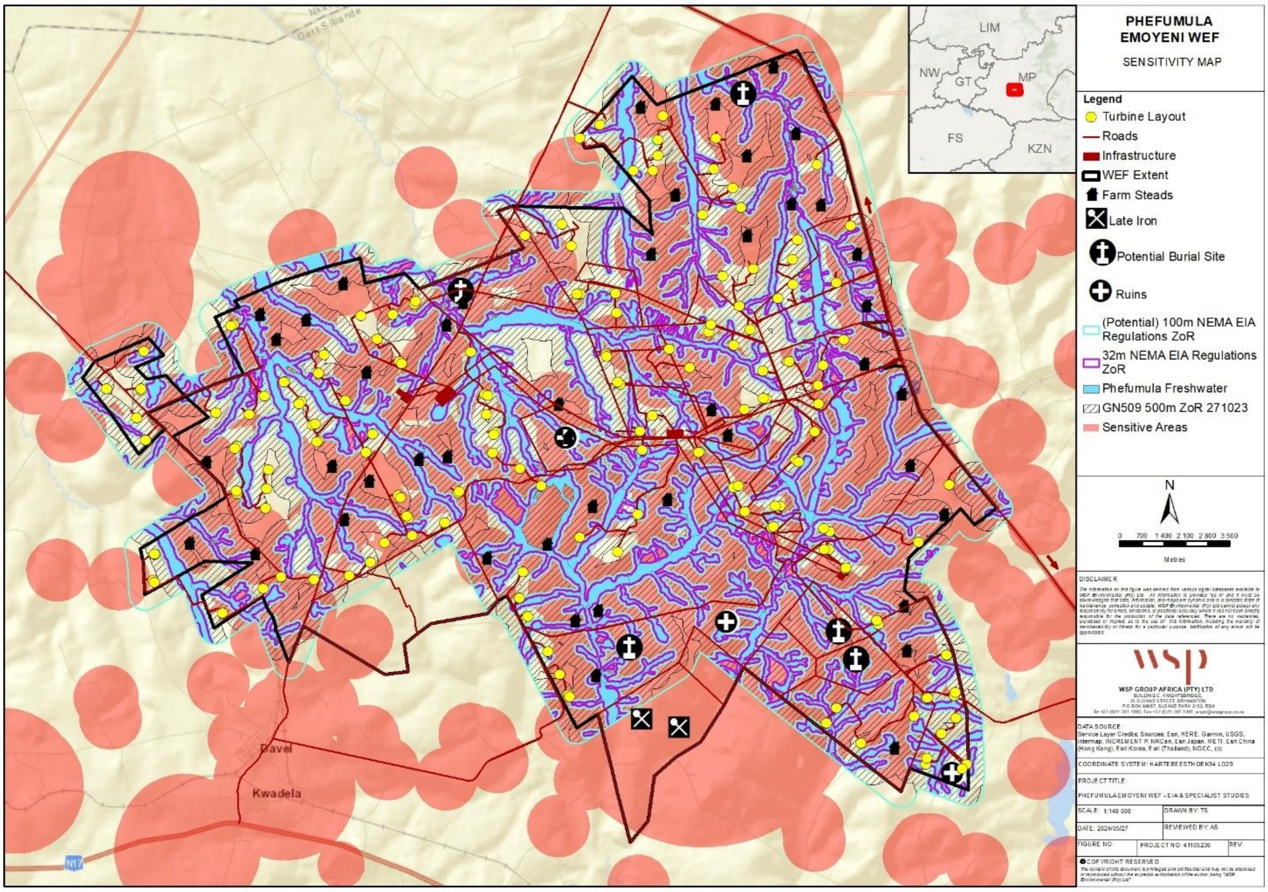


Figure 5-2 - Phefumula Emoyeni One WEF Preliminary Layout overlain on the Scoping Phase Sensitivity Map

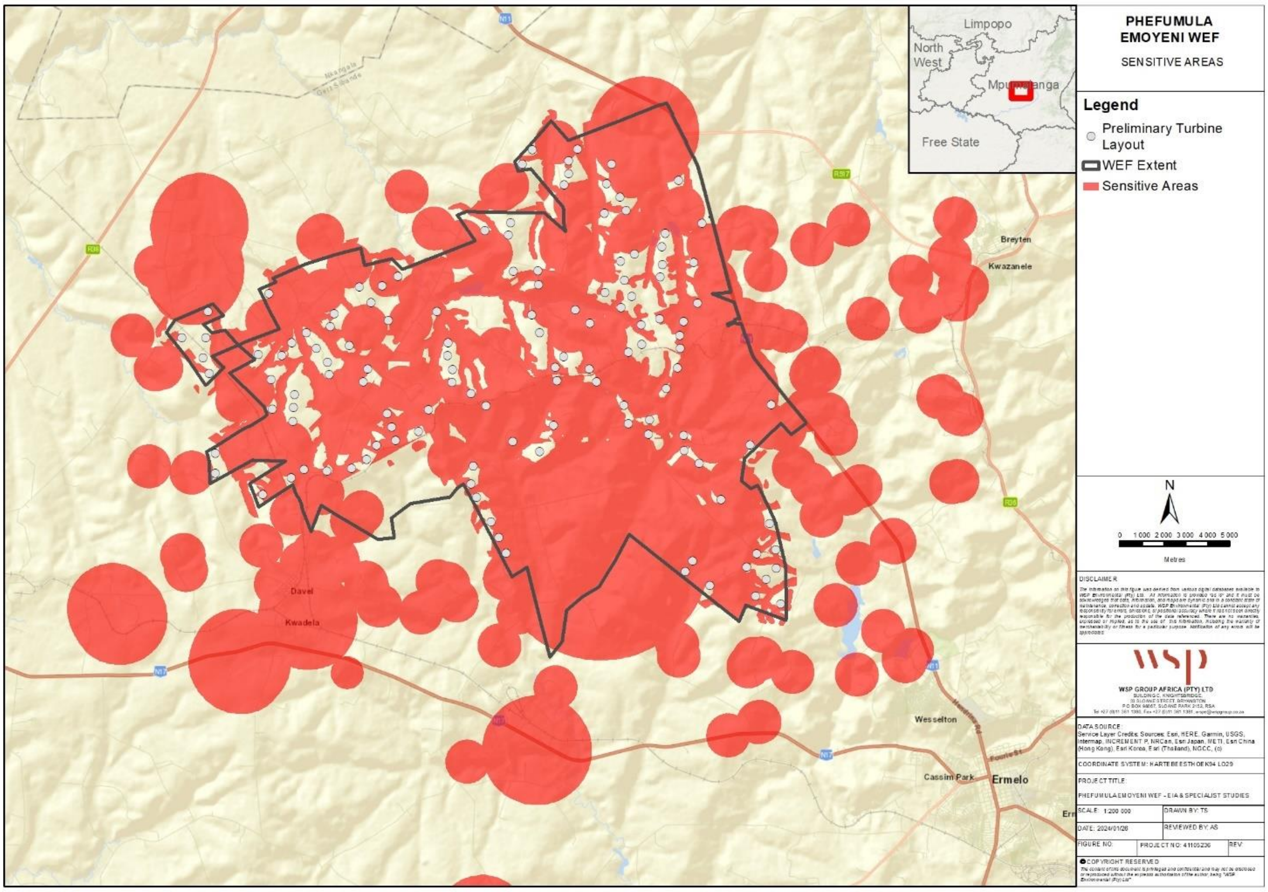


Figure 5-3 - Phefumula Emoyeni One WEF Preliminary Layout overlain on the Scoping Phase No-Go Map

5.2.2 REVISED LAYOUT ALTERNATIVE

Upon adjustment of the Preliminary Layout, the number of wind turbines has been reduced from 135 to 88 positions and associated main WEF components. This is layout that was assessed by specialists. This was done to take into consideration the specialist recommendations and to reduce the environmental risk associated with the proposed development. The revised layout alternative is illustrated in **Figure 5-4**.

During the course of the EIA Phase, further recommendations have been received from the specialists.

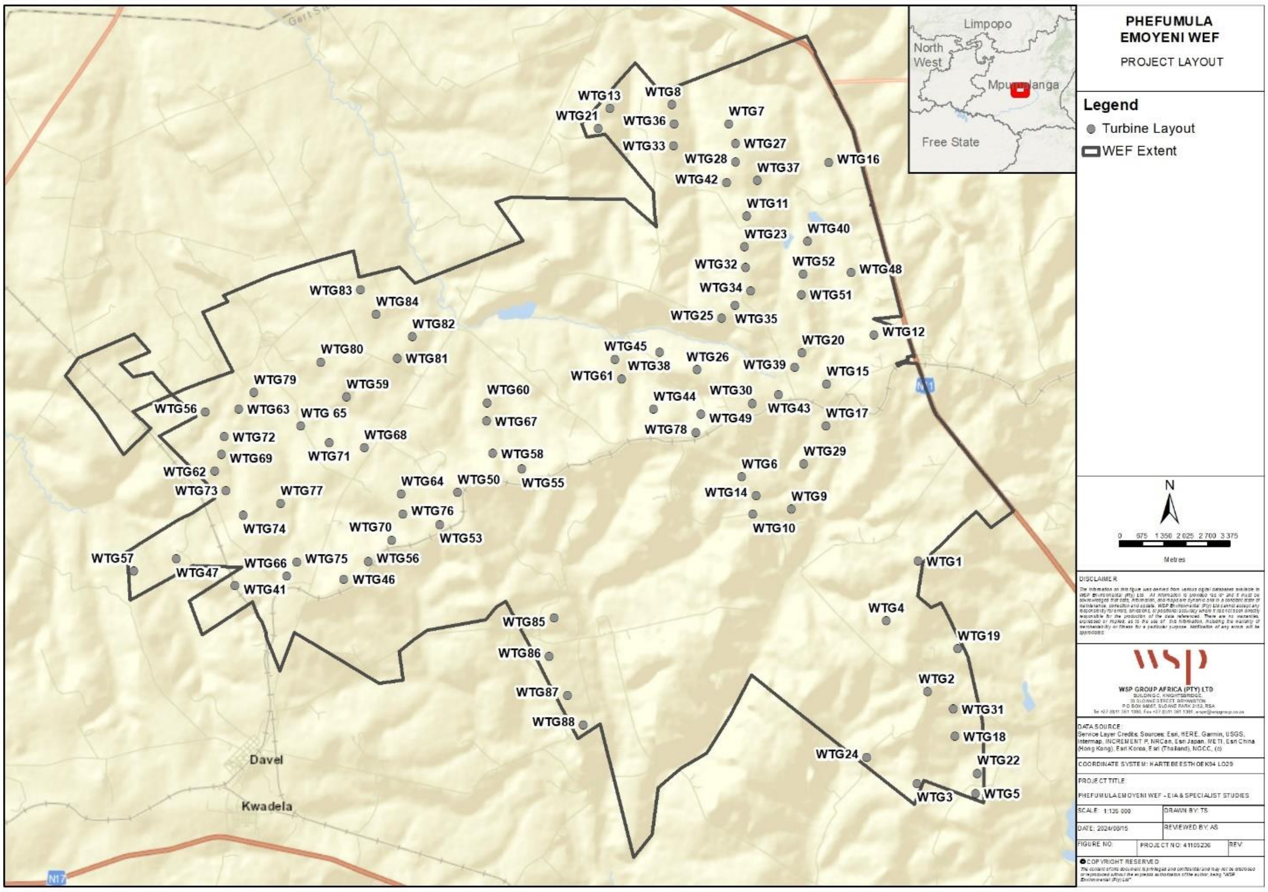


Figure 5-4 - Phefumula Emoyeni One WEF Revised Layout – with numbered Turbines (88 Turbines)

5.2.3 OPTIMISED LAYOUT (PREFFERED ALTERNATIVE)

During the course of the EIA Phase, it was confirmed by specialist observation that some of turbines were located within or encroaching on sensitive areas. As a result, the revised layout was optimised based on specialist inputs. These following recommendations were implemented:

- Terrestrial Biodiversity:
  - Turbines were shifted outside CBA irreplaceable and optimal areas and intact grasslands as far as practically possible.
- Avifauna
  - WTG 85 and 86 are located within a recommended turbine exclusion (including rotor-swept area) buffer, these turbines need to micro-sited out of the exclusion zones.
  - These two turbines were removed
- Aquatic biodiversity assessment:
  - It is strongly recommended that Turbine 42 be relocated to the north or east so that no part of its footprint is located within the delineated wetland boundary or associated 15m buffer. This turbine was shifted as requested.

- Furthermore a number of access roads are proposed to be relocated. Road layout to be updated in line with this request.

- Bats:
  - Turbine 11, T12, T13, T27, T44, T47, T48, T49, T53, T56, T68, T81, T82, and T88 have rotor sweep areas that encroach on High sensitivity buffers.
  - These turbines were shifted where required to avoid high sensitivity bat areas
- Heritage:
  - The ruins and semi-circular stone enclosures at PF006 impacted by WTG55. Turbine was shifted to avoid heritage site.
  - Burial sites which will be impacted by access roads (PF007, PF008, PF009) should preferably be avoided with a 30m buffer zone with access provided to family members.
- Noise:
  - The closest wind turbine to these receptors (WTG88) be located slightly northwards, away from the receptors, so that noise levels remain below the 40 dB(A) threshold.
  - This turbine was removed.
- Social:
  - The developers should liaise with the owners of the property to identify an alternative location for the substation and BESS. The owners have proposed an area on the northernmost site property.

Further micro-siting was undertaken by the client over the past months resulting in 12 turbines being dropped from the layout to produce the optimised layout. The Optimised layout identified up to 76 turbine positions and associated main WEF components and amended AOI. Currently only two turbines require further micro-siting- as a result of the updated aquatic studies.

As a result, more adjustments to the layout plan were made to reduce the impact on the receiving environment.

The optimised layout illustrated in **Figure 5-5** assumes a rotor diameter of 182m. It is noted that it is realistic to assume that this rotor diameter is more accurate in terms of the type of turbine that will ultimately be used. Utilising the 182m rotor diameter therefore does not require Turbine 11, T12, T13, T27, T44, T47, T48, T49, T53, T56, T68, T81, T82, and T88 to be relocated as the rotor sweep areas will not encroach on the High sensitivity buffers.

It must be noted that the EIA is requesting approval for a rotor diameter of up to 200m. It is understood that should a turbine with a 200m rotor diameter be identified as suitable at the time of the development of the WEF, the above-mentioned turbines will be required to be micro-sited and moved as requested by the specialist.

A detailed description of the layout optimisation together with maps of each individual turbine is included in **Appendix N**.

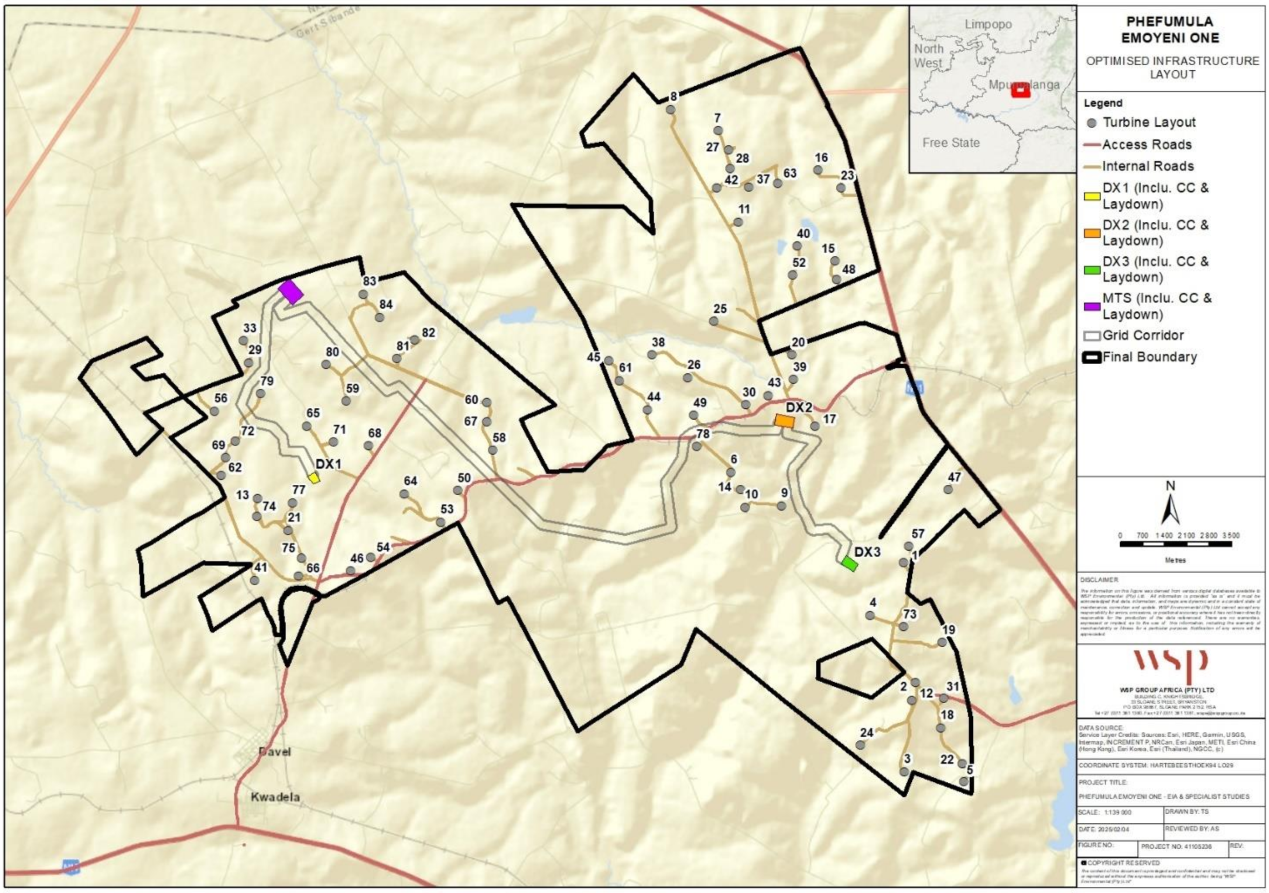


Figure 5-5 – Optimised layout

5.3 TECHNOLOGY ALTERNATIVES

The Phefumula Emoyeni One WEF will utilize wind technology to generate power. The motivation for the use of wind technology for this project is provided below:

Wind Resource

The Project site was selected on the availability of wind resources in the Mpumalanga region. The availability of wind resources is the main driver of project viability. The Project site was identified by the developer through a desktop pre-feasibility analysis based on the estimation of the Wind energy resource. The average annual wind speed at 150m (i.e., proposed hub height) ranges between 7 m/s and 8 m/s which is a sufficient resource to ensure the economic viability of a wind energy farm. This viable resource ensures the best value for money is gained for the economy of South Africa.

BESS technology

Two types of battery energy storage system technologies are being investigated.

One of the types of battery technology being considered for the BESS would be Vanadium Redox Flow batteries (VRF). The project will employ utility scale batteries. These energy storage systems can be supplied either as containerized units or as a fixed installation within a building etc. Due to the proposed size of the facility (up to 550MW) the Phefumula Emoyeni One WEF is currently envisioned as having units housed within a large battery building.

The other type of battery technology being considered for the BESS would be a Solid-State Lithium-ion Battery system which consists of multiple battery cells that are assembled to form modules. Each cell contains a positive electrode, a negative electrode, and an electrolyte. The BESS will comprise multiple battery units or modules housed in shipping containers and/or an applicable housing structure which is delivered pre-assembled to the project site. Containers are usually raised slightly off the ground and laid out in rows. They can be stacked if required although this may increase the risk of events in one container spreading to another container. Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings & offices, HV/MV switch gear, inverters and temperature control equipment that may be positioned between the battery containers.

5.4 NO-GO PROJECT ALTERNATIVE

The no-go alternative would be if the project were not to be developed.

In the “no project” alternative, the Phefumula Emoyeni One WEF project will not be developed. In this scenario, there could be a missed opportunity to address the need for an increase in renewable energy generation to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, potential negative environmental impacts of the project (as outlined in Section 6) associated with the development of the Phefumula Emoyeni One WEF would be avoided.

Specialists have considered the no-go alternative and the following has been concluded.:

- Agriculture:
  Specialist assessments for environmental authorisation are required to include a comparative assessment of alternatives, including the no-go alternative. The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The development compliments agriculture by providing an additional income source, without excluding agriculture from the land, or decreasing production. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, purely from an agricultural impact perspective, the proposed development is the preferred alternative between the development and the no-go. In addition, the no-go option would prevent the proposed development from contributing to the environmental, social, and economic benefits associated with the development of renewable energy in South Africa.
- Bats
  High bat sensitive areas represent No-Go areas for the construction of WEF infrastructure especially turbines, substations, buildings, construction camps, laydown areas, and possible quarries (to avoid disturbing key bat roosting, foraging, and/or commuting habitat, and to avoid high bat fatalities in these areas where high bat activity is anticipated). No turbine, including its full rotor swept area and a 2m pressure buffer around this, should occur in High sensitive areas. Consequently, turbines should be located a minimum of one blade length plus 2 m away from High sensitive areas. Construction of linear infrastructure such as roads and underground powerlines and cabling is only permissible in High Bat Sensitive Areas if this will not result in destruction or disturbance of bat roosts.
- Terrestrial Biodiversity (including Animal and Plant Species):

If the proposed Project does not proceed, it is anticipated that the current agricultural land use status quo will continue across most of the study area into the future. The tracts of grassland and wetland habitat in the study area will continue to be used for livestock (cattle) production and game farming, and the croplands will continue to be actively cultivated to produce maize and other crop types. Certain portions of the study area are subject to heavy grazing and trampling by cattle, and it is possible that overtime, the condition of grassland and wetland habitat with respects to flora species diversity and ability to carry livestock (productivity) may deteriorate due to the effects of long-term overgrazing. This may compromise the agricultural profitability of on-site farming operations. With respects to biodiversity, overgrazing is likely to drive the homogenisation of habitats and fauna diversity, including the persistence of Species of Conservation Concern (SCC).

- Risk

  From a health and safety point of view, and ignoring the fact that this project may help to mitigate possible adverse impacts of climate change, the No-Go option will always be a preferred option since there are no health and safety risks associated with not doing a project.

- Traffic

  This alternative considers the option of 'do nothing' and maintaining the status quo. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

  It needs to be highlighted, that the actual WEF design would have a nominal impact on the findings of the Traffic Impact Assessment (TIA) report, unless significantly altered

- Visual

  From a visual perspective, the "no-go" alternative, i.e. whereby the Phefumula Emoyeni One WEF will not be developed, would in principle be favoured, as this would mean that none of the visually detrimental elements would be introduced into the landscape and thereby retaining the existing visual resource value of the project site. However, the significance of the site as a visual asset needs to be weighed against other socio-economic considerations, such as the current and future energy requirements of the nation, to determine whether the proposed project should be supported. Furthermore, several other similar projects are also planned and, in some instances, already approved for development in the region, which means that the visual character of the area will be changing significantly in the near future.

6 GOVERNANCE FRAMEWORK

6.1 NATIONAL ENVIRONMENTAL LEGAL FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 6-1.**

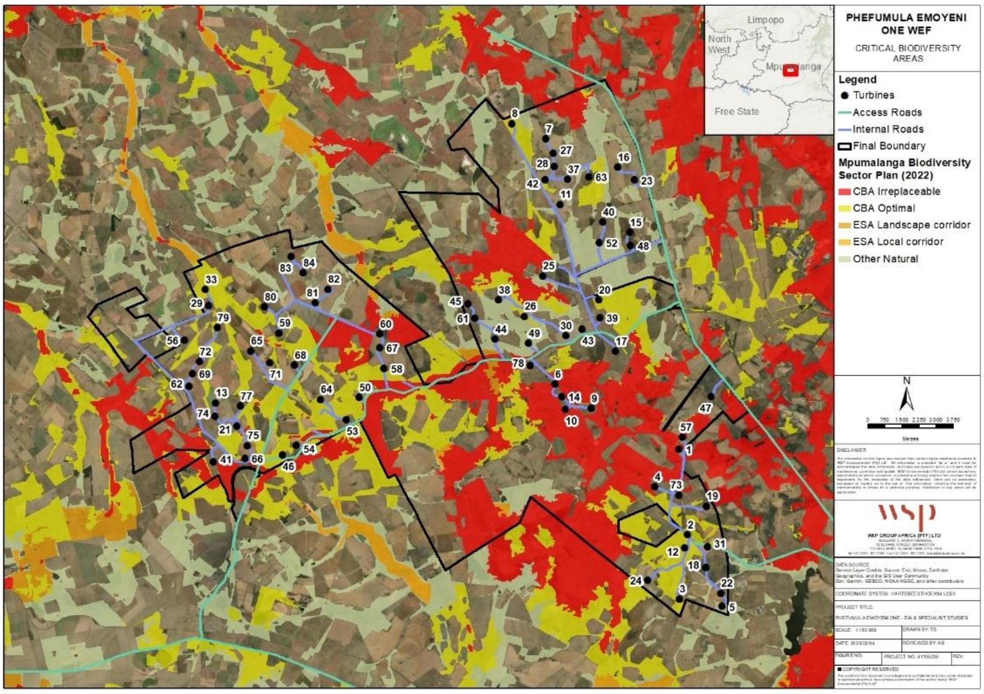
Table 6-1: Applicable National Legislation

Legislation	Description of Legislation and applicability
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	In terms of Section 24(2) of the NEMA, the Minister may identify activities, which may not commence without prior authorisation. The Minister thus published GNR 983 (as amended) (Listing Notice 1), GNR 984 (as amended) (Listing Notice 2) and GNR 985 (as amended) (Listing Notice 3) listing activities that may not commence prior to authorisation. The regulations outlining the procedures required for authorisation are published in the EIA Regulations of 2014 (GNR 982) (as amended). Listing Notice 1 identifies activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed in in this section are considered applicable to the development: A S&EIR process must be followed. An EA is required and will be applied for with the DFFE.
Listing Notice 1: GNR 983	**Activity 11(i)** – The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. **Description:** This activity will be triggered as the project is located outside of an urban area and includes internal grid infrastructure with a capacity of up to 33kV, three onsite IPP substations including a 33/132kV step-up transformer, and an over the fence 132kV cable to connect the onsite IPP substations to the one of three distribution/ Switching Stations as part of the infrastructure (switching stations included in the grid infrastructure EIA).

Legislation	Description of Legislation and applicability
Listing Notice 1: GNR 983	**Activity 12(ii)(a)(c)** The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more (a) within a watercourse (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. **Description:** The Facility will require the development of internal roads and/or access roads and electrical cabling (both above and underground) around the site. The physical footprint of internal access roads and electrical cabling required to connect the various components of the Facility will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site. The values associated with the Final Layout will be confirmed in the Final EIA Report.
Listing Notice 1: GNR 983	**Activity 14** The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. **Description:** The Facility will require storage and handling of dangerous goods, including fuel, cement, and chemical storage onsite, that will be greater than 80m3 but not exceeding 500m^3. This activity will also be applicable in the event that Redox Flow Battery technology is considered preferred.
Listing Notice 1: GNR 983	**Activity 19** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. **Description:** Internal access roads and stormwater control infrastructure, as well as electrical cabling required to connect the various components of the Facility will collectively require the excavation, infilling or removal of soil exceeding 10m3 from delineated watercourses on site. The values associated with the Final Layout will be confirmed in the Final EIA Report.
Listing Notice 1: GNR 983	**Activity 24(ii)** The development of a road: (ii) A road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres **Description:** The Facility will require the development of internal roads and/or access roads around the site. The roads will be 8-10m wide with 12m radius turning circles and gravel surfaces and 12-13m wide passing sections.

Legislation	Description of Legislation and applicability
Listing Notice 1: GNR 983	**Activity 28(ii)** Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. **Description:** The Facility is considered an industrial development, and is located on several farm portions zoned for agricultural use outside an urban area, used for agricultural purposes. The total area to be developed for the Facility (buildable area) is still to be confirmed but it will be greater than 1 hectare. Furthermore, individual components of the final layout such as the substations, O&M Buildings, Construction camps etc will individually have footprints of more than 1ha.
Listing Notice 1: GNR 983	**Activity 30** Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). **Description:** The Facility infrastructure is located within, and will require vegetation clearance or disturbance of Eastern Highveld Grassland. This ecosystem is confirmed to be listed in the National List of Ecosystems that are Threated and in Need of Protection (as indicated in GNR 1002 of 9 December 2011). Due to the fact that this ecosystem is listed as threatened, it is assumed that various threatened or protected species may be found within the development area. The restricted activity of “cutting, chopping off, uprooting, damaging or destroying, any specimen” has been identified in terms of NEM:BA and is therefore applicable to the vegetation clearance that will be required to construct the development. Considering this, Activity 30 is considered applicable.
Listing Notice 1: GNR 983	**Activity 48(i)(a)(c)** The expansion of— (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or where such expansion occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; **Description:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 100m^2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The values associated with the Final Layout will be confirmed in the Final EIA Report.
Listing Notice 1: GNR 983	**Activity 56(i)(ii)** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—

Legislation	Description of Legislation and applicability
	(i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; **Description:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads where no reserve exists and where such road is wider than 8 metres.
Listing Notice 2: GNR 984	**Activity 1(a)** The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, **Description:** The proposed energy generation technology (i.e. Wind) will generate more than 20MW of electricity output from a renewable resource (estimated at 550 MW).
Listing Notice 2: GNR 984	**Activity 9(a)(b)(c)(d)** The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development. **Description:** The proposed grid connection will include switching stations /distribution substations which will each have an IPP portion. Each substation may have a distribution capacity of up to 400kV. The capacity associated with these substations will be confirmed in the Final EIA Report.
Listing Notice 2: GNR 984	**Activity 15(i)** The clearance of an area of 20 hectares or more of indigenous vegetation **Description:** This activity will be triggered by the WEF as it will result in the clearance of at least 20 hectares or more of indigenous vegetation. The values associated with the Final Layout will be confirmed in the Final EIA Report.
Listing Notice 3: GNR 985	***Note:*** ***The CBAs identified are as per the Mpumalanga Biodiversity Sector Plan (MBSP) formally adopted by the MEC (Member of Executive Council) for Agriculture, Rural Development, Land and Environmental Affairs in the Provincial Gazette No 2535 of 26 May 2023 (Provincial Gazette Notice 279 of 2023). Proof of the Adoption of the MBSP is included in Appendix H.*** ***The map below illustrates the geographical areas applicable in terms of Listing Notice 3:***

Legislation	Description of Legislation and applicability
	
Listing Notice 3: GNR 985	**Activity 4(f)(i)(cc)(ee)** The development of a road wider than 4 metres with a reserve less than 13,5 metres. f. Mpumalanga (i) Outside urban areas: (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; **Description:** Internal access roads required 8-10m wide roads with 12m radius turning circles, gravel surface. The exact values will be confirmed in the Final EIA Report. Furthermore, roads required for the Facility will be located within, and will require vegetation clearance or disturbance of Eastern Highveld Grassland. This ecosystem is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) as identified in the MBSP which was adopted by the MEC in May 2023.
Listing Notice 3: GNR 985	**Activity10(f)(i)(cc)(ee))(hh)** The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. f. Mpumalanga

Legislation	Description of Legislation and applicability
	i. Outside urban areas: (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within a watercourse or wetland, or within 100 metres of a watercourse or wetland. **Description:** The Facility will require storage and handling of dangerous goods, including fuel, cement, and chemical storage onsite, that will be greater than 30m3 but not exceeding 80m3 within the specified geological areas. Furthermore, storage contemplated above will be located within, and will require vegetation clearance or disturbance of Eastern Highveld Grassland, which is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Storage contemplated above will be located within, and will require vegetation clearance) as well as being located within delineated watercourses on site, or within 100m of the outer extent of the delineated watercourses on site. Similarly, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) as identified in the Mpumalanga Biodiversity Sector Plan (MBSP) which was adopted by the MEC in May 2023.
Listing Notice 3: GNR 985	**Activity 12(f)(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. f.-Mpumalanga (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; **Description:** The clearance of indigenous vegetation will be required for the facility, however, the full extent is not yet known. Such clearance will be in excess of 300m2 and be partly located within Eastern Highveld Grassland, which is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, vegetation clearance, in excess of 300m2, required for the Facility will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA), as identified in the Mpumalanga Biodiversity Sector Plan (MBSP) which was adopted by the MEC in May 2023. The values associated with the Final Layout will be confirmed in the Final EIA Report.

Legislation	Description of Legislation and applicability
Listing Notice 3: GNR 985	**Activity 14(ii)(a)(c)(f)(i)(dd)(ff)** The development of— (ii) infrastructure or structures with a Physical footprint of 10 Square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; f. Mpumalanga i. Outside urban areas: (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; **Description:** The Facility will require the development of internal roads and/or access roads around the site. The physical footprint of internal access roads, stormwater control infrastructure and electrical cabling required to connect the various components of the Facility will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site. Furthermore, the physical footprint of internal access roads, stormwater control infrastructure and electrical cabling required to connect the various components of the Facility will be located within Eastern Highveld Grassland, which is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) as identified in the Mpumalanga Biodiversity Sector Plan (MBSP) which was adopted by the MEC in May 2023. The values associated with the Final Layout will be confirmed in the Final EIA Report.
Listing Notice 3: GNR 985	**Activity 18(f)(i)(cc)(ee)** The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. f. Mpumalanga i. Outside urban areas: (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans **Description** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads by more than 4 metres or the

Legislation	Description of Legislation and applicability
	lengthening of existing access and/or internal roads by more than 1km within the Mpumalanga Province and outside urban areas. Furthermore, such widening will occur within Eastern Highveld Grassland, which is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) as identified in the Mpumalanga Biodiversity Sector Plan (MBSP) which was adopted by the MEC in May 2023.
Listing Notice 3: GNR 985	**Activity 23(ii)(a)(c)(f)(i)(cc)(ee)** The expansion of— (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs — (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; f. Mpumalanga i. Outside urban areas: (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; **Description:** The Facility will require the expansion of existing internal roads and/or access roads around the site. The physical footprint of the expansion activities will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site. Furthermore, the physical footprint of the expansion activities will be located within Eastern Highveld Grassland, this ecosystem of which is listed in the National List of Ecosystems that are Threatened and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Similarly, the development activity contemplated will be located within Critical Biodiversity Areas (CBA) as identified in the Mpumalanga Biodiversity Sector Plan (MBSP) which was adopted by the MEC in May 2023. The values associated with the Final Layout will be confirmed in the Final EIA Report
Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GNR 320, 20 March 2020 and	The protocols provide the criteria for specialist assessment and minimum report content requirements for impacts for various environmental themes for activities requiring environmental authorisation. The protocols replace the requirements of Appendix 6 of the EIA Regulations, 2014, as amended. The assessment and reporting requirements of the protocols are associated with a level of environmental sensitivity identified by the national web

Legislation	Description of Legislation and applicability
GNR 1150, 30 October 2020)	based environmental screening tool (screening tool). The Screening Report was generated for the project on 04/09/2023 (**Appendix D**). The following environmental themes were applicable to the Phefumula Emoyeni One WEF: ▪ Agricultural Theme ▪ Animal Species Theme ▪ Aquatic Biodiversity Theme ▪ Archaeological and Cultural Heritage Theme ▪ Avian (Wind) theme ▪ Bats (Wind) Theme ▪ Civil Aviation Theme ▪ Defence Theme ▪ Flicker Theme ▪ Palaeontology Theme ▪ Plant Species Theme ▪ Noise Theme ▪ Landscape (Wind theme) ▪ Terrestrial Biodiversity Theme The Site Sensitivity Verification Report (SSVR), dated April 2024, is included in **Appendix J**.
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment. The proposed project does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921. The Environmental Management Programme (EMPr) that will accompany the EIA Report, will include reasonable measures for the prevention of pollution and good international industry practice (GIIP).
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI). SANBI was established by the NEMBA with the primary purpose of reporting on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems. The biodiversity assessment identifies CBAs which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Based on the preliminary desktop assessment and the Scoping terrestrial biodiversity report, a significant part of the Project Area falls within CBA (Irreplaceable and Optimal).

Legislation	Description of Legislation and applicability
	According to the description for the MBSP Terrestrial Assessment categories, CBAs are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The management approach is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages. CBAs in the Province can be divided into two sub-categories: ▪ Irreplaceable (parts of the site are within this sub-category), and ▪ Optimal (northern parts of the site are within this sub-category). Supplementary baseline terrestrial ecology studies will be undertaken during the EIA phase to inform the assessment of impacts and will include flora surveys of the project footprint to determine the presence of flora species of concern (SoC), and bird surveys of the area to define the potential risks to bird SoC. The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the EMPr.
National Biodiversity Offset Guideline (Issued Under Section 24j Of The National Environmental Management Act) (First Edition (October 2021)	The purpose of this guideline is to indicate when biodiversity offsets are likely to be required as mitigation by any competent authority (CA), to lay down basic principles for biodiversity offsetting and to guide offset practice in the environmental authorisation (EA) application context. This guideline is therefore applicable to applications for EA in terms of section 24 of NEMA. However, it can also be used to inform other administrative processes that may involve biodiversity offsetting, including applications for EA in terms of section 24G of NEMA, emergency directives contemplated in section 30A of NEMA, applications for licences under the National Water Act, 1998, the National Forests Act, 1998 and the National Environmental Management: Waste Act, 2008, applications for development rights in terms of the Spatial Planning and Land Use Management Act, 2013 and requests for the de-proclamation, or the withdrawal of declarations, of protected areas in terms of provincial legislation or NEMPAA. Biodiversity is fundamental to the health and well-being of people, as well as economic activity and socio-economic upliftment. The National Biodiversity Assessment (2018) (NBA 2018) states that South Africa's biodiversity assets and ecological infrastructure contribute significantly towards meeting national development priorities. Biodiversity offsetting, if done correctly, can advance the environmental right in the Constitution of the Republic of South Africa, 1996 (Constitution). Section 24 of the Constitution provides that everyone has the right to, amongst other things, have the environment protected for the benefit of present and future generations through reasonable legislative and other measures that, amongst other things, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Biodiversity offsetting is one of the ways in which South Africa's protected and conservation areas can be expanded, thereby promoting conservation. It may well also help to secure ecologically sustainable development as it mitigates the adverse impact of economic and social development on biodiversity, which, in turn, underpins such development. The biodiversity offsetting process, which only applies when a biodiversity offset is required involves the following steps:

Legislation	Description of Legislation and applicability
	▪ Identifying the need for a biodiversity offset. ▪ Determining the requirements of a biodiversity offset and compilation of a Biodiversity Offset Report. ▪ Selecting a biodiversity offset site. ▪ Securing the biodiversity offset site. ▪ Preparing a Biodiversity Offset Management Plan. ▪ Preparing biodiversity offset conditions for an EA. ▪ Concluding a Biodiversity Offset Implementation Agreement. A biodiversity offset strategy has been compiled and is included in **Appendix K**. The biodiversity offset strategy is being included as a result of the very high sensitivities confirmed in terms of avifauna, the presence of primary grasslands and PES A/B wetlands on site, the potential residual impacts as well as recommendations received from the DFFE.
National Environmental Management Protected Areas Act (No. 57 of 2003)	The purpose of the National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) is to, inter alia, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas. Section 50(5) of NEMPAA states that "no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority." There are no protected areas within the study area.
The National Water Act (No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides the framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment. The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water that the Minister may declare a watercourse. Section 21 of the Act outlines a number of categories that require a water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the Department of Water and Sanitation (DWS) if they are under certain thresholds or meet certain criteria. The list of water uses applicable to the proposed Project include: ▪ Taking water from a water resource; ▪ Impeding or diverting the flow of water in a watercourse; ▪ Disposing of waste in a manner which may detrimentally impact on a water resource; ▪ Altering the bed, banks, course or characteristics of a watercourse; The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use Authorisation Application (WUA) as determined by the risk assessment will be undertaken in compliance with procedural regulations published by the DWS within General Notice 267 (GN267). These regulations specify required information per water use and the reporting structure of required supporting technical information.

Legislation	Description of Legislation and applicability
The National Heritage Resources Act (No. 25 of 1999)	The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resources Agency (SAHRA), and lists activities that require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. Part 2 of the NHRA details specific activities that require a Heritage Impact Assessment (HIA) that will need to be approved by SAHRA. Parts of Section 35, 36 and 38 apply to the proposed project, principally: *Section 35 (4) - No person may, without a permit issued by the responsible heritage resources authority-* *destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;* *destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite.* *Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-* *any development or other activity which will change the character of a site— (i) exceeding 5 000 m^2 in extent, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.* In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed Phefumula Emoyeni One WEF, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). A Heritage Impact Assessment Report (**Appendix G.11**) has been carried out by a suitably qualified specialist, revealing: ▪ The Project area is situated within a large, open landscape of which large sections have been used for agricultural activities as well as cattle farming. Many farmsteads are also situated throughout the Project area, with some still being occupied. A total of 37 sites were recorded during the survey which includes multiple burial sites, farmsteads, ruins, circular stone enclosures, and possibly Historically planted trees; ▪ On the current layout the ruins/packed stone foundations and semi-circular enclosures at PF006 will be impacted by the WTG55 and avoidance of the site is preferable. If avoidance is not possible, the site will require mitigation through recording and mapping prior to applying for the appropriate destruction permit; ▪ Three burial sites (PF007, PF008, PF009) will be impacted by access roads. Burial site PF007 will be impacted by the access road which leads to WTG58. Burial site PF008 is situated next to an existing gravel road but the burial site will be impacted by widening of the road as well as during the use of the road. Burial site PF009 is situated between ploughed fields next to an existing gravel road

Legislation	Description of Legislation and applicability
	leading to WTG13 and the expanding of the road and use thereof will encroach the 30m buffer zone of the burial site. It is always preferable to avoid all burial sites with a 30m buffer zone. If avoidance of these three burial sites is not possible, the graves can be moved with the relevant permits. A Grave management plan for the burial sites will also have to be compiled as well as access provided to burial sites for family members wishing to visit the graves. ▪ Due to the change in Project layout after the survey was conducted, some areas were not surveyed and a Heritage Walk-down will be required of the final Project layout prior to construction; and ▪ According to the SAHRA Paleontological sensitivity map the study area is of insignificant and very high palaeontological sensitivity and an independent study was commissioned for this aspect (Bamford 2024). The proposed project has been loaded onto the SAHRIS portal for comment and was allocated the Case ID: 22347.
Mineral and Petroleum Resources Development Act (No. 28 of 2002)	The aim of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources. Section 53(1) of the MPRDA provides that any person who intends to use the surface of any land in any way that may be contrary to any object of the MPRDA, or which is likely to impede any such object, must apply to the Minister of Mineral Resources (the Minister) for approval. Section 53 of the MPRDA provides a mechanism for ensuring that, inter alia, the mining of mineral resources is not detrimentally affected through the use of the surface of land and which may, for example, result in the sterilisation of a mineral resource. A Section 53 consent will be required due to the fact that the project is located on various mining right areas. The Amendment Regulations (GNR 420 of 27 March 2020) introduced a template for section 53 applications (Form Z) and the specific information that applicants will need to provide as part of a section 53 application. WSP can confirm that a Section 53 consent has been received as required.
Noise Control Regulations in terms of the Environmental Conservation, 1989 (Act 73 of 1989)	In South Africa, environmental noise control has been in place for three decades, beginning in the 1980s with codes of practice issued by the South African National Standards (formerly the South African Bureau of Standards, SABS) to address noise pollution in various sectors of the country. Under the previous generation of environmental legislation, specifically the Environmental Conservation Act 73 of 1989 (ECA), provisions were made to control noise from a National level in the form of the Noise Control Regulations (GNR 154 of January 1992). In later years, the ECA was replaced by the National Environmental Management Act 107 of 1998 (NEMA) as amended. The National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) was published in line with NEMA and contains noise control provisions under Section 34: (1) The minister may prescribe essential national standards – (a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or (b) for determining – (i) a definition of noise; and (ii) the maximum levels of noise.

Legislation	Description of Legislation and applicability
	(2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards. Under NEMAQA, the Noise Control Regulations were updated and are to be applied to all provinces in South Africa. The Noise Control Regulations give all the responsibilities of enforcement to the Local Provincial Authority, where location specific by-laws can be created and applied to the locations with approval of Provincial Government. Where province-specific regulations have not been promulgated, acoustic impact assessments must follow the Noise Control Regulations. Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and national noise standards. These have not yet been accomplished and as a result all monitoring and assessments are done in accordance with the South African National Standards (SANS) 10103:2008 and 10328:2008.
Conservation of Agricultural Resources Act (No. 43 of 1983)	The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) provides for the implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas. In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DFFE and the DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners' cost and risk. The CARA Regulations with regards to alien and invasive species have been superseded by NEMBA Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
Civil Aviation Act (No. 13 of 2009)	Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by South African Civil Aviation Authority (SACAA) as an agency of the Department of Transport (DoT). SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. The DFFE Screening Tool Report identified Civil Aviation as having Low-Medium-High sensitivity for the proposed WEF, as portions of the footprint being located within 8km and between 8 and 15km of other civil aviation aerodrome. An Application for the Approval of Obstacles will also be submitted to ATNS. SACAA will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.

Legislation	Description of Legislation and applicability
Occupational Health and Safety Act (No. 85 of 1993)	The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed project. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.
National Energy Act (No. 34 of 2008)	The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantitates, and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. The main objectives of the Act are to: ▪ Ensure uninterrupted supply of energy to the Republic; ▪ Promote diversity of supply of energy and its sources; ▪ Facilitate effective management of energy demand and its conservation; ▪ Promote energy research; ▪ Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy; ▪ Ensure collection of data and information relating to energy supply, transportation and demand; ▪ Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development; ▪ Provide for certain safety, health and environment matters that pertain to energy; ▪ Facilitate energy access for improvement of the quality of life of the people of the Republic; ▪ Commercialise energy-related technologies; ▪ Ensure effective planning for energy supply, transportation, and consumption; and ▪ Contribute to sustainable development of South Africa's economy. In terms of the act, the Minister of Energy is mandated to develop and, on an annual basis, review and publish the Integrated Energy Plan (IEP) in the Government Gazette. The IEP analyses current energy consumption trends within different sectors of the economy (i.e. agriculture, commerce, industry, residential and transport) and uses this to project future energy requirements, based on different scenarios. The IEP and the Integrated Resource Plan are intended to be updated periodically to remain relevant. The framework is intended to create a balance between energy demand and resource availability so as to provide low-cost electricity for social and economic development, while taking into account health, safety and environmental parameters.
Electricity Regulation Act (No. 4 of 2006)	The Electricity Regulation Act (No. 4 of 2006) (ERA) aims to: ▪ Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa; ▪ Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency. effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic: ▪ Facilitate investment in the electricity supply industry; ▪ Facilitate universal access to electricity; ▪ Promote the use of diverse energy sources and energy efficiency; ▪ Promote competitiveness and customer and end user choice; and

Legislation	Description of Legislation and applicability
	▪ Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

6.2 POLICIES AND PLANS

Table 6-2 summarised key policies and plans as an outline of the governance framework for the project.

Table 6-2: Applicable Regional Policies and Plans

Applicable Policy	Description of Policy
National Development Plan	The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The NDP identifies several enabling milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing citizens with the means to improve their own lives and boost their incomes. Infrastructure is essential to development. Chapter 3, Economy, and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges. In terms of implementation the NDP identifies three phases. The first two are of specific relevance to the proposed project. The first phase (2012–2017) notes that ensuring the supply of energy and water is reliable and sufficient for a growing economy. The second phase (2018–2023) involves building on the first phase to lay the foundations for more intensive improvements in productivity. The provision of affordable and reliable energy is a key requirement for this to take place. Chapter 4, Economic infrastructure, notes that economic infrastructure provides the foundation for social and economic development. In this regard South Africa must invest in a strong network of economic infrastructure designed to support the country's medium- and long-term economic and social objectives. The plan envisages that, by 2030, South Africa will have an energy sector that promotes: Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. More specifically, South Africa should have adequate supply security in electricity and in liquid fuels, such that economic activity, transport, and welfare are not disrupted.

Applicable Policy	Description of Policy
	The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation. In this regard coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources, will play a much larger role.
Integrated Resource Plan 2010 – 2030	The IRP is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. On 6 May 2011, the then Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. The IRP recognises that Solar photovoltaic (PV), wind and concentrated solar power (CSP) with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.
New Growth Path	Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: energy, transport, communication, water, and housing.
National Infrastructure Plan	The South African Government adopted a National Infrastructure Plan (NIP) in 2012. The NIP aims to transform the South African economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to improved economic growth.
Integrated Energy Plan (IEP)	The development of a National IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a roadmap of

Applicable Policy	Description of Policy
	the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives are identified, namely: ▪ Objective 1: Ensure security of supply. ▪ Objective 2: Minimise the cost of energy. ▪ Objective 3: Promote the creation of jobs and localisation. ▪ Objective 4: Minimise negative environmental impacts from the energy sector. ▪ Objective 5: Promote the conservation of water. ▪ Objective 6: Diversify supply sources and primary sources of energy. ▪ Objective 7: Promote energy efficiency in the economy. ▪ Objective 8: Increase access to modern energy. The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e., agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and consider the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others. Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The IEP is therefore focused on determining the long-term energy pathway for South Africa, considering a multitude of factors which are embedded in the eight objectives. As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios: ▪ The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term. ▪ The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy. ▪ The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply. ▪ The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met. The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of existing electricity generation capacity, the IEP indicates that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current

Applicable Policy	Description of Policy
	electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth. By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs. In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy. An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered. In terms of promoting job creation and localisation potential the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller contribution. The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.
National Protected Area Expansion Strategy, 2018	The National Protected Area Expansion Strategy 2018 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2018). According to the screening tool, there are areas within the study area that have been identified as priority areas for inclusion in future protected areas. According to the NPAES (2018), large portions of habitat in the study area have been mapped as Priority Focus Areas for protected area expansion. Similarly, the delineations presented in the Mpumalanga Protected Area Expansion – 20 Year Plan indicate that large portions of the study area are designated as Priority 2 and Priority 3 areas for protected area expansion.
Biodiversity Management Plan (BMP) for Vultures in	The Biodiversity Management Plan (BMP) for Vultures in South Africa, published in terms of Section 43 of the National Environmental Management

Applicable Policy	Description of Policy
South Africa published in terms of section 43 of the National Environmental Management Biodiversity Act, 2004 (Act no. 10 of 2004)	Biodiversity Act, 2004 (Act No. 10 of 2004), is a strategic document developed to address the conservation and management of vulture species in the country. The primary aim of the BMP is to ensure the long-term survival and recovery of vulture populations, which have been significantly impacted by various threats such as poisoning, habitat destruction, and the decline of food sources.

6.3 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

Table 6-3 summarised key provincial and municipal plans as an outline of the governance framework for the project.

Table 6-3: Provincial and Municipal Plans

Applicable Plan	Description of Plan
Mpumalanga Biodiversity Sector Plan (MBSP)	The MBSP is a spatial tool which serves to provide such information to end-users and guide decision making to ensure that the biodiversity objectives are achieved. The MBSP is based on an objective planning approach which considers national and provincial biodiversity targets while trying to avoid conflict with competing land uses. Both terrestrial and freshwater biodiversity priority areas are identified in the MBSP, either as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). These CBA and ESA areas must be considered and taken into account in processes that will result in a change in land use and will also form part of the geographic areas in which certain activities will require environmental authorisation in terms of the Environmental Impact Assessment Regulations Listing Notice 3 (Government Notice R985 of 04 December 2014, as amended by Government Notice R324 of 07 April 2017), in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). This MBSP Handbook presents the map products and explains how they were developed, and how and when they should be used. It describes the ecosystems and important biodiversity features of Mpumalanga and presents a set of land-use guidelines and other tools that can be used to effectively conserve Mpumalanga's biodiversity as part of living landscapes that combine multiple land-uses. The MBSP was formally adopted by the MEC (Member of Executive Council) for Agriculture, Rural Development, Land and Environmental Affairs in the Provincial Gazette No 2535 of 26 May 2023 (Provincial Gazette Notice 279 of 2023).
Gert Sibande District Municipality Integrated Development Plan (IDP) (2020/ 2021)	According to the Municipal Systems Act (Act 32 of 2000) (MSA), all municipalities have to undertake an IDP process. The IDP is a legislative requirement thus it has legal status and supersedes all other plans that guide development at local government level. The GSDM IDP Review (2019/ 2020) and Final IDP (2020/2021) has identified the following development priorities: ▪ Municipal Transformation and Organisational Development ▪ Basic Service Delivery and Infrastructure Development ▪ Local Economic Development ▪ Municipal Financial Viability and Management

Applicable Plan	Description of Plan
	▪ Good Governance and Public Participation ▪ Spatial Development Analysis and Rationale The main goal and strategic objective of the Basic Service Delivery and Infrastructure Development priority is a reliable and sustainable service. One of the main strategic objectives for reaching the goal is the provision of basic services such as water and electricity to an approved minimum level of standards in a sustainable manner; as per the national guidelines. **Key Performance Area (KPA) 1: Municipal Transformation and Organisational Development** • To develop and retain skilled and capacitated workforce • To accelerate provision of immediate & long-term bulk Energy Water and Sanitation • Institutional Capacity Development • Motivate High Performers **KPA 2: Basic Service Delivery and Infrastructure Development infrastructure development to support effective and sustainable community services** • Roads Maintenance • To facilitate and coordinate provision of sustainable community and social services • Community Facilities Maintenance • Library Services • To provide quality and sustainable municipal services. • Disaster Management and Fire Services • Laboratory Services • Environmental Management Services (EMS) • Municipal Health Services **KPA 3: Local Economic Development:** • To facilitate economic growth and development • Sector Development • Special Initiatives • Enterprise Development **KPA 4: Municipal Financial Viability and Management** • To ensure financial viability and provide support to local municipalities • Financial Management • Municipal Support • Budget Management and Reporting • KPA Strategic Objective Programmes • Asset Management • Supply Chain Management **KPA 5: Good Governance and Public Participation** • To ensure effective governance in the administration of the institution • Governance and Administration • Communications • Public Participation • Performance Management • Information Communication Technology (ICT)

Applicable Plan	Description of Plan
	• Internal Audit Risk Management **KPA 6: Spatial Development Analysis and Rationale** • To support and coordinate spatial transformation • Strategic Planning • Development Control • Intelligence and Monitoring
Msukaligwa Local Municipality IDP (2021/ 2022)	**The following challenges or threats to the natural environment within the local municipality have been identified:** • Human population growth, transformation of land and urbanization; • Mining, especially open-cast coal mining; • Crop cultivation and afforestation. • Overgrazing; • Loss of riverine and wetland/marsh habitat through human intervention; • Air quality as the Local Municipality was amongst the five Local Municipalities that were declared as Highveld Priority Area in 2007; • Unavailability of environmental section and environmental officials to implement environmental management programmes; • Unavailability/ limited/ outdated environmental planning tools; • Unsustainable developments within the Local Municipality; • Climate change leading to biodiversity destruction and other natural disasters; • Alien invasive plants that are replacing indigenous plants while also encroaching water bodies thereby reducing water level in them. **Efforts made to Address the Challenges** • Landfill sites are maintained on a regular basis to ensure clean environment; • Plans were put in place for conducting sewer analysis to deal with sewer spillages within the municipality; • Provisions made in the IDP for the upgrading of existing waste water treatment plants and construction of new plants; • Environmental management programmes incorporated in the IDP; • Awareness campaigns through waste management education are being conducted; • Participating in government environmental management initiatives that promote job creation and sustainable livelihoods; • Support all government initiatives to protect natural resources.

6.4 INTERNATIONAL ENVIRONMENTAL AND SOCIAL STANDARDS

6.4.1 IFC PERFORMANCE STANDARDS

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group (WBG) and is headquartered in Washington, D.C., United States. It was established in 1956 as the private sector arm of the WBG to advance economic development by investing in strictly for-profit and commercial projects that purport to reduce poverty and promote development.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that its projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC is owned and governed by its member countries but has its own executive leadership and staff that conduct its normal business operations. It is a corporation whose shareholders are member governments that provide paid-in capital, and which have the right to vote on its matters. Originally more financially integrated with the WBG, the IFC was established separately and eventually became authorized to operate as a financially autonomous entity and make independent investment decisions. It offers an array of debt and equity financing services and helps companies face their risk exposures, while refraining from participating in a management capacity. The corporation also offers advice to companies on making decisions, evaluating their impact on the environment and society, and being responsible. It advises governments on building infrastructure and partnerships to further support private sector development.

The IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. The Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs may also be applied by other financial institutions (FIs).

The Project is considered a Category B project in terms of the IFC Policy on E&S Sustainability (2012), having the potential to cause limited adverse environmental or social risks and/or impacts that are few, generally site specific, largely reversible, and readily addressed through mitigation measures.

The objectives and applicability of the eight PSs are outlined in **Table 6-4.**

Table 6-4: IFC Performance Standards Applicability to the Project

<table>
<tr><th>Reference</th><th colspan="2">Requirements</th><th>Project Specific Applicability</th></tr>
<tr><td colspan="4">Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts</td></tr>
<tr><td>Overview</td><td colspan="3">Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.</td></tr>
<tr><td>Objectives</td><td colspan="3">▪ To identify and evaluate environmental and social risks and impacts of the project.
▪ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.
▪ To promote improved environmental and social performance of clients through the effective use of management systems.
▪ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
▪ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.</td></tr>
<tr><td rowspan="9">Aspects</td><td>1.1</td><td>Policy</td><td rowspan="9">The IFC Standards state under PS 1 (Guidance Note 23) that “the breadth, depth and type of analysis included in an ESIA must be proportionate to the nature and scale of the proposed project’s potential impacts as identified during the course of the assessment process.” This document is the <u>third</u> deliverable from the Scoping and EIA process undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been compiled and is included in Appendix L.</td></tr>
<tr><td>1.2</td><td>Identification of Risks and Impacts</td></tr>
<tr><td>1.3</td><td>Management Programmes</td></tr>
<tr><td>1.4</td><td>Organisational Capacity and Competency</td></tr>
<tr><td>1.5</td><td>Emergency Preparedness and Response</td></tr>
<tr><td>1.6</td><td>Monitoring and Review</td></tr>
<tr><td>1.7</td><td>Stakeholder Engagement</td></tr>
<tr><td>1.8</td><td>External Communication and Grievance Mechanism</td></tr>
<tr><td>1.9</td><td>Ongoing Reporting to Affected Communities</td></tr>
<tr><td colspan="4">Performance Standard 2: Labour and Working Conditions;</td></tr>
<tr><td>Overview</td><td colspan="3">Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.</td></tr>
<tr><td>Objectives</td><td colspan="3">▪ To promote the fair treatment, non-discrimination, and equal opportunity of workers.
▪ To establish, maintain, and improve the worker-management relationship.
▪ To promote compliance with national employment and labour laws.
▪ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client’s supply chain.
▪ To promote safe and healthy working conditions, and the health of workers.
▪ To avoid the use of forced labour.</td></tr>
</table>

Reference	Requirements		Project Specific Applicability
Aspects	2.1	Working Conditions and Management of Worker Relationship Human Resources Policy and Management Working Conditions and terms of Engagement Workers organisation Non- Discrimination and Equal Opportunity Retrenchment Grievance Mechanism	The construction activities will require contractors for completion. A safe working environment and fair contractual agreements must be in place. The operational phase will have permanent employees for day-to-day activities as well as contractors who will all need a safe working environment and fair contractual agreements. Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the ESIA stage. Recommendations are provided concerning development of a detailed Human Resources (HR) and Occupational Health and Safety (OHS) system by the developer and its partners as the Project moves towards implementation. In addition, measures to address the Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 are referenced. The EMPr (**Appendix L**) incorporates the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.
	2.2	Protecting the Workforce Child Labour Forced Labour	
	2.3	Occupational health and Safety	
	2.4	Workers Engaged by Third Parties	
	2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.		
Objectives	▪ To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. ▪ To promote more sustainable use of resources, including energy and water. ▪ To reduce project related GHG emissions.		
Aspects	3.1	Policy Resource Efficiency Greenhouse Gases Water Consumption	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in Section 7 of this report. There are no material resource efficiency issues associated with the Project. The EMPr will include general resource efficiency measures. The project is not GHG emissions intensive and a climate resilience study or a GHG emissions-related assessment is not deemed necessary for a project of this nature. However, the Phefumula Emoyeni One WEF seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. Dust air pollution in the construction phase is addressed in the EMPr (**Appendix L**).
	3.2	Pollution Prevention Air Emissions Stormwater Waste Management Hazardous Materials Management Pesticide use and Management	

Reference	Requirements		Project Specific Applicability
			The Project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures is included in the EMPr (**Appendix L**). Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern. The waste generation profile of the project is not complex. Waste mitigation and management measures is included in EMPr (**Appendix L**). Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr has taken these anticipated hazardous materials into account and recommend relevant mitigation and management measures.
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	▪ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. ▪ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.		
Aspects	4.1	Community Health and Safety Infrastructure and Equipment Design and Safety Hazardous Materials Management and Safety Ecosystem Services Community Exposure to Disease Emergency Preparedness and Response	The requirements included in PS 4 will be addressed in the S&EIA process and the development of the EMPr. During the construction phase there will be an increase in vehicular traffic along public roads, largely due to the need for importation of construction material. Pedestrian and road safety risks will be qualitatively evaluated in the S&EIA process and the clients' standard safety and security measures, as well as potential additional measures recommended by WSP, has been detailed in the EMPr (**Appendix L**).
	4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives	▪ To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. ▪ To avoid forced eviction.		

Reference	Requirements		Project Specific Applicability
	▪ To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. ▪ To improve, or restore, the livelihoods and standards of living of displaced persons. ▪ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	Displacement Physical Displacement Economic Displacement Private Sector Responsibilities under Government Managed Resettlement	PS5 is not applicable to the proposed Phefumula Emoyeni One WEF as no physical or economic displacement or livelihood restoration will be required. The proposed Phefumula Emoyeni One WEF is located on privately owned land that is utilised for agriculture by the landowners. The significance of all potential agricultural impacts is kept low by the very small proportion of the land that is impacted.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	▪ To protect and conserve biodiversity. ▪ To maintain the benefits from ecosystem services. ▪ To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	Protection and Conservation of Biodiversity	A significant part of the Project Area falls within CBAs (Irreplaceable and Optimal). A Biodiversity Impact Assessment as well as an Avifaunal Impact Assessment and Aquatic Systems Impact Assessment have been included in the proposed scope for the EIA phase. Furthermore, a biodiversity offset plan is included as **Appendix K**. The methodologies for the specialist assessments include a combination of literature review, in-field surveys and sensitivity mapping. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa. The prevalence of invasive alien species will be determined, and mitigation and management measures have been included in the EMPr (**Appendix L**).
Performance Standard 7: Indigenous People			
Overview	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic,		

Reference	Requirements		Project Specific Applicability
	social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.		
Objectives	▪ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. ▪ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. ▪ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. ▪ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. ▪ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. ▪ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Aspects	7.1	General Avoidance of Adverse Impacts Participation and Consent	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area. The Project does not involve displacement. PS7 will not be triggered.
	7.2	Circumstances Requiring Free, Prior, and Informed Consent Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use Critical Cultural Heritage Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
	7.3	Mitigation and Development Benefits	
	7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	▪ To protect cultural heritage from the adverse impacts of project activities and support its preservation. ▪ To promote the equitable sharing of benefits from the use of cultural heritage.		

Reference	Requirements		Project Specific Applicability
Aspects	8.1	Protection of Cultural Heritage in Project Design and Execution	A Heritage Impact Assessment Report (**Appendix G.11**) has been carried out by a suitably qualified specialist, revealing that archaeological sites (Stone Age and Historic Archaeological), cultural heritage sites, burial grounds or isolated artifacts are unlikely to be present on the affected landscape. A Chance Find Procedure has been included in the EMPr (**Appendix L**).

6.4.2 WORLD BANK GROUP ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

In support of the Performance Standards, the World Bank Group (WBG) has published several Environmental Health and Safety (EHS) Guidelines. The EHS Guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to PS3: Pollution Prevention and Abatement, as well as certain aspects of occupational and community health and safety.

Where host country regulations differ from the levels and measures presented in the EHS Guidelines, projects seeking international funding may be expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is required.

The following IFC / WBG EHS Guidelines have been generally consulted during the preparation of the EIA in order to aid the identification of EHS aspects applicable to the project:

- Wind Energy (August 2015) - The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as the environmental impact assessment, and continue to be applied throughout the construction and operation phases.
- The guidelines list issues associated with wind energy facilities which need to be considered. These include:
  - Environmental impacts associated with the construction, operation, and decommissioning of wind energy facilities activities may include, among others, impacts on the physical environment (such as noise or visual impact) and biodiversity (affecting birds and bats, for instance).
  - Due to the typically remote location of wind energy facilities, the transport of equipment and materials during construction and decommissioning may present logistical challenges (e.g., transportation of long, rigid structures such as blades, and heavy tower sections).
- Environmental issues specific to the construction, operation, and decommissioning of wind energy projects and facilities include the following:

- Landscape, Seascape, and Visual impacts;
- Noise;
- Shadow Flicker; and
- Water Quality.

- Electric Power Transmission and Distribution (2007) - information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.
- General EHS Guidelines – this includes a section on a range of environmental, occupational health and safety, community health and safety, and construction activities that would apply to the project. The guideline also contains recommended guidelines adopted form the World Health Organisation (WHO) for ambient air and water quality, which are referred to in the relevant impact assessment sections in the ESIA report.

6.4.3 EQUATOR PRINCIPLES

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs apply globally to all industry sectors and to five financial products 1) Project Finance Advisory Services, 2) Project Finance, 3) Project-Related Corporate Loans, 4) Bridge Loans and 5) Project-Related Refinance and Project-Related Acquisition Finance. The relevant thresholds and criteria for application is described in detail in the Scope section of the EP. Currently 125 Equator Principles Financial Institutions (EPFIs) in 37 countries have officially adopted the EPs, covering the majority of international project finance debt within developed and emerging markets. EPFIs commit to implementing the EPs in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EPs.

While the EPs are not intended to be applied retroactively, EPFIs apply them to the expansion or upgrade of an existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact. The EPs have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market.

The EPs have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry and have supported member banks in developing their own Environmental and Social Risk Management Systems.

The requirements and applicability of the EPs are outlined in **Table 6-5.**

It should be noted that Principles 8 and 10 relate to a borrower's code of conduct and are therefore not considered relevant to the S&EIA process and have not been included in this discussion.

Table 6-5: Requirements and Applicability of the Equator Principles

Requirement		Project Specific Applicability
Principle 1: Review and Categorisation		
Overview	When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC. Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale, and stage of the Project, and with the level of environmental and social risks and impacts. The categories are: Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented; Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.	Based upon the significance and scale of the Project's environmental and social impacts, the proposed project is regarded as a Category B project i.e., a project with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
Principle 2: Environmental and Social Assessment		
Overview	For all Category A and Category B Projects, the EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and where residual impacts remain, to compensate/ offset/ remedy for risks and impacts to Workers, Affected Communities, and the environment, in a manner relevant and appropriate to the nature and scale of the proposed Project The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For	This document is the second deliverable (i.e., <u>Final</u> Scoping Report) from the S&EIA process undertaken for the proposed Project. The impact assessment will be undertaken during the next phase of the S&EIA process. The assessment will comprehensively assess the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been compiled and is included in **Appendix L**.

Requirement		Project Specific Applicability
	Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. For other Category B and potentially C Projects, a limited or focused environmental or social assessment may be appropriate, applying applicable risk management standards relevant to the risks or impacts identified during the categorisation process. The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation.	
Principle 3: Applicable Environmental and Social Standards		
Overview	The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project and transaction meet each of the Principles. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC PS and WBG EHS Guidelines. For Projects located in Designated Countries, compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.	As South Africa has been identified as a non-designated country, the reference framework for environmental and social assessment is based on the IFC PS. In addition, this S&EIA process has been undertaken in accordance with NEMA (the host country's relevant legislation).
Principle 4: Environmental and Social Management System and Equator Principles Action Plan		
Overview	For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.

Requirement		Project Specific Applicability
	requirements in line with the applicable standards.	
Principle 5: Stakeholder Engagement		
Overview	EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities Workers and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. To accomplish this, the appropriate assessment documentation, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation. Disclosure of environmental or social risks and adverse impacts should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. All Projects affecting Indigenous Peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for Indigenous Peoples contained in relevant national law, including those laws implementing host country obligations under international law.	The S&EIA process includes an extensive stakeholder engagement process which complies with the South African EIA Regulations. The process includes consultations with local communities, nearby businesses, and a range of government sector stakeholders (state owned enterprises, national, provincial and local departments). The stakeholder engagement process solicits interest from potentially interested parties through the placement of site notices and newspaper advertisements as well as written and telephonic communication. The stakeholder engagement process is detailed in Section 4.6. A further Stakeholder Engagement Plan will be developed and implemented as part of the ESMS (post-EIA phase) for the construction and operational phases of the project.
Principle 6: Grievance Mechanism		
Overview	For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The borrower will inform the Affected Communities and Workers about the grievance mechanism in the course of the stakeholder	The EMPr will include a Grievance Mechanism Process for Public Complaints and Issues. This procedure effectively allows for external communications with members of the public to be undertaken in a transparent and structured manner. A Grievance Mechanism will be developed and implemented as part of the ESMS (post-EIA phase) for the construction and operational phases of the project.

Requirement		Project Specific Applicability
	engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible, at no cost, and without retribution to the party that originates the issue or concern.	
Principle 7: Independent Review		
Overview	For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.	This principle will only become applicable in the event that that the project is developed in the future.
Principle 9: Independent Monitoring and Reporting		
Overview	To assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting for all Category A, and as appropriate, Category B projects. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information, which will be shared with the EPFI in accordance with the frequency required.	This principle will only become applicable in the event that the project is developed in the future.

6.5 OTHER GUIDELINES AND BEST PRACTICE RECOMMENDATIONS

6.5.1 GENERIC EMPR RELEVANT TO AN APPLICATION FOR SUBSTATION AND OVERHEAD ELECTRICITY TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

NEMA requires that an EMPr be submitted where an EIA has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation. The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations, 2014, as amended, or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice, that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the applicant and the CA.

GN 435 of 22 March 2019 identified a generic EMPr relevant to applications for substations and overhead electricity transmission and distribution infrastructure which require authorisation in terms of Section 42(2) of NEMA. Applications for overhead electricity transmission and distribution infrastructure that trigger Activity 11 of Listing Notice 1 or Activity 9 of Listing Notice 2 and any other listed or specified activities must use the generic EMPr.

The objective of the generic EMPr is "*to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of overhead electricity transmission and distribution infrastructure. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature*."

The generic EMPr for Substations is included in the Site-Specific EMPr (**Appendix L**).

6.5.2 BIODIVERSITY MANAGEMENT PLAN (BMP) FOR VULTURES

To substantially reduce vulture mortalities caused by existing energy infrastructure and mitigate any loss to vultures from new energy infrastructure, several strategies and actions are typically outlined in conservation plans, such as the Biodiversity Management Plan (BMP) for Vultures in South Africa. Energy infrastructure, including powerlines, wind turbines, and solar farms, poses significant threats to vultures, primarily through collision, electrocution, and habitat disruption.

Key strategies that could be included to address these threats:

6.5.2.1 Powerline Modifications and Mitigation Measures:

- Bird-Friendly Powerline Design: Modify existing powerlines to make them more visible and less dangerous to vultures. This may involve using markers or insulation that help prevent birds from colliding with the wires or getting electrocuted on the poles.
- Undergrounding of Powerlines: Where feasible, the burial of powerlines can help reduce the risk of collisions, especially in critical vulture habitats.
- Risk Mapping and Identifying High-Risk Areas: Conduct studies to identify areas with higher vulture traffic or species-specific risk zones, particularly during foraging or migration periods. Powerlines could be rerouted or buried in such areas to reduce mortality risks.
- Monitoring and Reporting: Set up systems to regularly monitor the mortality rate due to powerline collisions and electrocution. Encourage reporting of dead or injured vultures to better track incidents.

6.5.2.2 Wind and Solar Energy Infrastructure:

- Site Assessment for New Developments: Before establishing new wind or solar farms, thorough environmental assessments should be carried out to identify if the site overlaps with important vulture habitats, migration corridors, or feeding grounds. Projects should be sited in areas that minimize the risks to vultures.
- Wind Turbine Design Adjustments: For existing wind farms, implementing bird-friendly turbine designs (such as placing turbines away from known vulture flight paths or using slower-moving blades) can significantly reduce collision risks.
- Smart Infrastructure Operation: Reduce turbine speeds during times of high vulture activity or in areas with frequent vulture movement. In some cases, wind farms can install technology that detects bird activity, allowing them to temporarily shut down turbines when vultures are nearby.

- Strategic Placement of Solar Farms: Avoid placing solar farms in regions that provide critical feeding or nesting sites for vultures. Land-use planning should consider their importance to local biodiversity.

6.5.2.3 Collaboration with Energy Sector Stakeholders:

- Partnerships with Energy Companies: Work closely with energy companies to promote the design and installation of bird-safe infrastructure. This includes sharing knowledge on vulture species' behaviors and flight paths to better inform infrastructure planning.
- Vulture-Friendly Guidelines and Best Practices: Develop industry guidelines that recommend vulture-friendly practices when building and operating energy infrastructure.
- Corporate Social Responsibility (CSR): Encourage energy companies to contribute to vulture conservation efforts, such as funding research or adopting mitigation measures at their sites.

6.5.2.4 Education and Capacity Building:

- Training for Energy Sector Workers: Energy companies, utility workers, and developers should be trained to identify vulture species and the risks they face. This would allow for early detection and mitigation of potential hazards related to infrastructure.
- Public Awareness Campaigns: Increase awareness among local communities and stakeholders about the risks posed by energy infrastructure to vultures and other wildlife. Public engagement can help in reducing unintentional harm (e.g., avoiding unregulated construction of infrastructure in vulture-rich areas).

6.5.2.5 Legislation and Policy Enforcement:

- Stronger Regulations and Standards: Government authorities can play a key role by implementing and enforcing regulations to ensure that all new energy infrastructure undergoes comprehensive environmental assessments that consider vulture populations.
- Incentives for Mitigation Measures: Provide incentives (e.g., tax breaks, funding) for companies that implement vulture-safe measures in their energy infrastructure projects.

6.5.2.6 Long-Term Monitoring and Adaptive Management:

- Continued Monitoring: Long-term monitoring of vulture populations, as well as energy infrastructure, should be conducted to assess the effectiveness of mitigation measures. This will help identify any new risks and allow for adaptive management strategies.
- Collaboration with Conservation Groups: Ongoing cooperation between government bodies, environmental NGOs, and researchers can help provide up-to-date data and innovative solutions for minimizing vulture mortalities.

By taking a proactive and collaborative approach, South Africa can significantly reduce the impact of energy infrastructure on vulture populations and ensure that new developments are designed with the protection of biodiversity in mind.

6.6 ADDITIONAL PERMITS AND AUTHORISATIONS

Table 6-6 outlines the additional permits and authorisations required for the proposed development, as well as the relevant Competent Authorities responsible.

Table 6-6 – Additional Permits and Authorisations required for the proposed development

Permits/Authorisation	Legislation	Relevant Authority	Status
Water Use Licence / General Authorisation	National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation	Application process will run concurrently with the EIA Phase.
Notification Of Intent To Develop (NID) Section 38 (1) and Section 38 (8)	National Heritage Resource Act (Act No. 25 of 1999)	Mpumalanga Heritage Resources Authority	In Process
Obstacle Permit	Civil Aviation Act (Act 13 of 2009)	Air Traffic and Navigation Services / Civil Aviation Authority	In Process
Section 53 Consent	Minerals and petroleum Resources Development Act (No. 28 of 2002)	Department of Mineral Resources and Energy	Surface rights consent has been obtained by Seriti Resources, the majority shareholder of Seriti green.
Permits for removal or destruction of Threatened or Protected Species (TOPs)	Mpumalanga Conservation Act (No. 10 of 1998)	MDARDLEA	Permits will be obtained prior to the commencement of construction if applicable.

7 DESCRIPTION OF BASELINE ENVIRONMENT

7.1 PHYSICAL ENVIRONMENT

The study area is in the Mpumalanga Highveld. The region has historically been dominated by farming and other agricultural uses, with vast areas under cultivation and livestock grazing. More recently, several opencast surface mining operations have been established directly east of the study area. Ermelo and the much smaller Breyten are located southeast and east of the study area, respectively, while Bethal and the smaller Hendrina are located further west and north, respectively. These urban centres, and especially their associated townships, are characterised by ongoing expansion.

The Msukaligwa Local Municipality is roughly dissected by the (continental) divide between the Upper Vaal and Usuthu / Pongola Water Management Areas (WMAs). In the north of the Local Municipality, certain sub-catchments drain into the Olifants and Inkomati WMAs. The headwaters of the Vaal River are found in the western half of the Local Municipality and drain in a south-westerly direction along with the Tweefontein River.

The Usuthu River rises in the northeast of the Msukaligwa Local Municipality. The headwaters of the Inkomati River flow northwards from the Msukaligwa Local Municipality into the Inkomati WMA, and the headwaters of the Olifants and Klein-Olifants River drain the far north-west of the Msukaligwa Local Municipality.

Existing vegetation in the undeveloped areas of Msukaligwa Local Municipality consists predominantly of typical highveld grasslands. Grasslands are dominated by a single layer of grasses and the amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localized habitats and geophytes are often abundant.

7.1.1 CLIMATE AND METEOROLOGY

Msukaligwa LM falls under the central Mpumalanga climatic zone characterized by warm, rainy summers and dry winters with sharp frosts. Rainstorms are often violent (up to 80mm per day) with severe lightning and strong winds, sometimes accompanied by hail. The winter months are droughty with the combined rainfall in June, July and August making up only 3.9% of the annual total (734mm). The average daily maximum temperature in January (the hottest month) is 25.2°C and in July (the coldest month) is 16.7°C. Due to its position near the escarpment, the area is somewhat windier than is typical for the South - Eastern Mpumalanga Highveld, although the majority of winds are still light, and their direction is controlled by topography.

7.1.2 EXISTING NOISE CLIMATE

The existing noise climate surrounding the Phefumula Emoyeni One WEF is predominantly rural with very low baseline noise levels anticipated. Noise sources include birds, insects, livestock and the activities of resident farmers. Vehicular influences may include traffic on local roads and the nearby N11 and N17 National Roads. **Figure 7-1** below shows the noise receptors in the surrounding area.

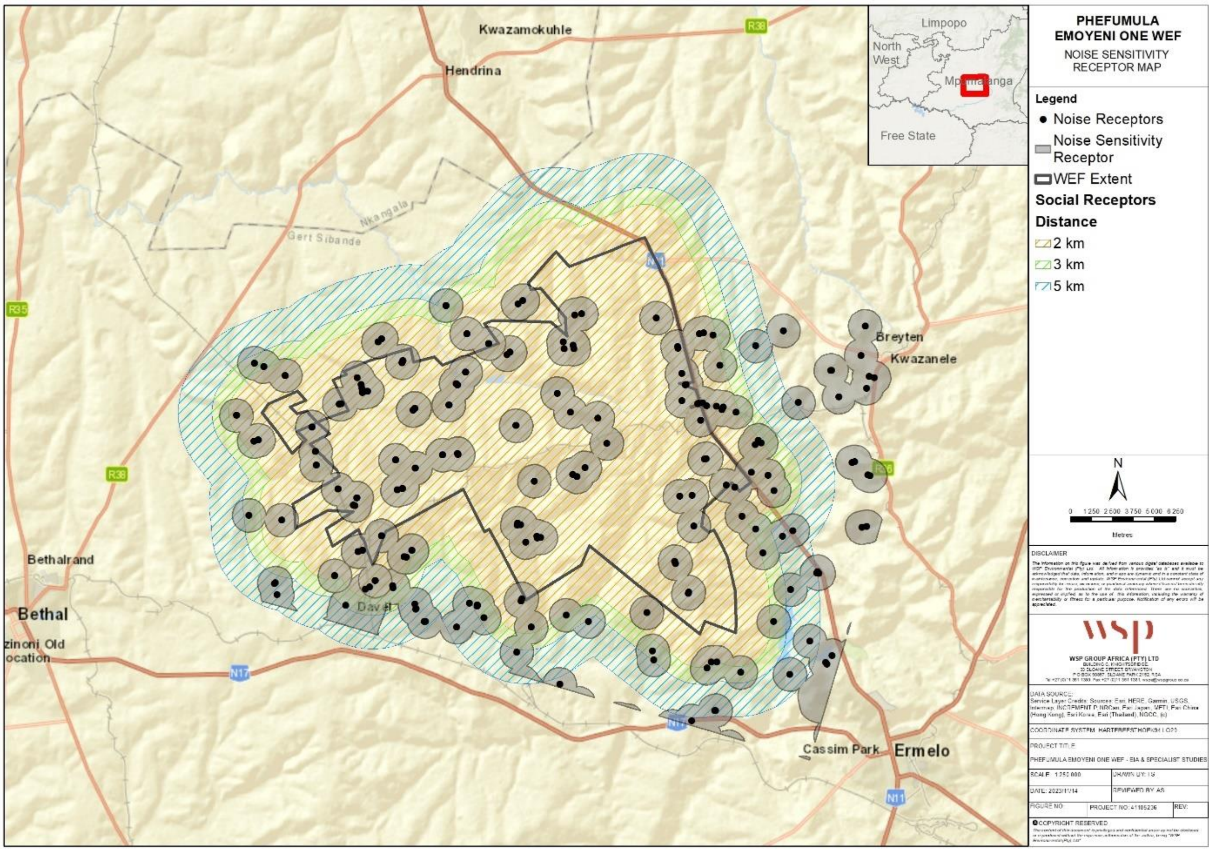


Figure 7-1 - Noise Receptors Identified

7.1.3 TOPOGRAPHY

Msukaligwa LM is characterized by the gently undulating highland topography with fairly broad to narrowly incised valleys of headwater drainages. The rural areas are also characterized by typical Highveld landscapes in the western and central parts, and more undulating terrain with dense commercial forests in the eastern parts. Interesting landscapes are found in the Chrissiesmeer pan veld area, which is more than 30 km to the east of the proposed Phefumula One WEF.

There are a number of marshy areas or vleis in the upper parts of the valleys and numerous pans, which vary from insignificant vegetated depressions to large deeply etched features with bare clayey floors. An ecologically important concentration of pans and freshwater lakes is located in the Chrissiesmeer area.

The natural topography is characterised mainly by rolling plains and low hills in most areas, which is locally interspersed by small ridges and flattish plateaus (**Figure 7-2**). The study area is roughly bisected by a non-prominent east-west watershed. Lower-lying areas are associated with the numerous small drainage lines and larger streams, that drain the study area from the main central watershed to the northwest and the south respectively, which also represents the general fall in elevation.

Most of the small rises formed by these watersheds are not prominent or steep, and therefore do not form specific visual landmarks or characteristic features, however a few of the larger landforms are landmarks in shorter-range views (**Figure 7-3**). Nevertheless, the natural topography of the site itself and much of the immediate surroundings remain largely untransformed and contribute to the rural appeal of the setting.

Figure 7-2 - Rolling plains and low hills are locally interspersed by small ridges and flattish plateaus

Figure 7-3 - Example of a small hill forming a landmark in a short-range view

7.1.4 GEOLOGY

Msukaligwa Local Municipality is underlain predominantly by arenite and dolerite intrusions of the Karoo Supergroup. Other underlying rock types include quartz monzonite, granite and basalt. The central-western part of the study area is underlain by the Ermelo coal field, where the predominant rocks are sedimentary, i.e. sandstones, shales and siltstones of the Ecca Group that contains erinaceous strata of the coal-bearing Vryheid formation.

The nature of the terrain and soil and geological characteristics are the main drivers of freshwater occurrence and typology in the study area. The predominant geology of the study area is characterised by sandstone and shales of the Vryheid Formation of the Ecca Group - sedimentary geology belonging to the Karoo Supergroup which characterises much of the interior of South Africa and the Mpumalanga Highveld. Such geology is typically associated with gently to moderately undulating terrain which is largely characteristic of the study area.

However, parts of the study area are typified by significant intrusions of Karoo dolerite, an igneous rock of much greater resistance to weathering than the dominant sedimentary rocks of the Ecca Group. The Karoo dolerites consist of a network of dolerite sills, sheets and dykes, which have intruded into the sedimentary geology.

The presence of igneous geology such as dolerite often leads to the formation of vertic and melanic soils – soils of highly clayey character that are typified by their distinctive swelling and shrinking characteristics in response to wetting and drying. Accordingly, most of the study area, including the southern and central parts are characterised by the Ea23 land type. Ea land types are characterised by high base status, dark coloured and/or red structured soils, usually of clay texture, associated with basis igneous rocks (Job et al, 2019). In Ea land types more than half of the land surface is covered by vertic, melanic or red structured diagnostic horizons. Duplex soils or exposed rock may cover significant portions of the land surface, but vertic, melanic or red structured horizons are dominant (Job et al, 2019).

The Ea23 land type is strongly typified by the presence of vertic clay soils, especially in lower-lying parts of the landscape. As such the vast majority of the valley bottom terrain unit within this land type consists of vertic soil forms, particularly the Rensburg Soil Form, which can be a wetland-related soil form. Vertic soils are still predominant on the hillslopes within this land type, but other poorly draining clayey soil forms (e.g. Valsrivier and Bonheim) are present.

The remainder (largely the northern parts of the study area) are characterised by Ba and Bb land types. Ba and Bb Land Types are generally located in the eastern and central interior basins of South Africa and are characterised by the predominant presence of dystrophic red (Ba) and yellow brown and grey soils (Bb). Plinthic soils are present in a small portion of these land types and depending on the underlying geology, the bottomlands are characterised by a predominance of dark clay soils (in areas of igneous geology) or Katspruit soil forms (a soil form associated with permanently saturated wetlands), and streambeds predominate where the geology is sedimentary. In the latter setting footslopes are typically predominated by Kroonstad and Pinedene soil forms (both wetland soil forms) (Job et al, 2019).

Figure 7-4 - Phefumula Emoyeni Geological Map (Source: Beyond Heritage)

7.1.5 SOILS AND AGRICULTURAL POTENTIAL

The site falls within an area that is classified as a Protected Agricultural Area. A Protected Agricultural Area is a demarcated area in which the climate, terrain, and soil are generally conducive for agricultural production and which, historically, has made important contributions to the production of the various crops that are grown across South Africa. Within Protected Agricultural Areas, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa.

However, there may be much variation within a Protected Agricultural Area and all land within it is not necessarily of sufficient agricultural potential to be suitable for crop production, due to site-specific terrain, soil, and other constraints. All land within a Protected Agricultural Area is therefore not necessarily worthy of prioritised protection as agricultural production land. There are no existing impacts on the site that are relevant to agricultural impact.

7.1.6 AQUATIC SYSTEMS

The study area is located within the context of the north-eastern highveld and is thus relatively high lying with altitudes ranging from around 1650m to just over 1800m above sea level. From a wider drainage and surface water occurrence perspective the study area is of significance as it is located in a wider area in which a number of large regional rivers rise. This wider area contains parts of the headwaters of the Olifants (Lepelle), Vaal, Crocodile and Phongolo Rivers. The study area straddles the catchment divide between the Olifants (drainage to the north) and Vaal Rivers (drainage to the south), and the study area thus straddles the continental divide, with drainage to the north flowing into the Indian Ocean via the Oliphants River and Limpopo Rivers and drainage to the south flowing into the Atlantic Ocean via the Vaal and Orange Rivers. The study area accordingly falls over three quaternary catchments, the B11A and B12A catchments which are two of the uppermost catchments of the Olifants River, as drained by the headwaters of the Olifants and Klein Olifants Rivers respectively, and the C11F catchment in the southern half of the study area which comprises parts of the uppermost catchment of the Vaal River (**Figure 7-5**).

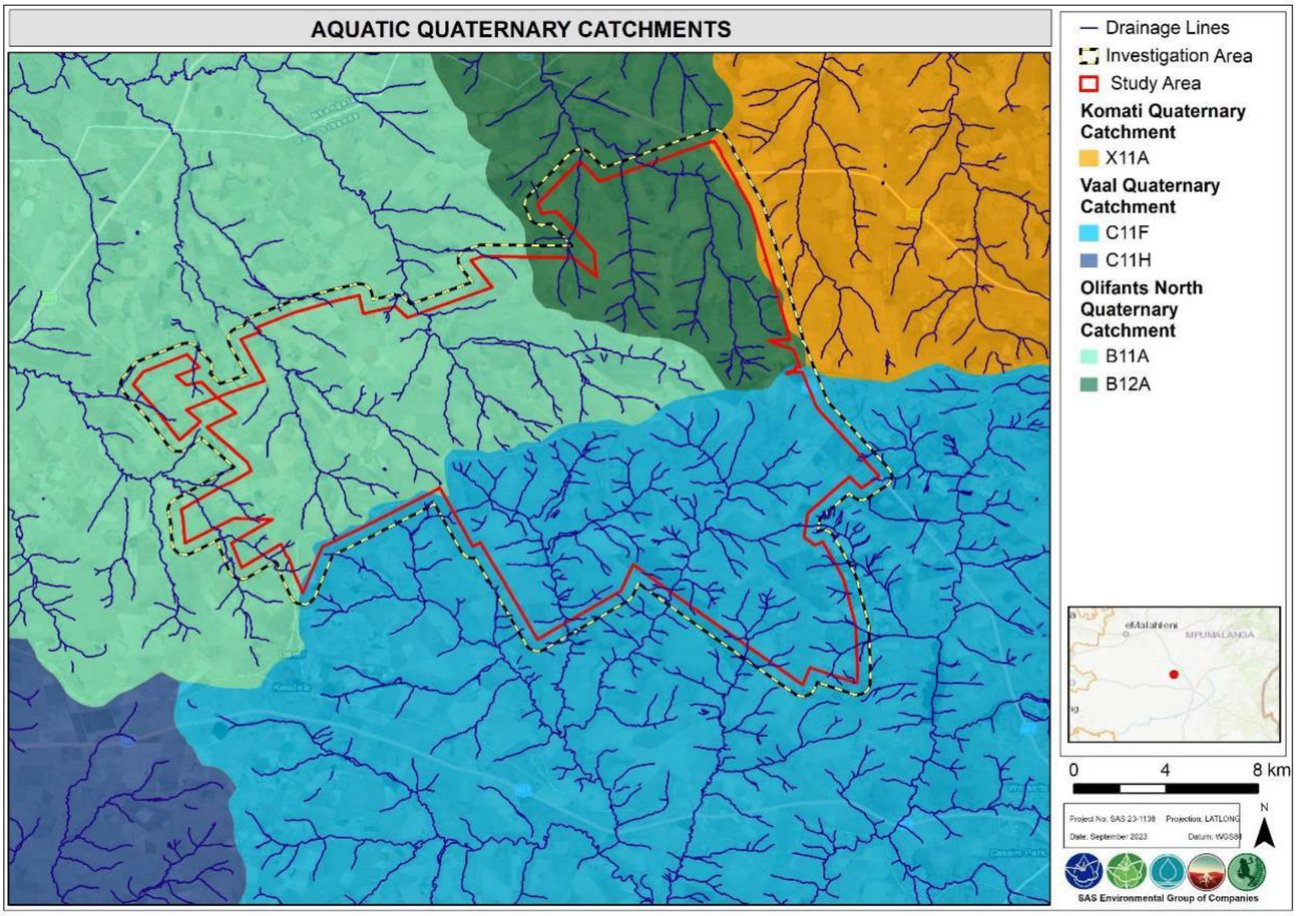


Figure 7-5 - Quaternary catchments and overall surface water drainage associated with the proposed Phefumula Emoyeni One study area and associated.

From a wetland / hydromorphic soils perspective the occurrence of the Kroonstad Soil Form in approximately 20% of the hillslope terrain form is strongly indicative of the presence of wetlands as the Kroonstad soil form is a distinctive wetland soil form. Clay soils continue to dominate on the midslopes with the increasing presence of weathered or hard rock, and with an absence of soils displaying signs of wetness.

The land types associated with the Phefumula Emoyeni One WEF are illustrated in **Figure 7-6**. Accordingly, from an analysis of the Ea23 land type, wetlands are mostly like to occur in bottomlands and to a lesser extent on footslopes, which was borne out by observations during the site visit where the Rensburg soil form was noted to be dominant in many valley bottom wetlands.

The Bb4 land type (far north-western part of the study area) is characterised by a predominance of Rensburg and Katspruit soil forms in the bottomlands, indicating the widespread presence of wetlands, as confirmed during the scoping site assessment. The observed presence of seep wetlands on the footslopes is supported by the widespread presence of the Longlands soil form as indicated in the land type sheet, occupying just under a third of the terrain unit land area.

Within the Ba22 land type (far north-eastern part of the study area) the Longlands soil form is similarly present and along with the presence of Katspruit, Rensburg and Willowbrook and Kroonstad soil forms occupying the vast majority of the remainder of the bottomlands. As with the Bb4 land type, the presence of seep wetlands in part of the landscape as confirmed to be widespread is supported by the presence of the Longlands and Avalon soil forms (both showing soft plinthic characteristics).

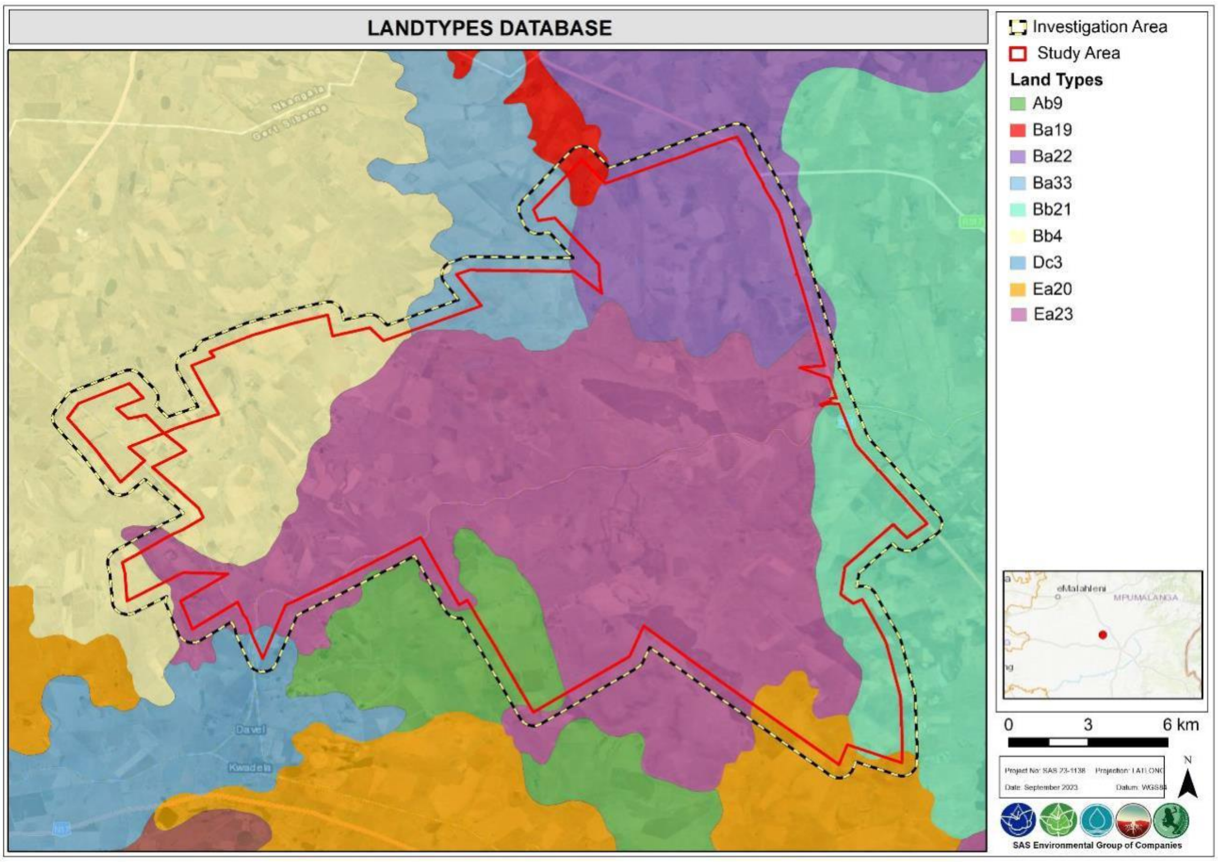


Figure 7-6 - Land types located withing the proposed Phefumula Emoyeni One WEF study area and associated investigation area.

Wetland soils sampled in seep wetlands typically displayed different soil conditions. In most seep wetlands sampled apedal as opposed to heavy clay soils were encountered, with shallow soils that overly a hard plinthic or hard rock sub-layer being present. The widespread presence of albic (E) horizons is strongly indicative of interflow and in some instances soft plinthic horizons were present, which are indicative of a seasonal rising and falling water table. **Figure 7-7** for representative photographs of the associated with the wetlands.

Figure 7-7 - Examples of soil samples displaying redoximorphic characteristics from different diagnostic subsoil horizons in wetlands in the study area; Top left: an albic (E) horizon displaying distinctive iron mottling from a seep wetland; Top right: another example of an albic horizon; Bottom left: an example of a soft plinthic B horizon; Bottom right: gley (G) horizon.

The moderately undulating terrain setting, with the presence of an east-west aligned high line (catchment divide) away from which surface flows drain southwards and northwards within shallow valley heads has resulted in a relatively high drainage density in the study area (refer to **Figure 7-5**). Accordingly, seeps are very common on the sloping ground in the upper slopes and valley heads within the higher lying ground in the study area. Such seeps are typically relatively narrow, often channelled features (as described above), with most seeps having experienced a degree of erosion. Seep wetlands are not just located on hillslopes but were commonly observed on the lower footslopes just above the valley floor. Such seepage compartments are not distinct from the adjacent valley bottom wetland, with the wetland habitat partly extending up the lower footslopes (see **Figure 7-8**).

Figure 7-8 - A wetland in the study area where wetland habitat extends up onto the lower footslopes; the approximate valley floor-footslope boundary is indicated by the dashed yellow line and the blue arrows show seepage areas (indicated by *Imperata cylindrica*) on the footslopes.

Such lateral seep areas were noted to be associated with sandstone outcropping in places and in many parts of the study area, particularly in the northern parts of the study area extensive seep wetland habitat is associated with bands of sandstone outcropping that are present along the footslopes of many valleys in the study area and which are aligned along the slope contours parallel to the orientation of drainage in the valley. In many instances, seep wetland habitat is present immediately downgradient of, and adjacent to, the lines of sandstone outcropping and the seepage of water is believed to be related to subsurface movement of water as influenced by sandstone.

7.1.6.1 Valley Bottom Wetlands

Valley bottom wetlands in the study area are generally narrow features with the absence of extensive lateral wetland habitat beyond the relatively incised wetland channel. However, wider areas of lateral wetland habitat do exist in some reaches, with these being located in wide, gently sloping valleys with the wetland being characterised by a meandering shallow channel which will regularly overtop its banks, thereby inundating the lateral wetland habitat.

Certain small sections of the larger valley bottom drainage in the study area comprise rivers rather than wetlands. In these sections, the presence of bedrock outcropping or the general absence of wetland habitat on either side of the macro channel banks entails that these reaches are not classified as wetlands, rather being riverine features.

Due to the nature of the terrain, there are generally very few areas of endorheic drainage in areas of very flat topography in which pans, and depression wetlands would typically be found. A handful of small depressions are located on the watershed between the Vaal and Olifants catchment in the study area (**Figure 7-9**).

Figure 7-9 – A small depression wetland located on the Vaal-Olifants watershed.

Freshwater ecosystems in the study area are subject to a number of impacts, the most prominent of which is the transformation of wetland habitat and the hydrological and geomorphological alteration caused by the impounding (damming) of seeps and valley bottoms. Most of the larger valley bottoms in the study area have been dammed, with large area of wetland habitat having been cumulatively transformed to open water habitats. The effects of impounding features, in particular roads are pronounced in many wetlands where there is a clear vegetative response to increased wetness upstream of the impounding structure and much drier conditions downstream of it as insufficient water is allowed to pass under the structure. Excessive erosion was noted in many places downstream of roads and dams, a likely geomorphological response to the depriving of sediment to the downstream reach by the impounding structure.

The catchments of many wetlands in the study area are cultivated for crops and accordingly the timing and patterns of inflows from the catchments to the wetlands have been altered. Geomorphological balances have also been affected due to increased availability of sediments as a result of tillage. Ecological processes have accordingly also been disrupted with wetlands in such land use settings being increasingly fragmented. Certain seep wetlands have been vegetatively transformed by cultivation, with the resultant loss of wetland habitat in such wetland units.

In certain wetlands gulley erosion is prominent, with the water table having been lowered and loss of wetland habitat having resulted. Although not widespread, reaches of certain wetlands have been infested with alien invasive vegetation such as poplars (*Populus sp.*).

7.1.6.2 Fresh water Ecosystems

The desk-based delineation and ground truthing confirmed the presence of numerous freshwater ecosystems that are distributed in most parts of the study area and within the associated investigation area. These freshwater ecosystems were confirmed to largely be wetlands. The two most commonly occurring wetland hydrogeomorphic (HGM) forms are:

- Seep wetlands.
- Channelled Valley Bottom wetlands.

The following wetland HGM forms are also found in the study area:

- Unchannelled Valley Bottom wetlands.
- Depression wetlands.

The freshwater ecosystems identified were classified according to the Classification System (Ollis et al., 2013) as Inland Systems. The freshwater ecosystems fall within the Highveld Aquatic Ecoregion and the Mesic Highveld Grassland Groups 3 and 4 Wet Veg (wetland vegetation) groups, classified by Mbona et al. (2015) as "Critically Endangered". At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the systems were classified as per the summary in **Table 7-1**, below. The freshwater ecosystems are depicted in the maps in **Figure 7-10** to **Figure 7-12** below.

Table 7-1 - Characterisation at Levels 3 and 4 of the Classification System (Ollis et al., 2013) of the freshwater ecosystems associated with the Phefumula Emoyeni One WEF study and investigation areas.

Freshwater Ecosystem HGM Type	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) Type
Channelled Valley Bottom Wetland	Valley floor—the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	A mostly flat wetland area located along a valley floor, characterised by the presence of an active channel running through it.
Unchannelled Valley Bottom Wetland		A mostly flat wetland area located along a valley floor without a river channel running through it.
Depression	Plain: an extensive area of low relief. These areas are generally characterised by relatively level, gently undulating or uniformly sloping land with a very gentle gradient that is not located within a valley. Gradient is typically less than 0.01 or 1:100.	A wetland or aquatic ecosystem with closed (or near closed) elevation contours which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates.
Seep Wetland	Slope-an inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part	A wetland area located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope.

Freshwater Ecosystem HGM Type	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) Type
	of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	

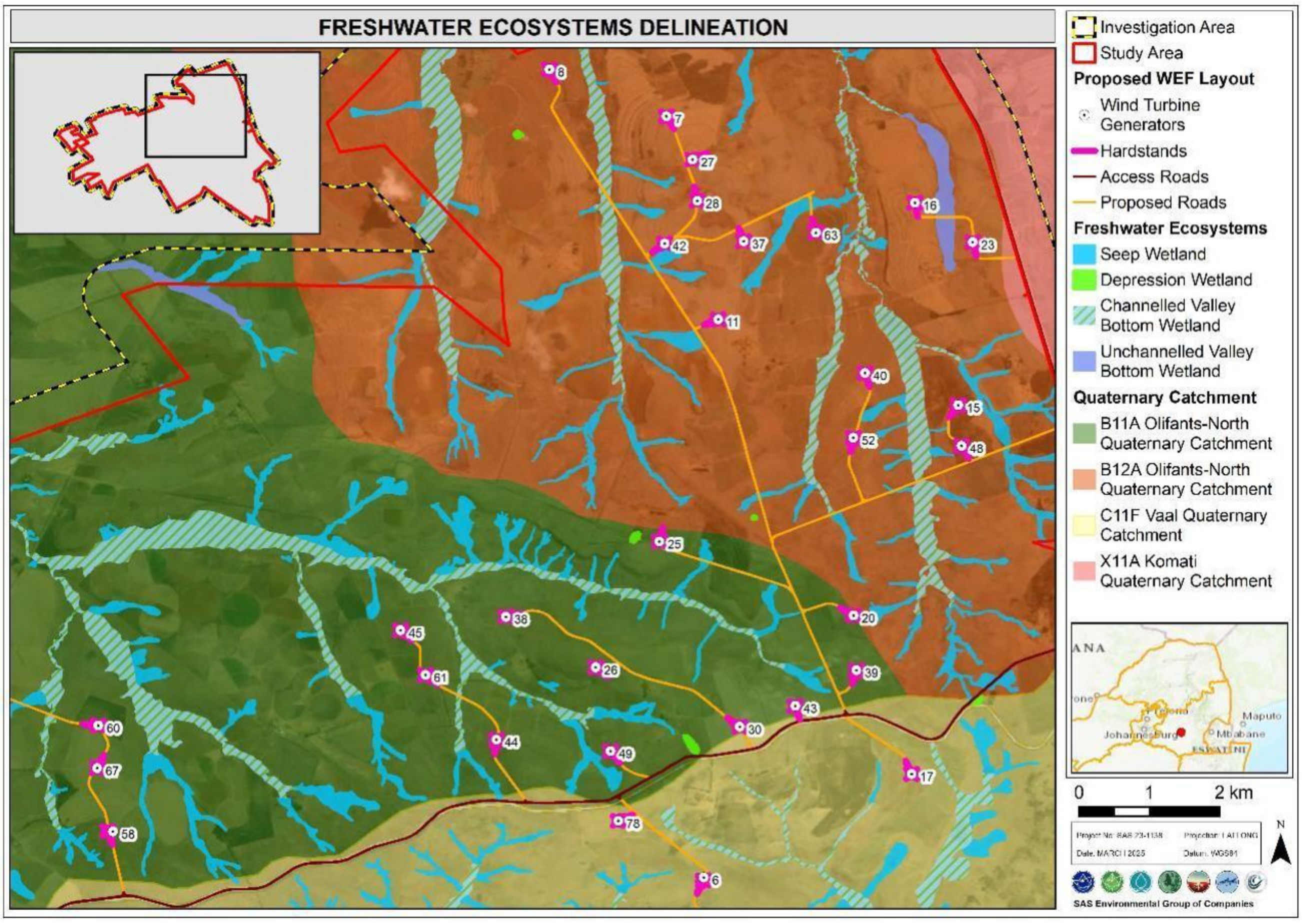


Figure 7-10 - Delineated freshwater ecosystems associated with the B12A quaternary catchment within the study and investigation areas.

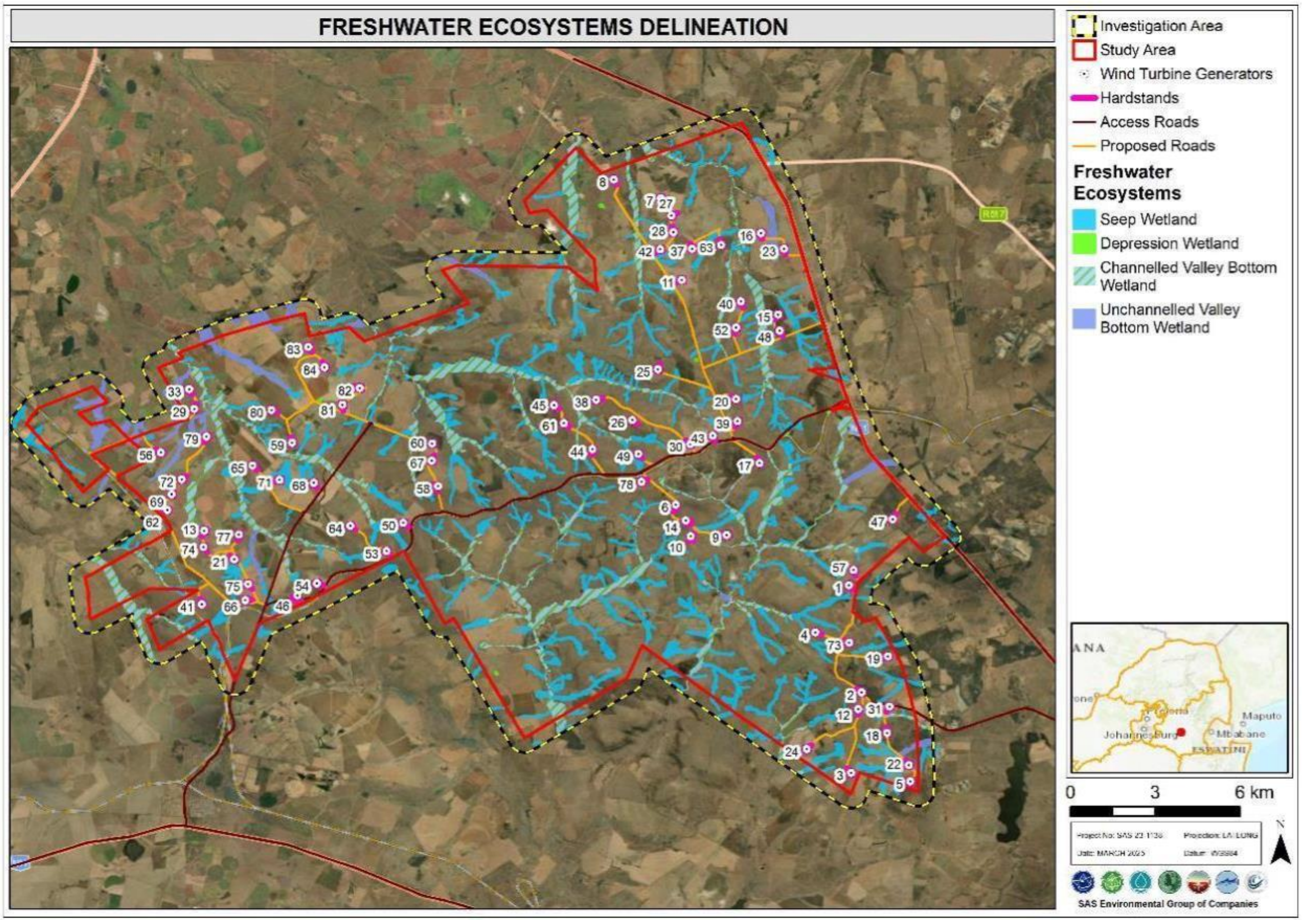


Figure 7-11 - Delineated freshwater ecosystems associated with the B11A quaternary catchment within the study and investigation areas.

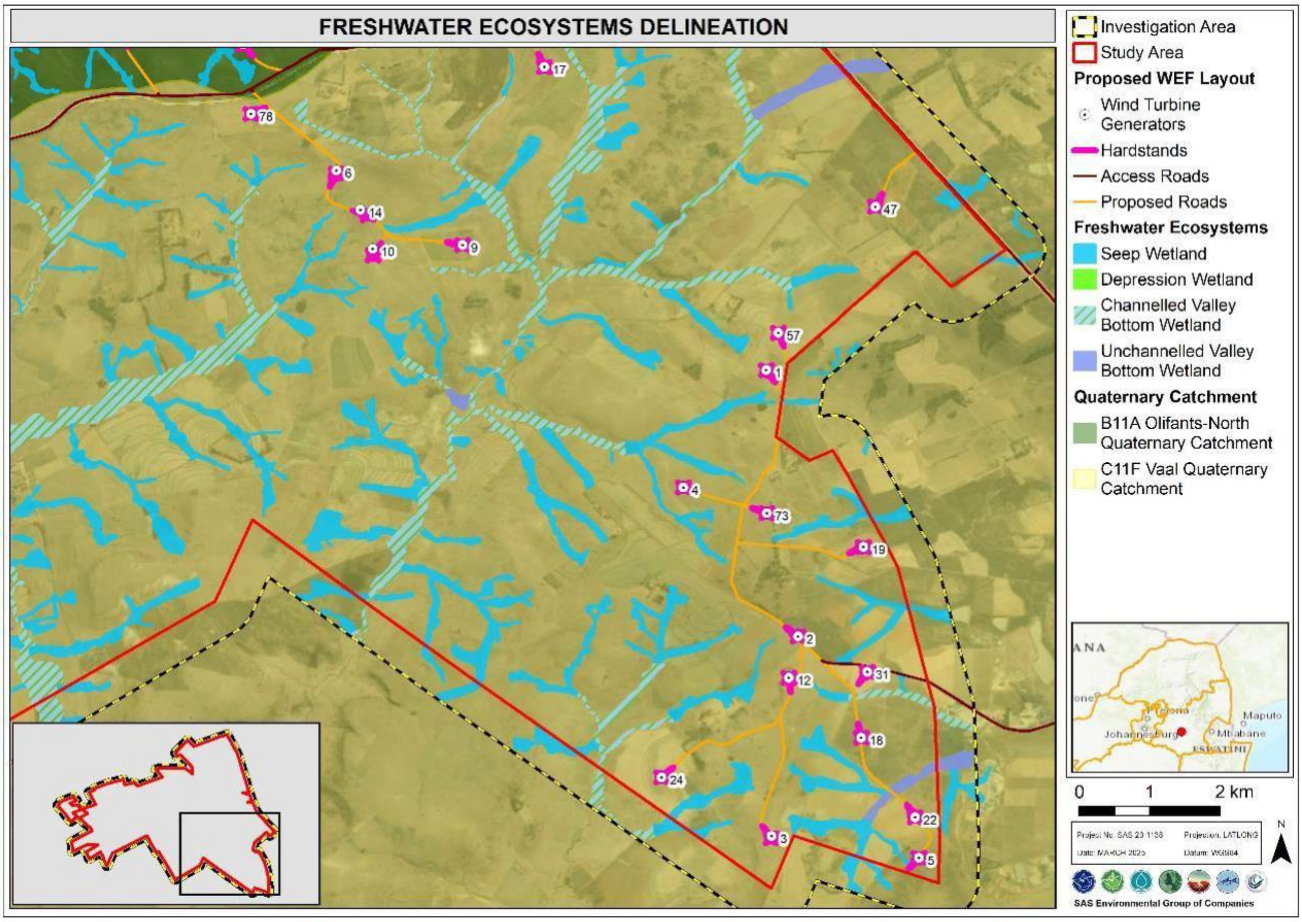


Figure 7-12 - Delineated freshwater ecosystems associated with the C11F quaternary catchment within the study and investigation areas.

It is important to note the following:

- All activities associated with the construction or upgrading of proposed infrastructure that are located within / or would directly affect wetlands would pose a 'Medium' risk significance to the freshwater ecosystems.
- All other activities associated with a 'Low' risk significance.
- The freshwater related sensitivities of the study area as outlined in the scoping phase freshwater assessment have been adequately considered in the latest iteration of the development layout - all proposed turbine locations except two have avoided placement within any freshwater ecosystem or associated 15m non-development buffer.
- Certain new access roads cross wetlands, and mitigation measures in terms of design and construction have been made to minimise the potential impact.
- A recommendation has been made that these two wind turbines (WTG 5 and 42) be relocated outside of the wetlands and their associated buffer. It can be ocnfirmed that WTG 5 has already been moved. WTG 42 is in the process of being micro-sited.
- In addition, a road realignment recommendation has been made to avoid the unnecessary impacting of another seep wetland.

- As the current layout does not indicate the position of proposed underground cabling, and other construction and operation infrastructure such as Battery Energy Storage Systems (BESS) infrastructure, the finalised position of this infrastructure as well as of turbine locations and proposed roads must be assessed as part of a walkdown assessment of this infrastructure by a freshwater specialist.
- Provided these recommendations, and the outcomes of the walkdown assessment are actioned, the WEF development can be authorised

7.2 BIOLOGICAL ENVIRONMENT

7.2.1 TERRESTRIAL VEGETATION

The study area is located in the Grassland Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Eastern Highveld Grassland and Soweto Highveld Grassland are the dominant vegetation types across the study area.

The regional study area is located in the Grassland Biome, which covers approximately 28% of South Africa and is the dominant biome of the central plateau and inland areas of the eastern subcontinent (SANBI, 2013). Grasslands are typically situated in moist, summer rainfall regions that experience between 400 mm and 2000 mm of rainfall per year. Vegetation consists of a dominant field-layer comprising grasses and herbaceous perennials, with little-to-no woody plants present.

South Africa's grassland ecosystems are parsed into five groups, with the study area located in the Mesic Highveld Grasslands group (SANBI 2013). Mesic Highveld Grasslands occur at mid-altitudes and experience warm, wet summers (MAP 700-1200 mm) and cold winters. They are typically highly productive sourveld grasslands that are dominated by long-lived perennial grasses (SANBI, 2013).

Fire is common in Mesic Highveld Grasslands and maintains these ecosystems in a relatively treeless form (SANBI, 2013). Apart from their importance as rich stores of biodiversity, grasslands are critically important water production landscapes, constituting about half of South Africa's Strategic Water Source Areas (SANBI, 2013).

The study area is located in the Eastern Highveld Grassland and Soweto Highveld Grassland vegetation types – shown in **Figure 7-13.** According to the NEMBA Threatened Ecosystems (2021), both vegetation types are threatened; Eastern Highveld Grassland is listed as Endangered and Soweto Highveld Grassland is listed as Vulnerable (**Figure 7-14**).

7.2.1.1 Eastern Highveld Grassland

Eastern Highveld Grasslands extend from Johannesburg in the east through to Bethel, Ermelo and Piet Retief in the west. This vegetation type is found on slightly- to moderately undulating plains, low hills and wetland depressions. Grasses are typical Highveld species from the genera Aristida, Digitaria, Eragrostis and Tristachya. Indigenous woody species are mainly restricted to rocky areas and include *Celtis africana, Protea caffra, Protea welwitschii, Diospyros lycioides, Searsia magalismontana* and *Senegalia caffra* (Mucina & Rutherford, 2011).

Eastern Highveld Grassland is listed as Endangered, and is subject to high rates of habitat loss as a result of cultivation, forestry, mines, urbanisation and the building of dams (Mucina & Rutherford, 2011). Estimates suggest that up to approximately 70% of the original extent of Eastern Highveld Grassland has been transformed. Only a very small fraction is conserved in statutory reserves (e.g., Nooitgedacht Dam and Jericho Dam Nature Reserves) (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) note the following species, amongst several others, as important taxa in Eastern Highveld Grassland:

- Shrubs: *Anthospermum rigidum* and *Seriphium plumosum*.
- Graminoides: *Aristida aequiglumis, Aristida congesta, Aristida junciformis, Cynodon dactylon, Digitaria monodactyla, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Eragrostis racemosa, Heteropogon contortus, Loudetia simplex, Setaria sphacelata, Sporobolus africanus, Themeda triandra, Alloteropsis semialata* and *Monocymbium ceresiiforme*.
- Herbs: *Berkheya setifera, Haplocarpha scaposa, Euryops gilfillanii, Euryops transvaalensis, Justicia anagalloides, Acalypha angusta, Chamaecrista mimosoides, Dicoma anomala, Kohautia amatymbica, Lactuca inermis, Gladiolus crassifolius, Haemanthus humilis* and *Selago densiflora*.
- Endemic Taxa: The geophytic herbs *Agapanthus inapertus, Eucomis vandermerwei* and the succulent herb *Huernia insigniflora* are endemic to this region.

7.2.1.2 Soweto Highveld Grassland

Soweto Highveld Grassland extends in a broad band between Johannesburg and Ermelo in the north, and Perdekop and the Vaal River in the south (Mucina & Rutherford, 2011). Vegetation is characterised by short to medium-high density tufted grassland, occurring on gently- to moderately undulating plains (Mucina & Rutherford, 2011). Grasslands are typically dominated by *Themeda triandra* along with several other co-dominant species. These grasslands are interrupted by small wetlands and rocky ridges and outcrops (Mucina & Rutherford, 2011).

Cultivation, urbanisation, road infrastructure and mining have similarly resulted in the transformation of more than half of the original extent of Soweto Highveld Grasslands (Mucina & Rutherford, 2011). Only a few patches are conserved in formal protected areas, such as Waldrift Nature Reserve, Krugersdorp Nature Reserve, Leeuwkuil Nature Reserve and Suikerbosrand Nature Reserve. This vegetation type is therefore listed as Vulnerable, according to the NEMBA Threatened Ecosystems (2021).

The mean annual precipitation (MAP) of the region is 662 mm. Rainfall occurs in the summer, with winters being typically cold and dry (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) list the following flora species as being important or characteristic taxa in the Soweto Highveld Grassland vegetation type, amongst others:

- Graminoids: *Themeda triandra, Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Cynodon dactylon, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Heteropogon contortus, Hyparrhenia hirta, Setaria sphacelata, Aristida junciformis, Aristida congesta, Aristida bipartita* and *Paspalum dilatatum*.
- Herbs: *Hermannia depressa, Euryops gilfillanii, Geigeria aspera, Graderia subintegra, Haplocarpha scaposa, Helichrysum rugulosum, Helichrysum nudifolium, Lippia scaberrima, Senecio coronatus, Vernonia oligocephala* and *Wahlenbergia undulata*.
- Shrubs: *Anthospermum hispidulum, Anthospermum rigidum, Berkheya annectens, Felicia muricata* and *Ziziphus zeyheriana.*

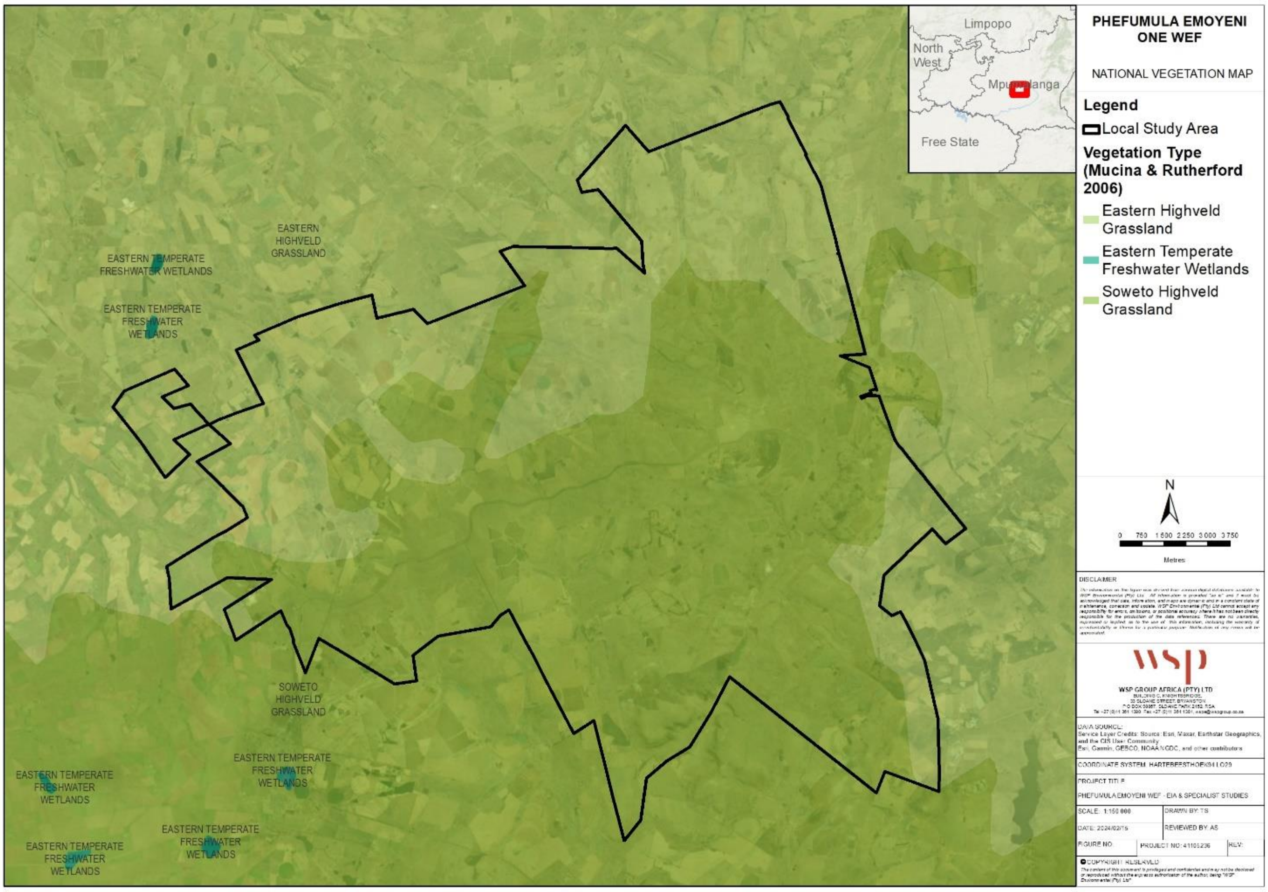


Figure 7-13 - Regional vegetation types associated with the study area.

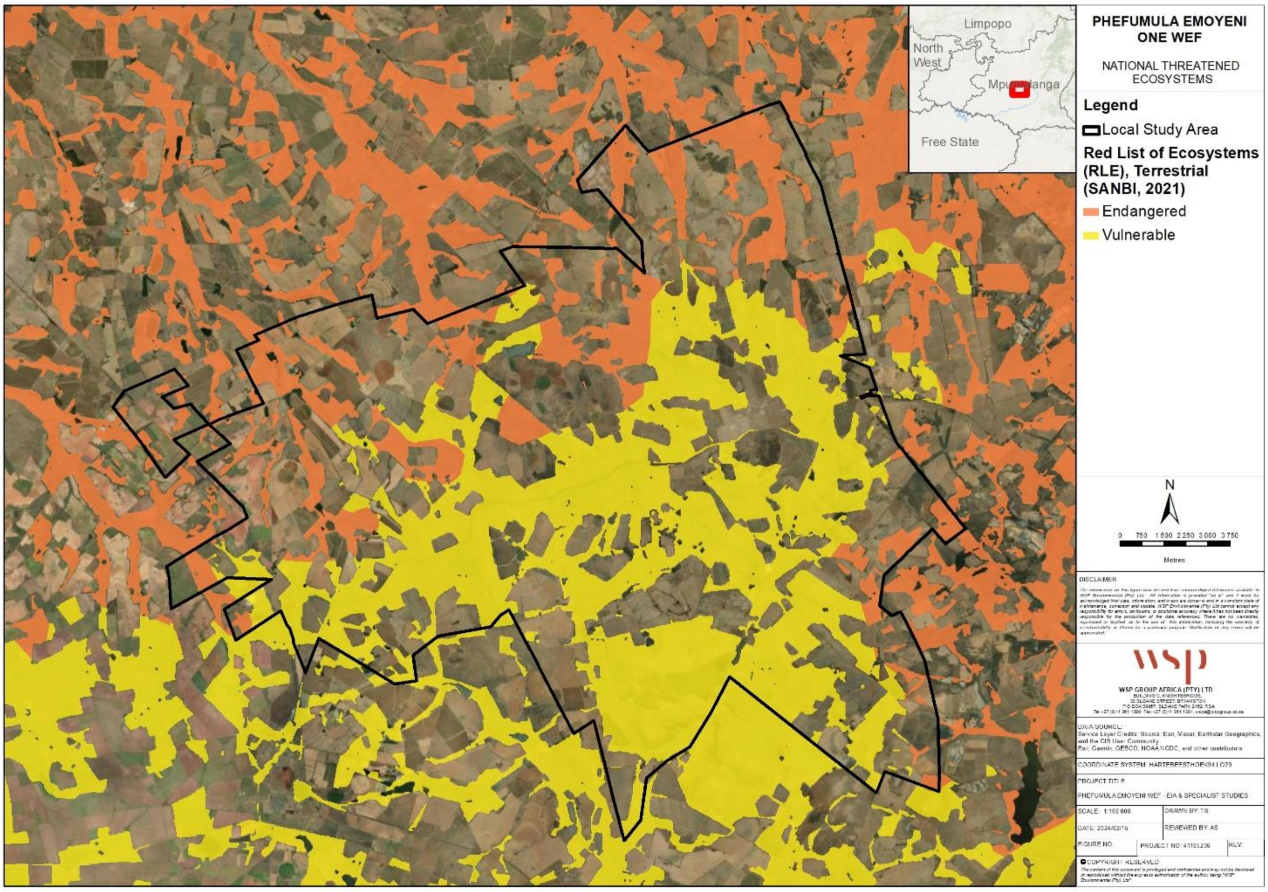


Figure 7-14 - Study area in relation to delineations of the National Red List of terrestrial ecosystems.

7.2.1.3 Flora Species of Conservation Concern

No flora species listed as threatened or Near Threatened on the national Red List were recorded in the study area during the field survey. However, *Kniphofia ensifolia* subsp. *ensifolia,* which is listed as Near Threatened on the Mpumalanga Red List, was recorded in the study area. Based on reviewed literature and data sources, 11 flora species that occur, or potentially occur in the study area are listed as Threatened or Near Threatened on the national and/or provincial Red Lists. These are listed in **Table 7-2**.

Several flora species that are listed as Protected at a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) were recorded in the study area during the field survey, including *Aloe ecklonis, Boophone disticha, Crinum bulbispermum, Gladiolus crassifolius, Gladiolus longicollis* subsp. *platypetalus, Gladiolus sericeovillosus* subsp. *calvatus* and *Haemanthus humilis*.

Flora species that are listed as Protected (and Specially Protected) under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) require specific conservation management, i.e., that cannot be cleared or picked without a permit from the provincial authority. No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the study area.

For additional information on flora SCC occurring/potentially occurring in the study area, including habitat preferences and a 'probability of occurrence' based on habitat suitability assessments, refer to the Plant Species Specialist Assessment Report for the proposed Project.

Table 7-2 - Threatened flora species occurring or potentially occurring in the study area

Family	Scientific Name#	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status
Aizoaceae	*Khadia carolinensis*	Vulnerable	Vulnerable	-
Apocynaceae	*Aspidoglossum xanthosphaerum*	Vulnerable	Vulnerable	-
Apocynaceae	*Miraglossum davyi*	Vulnerable	Vulnerable	-
Apocynaceae	*Pachycarpus suaveolens*	Vulnerable	Vulnerable	-
Asphodelaceae	*Kniphofia ensifolia* subsp. *ensifolia*	Least Concern	Near Threatened	Protected
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected
Orchidaceae	*Eulophia cooperi*	Least Concern	Rare	Protected
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected
-	Sensitive species 41	Vulnerable	Vulnerable	Protected
-	Sensitive species 691	Vulnerable	Near Threatened	-
-	Sensitive species 851	Vulnerable	-	-
-	Sensitive species 1200	Endangered	Endangered	-
#The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', *as* per the species assessment guidelines (SANBI, 2020).				

7.2.2 TERRESTRIAL CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

The MBSP technical report (Lotter, 2015) defines five categories of conservation focus; protected areas, CBA, ESA, other natural areas, and modified habitats. Definitions for each are listed below:

- **Protected Areas**: protected areas recognised in terms of the National Environmental Management Protected Areas Act, No. 57 of 2003, that are currently considered to meet biodiversity targets in the MBSP.
- **Critical Biodiversity Area**: areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition. The MBSP recognises two CBA ranks, viz, CBA Irreplaceable and CBA Optimal (these are alternatively referred to as CBA 1 and CBA 2, respectively).
- **Ecological Support Area:** play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. They need to be maintained in at least an ecologically functional state, but some limited habitat loss may be acceptable.
- **Other Natural Areas:** often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning, and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP.
- **Modified:** often referred to as transformed, these areas have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure.

Figure 7-15 shows the study area in relation to the delineations of the MBSP (2022). It is evident that large tracts of natural habitat in the study area, particularly in the south, are delineated as CBA Irreplaceable (CBA 1), while many other patches of habitat are delineated as CBA Optimal (CBA 2). Although less extensive than CBA land, other patches of habitat in the study area are delineated as ESA Local Corridor, ESA Landscape Corridor, and Other Natural Areas.

The continued integrity and protection of these CBAs is required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. The presence of CBA Irreplaceable and CBA Optimal land in the study area is therefore a concern with respects to terrestrial biodiversity management. As per the MBSP, development in CBA areas should be avoided. It is therefore recommended that no proposed Project infrastructure should be sited on land designated CBA Irreplaceable and to limit the infrastructure within CBA Optimal areas.

With respects to ESA areas, a greater range of land uses is permissible in such areas, including the development of turbines (under certain conditions). However, the functional state of these areas should not be compromised by proposed Project infrastructure or activities.

Land designated as ‘Other Natural Areas’ are not required to meet biodiversity targets, and turbine development in these areas is permissible.

The statuses of the various CBA designated habitat patches in the study area are predicated on a combination of the following features, as per data received from the MPTA (M. Lötter):

- Eastern Highveld Grassland;
- Soweto Highveld Grassland;
- Mesic Highveld Grassland– Groups 1-3;
- Intact grassland patches;

- Several fauna species:
  - Giant bullfrog (*Pyxicephalus adspersus*);
  - Blue Korhaan (*Eupodotis caerulescens*);
  - Rudd's Lark (*Hateromirafra ruddi*);
  - Botha's Lark *(Spizocorys fringillaris*);
  - White-bellied Korhaan (*Eupodotis senegalensis*);
  - African Grass Owl (*Tyto capensis*);
  - Oribi (*Ourebia ourebi ourebi*);
- Climate change land facets;
- Macro-corridor;
- Critical linkages;
- Three flora species:
  - *Aspidoglossum xanthosphaerum;*
  - *Khadia carolinensis;*
  - *Brachycorythis conica subsp. transvaalensis*; and
- Core and supporting corridors.

The field survey indicated that CBA land in the study area mostly comprises large intact patches of natural dry- and moist grassland and shrubland habitat. Aerial imagery indicates that certain small patches designated as CBA have actually been altered by farming activities, and are currently cultivated or characterised by old lands. Excluding these small modified patches, the remaining extensive tracts of CBA land in the study area are important and functional natural habitat. The continued integrity and protection of these CBAs is crucial to meet conservation targets for biodiversity pattern (species and ecosystems) and ecological processes. The presence of CBA Irreplaceable and CBA Optimal land in the study area is therefore a concern with respects to terrestrial biodiversity management. As per the MBSP, development in CBA areas should be avoided. It is therefore recommended that, as far as possible, no proposed Project infrastructure should be sited on land designated CBA Irreplaceable and CBA Optimal.

With respects to ESA areas, a greater range of land uses is permissible in such areas, including the development of turbines (under certain conditions). However, the functional state of these areas should not be compromised by proposed Project infrastructure or activities. Proposed Project infrastructure should therefore also ideally not impact designated ESA. Land designated as 'Other Natural Areas' are not required to meet biodiversity targets, and turbine development in these areas is permissible.

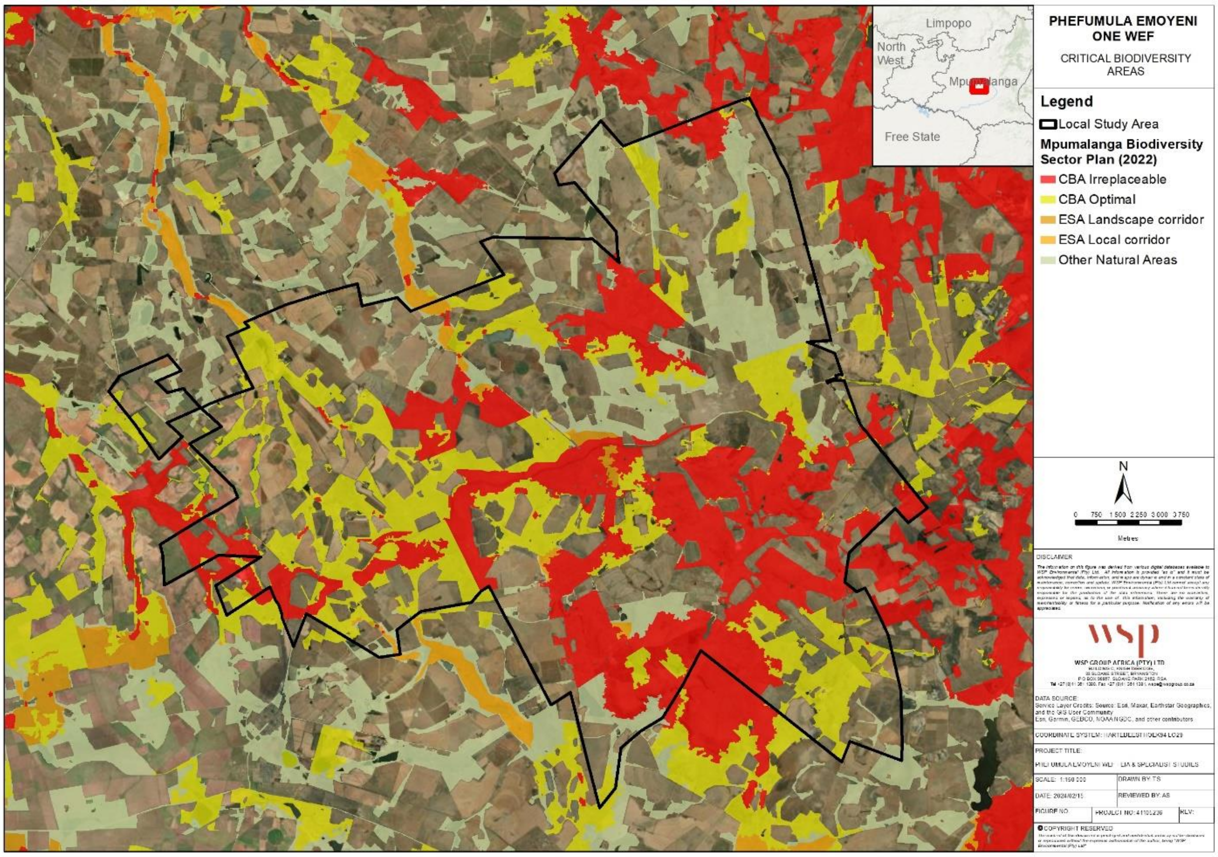


Figure 7-15 - Study area in relation to the delineations of the Mpumalanga Biodiversity Sector Plan (2022)

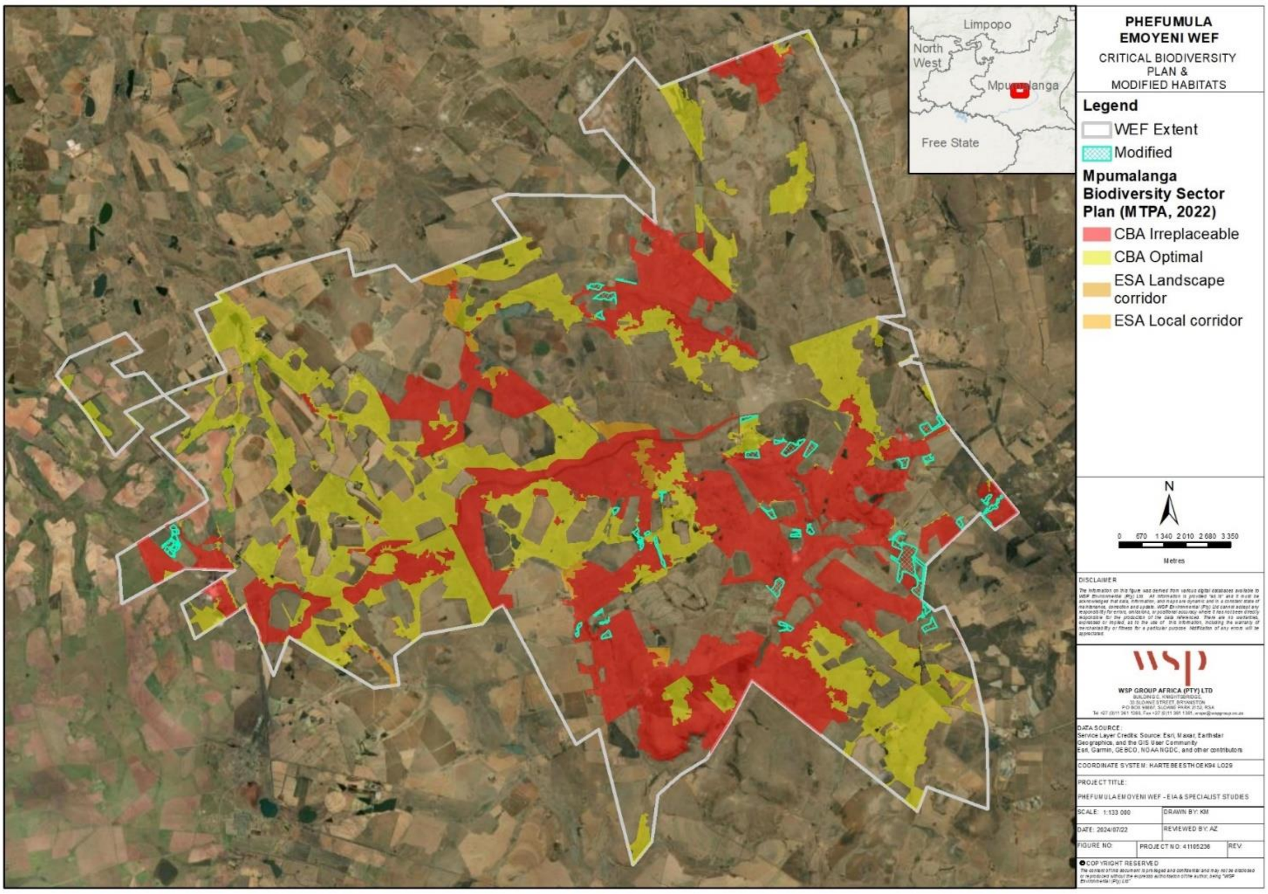


Figure 7-16 - Patches of CBA land that are actually modified and characterised by cultivation or old lands

7.2.2.1 Priority Focus Areas for Protected Area Expansion

Priority Focus Areas for protected area expansion are large, intact and unfragmented areas of high biodiversity importance, that are suitable for the creation/expansion of protected areas (Driver, et al., 2012). Land-use planning and decision making should avoid fragmenting Priority Focus Areas, to prevent such areas from being excluded from future protected area expansion. (Driver, et al., 2012).

According to the National Protected Area Expansion Strategy (2018), large portions of habitat in the study area have been mapped as Priority Focus Areas for protected area expansion (**Figure 7-17**). Similarly, the delineations presented in the Mpumalanga Protected Area Expansion – 20 Year Plan indicate that large portions of the study area are designated as Priority 2 and Priority 3 areas for protected area expansion**.**

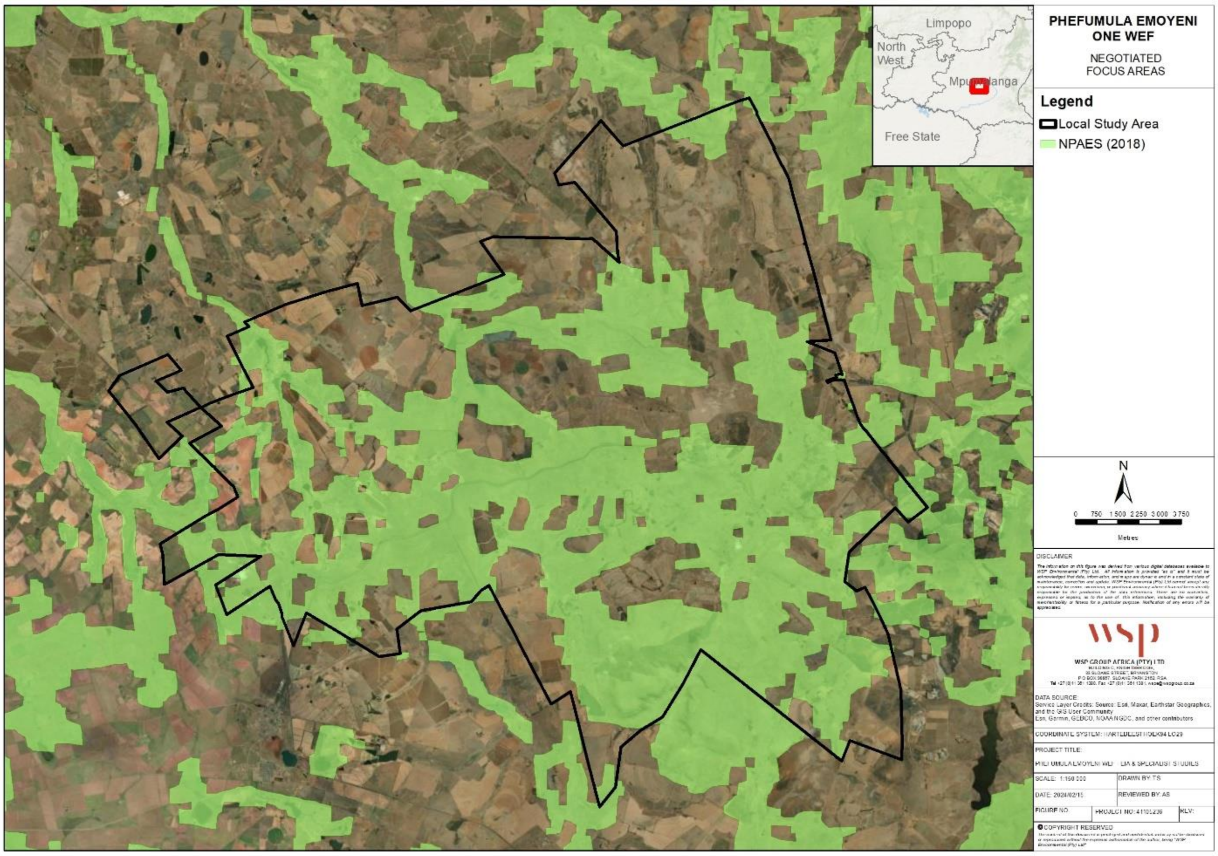


Figure 7-17 - Study area in relation to the delineation of the National Protected Area Expansion Strategy (2018)

7.2.2.2 Freshwater Ecosystem Priority Area Sub-Catchment

Freshwater Ecosystem Priority Areas (FEPA) are rivers and wetlands required to meet biodiversity targets for freshwater ecosystems. Essentially, these areas were identified at a national level as priority areas for conserving freshwater ecosystems and supporting the sustainable use of water resources, as well as upstream catchment management areas (Driver et al., 2012).

According to the mapping of FEPAs, the central/southern portion of the study area is located in a FEPA, while the far south of the study area is designated as an Upstream Management Area. The FEPA also extends along the eastern boundary of the study area, as shown in **Figure 7-18.**

According to Driver et al. (2012), FEPAs should be maintained in a natural/near natural condition, and anthropogenic activities in Upstream Management Areas should be carefully managed to prevent degradation of downstream FEPAs.

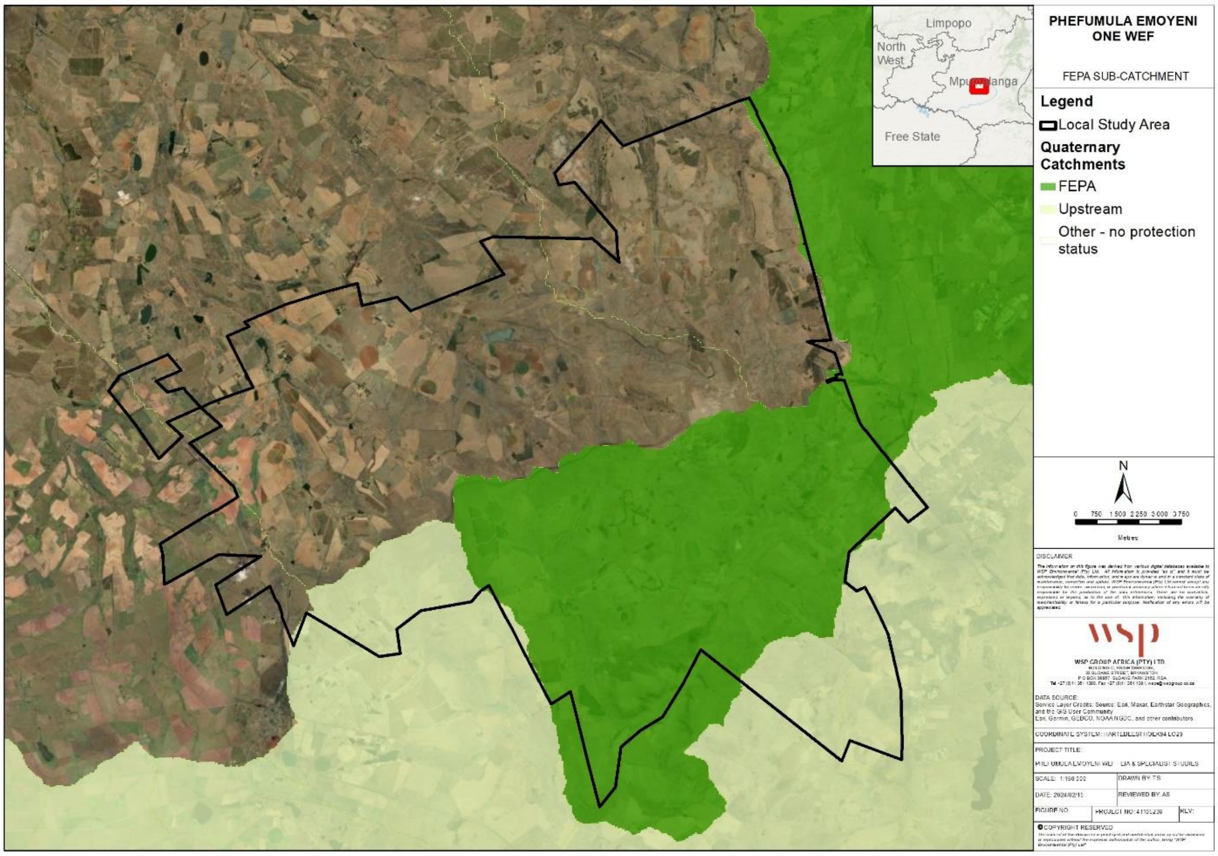


Figure 7-18 - Study area in relation to Freshwater Ecosystem Priority Areas.

7.2.2.3 Indigenous Forests

No indigenous forest habitat occurs within the study area. The study area is dominated by cultivated fields and tracts of natural grassland and wetland habitat.

7.2.2.4 Protected Areas and Conservation Areas

The study area is not located within or in close proximity to a protected area. The closest include:

- Rietvlei Private Nature Reserve, which is located to the south of the N17 national road, approximately 12 km south of the study area;
- Ahlers Private Nature Reserve, which is located approximately 14 km south-east of the study area.

Chrissiesmeer Protected Environment is another important conservation area that was noted in the surrounding landscape. This protected environment was established in 2014 and covers a large, albeit fragmented area, approximately 23 km east of the study area. It is forms crucial habitat for several threatened bird species, and encompasses the Chrissie Pans Important Bird Area.

7.2.2.5 Habitat Units in the Study Area

Based on data collected during the field survey, six primary habitat units were identified in the study area. These include three units regarded as natural habitat, and three units regarded as modified habitats:

- Natural Habitats
  - Mixed Dry Grassland;
  - Rocky Shrubland;
  - Moist Grassland;
- Modified Habitats
  - Old Lands;
  - Cultivated Fields; and
  - Alien Tree Plantations.

Habitat units are described in the Terrestrial Biodiversity Impact Assessment Report included in **Appendix G-3**. A habitat unit map for the study area is shown in **Figure 7-19**. It must be noted that the study area is an active agricultural landscape, and subject to ongoing farming activity/disturbances. The temporal and spatial character of Cultivated Fields and Old Lands, is thus often changing.

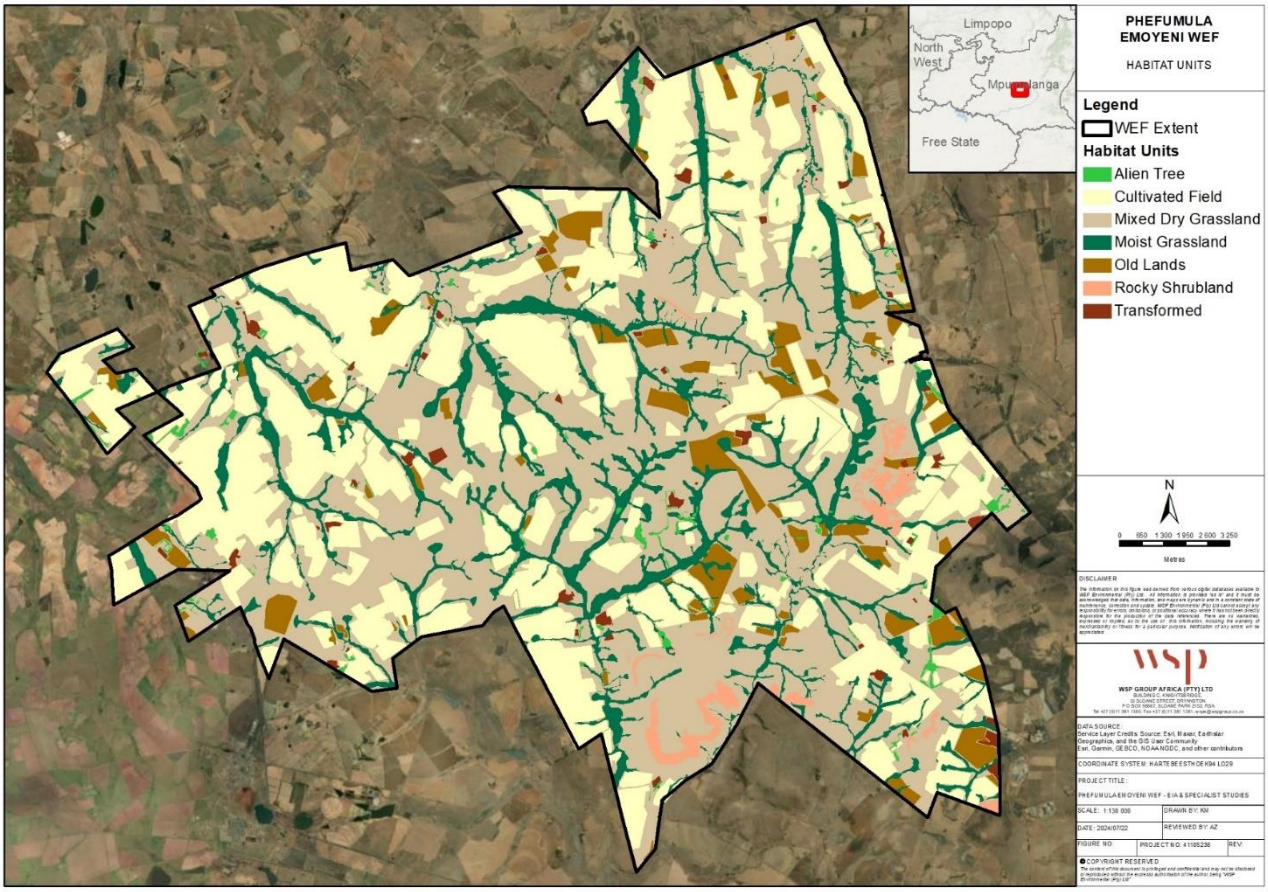


Figure 7-19 - Habitat unit map of the study area

7.2.3 TERRESTRIAL FAUNA SPECIES

7.2.3.1 Mammals

Reviewed literature indicates that up to 27 mammal species that are known to occur in the region in which the study area is located, and thus potentially in the study area, are of conservation concern. Of these, 19 taxa are listed as threatened/Near Threatened on the regional Red List (Child, et al., 2016), 14 taxa are listed on the NEMBA ToPS list (2007), and 21 taxa are listed as either threatened or protected at a provincial level. For a list of fauna SCC that potentially occur in the study area, based on literature and datasets, refer to Appendix C of the Terrestrial Fauna Impact Assessment Report (**Appendix G.3**).

It is expected that several mammal SCC are likely to be fairly common in the study area, including: Serval (*Leptailurus serval*) – Near Threatened; Cape Clawless Otter (*Aonyx capensis*) - Near Threatened; and Aardvark (*Orycteropus afer*) - Protected (MP). These taxa, amongst others, may be impacted by the proposed Project. Refer to Appendix C of the Terrestrial Fauna Impact Assessment Report (**Appendix G.3**).

7.2.3.2 Birds

Reviewed literature indicates that about 22 bird SCC that are known to occur in the region in which the study area is located. These include 20 species listed as Threatened/Near Threatened on the regional Red List (Taylor, et al., 2015), 10 species listed on the NEMBA ToPS list (2007), and 22 species are listed as either threatened or protected at a provincial level. Refer to the avifauna specialist report for more information (**Appendix G.4**)

7.2.3.3 Herpetofauna

Based on distribution records, six reptile species of conservation concern potentially occur in the study area. These are all listed on the Mpumalanga Red List. None of these are listed as threatened/Near Threatened on the regional Red List. One amphibian of conservation concern, namely the Giant Bullfrog (*Pyxicephlaus adspersus*) potentially occurs in the study area. This is also not listed as threatened on the regional Red List. It is, however, listed as Protected on the NEMBA ToPS list (2007) and according to the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). For a list of fauna SCC that potentially occur in the study area, based on literature and datasets, refer to Appendix D of the Terrestrial Fauna Impact Assessment Report (**Appendix G.3**). It is possible that herpetofauna SCC, including the Giant Bullfrog, occur in the study area and may be impacted by the proposed Project.

7.2.3.4 Invertebrates

Three invertebrate species of conservation concern potentially occur in the study area. These are The Potchefstroom Blue (*Lepidochrysops procera*) – Rare, Roodepoort Copper (*Aloeides dentatis maseruna*) – Rare (MP) and the Marsh Sylph (*Metisella meninx*) – Near Threatened. It is possible that these SCC occur in the study area and may be impacted by the proposed Project.

7.2.3.5 Fauna Species of Conservation Concern

This section presents a summary discussion on fauna SCC taken from the Animal Species Specialist Assessment Report. For additional information on fauna SCC occurring and potentially occurring in the study area, refer to the Animal Species Specialist Assessment Report (**Appendix G.3**).

The large and intact patches of natural habitat in the study area provide important life-cycle habitat for a diverse fauna community, that includes numerous fauna SCC. During the field survey, several fauna SCC were documented in the study area, including the following:

- Four mammal species of conservation concern:
  - Serval (*Leptailurus serval*) - Near Threatened;
  - Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) - Endangered;
  - Cape Clawless Otter (*Aonyx capensis*) - Near Threatened;
  - Swamp Musk Shrew (*Crocidura mariquensis*) - Near Threatened; and
- Six bird species of conservation concern (refer to the Avifauna Specialist Study for additional detailed information on bird SCC):
  - Blue Crane (*Anthropoides paradiseus*) - Near Threatened;
  - Lesser Flamingo (*Phoeniconaias minor*) - Near Threatened;
  - Greater Flamingo (*Phoenicoperus roseus*)- Near Threatened;
  - Southern Bald Ibis (*Geronticus calvus*) - Vulnerable;
  - Yellow-billed Stork (*Mycteria ibis*) - Endangered; and
  - Blue Korhaan (*Eupodotis caerulescens*) - Vulnerable (NEMBA ToPS, 2007).

Habitat suitability assessments conducted for the Animal Species Specialist Assessment also indicate that several additional fauna SCC possibly/probably occur in the study area, and therefore may potentially be impacted by proposed Project activities. It is noted that the observed fauna SCC are associated with grassland and wetland-type habitats in the study area, and the integrity and connectivity of these habitat patches is important to maintaining local metapopulation dynamics and the continued persistence of on-site fauna SCC.

7.2.4 HABITATS AND LANDCOVER

According to GeoTerra Land Cover Imagery (2020) of the study area indicates that large patches of the study area comprise cultivated land. These areas are likely to be either actively cultivated and therefore denuded of natural vegetation or lying fallow (old lands) and dominated by secondary vegetation dominated by ruderal, pioneer indigenous and alien flora species.

Outside of cultivated land, the majority of the study area consists of open grassland habitat (as shown in **Figure 7-20)** and wetland habitats (delineated in **Figure 7-21**). These habitats provide important habitat for local flora and fauna, which includes various species of conservation concern.

Aerial imagery also indicates the presence of stands of wooded habitat in the study area. These are likely to be stands of alien invasive species, such *Acacia dealbata* and *Acacia mearnsii*, both of which are aggressive invaders that are listed under NEMBA Category 2.

Livestock farming with cattle, sheep/goats is likely to be a common land use in the study area. It is thus likely that certain patches of natural grassland have been heavily grazed and possibly over-grazed, which may have affected the floristic composition of these habitats.

The study area is also criss-crossed by numerous formal and inform farm roads and tracks. These have caused fragmentation of remaining patches of natural habitat, which has impacted habitat connectivity and the ability of flora and fauna to disperse/move across the landscape.

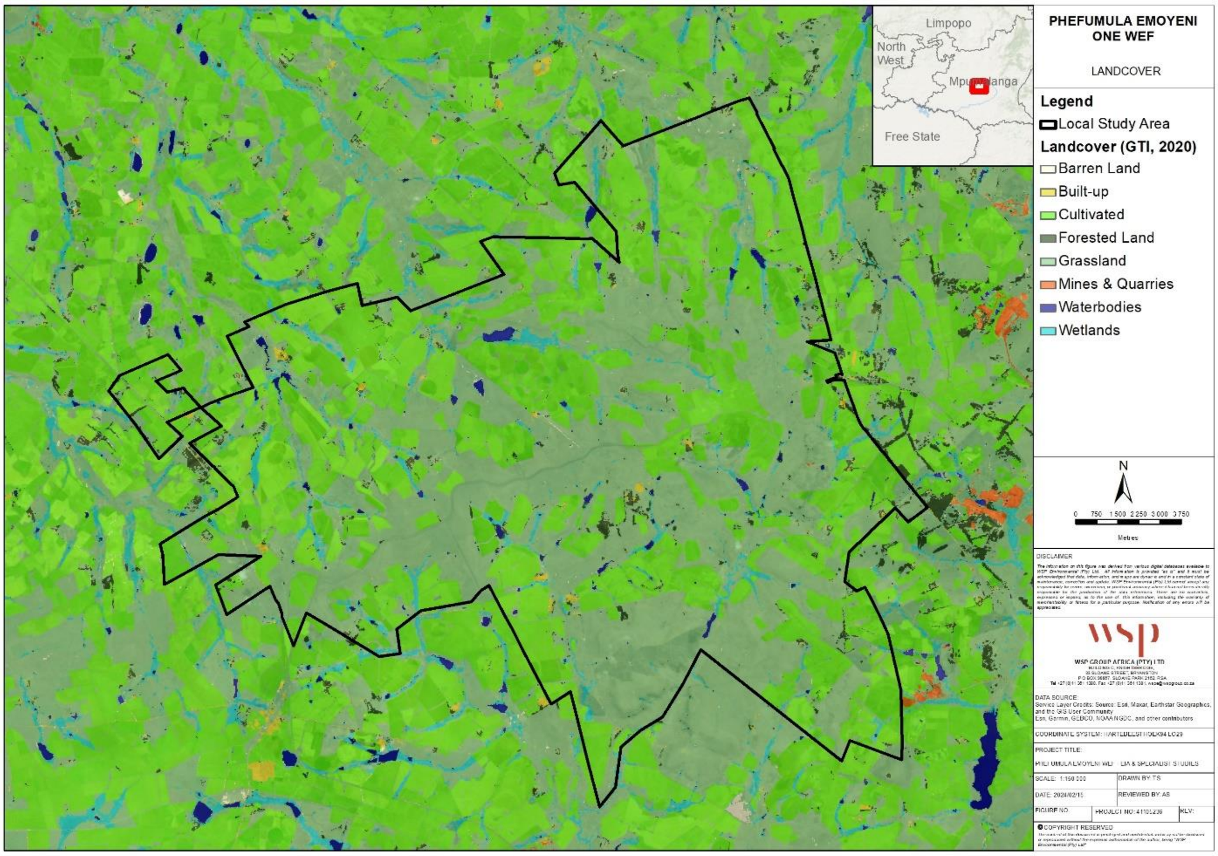


Figure 7-20 - Landcover associated with the study area and surrounding landscape.

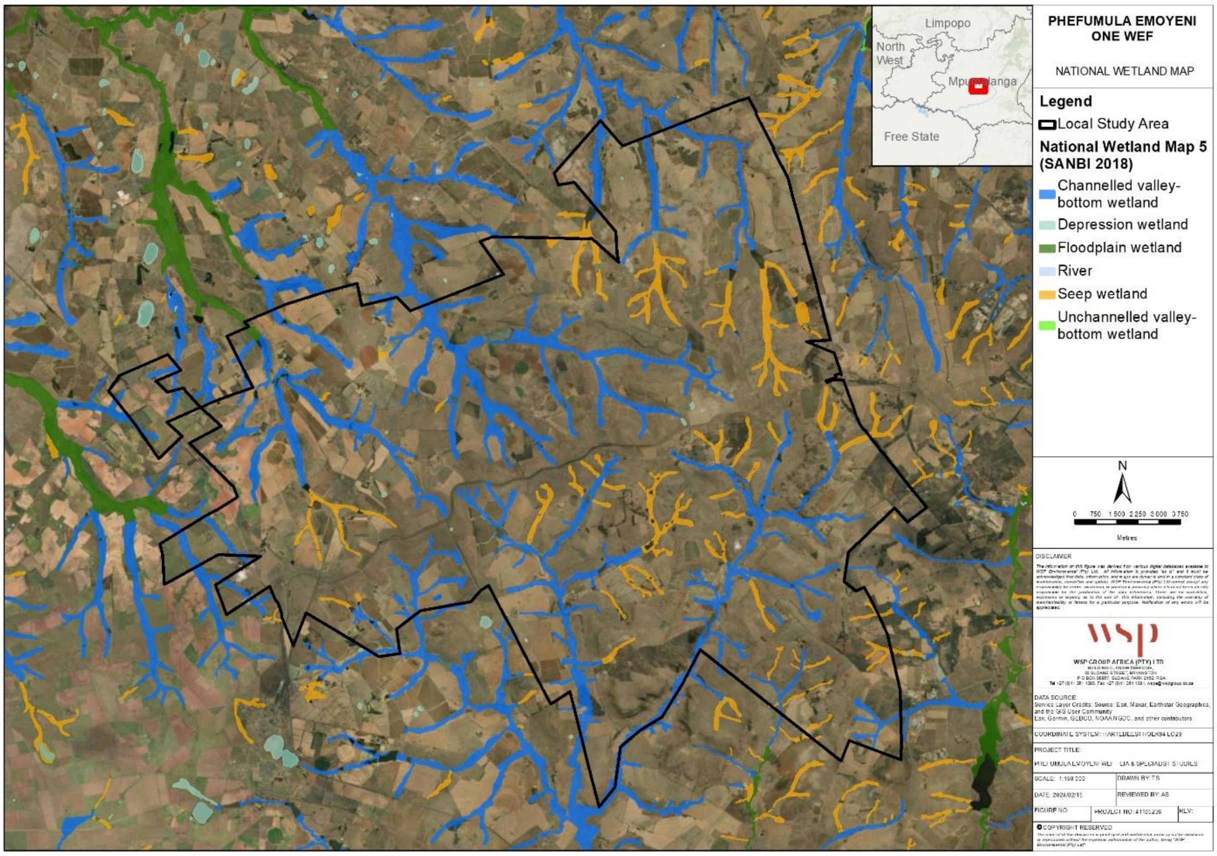


Figure 7-21 - Wetland in the study area, as per SANBI (2018)

7.2.5 BATS

Bat species which potentially occur in the study area are listed in the Bat Impact Assessment Report (**Appendix G.5**), together with their current Red List status, and turbine fatality risk (as given in MacEwan et al. 2020a). Of 23 bat species that are listed for the study area, 10 species have a High to Medium occurrence potential, and 13 species have a Low occurrence potential. Among the 10 species most likely to occur, five have a High fatality risk of collision with turbines, and two a Medium–High fatality risk.

The widespread, but High Risk, migratory Natal Long-fingered Bat (*Miniopterus natalensis*) and aerial-feeding Egyptian Free-tailed Bat (*Tadarida aegyptiaca*) and Cape Serotine (*Laephotis capensis*), almost certainly occur in the study area.

The regionally common, Mauritian Tomb Bat (*Taphozous mauritianus*), Egyptian Slit-face Bat (*Nycteris thebaica*) and cavity-roosting Geoffroy's Horseshoe Bat (*Rhinolophus clivosus*) were rated with a Moderate-High potential occurrence. The aerial-feeding Mauritian Tomb Bat (*T. mauritianus*) has a high fatality risk, but the other two lower-flying species have a Low fatality risk.

The regionally prevalent, cavity-roosting Bushveld Horseshoe Bat (*Rhinolophus simulator*) and Temminck's Myotis (*Myotis tricolor*), and the roof-roosting Yellow-bellied House Bat (*Scotophilus dinganii*) were rated with a Medium potential occurrence. The low-flying Bushveld Horseshoe Bat has a Low fatality risk but the higher-flying Temminck's Myotis (*M. tricolor*) and Yellow-bellied House Bat (*S. dinganii*) have a Medium-High fatality risk.

Thirteen species were rated with a Low potential occurrence – but cannot be ruled out at this stage.

Of the 23 listed species, the following five species are regarded by IWS as Species of Conservation Concern (SCC):

- Percival's Short-eared Trident Bat (*Cleotis percivali*): Regionally Red Listed as Endangered (Child et al. 2016).
- Blasius's Horseshoe Bat (*Rhinolophus blasii*): Regionally Red Listed as Near Threatened (Child et al. 2016) and experiencing a global population decline (IUCN 2022-1).
- Sundevall's Leaf-nosed Bat (*Hipposideros caffer*): Currently not Red Listed but experiencing a global population decline (IUCN 2022-1).
- Midas Free-tailed Bat (*Mops midas*): Currently not Red Listed but experiencing a global population decline (IUCN 2022-1).
- Natal Long-fingered Bat (*M. natalensis*): known to roost in large numbers (sometimes hundreds or thousands of individuals) and to migrate hundreds of kilometres (Miller-Butterworth et al. 2003; Kearney et al. 2016; MacEwan et al. 2016).
- Except for the widespread Natal Long-fingered Bat (*M. natalensis*), the potential occurrence of the five most conservation important bat species is regarded as Low.

7.2.5.1 Sensitive bat areas

High Bat Sensitive Areas include:

- Isolated locations with natural rock faces, overhangs, cavities, crevices, and/or exfoliating rock, and a 500 m buffer around these, based on the possibility that these may provide roosting habitat for the cave-, cavity- and crevice-roosting bat species that have been listed for the study area, and the minimum 500 m buffer recommendation in the MacEwan et al. (2020a) guidelines for a small roost of Least Concern bats and/or Low fatality risk bats.
- All buildings and a 500m buffer around these, and all ruins and a provisional 500m buffer around these, based on the strong possibility that occupied and abandoned dwellings may provide suitable roosting habitat for certain cavity / roof-roosting bat species, and the minimum 500 m buffer recommendation in the MacEwan et al. (2020a) guidelines for a small roost of Least Concern bats and/or Low fatality risk bats.
- All natural and artificial hydrological features including rivers, dams, pans, and herbaceous wetlands, and a 200 m buffer around these, based on the known importance of surface water resources for bats (Serra-Cobo et al. 2000; Akasaka et al. 2009; Hagen and Sabo 2012; Sirami et al. 2013), and the minimum 200 m buffer recommendation in the best practice guidelines by MacEwan et al. (2020a) for known and potential bat important features.
- Patches of indigenous and exotic woody vegetation, based on the known importance of trees for clutter and clutter-edge foraging, tree-roosting, and fruit-eating bat species. Dense stands of woody vegetation were assigned a 200 m buffer, based on the minimum 200 m buffer recommendation in the best practice guidelines by MacEwan et al. (2020a) for known and potential bat important features.

Medium-High Bat Sensitive Areas include:

- Patches of natural savannah habitat, based on the known importance of trees for clutter and clutter-edge foraging, tree-roosting, and fruit-eating bat species.

- Grassland, based on consideration that the local grassland vegetation types are highly threatened (as described by IWS 2021), and support numerous priority conservation species.
- Fallow and old fields with trees or bushes, based on the afore-mentioned importance of trees.
- Fallow and old fields with disturbed herbaceous wetlands, and a 200 m buffer around these, based on the afore-mentioned importance of hydrological features for bats, and the minimum 200 m buffer recommendation for potential bat important features in the MacEwan et al. (2020a) guidelines.

Medium Bat Sensitive Areas include:

- All irrigated or rain-fed cultivated fields, and bare or grassy fallow and old fields, based on the known concentrated activity of bats over various commercial (especially irrigated) crop types in South Africa (Noer et al. 2012; Taylor et al. 2013; Mtsetfwa et al. 2018).
- Flooded mine pits, based on the possibility that bats may visit these for drinking and/or foraging.

Low Bat Sensitive Areas include:

- Mining, industrial, commercial, road, rail, village, eroded, and barren areas.

7.2.6 AVIFAUNA

The Project Site is located within the Amersfoort-Bethal-Carolina IBA (SA018) and 18km west of the Chrissie Pans IBA (SA019) (**Figure 7-22**).

According to Barnes (1998), the Amersfoort-Bethal-Carolina IBA holds a large proportion (>10%) of the global population of Botha's Lark *Spizocorys fringillaris*, although confirmation is required as to whether this is still the case. This lark generally avoids rocky areas, tall grass in bottomlands, vleis, croplands and planted pastures, but its preferred habitat – short, dense, natural grassland found on plateaus and upper hill slopes – occurs within this IBA. Data regarding the IBA's current species composition is limited, but the grassland areas occasionally hold Denham's Bustard, White-bellied Bustard, Blue Korhaan, African Grass Owl, Buff-streaked Chat, Southern Bald Ibis, Black-winged Pratincole and Secretarybird.

The key species within this IBA is the globally threatened Botha's Lark. Other globally threatened species are Blue Crane, Southern Bald Ibis, Black Harrier, Blue Korhaan, Black-winged Pratincole, Secretarybird, Martial Eagle and Denham's Bustard. Regionally threatened species are African Grass Owl, White-bellied Bustard and Lanner Falcon.

As per communication from BirdLife South Africa (July 2024) it should be noted that IBA's are being replaced by Key Biodiversity Areas (KBA's).

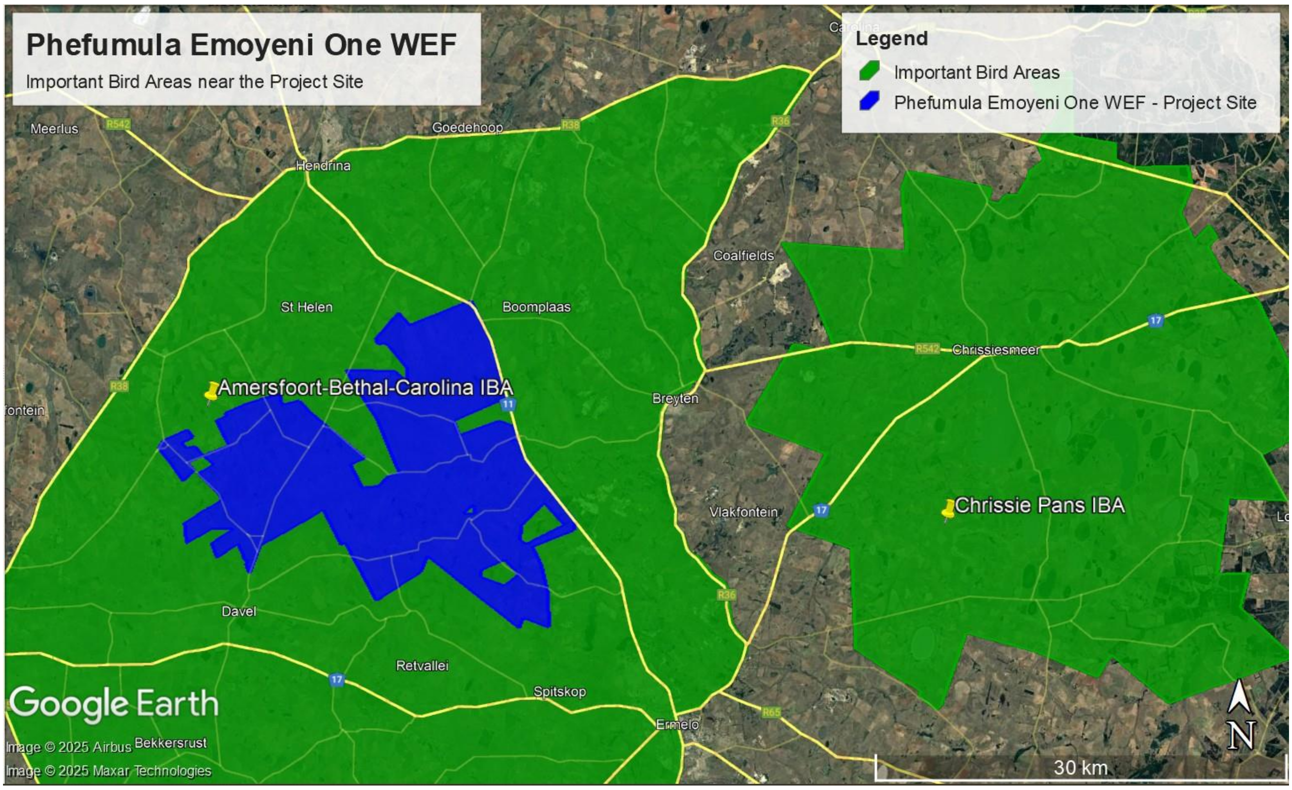


Figure 7-22 - Important Bird Areas near the Project Site.

Key Biodiversity Areas (KBA's) are 'sites that contribute significantly to the global persistence of biodiversity', which means they are the most important places in the world for species and their habitats – whether these be in terrestrial, freshwater, estuarine or marine ecosystem.

The Global Standard for the Identification of Key Biodiversity Areas, published in 2016, sets out internationally agreed scientific criteria for the identification of KBAs worldwide. Sites qualify as global KBAs if they meet the specific standardised criteria and quantitative thresholds focused on one or more of five trigger aspects:

- Threatened biodiversity
- Geographically restricted biodiversity
- Ecological integrity
- Biological processes
- Irreplaceability through quantitative analysis

The Project Site only marginally overlaps with a KBA, namely the Chrissie Pans KBA (KBA ID 47) (**Figure 7-23**).

It is important that from an avifaunal habitat use perspective, it be noted that birds will still use suitable habitats (at a more fine site specific scale as opposed to the broad landscape level delineations being considered for defining KBA boundaries). Therefore, from an avifaunal perspective, it is essential to initially focus on avoidance strategies and then investigate appropriate mitigation measures.

Understanding the avian communities in the landscape is crucial and this has been informed by the on-site findings based on the monitoring and associated species-specific modelling. This approach ensures that regardless of whether a site or species is present within a Key Biodiversity Area (KBA) or a previously defined Important Bird Area (IBA), it receives the same level of attention and protection.

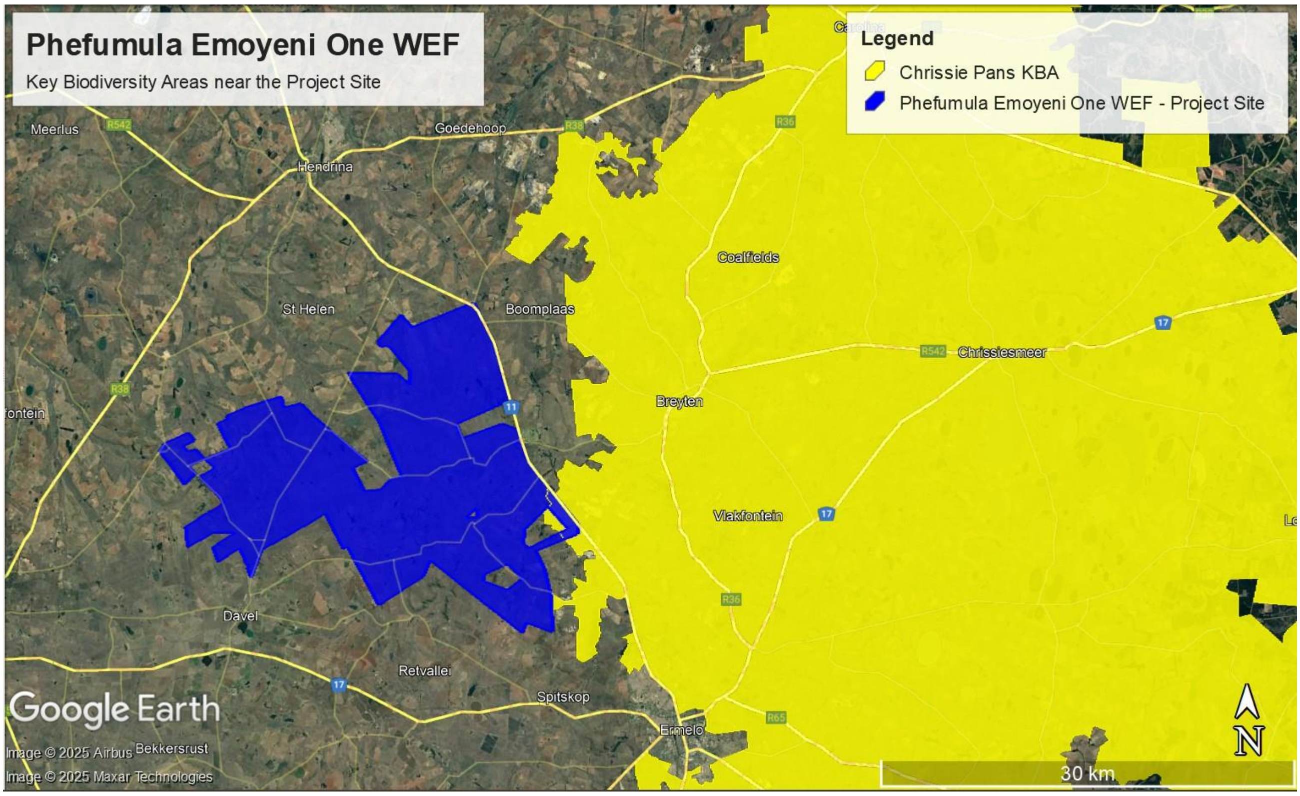


Figure 7-23 - Key Biodiversity Areas near the Project Site

The Project Site falls within Mesic Highveld Grasslands NPAES Key Focus Area (DFFE, 2018) (**Figure 7-24**).

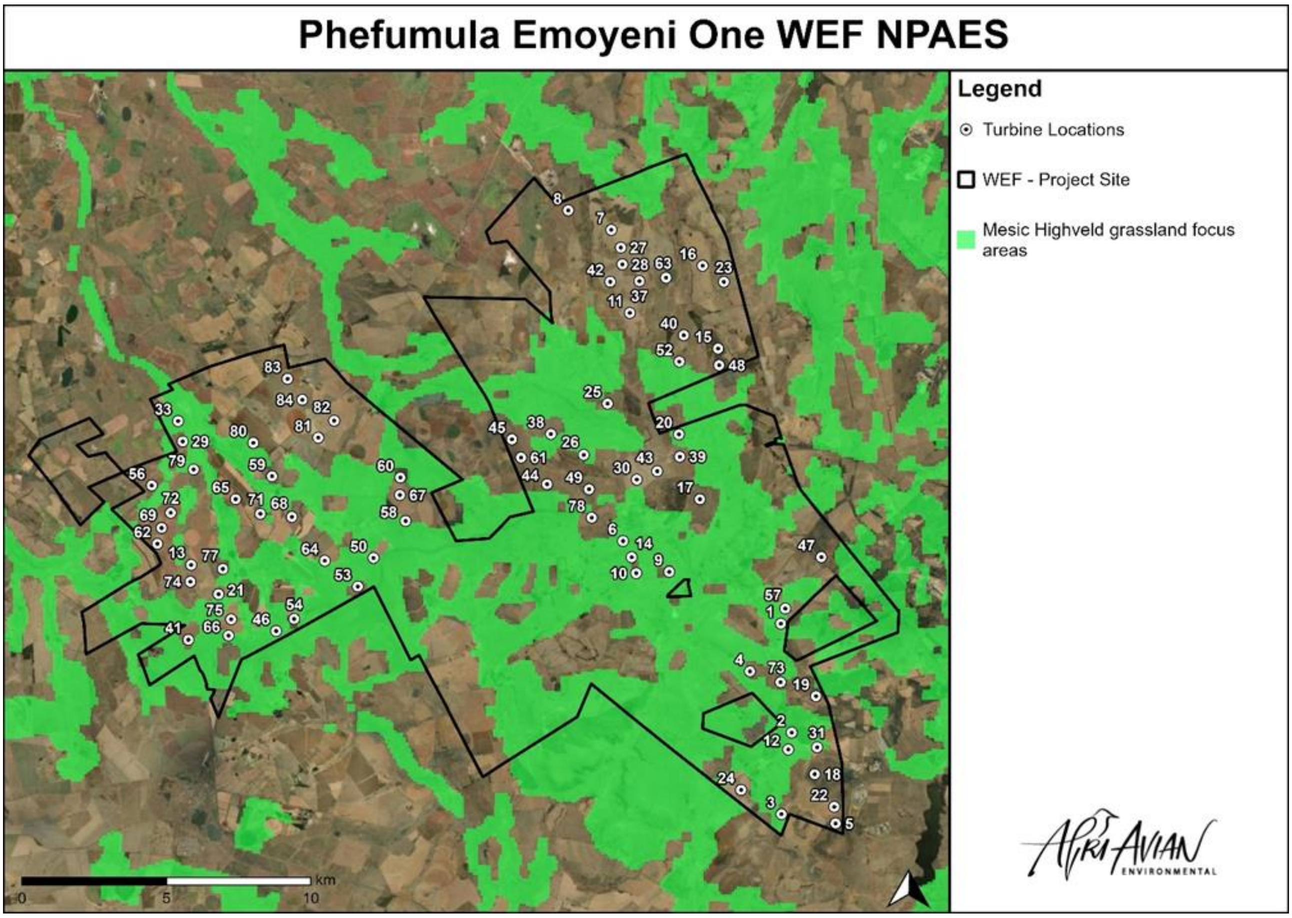


Figure 7-24 - Project Site in relation to Mesic Highveld Grasslands NPAES Key Focus Area

7.2.6.1 Potential Avifauna Species on Site

A total of 224 species could potentially occur within the Broader Area where the Project Site is located. Of these, 40 are classified as priority species for wind energy developments. Of these 40 priority species, 36 have a medium to high likelihood of occurring regularly in the Project Area of Influence (Project Site). Of the 40 priority species, 34 (85%) have been recorded during the on-site field surveys thus far (three of four surveys completed). Eighteen (18) priority species recorded in the Broader Area are also Species of Conservation Concern (SCC). Twelve (12) SCC have been recorded during the on-site field surveys thus far namely, African Marsh Harrier (Regionally Endangered), Black Harrier (Globally and Regionally Endangered), Black Stork (Regionally Vulnerable), Black-winged Pratincole (Globally and Regionally Near-Threatened), Blue Crane (Globally Vulnerable and Regionally Near-Threatened), Cape Vulture (Globally Vulnerable and Regionally Endangered), Denham's Bustard (Globally Near-Threatened and Regionally Vulnerable), Lanner Falcon (Regionally Vulnerable), Martial Eagle (Globally and Regionally Endangered), Pallid Harrier (Globally and Regionally Near-Threatened), Secretarybird (Globally Endangered and Regionally Vulnerable) and Southern Bald Ibis (Globally and Regionally Vulnerable).

The likelihood of priority species occurring in the Project Site, habitat classes, and potential long-term impacts of the proposed WEF are listed in **Table 7-3** below.

Table 7-3 - Priority species that could occur in the Project Site, habitat classes within the Project Site, and the potential impacts of the Phefumula Emoyeni One WEF on avifauna.

Common Name	Scientific Name	Full Protocol	Ad Hoc Protocol	Global Conservation Status	Regional Conservation Status	Recorded during monitoring	Likelihood of Regular Occurrence	Grassland	Woodland & Alien Trees	Drainage Lines & Wetlands	Dams	Agriculture	High Voltage Power Lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance	MV Lines - Electrocution	MV Lines - Collision
African Fish Eagle	*Haliaeetus vocifer*	10,66	0,83	-	-	x	H		x	x	x		x	x		x	x	
African Harrier-Hawk	*Polyboroides typus*	8,20	0,00	-	-	x	M		x		x		x	x		x	x	
African Marsh Harrier	*Circus ranivorus*	0,00	0,00	-	EN	x	M	x		x	x		x	x	x	x	x	
Amur Falcon	*Falco amurensis*	13,93	4,96	-	-	x	M	x	x		x	x	x	x			x	
Black Harrier	*Circus maurus*	0,82	0,00	EN	EN	x	M	x	x	x			x	x		x	x	
Black Sparrowhawk	*Accipiter melanoleucus*	17,21	1,65	-	-	x	H		x		x		x	x		x	x	
Black Stork	*Ciconia nigra*	0,82	0,00	-	VU	x	M			x	x		x	x		x	x	x
Black-chested Snake Eagle	*Circaetus pectoralis*	3,28	1,65	-	-	x	M	x	x		x		x	x		x	x	
Black-winged Kite	*Elanus caeruleus*	85,25	28,93	-	-	x	H	x	x		x	x	x	x	x	x	x	
Black-winged Lapwing	*Vanellus melanopterus*	0,82	0,00	-	-	x	M	x		x	x	x		x	x			
Black-winged Pratincole	*Glareola nordmanni*	0,00	0,00	NT	NT	x	M	x		x	x	x		x	x			
Blue Crane	*Grus paradisea*	3,28	0,00	VU	NT	x	M	x		x	x	x		x	x	x		x
Blue Korhaan	*Eupodotis caerulescens*	30,33	3,31	NT	LC	x	H	x				x		x	x	x		x
Booted Eagle	*Hieraaetus pennatus*	0,00	0,00	-	-	x	M		x		x		x	x		x	x	
Brown Snake Eagle	*Circaetus cinereus*	1,64	0,00	-	-	x	M		x		x		x	x		x	x	
Cape Vulture	*Gyps coprotheres*	0,00	0,00	VU	EN	x	L	x	x		x		x	x		x	x	x
Caspian Tern	*Hydroprogne caspia*	0,82	0,00	-	VU		L				x			x				
Common Buzzard	*Buteo buteo*	27,05	8,26	-	-	x	H	x	x			x	x	x			x	
Denham's Bustard	*Neotis denhami*	0,00	0,00	NT	VU	x	M	x				x		x	x	x		x
Greater Flamingo	*Phoenicopterus roseus*	13,93	11,57	-	NT		M				x			x				x
Greater Kestrel	*Falco rupicoloides*	4,92	0,00	-	-	x	M	x	x			x	x	x		x	x	
Grey-winged Francolin	*Scleroptila afra*	45,08	2,48	-	-	x	H	x				x		x	x	x		
Jackal Buzzard	*Buteo rufofuscus*	15,57	0,00	-	-	x	H	x	x			x	x	x		x	x	
Lanner Falcon	*Falco biarmicus*	9,02	1,65	-	VU	x	M	x	x	x	x	x	x	x		x	x	
Lesser Flamingo	*Phoeniconaias minor*	6,56	2,48	NT	NT		M			x	x			x				x

Common Name	Scientific Name	Full Protocol	Ad Hoc Protocol	Global Conservation Status	Regional Conservation Status	Recorded during monitoring	Likelihood of Regular Occurrence	Grassland	Woodland & Alien Trees	Drainage Lines & Wetlands	Dams	Agriculture	High Voltage Power Lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance	MV Lines - Electrocution	MV Lines - Collision
Long-crested Eagle	*Lophaetus occipitalis*	0,00	0,83	-	-	x	M		x		x		x	x		x	x	
Marsh Owl	*Asio capensis*	19,67	0,83	-	-	x	H	x		x				x	x	x	x	x
Martial Eagle	*Polemaetus bellicosus*	6,56	0,00	EN	EN	x	M	x	x		x		x	x		x	x	
Northern Black Korhaan	*Afrotis afraoides*	0,00	0,00	-	-	x	M	x				x		x	x	x		x
Pallid Harrier	*Circus macrourus*	0,00	0,00	NT	NT	x	M	x	x		x		x	x			x	
Peregrine Falcon	*Falco peregrinus*	0,00	0,00	-	-	x	M	x	x		x		x	x		x	x	
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	0,00	0,00	-	-	x	M		x		x		x	x		x	x	
Saddle-billed Stork	*Ephippiorhynchus senegalensis*	0,82	0,00	-	EN		L			x	x			x		x		x
Secretarybird	*Sagittarius serpentarius*	17,21	3,31	EN	VU	x	H	x			x	x		x	x	x		x
Southern Bald Ibis	*Geronticus calvus*	25,41	4,96	VU	VU	x	H	x				x		x	x	x	x	x
Spotted Eagle-Owl	*Bubo africanus*	5,74	0,00	-	-	x	M		x					x		x	x	x
Wahlberg's Eagle	*Hieraaetus wahlbergi*	0,00	0,00	-	-	x	M		x		x		x	x		x	x	
White Stork	*Ciconia ciconia*	4,92	2,48	-	-	x	M	x		x	x	x		x	x			x
White-bellied Bustard	*Eupodotis senegalensis*	2,46	0,00	-	VU		L	x						x	x	x		x
Yellow-billed Stork	*Mycteria ibis*	2,46	0,83	-	EN		L			x	x			x				x

7.2.6.2 Pre-construction Monitoring

The objective of the pre-construction monitoring at the proposed Phefumula Emoyeni One WEF is to gather baseline data over a period of four seasons on the following aspects pertaining to avifauna at the development area:

- The abundance and diversity of birds to measure the potential displacement effect of the wind farm.
- Flight patterns of priority species to assess the potential collision risk with the turbines.

The monitoring protocol for the WEF site was designed according to the following set of guidelines:

- Jenkins, A.R., Van Rooyen, C.S., Smallie, J.J., Anderson, M.D., & A.H. Smit. 2015. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Produced by the Wildlife & Energy Programme of the Endangered Wildlife Trust & BirdLife South Africa. Hereafter referred to as the wind guidelines.

The results of the pre-construction monitoring conducted are detailed in the Avifauna Specialist Report included in **Appendix G.4**. The monitoring surveys completed to were conducted in the following time periods:

- Survey 1: 05–16 November 2022, 17–20 January 2023, and 14–20 February 2023
- Survey 2: 11 April – 02 May 2023
- Survey 3: 13 June – 4 August 2023
- Survey 4: 04–21 October 2023

Refer to Appendix F of the Avifauna Specialist Study (**Appendix G.4**) for details on the pre-construction monitoring protocol.

7.2.6.3 Collision Risk Modelling

A Bayesian approach to collision risk modelling was utilised in assessing fatality rates for wind priority species. This framework allows for the use of the best available biological data and other survey data to inform prior distributions as parameters, whilst posterior distributions reflect the site-specific data collected pre-construction (New et al. 2015). Three crucial components that contribute to the risk of collisions and associated fatalities were incorporated into the analysis, namely bird exposure, collision probability and hazardous area exposure (New et al. 2015). Prior distributions reflecting both exposure and collision probability were generated for a number of species using data from multiple post-construction facilities in South Africa. Defining parameters for exposure and the probability of collision using local data related to the respective species greatly increases the validity of fatality predictions as demonstrated by New et al. (2015) and further confirmed by a local South African case study (Colyn et al. 2024 in prep).

Three fatality estimate scenarios have been produced (**Figure 7-25**):

- No avoidance or mitigation (orange bars): several species approach or are well over the threshold of one fatality per year. Southern Bald Ibis, in particular, has a fatality estimate of more than seven birds per year.
- Avoidance (nests sites) and no mitigation (dark blue bars). Flight risk modelling was conducted surrounding only known nests sites for three species – Southern Bald Ibis, Martial Eagle and Secretarybird. This incorporates these species-specific avoidance areas. For Southern Bald Ibis, the avoidance alone did not reduce the fatality estimate greatly. This is largely due to extensive flight activity being recorded across the WEF Project Site well away from the colony localities.
- Avoidance and Shutdown on Demand (SDoD) mitigation assuming an 80% efficacy (light blue bars). Three species yielded estimates reaching or exceeding a fatality rate of one bird/year – Black-winged Pratincole, Jackal Buzzard and Southern Bald Ibis.

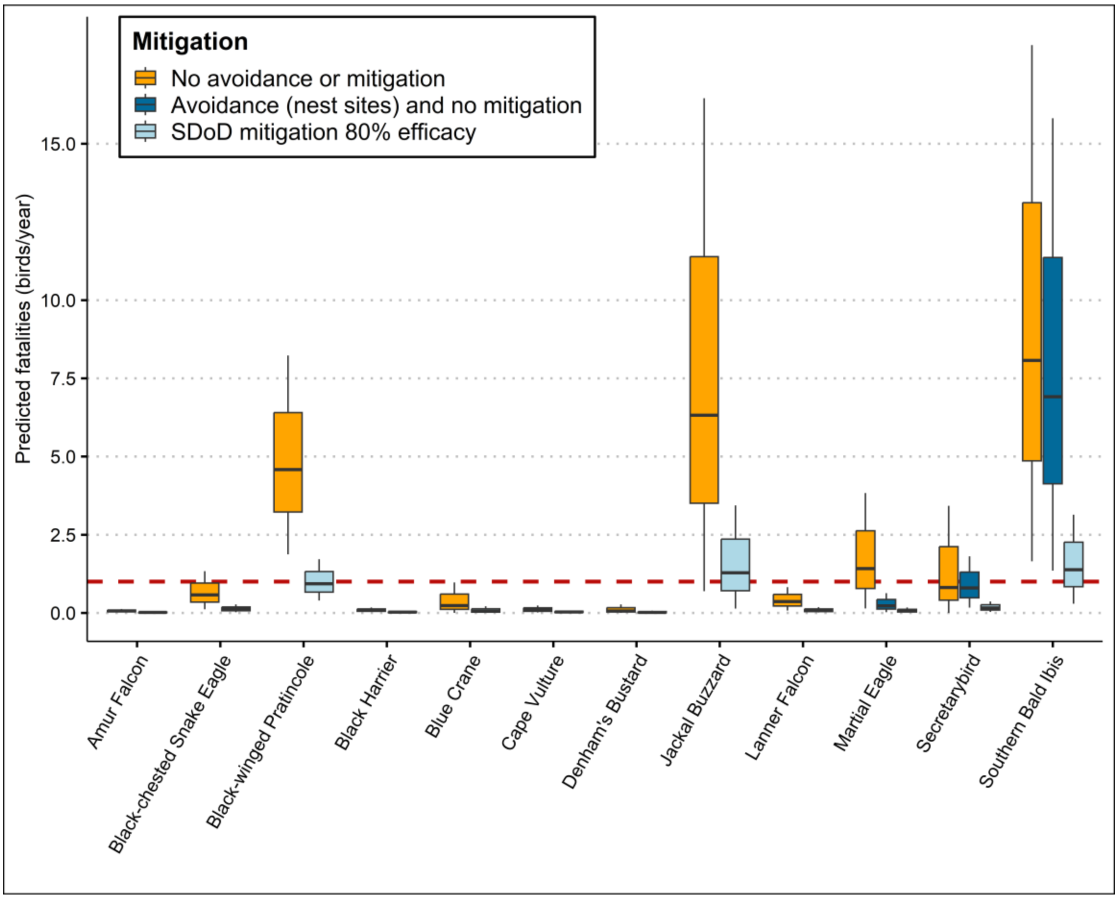


Figure 7-25 - Collision risk modelling predicted fatalities with 1) no mitigation (orange bars), 2) with nest avoidance for the three known species nesting sites (dark blue bars), and 3) with nest avoidance and SDoD implementation (light blue bars)

7.2.6.4 Flight Risk and Habitat Suitability

The various methodologies outlined below were used to spatially model risk for various species and were used to inform the wind farm layout through avoidance and to inform mitigation zones, as well as assist with mitigation implementation. The outputs are shown in the sensitivity maps included in the Avifauna Specialist Report (**Appendix G.4**).

Habitat suitability modelling

Habitat suitability modelling was undertaken for sensitive grassland species: Yellow-breasted Pipit (VU), Rudd's Lark (EN) and Black-winged Pratincole (NT); and for sensitive wetlands species: Grey Crowned Crane (EN), African Marsh Harrier (EN), Species 23 (CR), Striped Flufftail (VU) and African Grass Owl (VU). Model outputs were informed and validated by data obtained from site-specific fieldwork and surveys conducted in the surrounding area.

An R workflow was scripted and used to prepare, pre-process and analyse remote sensing data acquired by the Sentinel 2 satellite platform (Copernicus 2023). A classification modelling framework, which included the use of an ensemble model, was used to assess habitat suitability for target species6. A stepwise variable selection technique was used to conduct a data driven process of variable selection. Variable selection includes the removal of highly correlated variables, thereby preventing autocorrelation and improving the interpretation of final model results (Vignali et al. 2020).

The modelling workflow included data partitioning, model training, variable selection, model testing, model optimization through hyperparameter tuning and final model predictions. Occurrence data were sourced by an extensive internal database, supplemented with in-situ data collected at the Project Site across the reporting period. The overall occurrence and absence dataset was partitioned into training (80%) and testing (20%) subsets. Subsequently, we trained the primary models using the Random Forest and ANN algorithms, followed by hyperparameter tuning and model optimization using the genetic algorithm (Vignali et al. 2020). Variable importance and partial dependence plots were generated for the final set of variables selected following initial model training and optimization. A final global model was trained using the entire training occurrence dataset for each species, and this model was then used to make predictions of habitat suitability within the local area of interest (i.e. proposed development footprint) for specific species.

Model performance was assessed using the Receiver-operating characteristic (ROC) and associated area under the curve (AUC-ROC) value (Freeman and Moisen 2008). ROC plots compare the true positive and false positive rates and are commonly used as a metric of model performance in classification studies (Jimenez-Valverde 2012; Sofaer et al. 2018).

Wetland Habitat Modelling7

For the primary threatened avian species associated with wetlands that are likely to occur on-site, namely African Grass Owl, Blue Crane, and African Marsh Harrier, a wetland sensitivity layer was generated from the species-specific predictive models. The species models are focused on identifying core habitats for the respective species, with a focus on breeding habitat, where relevant, as well as associated foraging habitat. For Blue Crane, this largely focused on potential roost sites (see below). Due to the habitat flexibility of both African Grass Owl and that of Blue Crane, habitats highlighted may include agricultural fringes and other habitats surrounding wetlands, seeps, and other rank vegetation. Not all wetland habitats will be highlighted by the model, as the models are trained to try to identify those habitats with the correct vegetation structure as determined from the satellite imagery.

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[6] An ensemble modelling approach incorporates the use of more than one classification algorithm, drawing on the strengths of each and resisting any inherent bias that could be present in a single model. This general modelling process has been previously used in multiple peer-reviewed avian habitat suitability studies (Colyn et al. 2020a; Colyn et al. 2020b; Colyn et al. 2020c).

[7] An aquatic specialist primarily focuses on the infrastructure footprint, while considerations from an avian perspective involve more aspects, such as suitable avifaunal microhabitats (such as moist grasslands) surrounding the actual wetland footprint. For this reason, bird habitats were evaluated from both wetland and aquatic viewpoints, independent of the aquatic specialist's perspective. A delineation was made with an associated buffer area to account for the blade swept area. It is also essential to consider the flight paths of birds and their movements across the landscape, which significantly differs from what the aquatic specialist would take into account. Thus, there is a clear differentiation between these two aspects from both an avifauna and aquatic perspective.

Wetland surveys were also conducted on site as part of the avifaunal monitoring campaign, wetland habitat surveys and dedicated avian surveys.

Flamingos

A habitat suitability model has been developed to determine high-risk areas for flamingos based on algal blooms in the respective pans, and turbine exclusion zones were delineated. The associated risk model is a data-driven framework designed to inform the buffering of waterbodies and pans within a wind energy facility's area of interest (AOI). The model integrates multiple environmental and ecological datasets to determine suitable habitat conditions for foraging flamingo, ensuring appropriate setback distances for wind turbines to mitigate potential impacts (**Figure 7-26**). The model incorporated data collected through systematic counts that were conducted by AfriAvian in the broader area during 2023 and 2024. These data were further supplemented with CWAC data collected across known highly productive flamingo sites in Mpumalanga and Free State, as well as vetted BirdLasser data for the waterbodies in the given region. The model accounts for algal productivity using multi-year remote sensing data, combined with multiple metrics characterising the size and seasonality of the waterbody. The extent of turbine exclusion zones delineated around the waterbodies were generated as a product of the derived waterbody productivity score. Larger, more productive waterbodies have a higher probability of attracting and supporting larger numbers of flamingos and subsequently would yield a much larger exclusion zone compared to smaller, lower productivity waterbodies.

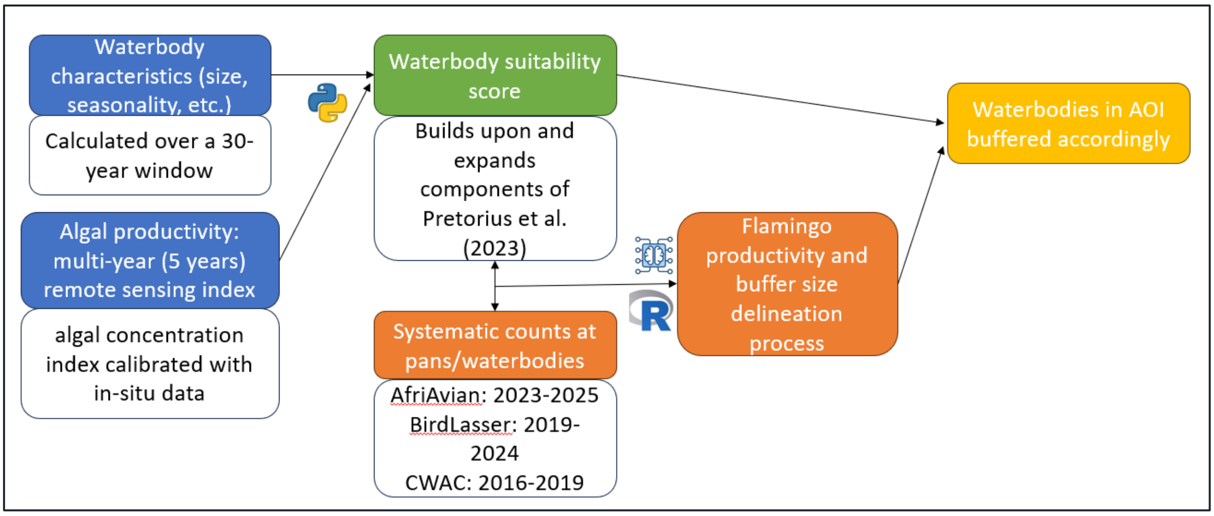


Figure 7-26 - The workflow used to generate waterbody suitability and flamingo productivity scores for all pans/waterbodies in the AOI and associated sensitivity buffers

Tracking data currently being collected as part of the MDARDLEA / EWT Mpumalanga bird flyway research project indicates how a flamingo traversed the Phefumula Emoyeni One WEF Project Site and surrounding landscape. The Flamingo was present on a pan on the site for three days during the dry spring season of 2024. See **Figure 7-27** below for an indication of how the flamingo traversed the landscape.

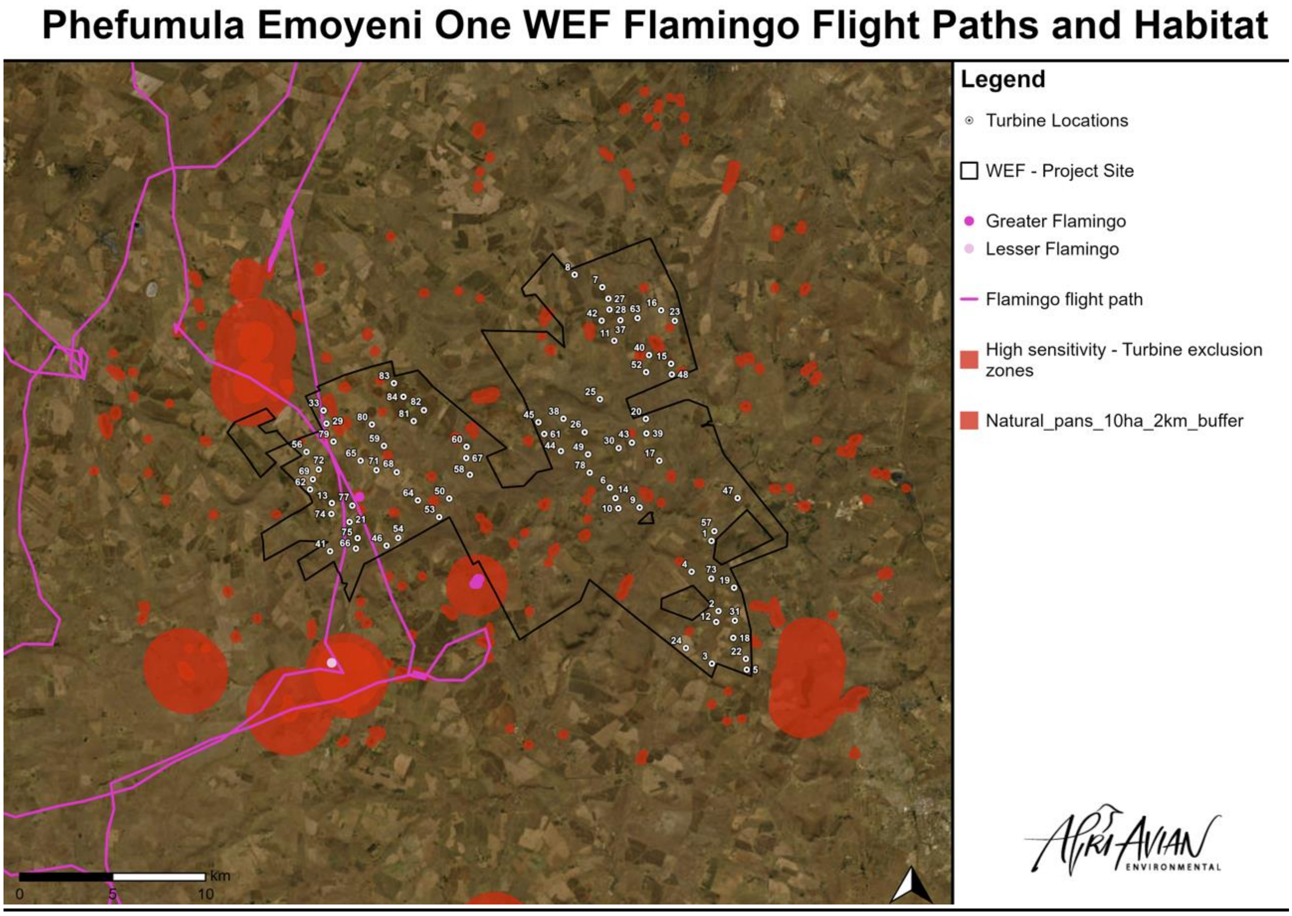


Figure 7-27 - Tracking data currently being collected as part of the MDARDLEA / EWT Mpumalanga bird flyway research project indicates how a flamingo traversed the Phefumula Emoyeni One WEF Project Site and surrounding landscape

Southern Bald Ibis roosts

AfriAvian scripted and used R and python workflows to prepare, pre-process and analyse all predictor variables with specific relevance to Southern Bald Ibis known habitat presence and behaviour. Predictor variables represented distance from colony, distance from roost, various facets of topography, drainage, and vegetation (grassland) productivity. Topographical features included ruggedness, drainage, topographical relief and thermal uplift, whilst aspects of vegetation productivity were derived from remote sensing indices. We utilised an Artificial Neural Network (ANN) predictive modelling workflow to train flight risk models (FRM). ANNs are capable of learning complex patterns and relationships in data, making them suitable for a wide range of classification problems. The modelling workflow included data partitioning, model training, optimization of algorithms and hyperparameters, and model testing and validation. Flight data was classified into high risk (1) and low risk (0) flights based on flight heights intersecting with typical blade swept heights (30-300m). High risk flights were processed using an internal workflow to convert flightlines into point data (Colyn et al. 2024). Flight data were sourced by an extensive internal database, supplemented with in-situ data collected across all in-situ site surveys. We partitioned the overall occurrence and absence dataset into training (80%) and testing (20%) subsets, which resulted in 16747 and 4186 training and independent test data points, respectively. Model performance was assessed using measures of accuracy, recall, precision and F1 score derived from independent test datasets. The final global model yielded a precision, recall and F1 score of 0.82, 0.79 and 0.80, respectively. The strongest contributors to predictive performance and associated flight risk were distance from colony and roost, the productivity of underlying grassland habitat, productivity of dryland agricultural crops, topographical ruggedness and thermal yield.

Secretarybird potential breeding areas

Secretarybird nest structures were identified on-site during the survey efforts. Some structures are only ever used as roosts and nest-building can continue indefinitely (Tarboton, 2001). Prior to the Operational Phase of the WEF all tree structures across the Project Site must be mapped by generating a canopy height model and applying a tree structure criteria-based model. Secretarybird management zones across the WEF site will be delineated using the mapped tree structures, known nests sites and flight risk modelled outputs. During the operational phase of the WEF monthly orthophoto assessments will be conducted to monitor the prioritized management zones to identify active nest and roost structures. If active nests/roosts are identified SDoD and/or automated curtailment will be implemented.

7.2.6.5 Sensitive Species 23

A comprehensive Species 23 assessment report, which includes detailed modeling and survey efforts, is attached as Appendix J of the Avifauna Specialist Report included as **Appendix G.4**. The core findings include:

- Methodology
  - A deep learning-based CNN (Convolutional Neural Network) model was used to assess fine scale habitat suitability using Sentinel-2 remote sensing data.
  - In-situ wetland assessments were conducted in Nov/Dec 2024, with further acoustic monitoring planned for the summer of 2024/2025.
- Key Findings
  - Fine-scale habitat modelling found no suitable habitat (probability >0.25) within the PAOI, suggesting low risk to Species 23.
  - Field surveys assessed seven wetland habitat units across the PAOI, covering 20 individual sites.
  - Given the lack of any suitable habitat identified within the AOI, both through modelling and in-situ surveys, no passive acoustic monitoring was undertaken.
  - Most wetlands (Sites A-E) were dominated by graminoid riparian and channelled valley-bottom habitats, but extensive degradation (e.g., overgrazing, trampling by livestock) reduced suitability for Species 23.
  - No highly suitable breeding or foraging habitat was found in the PAOI.
- Implications & Sensitivity Rating
  - The combination of modelling and field assessments confirms that Species 23 is unlikely to be affected by the proposed WEF development.
  - The probability of species occurrence and associated risk is considered low.
  - This supports the feasibility of the WEF project from a species 23 perspective.

It should further be noted that the wetland habitat sites in the area were flagged as low suitability based on various factors (climate, land-use, land management practices) at both local and district levels. The closest area with better habitat suitability for the species is located about 25–50 kilometres east, where the habitat profile shifts to more moist, highland grasslands. Suitability decreases in a westerly direction due to changes in the habitat profile,

7.3 SOCIAL ENVIRONMENT

7.3.1 LAND USE

The land cover of the site and surrounding area is shown on **Figure 7-28**. Large parts of the overall project site are essentially undeveloped or used for extensive agricultural practices, with farmsteads, smallholdings, numerous dams, and several gravel roads being the most prominent infrastructure. The site is also bounded by the N11 highway to the east, and several high-mast power lines (**Figure 7-29**) and radio towers (**Figure 7-30**) also occur within the site, although the latter are not prominent in medium-range views. Other large roads in the study area include the N17 highway to the south and R38 west and north of the site.

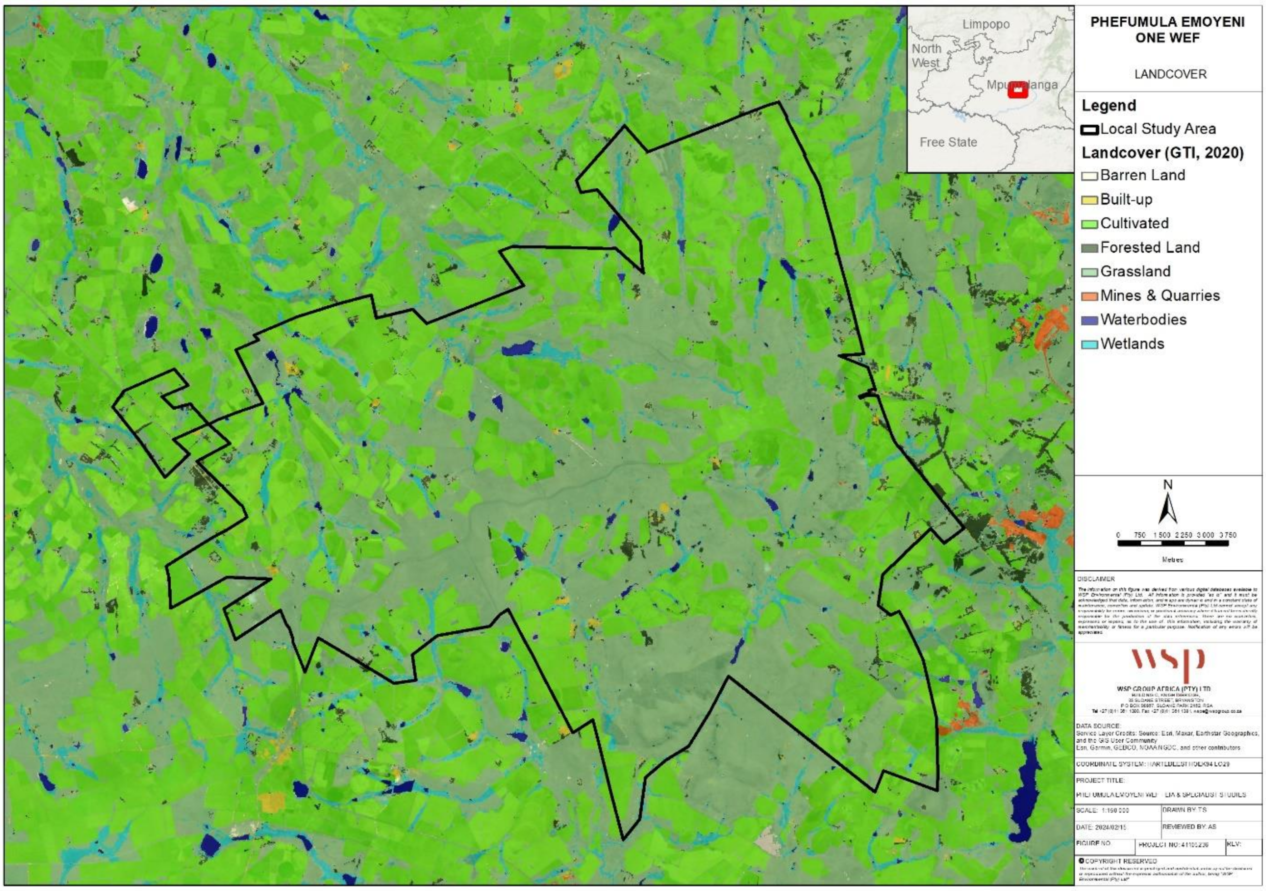


Figure 7-28 - Landcover associated with the study area and surrounding landscape.

Figure 7-29 - High-mast power lines traverse parts of the project site

Figure 7-30 - Several tall telecommunication towers are also located within the site, although these are not prominent in medium-range views – pictured here is the project meteorological measurement mast

According to GeoTerra Land Cover Imagery (2020) of the study area indicates that large patches of the study area comprise cultivated land. Livestock farming with cattle, sheep/goats is likely to be a common land use in the study area. The study area is also traversed by numerous formal and inform farm roads and tracks which is possibly used by neighbouring farmers for access.

7.3.2 TRANSPORT NETWORK

The proposed Phefumula Emoyeni One WEF site is located near Ermelo in Mpumalanga. It is expected that non-motorised transportation (NMT) is a dominant mode of transportation in the environment of the site, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses. Currently, there are no known future planned public transport facilities in the vicinity of the site.

Consequently, four access points were chosen, which are located along the N11 and lead on to public roads to the Phefumula Emoyeni One WEF project area. These are more discussed in more detail in the Transportation Study (**Appendix G.9**) hereafter (see **Figure 7-31**):

- Access Point 1: From N11 turn into D383;
- Access Point 2: From N11 turn into D1102;
- Access Point 2: From N11 turn into D1217 (north);
- Access Point 4: From N11 turn into D1217 (south).

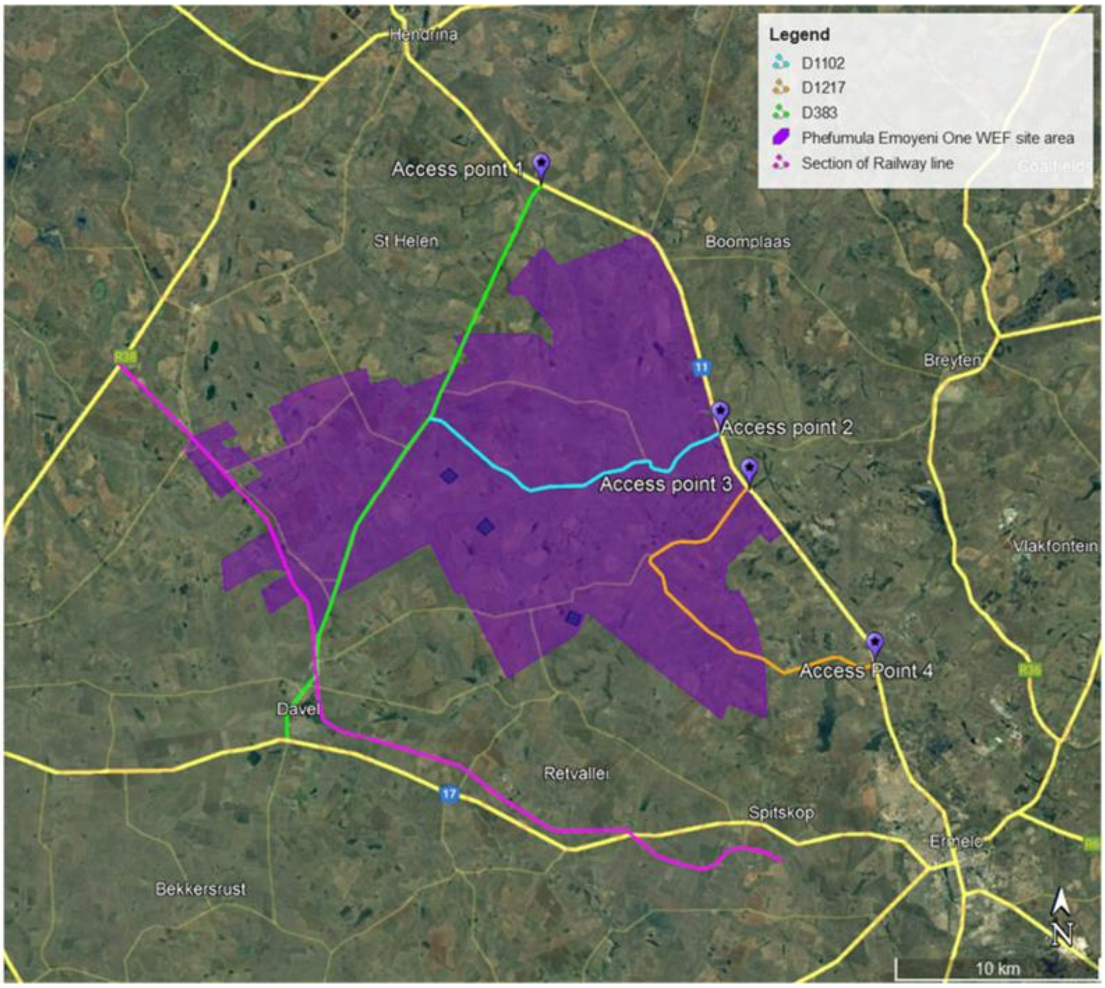


Figure 7-31 - Potential Access Points to the Site

7.3.3 HERITAGE AND CULTURAL RESOURCES

The study area is rural in character and sparsely developed. Infrastructure includes fences, windpumps, and access roads all associated with the farming activities in the study area. The Project area is undulating and used for cultivation and grazing.

The archaeological record for the greater study area consists of the Stone Age, Iron Age and Historical Period.

7.3.3.1 Stone Age

The Stone Age of southern Africa starts when hominins (ancestral to modern-day humans) first started to produce crude tools made with stone. The Earlier Stone Age (ESA 2 million - 200 000 years ago) is associated with hominins such as *Homo habilis* and *Homo erectus* (Dusseldorp et al. 2013). Mpumalanga currently does not have an extensive ESA archaeological record, at Maleoskop on the farm Rietkloof, only a few ESA artefacts have been found and stone tools consisted of choppers (Oldowan), hand axes, and cleavers (Acheulean) (Esterhuysen & Smith 2007) and some surface scatters have been recorded near Piet Retief (Nel & Karodia 2013).

Middle Stone Age (MSA) artefacts represents archaic and modern humans that occupied the landscape between 300 000 to 40 000 before present. Later Stone Age (LSA) occupational sequences reflect San and Khoisan communities from 40 000 years ago until recently (Dusseldorp et al. 2013). Although the MSA and LSA has not been extensively studied in Mpumalanga, evidence for these periods has been excavated from Bushman Rock Shelter in the Ohrigstad District (Esterhuysen & Smith 2007; Lombard et al. 2012) and it is known that San communities lived near Lake Chrissie as recently as the 1950s (e.g., Schlebusch et al. 2016). MSA and LSA surface scatters have also been investigated in the vicinity of Piet Retief, and De Wittekrans nearby Camden is a Later Stone Age archaeological rock art site complex (Nel & Karodia 2013).

7.3.3.2 Iron Age

The archaeology of farming communities of southern Africa encompasses three phases. The Early Iron Age (200-900 CE) represents the arrival of Bantu-speaking farmers in southern Africa. Living in sedentary settlements often located next to rivers, these farmers cultivated sorghum, beans, cowpeas, and kept livestock. The Middle Iron Age (900-1300 CE) is mostly confined to the Limpopo Valley in southern Africa with Mapungubwe Hill probably representing the earliest 'state' in this region (Huffman 2007).

The Late Iron Age (LSA - 1300-1840s CE) marks the arrival and spread of ancestral Eastern Bantu-speaking Nguni and Sotho-Tswana communities into southern Africa. The location of Late Iron Age settlements is usually on or near hilltops for defensive purposes. The Late Iron Age as an archaeological period ended by 1840 CE, when the Mfecane caused major socio-political disruptions in southern Africa (Huffman 2007). Close to Ermelo, on Tafelkop Mountain, is the well-known LIA Tafelkop Settlement. It consists of various settlement complexes with over 100 corbelled huts in numerous clusters on the mountain top (Esterhuysen & Smith 2007). The site was declared a Provincial Heritage Site.

Dates from Early Iron Age sites indicated that by the beginning of the 5th century CE Bantu-speaking farmers had settled in the Mpumalanga lowveld. Subsequently, farmers continued to move into and between the lowveld and highveld of Mpumalanga. Iron Age sites such as Welgelegen Shelter, Robertsdrift situated 50-100 km west of Camden dates from the 12th to the 18th century (Derricourt & Evers 1973; Esterhuysen & Smith 2007).

During the mid-17th century Europeans started to settle in modern-day Cape Town. During and after the conflict caused by the Mfecane (1820-1840), during the reign of king kaSenzangakhona Zulu, known as Shaka, Dutch-speaking farmers started to migrate to the interior regions of South Africa. A period that is marked by various skirmishes and battles between the local inhabitants, Dutch settlers and the British (Giliomee & Mbenga 2007).

7.3.3.3 Historical context of Camden

Camden power station was commissioned in 1967 (Gaigher 2011; Matenga 2020). However, the nearby town of Ermelo has a rich history. The earliest record for settlers in Ermelo is from 1860, when the area was under the jurisdiction of Zulu-speaking Nhlapo communities (Nhlapo 1945). The construction of the town of Ermelo was initiated by the Dutch Reform Church, which purchased the eastern part of the farm Nooitgedacht on 26 May 1879. The town was officially proclaimed on 12 February 1880 by William Owen Lanyon, the Administrator of the Transvaal (Greyling 2017).

7.3.3.4 Battlefields and war history

Due to the proximity of Ermelo to the Nederlandsche Zuid-Afrikaansche Spoorweg-Maatskappij railway line linking Pretoria with Lourenço Marques (Maputo), the area was subject to various skirmishes during the Anglo-Boer War of 1899-1902. At the time there were about 100 families residing in the town and many women and children were sent to British concentration camps. In 1901, British troops burnt the town down due to their scorched earth policy, and Ermelo was rebuilt in 1903 (Moody 1977; Pretorius 2000; Van Schalkwyk 2012; Greyling 2017).

7.3.3.5 Graves and Burial sites

Numerous burial sites are indicated by the Genealogical Society of the South Africa (GSSA) for the study area (**Figure 7.32**). The known cemeteries are summarised in **Table 7-4** below.

Table 7-4 - Cemeteries identified in the area

Cemetery	Location	Number of Graves
Witbank	26°19'0.00"S; 29°43'60.00"E	11
Nooitgedacht 237	26°21'17.64"S; 29°48'26.16"E	1
Bosmanskrans 217 (3)	26°14'56.70"S; 29°49'48.72"E	8
Bosmanskrans 217 (2)	26°16'13.20"S; 29°50'12.54"E	8
Bosmanskrans 217 (1)	26°17'16.86"S; 29°50'35.40"E	8
Elim 247	26°18'17.76"S; 29°51'18.72"E	12
Nooitgedacht 237	26°21'17.64"S; 29°48'26.16"E	1

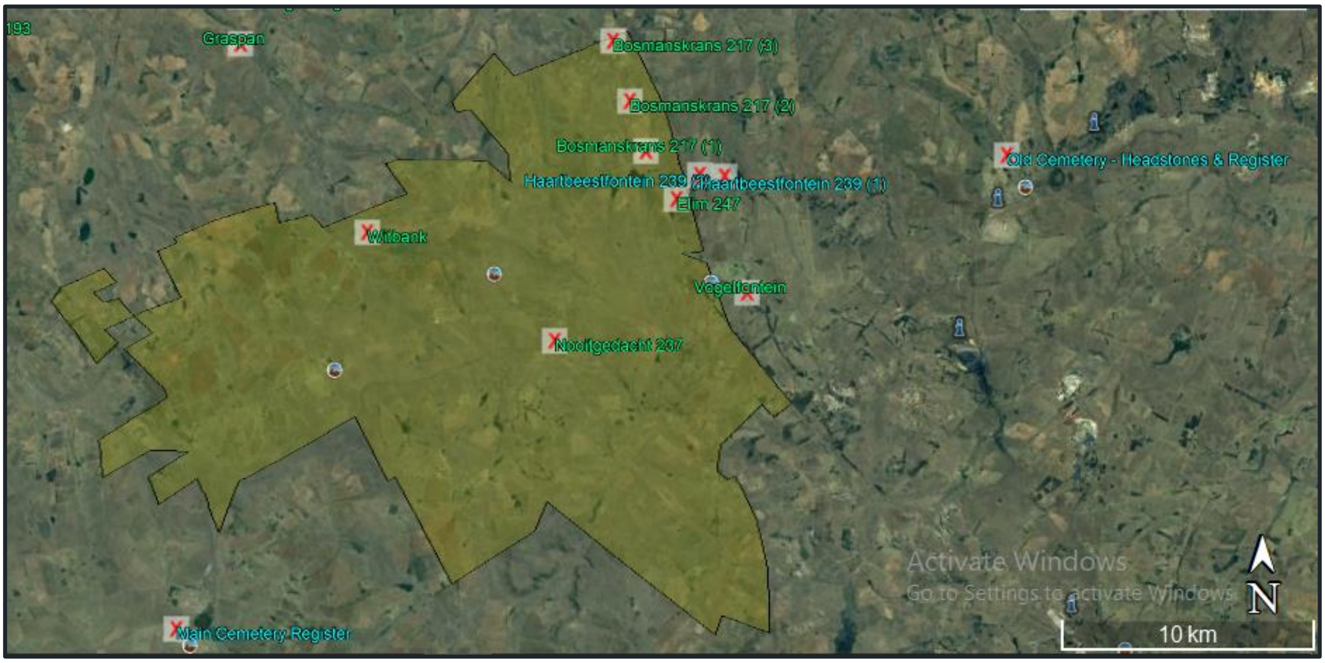


Figure 7.32. Cemeteries identified in the study area.

7.3.3.6 Cultural Landscape

The surrounding and most of the impact area are cultivated, and forms part of a landscape characterised by wide scale cultivation and mining activities. Development in the study area is limited to farming infrastructure such as access roads, fences, and agricultural developments. The clusters of trees around farmsteads are generally planted to protect the houses from wind and they form part of the cultural landscape.

7.3.3.7 Heritage Resources

Heritage observations within the study area included multiple burial sites, farmsteads, ruins, and circular stone enclosures and were recorded as waypoints. General site distribution of the recorded observations in relation to the Project layout is spatially illustrated in **Figure 7-33** and briefly described in **Table 7-5.**

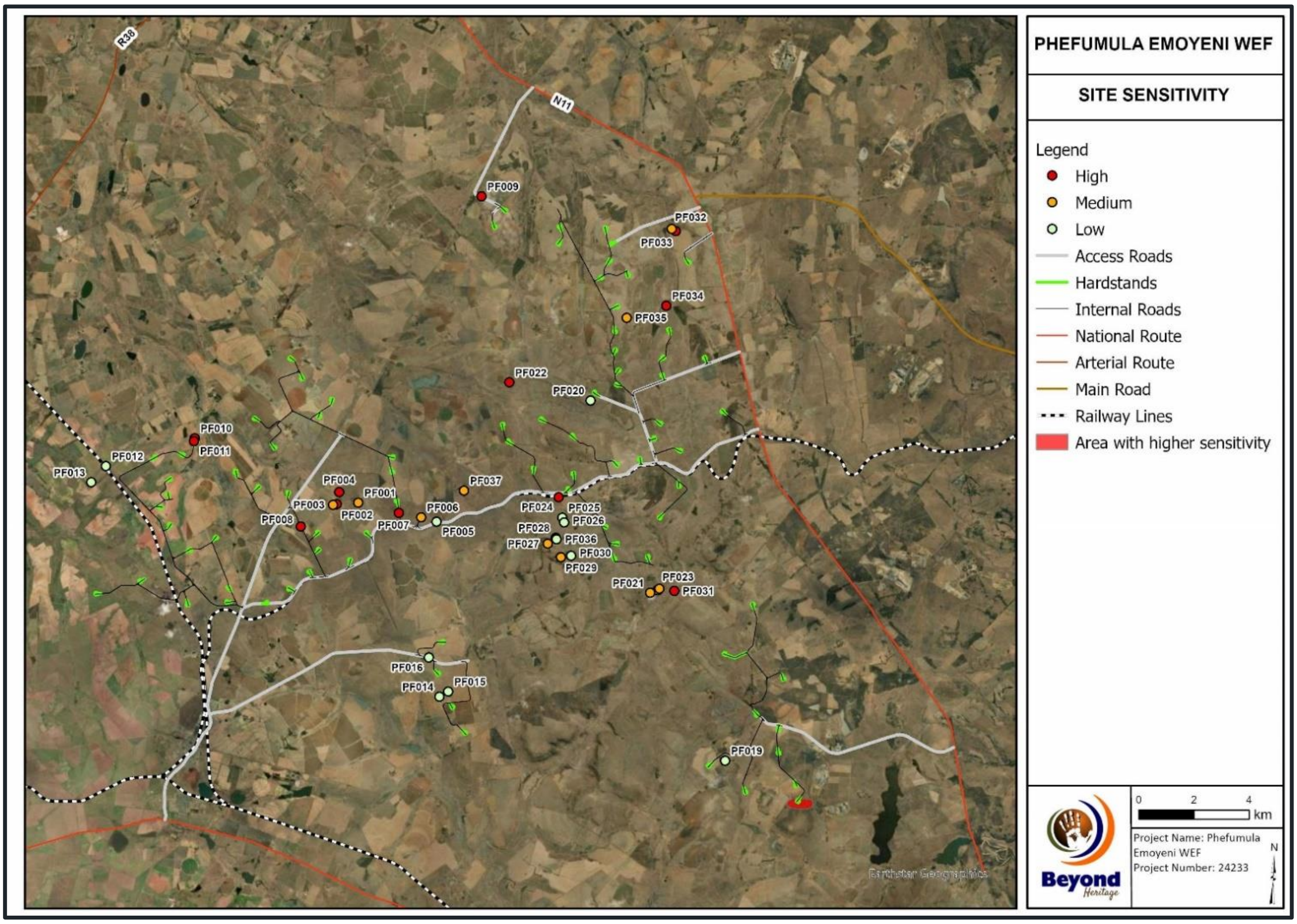


Figure 7-33 – Site Distribution Map

Table 7-5 - Sites recorded in the study area

Label	Longitude	Latitude	Description	Significance
PF001	29°43'30.73"E	26°21'46.70"S	Historical farmstead – Still occupied	Medium Significance GP B
PF002	29°43'2.21"E	26°21'49.53"S	Historical Burial site – 6 graves located within a brick-built family cemetery	High Significance 3A
PF003	29°42'57.77"E	26°21'50.46"S	Historical farmstead – Still occupied	Medium Significance GP B
PF004	29°43'4.94"E	26°21'35.42"S	Large burial site – 65 – 70 packed stone and various cement graves, some graves have newer granite headstones and skirting.	High Significance 3A
PF005	29°45'14.07"E	26°22'5.62"S	Ruins/Packed stone foundations related to possible historical railroad	Low Significance GP C
PF006	29°44'53.51"E	26°22'1.12"S	Ruins/Packed stone foundations and semi-circular enclosures.	Medium Significance GP B
PF007	29°44'24.13"E	26°21'56.96"S	Burial site. 13 to 15 graves situated within a cement and concrete built cemetery. The graves consist of various degraded and collapsed granite headstones and skirting.	High Significance 3A
PF008	29°42'16.53"E	26°22'17.56"S	Burial site situated under a large thicket of trees along the edge of existing agricultural fields. – 70 to 80 various graves built from granite, packed stone, cement and brick. Sections of the cemetery is still being maintained.	High Significance 3A
PF009	29°45'56.03"E	26°15'41.45"S	Burial site – 3 graves situated on the edge of an existing agricultural field on top of the ploughed contour line. 1 grave has a granite headstone and skirting with the other 2 having degraded brick and stone skirting. The burial site is highly disturbed.	High Significance 3A
PF010	29°39'52.78"E	26°20'38.67"S	Burial site – 1 brick built grave situated in a small open field.	High Significance 3A
PF011	29°39'52.12"E	26°20'42.16"S	Burial site – 1 fenced off grave with an overgrown granite headstone.	High Significance 3A
PF012	29°37'58.02"E	26°21'15.57"S	Ruin/Degraded railway structure.	Low Significance GP C
PF013	29°37'39.59"E	26°21'35.23"S	Historical farmstead - Ruins	Low Significance GP C
PF014	29°45'27.12"E	26°25'30.85"S	Possible historical plantation of trees.	Low Significance GP C

Label	Longitude	Latitude	Description	Significance
PF015	29°45'38.22"E	26°25'24.46"S	Possible historical lane of trees.	Low Significance GP C
PF016	29°45'11.15"E	26°24'45.46"S	Broken down and degraded informal settlement.	Low Significance GP C but graves may be associated with the ruins and will then be High Significance
PF017	29°50'7.41"E	26°23'15.59"S	Two packed stone graves situated within a circular packed stone enclosure.	High Significance 3A
PF018	29°50'7.75"E	26°23'15.77"S	Packed stone ruins with circular packed stone enclosures.	Medium Significance GP B
PF019	29°51'44.90"E	26°26'32.68"S	Broken down informal settlement – Site is completely demolished – Only some evidence left such as lower grinding stone.	Low Significance GP C but graves may be associated with the ruins and will thenbe High Significance
PF020	29°48'29.40"E	26°19'36.12"S	Ruins - Packed stone foundations - Historical	Low Significance GP C
PF021	29°49'57.57"E	26°23'19.22"S	Ruins – Packed stone ruins with some circular packed stone enclosures.	Medium Significance GP B
PF022	29°46'42.13"E	26°19'18.65"S	Burial site – 28 graves. Majority have granite headstones and skirting. Some made from packed stone, and some built from brick and cement. Fenced off.	High Significance 3A
PF023	29°50'9.33"E	26°23'13.73"S	Packed stone ruins/Circular packed stone walling and enclosures	Medium Significance GP B
PF024	29°47'53.13"E	26°21'31.13"S	Burial site – Large cemetery situated next to a possible historical railway line. Contains 75+ graves made from various materials such as packed stone, granite and brick.	High Significance 3A
PF025	29°47'58.84"E	26°21'54.99"S	Ruins/Broken down structure	Low Significance GP C
PF026	29°48'1.64"E	26°22'0.51"S	Degraded school building/fairly recent.	Low Significance GP C
PF027	29°47'40.90"E	26°22'26.23"S	Large historical farmstead – Currently occupied.	Medium Significance GP B

Label	Longitude	Latitude	Description	Significance
PF028	29°47'51.12"E	26°22'18.92"S	Burial site containing two packed stone graves and metal grave markers.	High Significance 3A
PF029	29°47'58.85"E	26°22'41.36"S	Historical farmhouse – Intact but not occupied.	Medium Significance GP B
PF030	29°48'12.50"E	26°22'39.17"S	Large historical packed stone kraal. 25x15m	Low Significance GP C
PF031	29°50'29.24"E	26°23'15.85"S	Burial site containing 20-25 graves made from various materials such as granite, cement and brick and packed stone.	High Significance 3A
PF032	29°50'7.05"E	26°16'10.68"S	Historical farmstead-Various masoned stone ruins and structures. Some of the historical structures have been renovated.	Medium Significance GP B
PF033	29°50'12.11"E	26°16'13.07"S	Burial site – Historical cemetery with large cement and brick wall. Containing 8 graves with granite and cement headstones and covers. Oldest grave 1908	High Significance 3A
PF034	29°50'3.57"E	26°17'41.09"S	Burial site – Large informal burial site containing 30 – 35 graves made from packed stone, granite and cement.	High Significance 3A
PF035	29°49'12.76"E	26°17'57.31"S	Historical farmstead – Fairly degraded and abandoned. Structures fairly intact.	Medium Significance GP B
PF036	29°47'52.40"E	26°22'20.52"S	Large broken down and degraded informal settlement. Only building rubble remains.	Low Significance GP C
PF037	29°43'30.73"E	26°21'46.70"S	Historical farmstead – Abandoned and degraded.	Medium Significance GP B

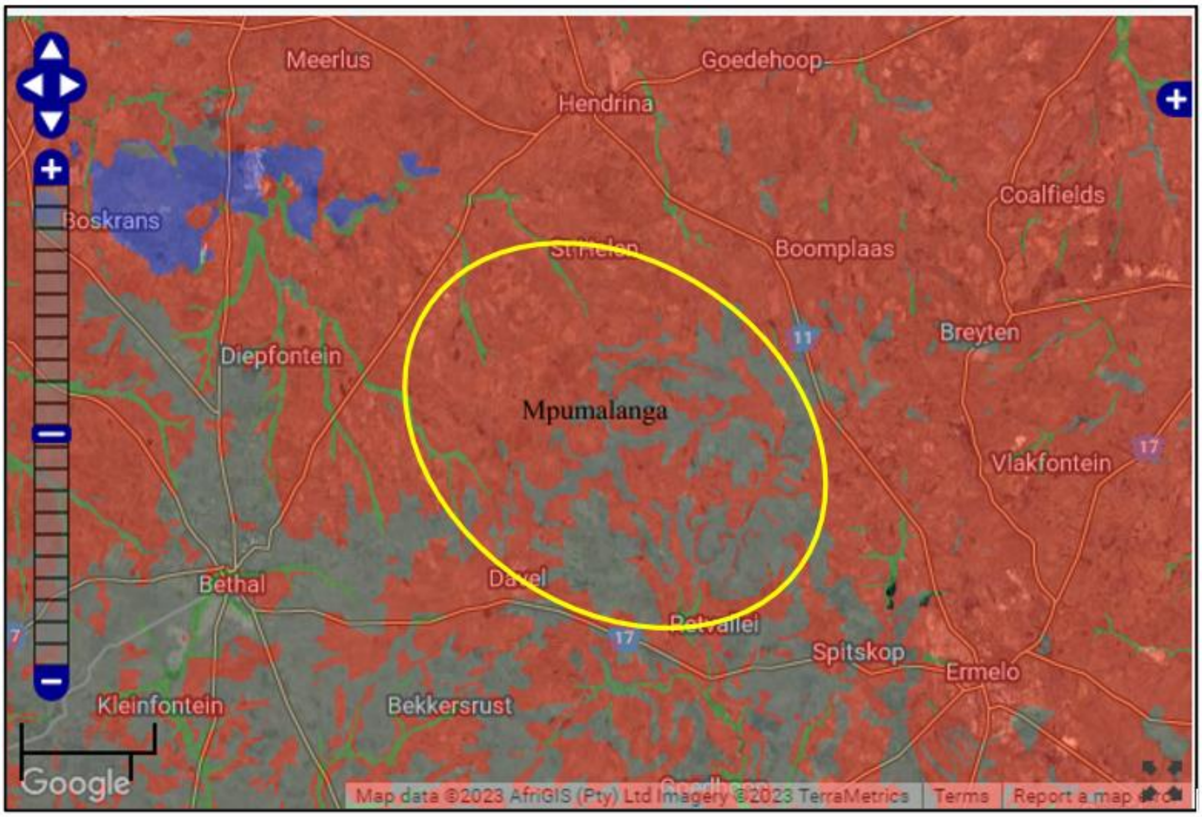
7.3.4 PALAEONTOLOGY

The study area is of insignificant and very high palaeontological sensitivity (**Figure 7.34**). The site for development is in the very highly sensitive Vryheid Formation (red) and the non-fossiliferous Jurassic dolerite (grey). The Quaternary sands and alluvium are indicated as moderately sensitive (green).

The Vryheid Formation lies on the uneven topography of pre-Karoo or Dwyka Group rocks in the northern and northwestern margins, but lies directly on the Pietermaritzburg Formation in the central and eastern part. The lithofacies show a number of upward-coarsening cycles, some very thick, and they are essentially deltaic in origin. There are also delta-front deposits, evidence of delta switching, and fluvial deposits with associated meandering rivers, braided streams, back swamps or interfluves and abandoned channels (Cadle et al., 1993; Cairncross, 1990; 2001; Johnson et al., 2006). Coal seams originated where peat swamps developed on broad abandoned alluvial plains, and less commonly in the backswamps or interfluves. Most of the economically important coal seams occur in the fluvial successions (ibid). In the east (Mpumalanga and northern KwaZulu Natal), the Vryheid formation can be subdivided into a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval again (Taverner-Smith et al., 1988).

Fossil plants of the Glossopteris flora occur in the Vryheid Formation. This flora includes Glossopteris leaves, seeds, fructifications, roots and wood, as well other groups such as the lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

Based on the site visit walkdown specifically to the sites for the turbines as currently positioned, the area is open and almost flat. It is covered with soils and grasslands used for grazing, some croplands too. There were no rocky outcrops, no rocks and NO FOSSILS were seen.



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 7.34. Palaeontological sensitivity map of the approximate study areas (yellow polygon).

7.3.5 VISUAL CHARACTER AND SENSITIVITY

The natural topography of the site and study area is representative of that of the region, and is largely devoid of distinctive landmarks, although larger rises and low ridges do provide some visual variation and create focal points in short range views. The site natural topography is also essentially untransformed, in comparison to areas directly to the west which have notably been transformed by surface coal mining. The site topographical visual resource value is therefore rated as high.
Similarly, the hydrological aspect of the site is undistinctive and visually like that of much of the larger area, although large sections of wetland are still largely intact. The many dams of different sizes do create points of interest and attract birdlife which adds diversity and a dynamic aspect to the site, and the hydrological aspects of the site is therefore rated as being of high visual resource value.

Given the fact that only a fraction of the once expansive original Highveld grasslands remains, and the further threat posed by mining, agriculture, informal settlement, and associated degradation, the visual resource value of the remaining untransformed sections of the site's vegetation cover is rated as high. Similarly, individual clumps and lanes of planted pine and oak trees create points of interest and contribute to the rural character and charm of the area, and also have a high visual resource value.

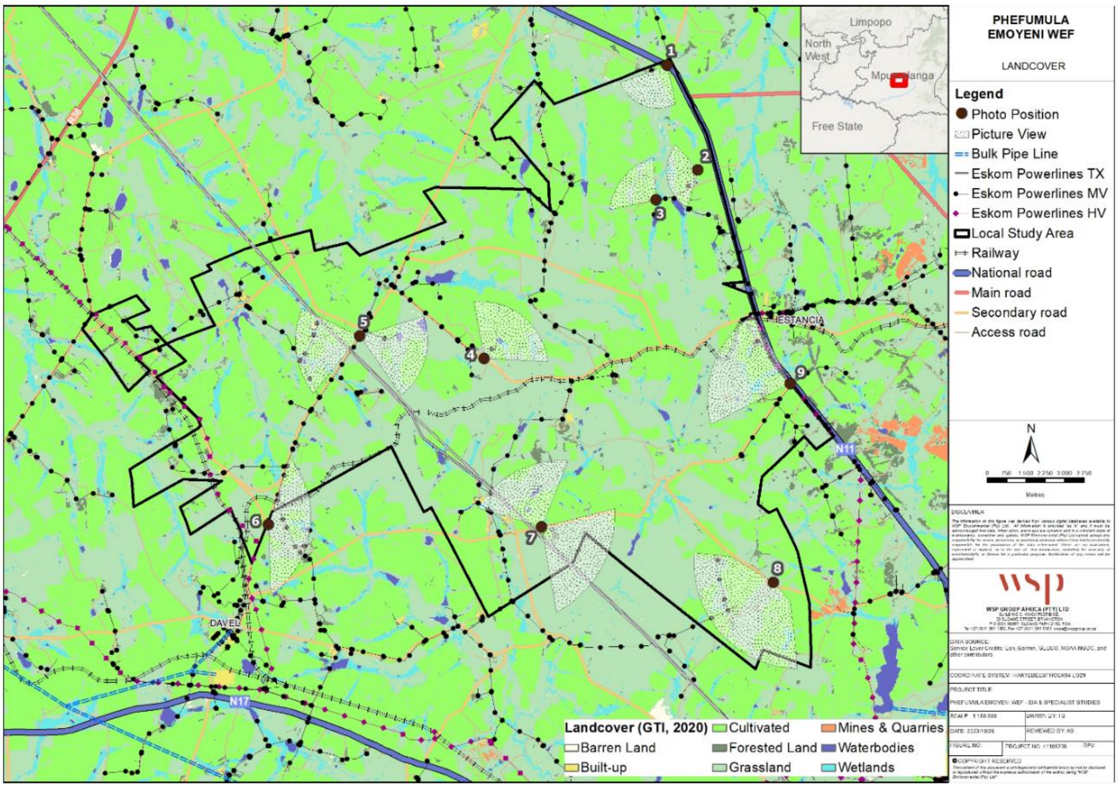


Figure 7-35 - Land cover map showing surface water and remaining natural vegetation areas which are deemed high visual resource value aspects of the site which are deemed high visual resource value aspects of the site.

7.3.5.1 Visual Receptor Groups

Visual impact is primarily concerned with human interest. Potential viewers, or visual receptors, thus constitute people that might see and be affected by the proposed development. Receptor sensitivity refers to the degree to which an activity is expected to impact receptors, and depends on the following:

- The various groups of people (visual receptor groups) that occur within the project study area.
- How many people will see and be impacted by the project.
- How frequently they are expected to be exposed to the project.
- Their perceptions regarding the aesthetics of the existing visual context.

Visual receptors of the proposed project can be broadly categorised into two main groups, namely:

- People who live or work in the area, and who will be continuously or frequently exposed to the Project components (resident receptors)
- People who travel through the area and are only temporarily exposed to the project components (passing receptors)

Receptors in the study area potentially include the following groups:

- Residents of the various farmsteads and smallholdings on or within viewing distance of the site, and workers at these establishments (resident receptors).
- People working at the various mines that occur east of the site, and other agricultural and commercial establishments surrounding the site (resident receptors).
- Residents of and visitors to the towns and associated settlements potentially within sight of the site (resident and passing receptors).
- Other travellers along the various national and regional roads, and other asphalt and gravel roads surrounding the site (passing receptors).

The degree to which these receptors will be impacted by the project will be dependent on the level of visibility of the project components within the project study area, which will be further assessed during the impact assessment phase.

The following ratings have been applied to the identified visual receptor groups:

- **Resident receptors:** Resident receptors comprise at least a moderate to possibly large number of people (incidence factor) living and/or working in the study area. We advance that considering the low existing levels of development associated with the rural setting, a notable contingent of this receptor group will probably attach a high value (vulnerability factor) to the visual appearance of the project site.
- **Passing receptors:** People travelling through the study area will include residents, travelling workers, regional tourists, and people on route to towns in the area, or destinations elsewhere. Given the proximity of numerous towns and the fact that the site is bordered by the N11 it is likely that many people (incidence factor) see the site on a frequent basis. It can be assumed that different people within this receptor group will have widely divergent views on the value of the site and surroundings as a visual resource, which will largely be determined by their relation to the area. To account for this degree of variability, it is assumed that this group on a whole will on average attach at least a moderate degree of value to the proposed project site (vulnerability factor)

7.3.5.2 VISUAL ABSORPTION CAPACITY

Visual absorption capacity (VAC) can be defined as an “estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality” (Oberholzer, 2008). The ability of a landscape to absorb development or additional human intervention is primarily determined by the nature and occurrence of vegetation cover, topographical character, and human structures.

A further major factor is the degree of visual contrast between the proposed new project and the existing elements in the landscape. If, for example, a visually prominent industrial development already exists in an area, the capacity of that section of landscape to visually “absorb” additional industrial structures is higher than that of a similar section of landscape that is still in its natural state. VAC is therefore primarily a function of the existing land use and cover, in combination with the topographical ruggedness of the study area and immediate surroundings.

Based on the very limited degree of landscape transformation of the site within the study area, the gently rolling topography, and overall lack of distinctive features, vertical elements or landmarks, the VAC of the site is rated as low (**Figure 7-36**).

Figure 7-36 - The entire site is characterised by low degree of visual absorption capacity.

7.3.6 SOCIO-ECONOMIC

7.3.6.1 Regional Context

The proposed project is in Mpumalanga Province, located in the Northeastern part of South Africa. Mpumalanga Province covers an area of 76 495km² and has a population of approximately 4 335 965. The capital city of Mpumalanga is Mbombela, and other major cities and towns include Emalahleni, Secunda, eMkhondo, Malelane, Middelburg, Barberton, and Ermelo which is the closest town to the proposed project.

The province is divided into three district municipalities: Ehlanzeni, Nkangala Districts, and Gert Sibande, in which the proposed project is located. These three districts are further subdivided into 17 Local Municipalities. The proposed development is situated in the Msukaligwa Local Municipality (MLM).

7.3.6.2 District Context

Gert Sibande District Municipality is a Category C municipality in Mpumalanga Province. It is bordered by the Ehlanzeni and Nkangala District Municipalities to the north, KwaZulu-Natal and the Free State to the south, eSwatini to the east, and Gauteng to the west.

The district covers an area of 31 840km², making it the largest of the three districts in the province. It comprises seven local municipalities: Govan Mbeki, Chief Albert Luthuli, Dipaleseng, Mkhondo, Lekwa, Dr Pixley ka Isaka Seme and Msukaligwa. (Municipalities of South Africa, 2023).

7.3.6.3 Local Context

Msukaligwa Local Municipality covers an area of 6 016 km². It is one of the seven local Municipalities within the Gert Sibande District Municipality. It has a population of 149,377 people. Msukwaligwa LM is the 3rd most populated municipality in the District of Gert Sibande.

The Msukaligwa Local Municipality is bounded by Govan Mbeki Municipality, Chief Albert Luthuli Local Municipality, Mkhondo Local Municipality and Lekwa Local Municipality. It is accessible through three National Roads and Provincial main roads, which are N2, N11, and N17, R33, R39, R65 and R542. **Figure 7-37** below depicts the local context.

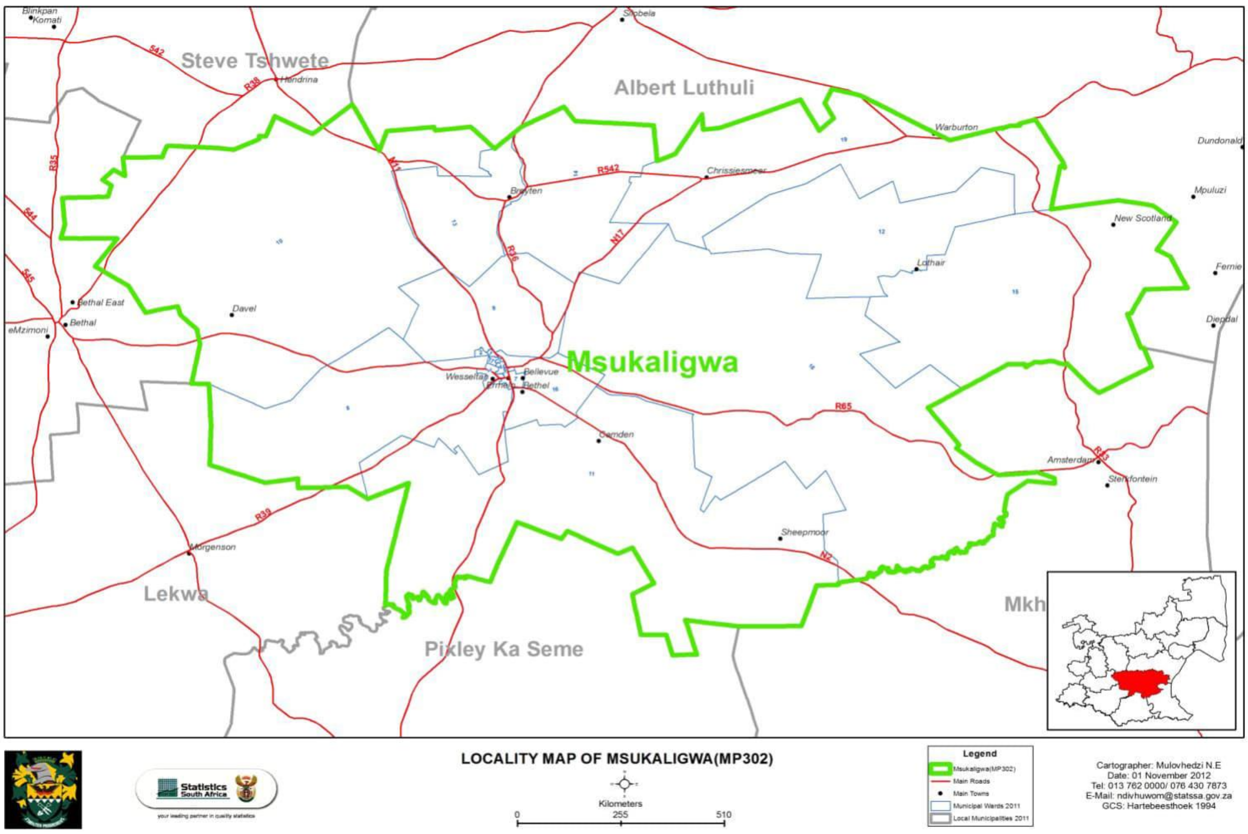


Figure 7-37 - Local Context Msukaligwa Municipality comprises 19 Wards, with wards 1-9 and 17 clustered within Ermelo town and Wesselton Township (Msukaligwa Municipality, 2022)**.**

7.3.6.4 Demographic Overview

Trends in demography are fundamental driving forces for any development of an area in terms of housing, retail, engineering services, community and government services, safety, and security. The demographic profile influences the type of goods and services, their level of demand and the pressure on local services, infrastructure, and public transport.

7.3.6.5 Population

According to Statistics South Africa Community Survey 2016, the municipality has a population of 164,608 persons with a population density of 27.3 persons per square kilometre.

According to Stats SA Mid-Year Population Estimates 2021, the estimated population number for 2022 is 190 532 people or 14.8% of the Gert Sibande District population and Stats SA projects that in 2030, the population will increase to 217 272 or 15.0% of the district. This increase will pressure infrastructure, service delivery and employment opportunities within the municipality.

The number of households in Msukaligwa increased from 40 932 to 51 089 between 2011 and 2016 (more than 10,000 households). According to Stats SA, the estimated number of households in 2022 is 63,050 and is projected to increase to 71,899 households by 2030 see **Figure 7-38.**

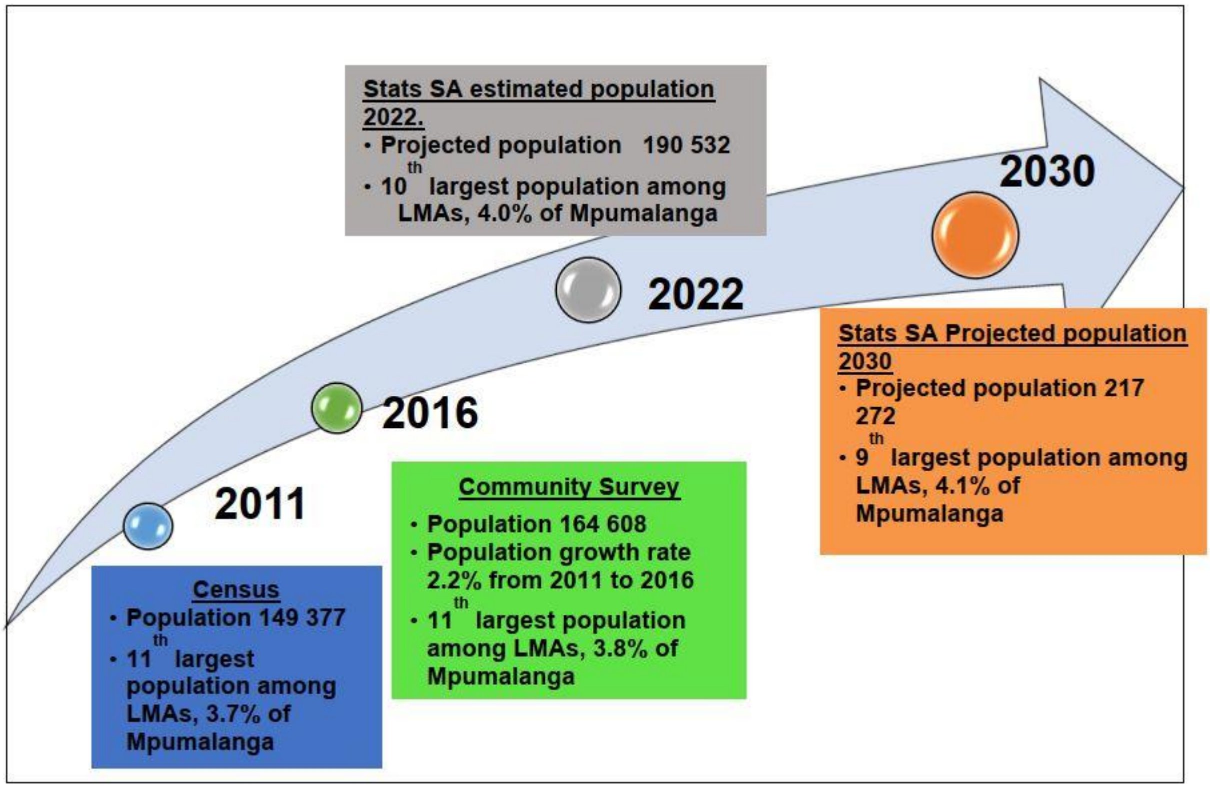


Figure 7-38 - Msukaligwa Population Data and Projection (Socio-economic profile by the Department of Economic Development and Tourism, 2022)

7.3.6.6 Gender And Age Profile

According to the Statistics South Africa Community Survey 2016, most of the MLM has a young population (15-34 years), forming 41.2% of the total population. The general trend is a decrease in children between 5 and 14 years since 2001, with an increase in the 25-43 age group. This trend may indicate decreased birth rates / reduced population growth. The female population exceeds the male population by just over a per cent (51.1%). See **Figure 7-39** for the population pyramid.

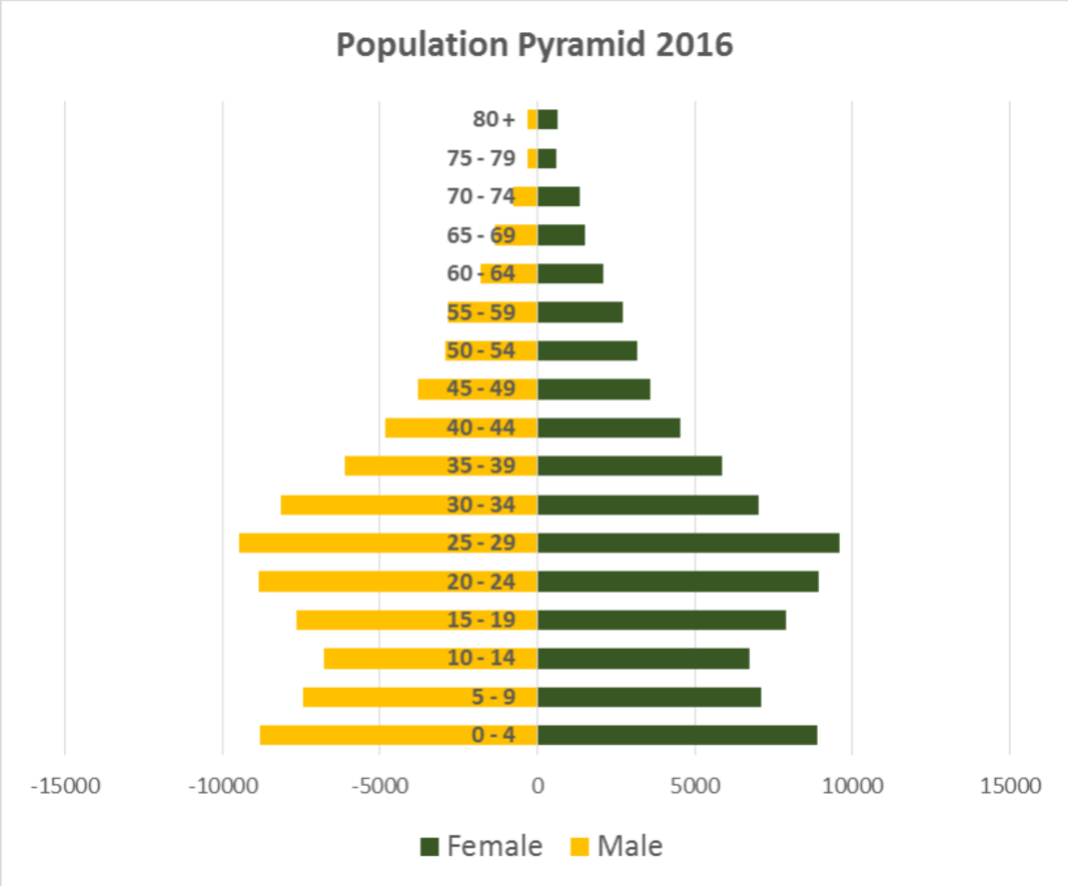


Figure 7-39 - Population Pyramid, 2016

7.3.6.7 Educational Profile

Table 7-6 indicates that 9.6% of persons without schooling decreased between 2011 and 2016. Despite this positive decrease, a population of children within the municipality remain uneducated. Msukaligwa's grade 12 pass rates decreased from 80.6% in 2014 to 76.4% in 2020. The pass rate decreased by 55.3% between 2020 and 2021, mainly due to Covid-19-related factors. The admission rate to university/degree studies deteriorated to 32.6% in 2021 regarding ranking in the province. In 2016, only 79.0 % of students completed grade 7. However, there was a slight improvement in functional literacy within the municipality in 2020 when 85.6% of students over 15 years were recorded to have passed grade 7 (Msukaligwa Municipality, 2022).

There is also a challenge to accommodating the educated young people in the area as inadequate and inappropriate employment opportunities exist.

Table 7-6 – Educational Levels

Educational Indicators		
% Population 15+ with no schooling	2011	2016
	8.2 %	9.6 %

% Population 15+ with matric and post matric qualification		23.6 %		39.6%	
Grade 12 Pass Rate	2014	2020	2021	Admission to B degree studies	2021
	80.6 %	76.4 %	71.1 %		32.6 %
Functional Literacy rate					
Age 15yr+ and completed grade 7 or higher					
2011	2015			2016	2020
79.0 %	80.8 %			81.4 %	85.6 %

(Msukaligwa Municipality, 2022)

7.3.6.8 Educational Facilities

Msukaligwa Municipality has only one FET College. Considering the continuous population growth within the municipality and the shortage of skills within communities, there is a need for a tertiary institution within the district. MLM IDP indicates that with the development within the municipality comes a need for a high school at Ermelo Ext. 32, 33, 34 and New Ermelo area, Khayelihle, close to Emadamini and Thusi Ville, and additional Primary Schools, except for those mentioned in **Table 7-7**. The table also indicates an imbalance in the number of primary schools compared to the number of high schools (Statistics South Africa, 2011).

Table 7-7 – Educational Facilities

Educational Facility	Number
Primary Schools	71
High Schools	6
Combined Schools	12
Secondary Schools	11
Tertiary institutions	0
FET Colleges	1
Training Centres/Adults Education	9
No. of Private Schools	3
Day Care Centres	40

(Msukaligwa Municipality, 2022)

7.3.6.9 Labour Profile

Table 7-8 below indicates the labour force comparison within Msukaligwa Municipality from 2011 to 2016. The unemployment rate in the municipality stood at 23.6% in 2016, which decreased from 26.8 % in 2011. Furthermore, data from 2016 showed a reduction in economically active persons compared to 2011 figures. This reduction in unemployment figures indicates that the labour market was absorbing more people, or it could have resulted from retirement rates as figures showed an increase in economically active people.

According to the Provincial Department of Economic Development and Tourism, the unemployment rate for females and males is 31.4 % and 18.1 %, respectively, with the youth being the highest at 34.5 % in 2016. This information will assist when planning any developmental intervention within the municipality.

Table 7-8 – Employment Status

Employment Status	2011	2016
Employed	41 698	43 751
Unemployed	15267	15 084
Economically active	56969	53208
Not Economically active	51476	52565
Total	149 377	164 608

Statistics South Africa, Census 2011 and Community Survey 2016

7.3.6.10 Employment Sector Contribution

The municipality comprises sectors that contribute to the regional economy and employ the people of Msukaligwa and surrounding areas.

Table 7-9 below depicts that in 2020, the industries contributing to the increment in employment over the years include trade (22.0%), Community services (15.3%), finance (12.5%), manufacturing (10.4%) and mining (9.5%). Though there is a slight decrease in trade and community services, this played a role in the employment increase.

Table 7-9 – Employment per sector & Contribution to Regional (Gert Sibande) GVA

	2015		2020	
Sector	Employment	Contribution to GVA	Employment	Contribution to GVA
Agriculture	11.5%	14.6%	6.3%	18.5%
Mining	7.7%	11.5%	9.5%	5.6%
Manufacturing	0.8%	9.5%	3.0%	19.2%
Utilities	0.8%	9.5%	3.0%	19.2%
Construction	3.9%	7.4%	7.5%	17.0 %
Trade	23.7%	20.4%	22.7%	23.3%
Transport	6.9%	28.7 %	5.2 %	31.0 %

	2015		2020	
Finance	9.6%	24.3%	12.5%	24.5%
Community	19.0%	21.4%	15.3%	23.0%
Private Households	9.1 %	-	7.6 %	
Total	100%	13.4 %	100%	16.7 %

(Msukaligwa Municipality, 2022)

7.3.6.11 Inequality and poverty levels

From 2011 to 2016, Msukaligwa experienced an increase in impoverished people. According to Statistics South Africa, the poverty rate (individuals living in South Africa with less than R945 a month) was 38.2 %. Municipalities can collaborate with private entities to alleviate poverty through economic development interventions. The Gini Co-efficiency[8] has not improved from 2011 to 2016. This Gini Co-efficiency indicates high inequality in terms of income distribution. The total number of people living in poverty in 2011 was 56,823, slightly increasing to 60,213 in 2016. The absolute poverty Gap is 137 million Rands. This gap indicates that those living under the poverty line will have to collectively obtain a further R137 Million Rands to be over the threshold. (Statistics South Africa, 2016).

Table 7-10 – Population and People below the minimum living standard

Indicators	2011	2016
	0.61	0.61
Poverty rate[9]	33.6%	38.2 %
People in Poverty	56,823	60.213
Poverty gap (R Million)[10]	R137	

7.3.6.12 Community Health

According to the Msukaligwa municipality IDP, the Department of Health reported in 2013 that the HIV infection rate was 46.5 % among the antenatal clients te[s]ted, which increased compared to the year 2012 with a rate of 34.4%. Msukaligwa IDP also indicates a shortage of health facilities, with only a single private hospital and one government hospital. See **Table 7-11** below for health facilities available within the municipality. (Msukaligwa Municipality, 2022),

[8] The Gini coefficient is a statistical measure of economic inequality in a population.
[9] The poverty rate is the ratio of the number of people (in a given age group) whose income falls below the poverty line
[10] The poverty gap index is a measure of the degree of poverty. It is defined as extent to which individuals on average fall below the poverty line, and expresses it as a percentage of the poverty line

Table 7-11 – Health Facilities

Facilities	Number
Private Hospitals	1
Primary Health Care Clinics	10
Mobile Clinics	4
Government Hospitals	1
Infectious Hospital (TB)	1
Dentists	4
Gynaecologist	1
Social Workers	12
Private Doctors	20

(Msukaligwa Municipality, 2022)

7.3.7 HEALTH AND SAFETY RISK

The health and safety risk assessment will specifically look at the Battery Energy Storage System (BESS) installation.

Ideally, due to the possibility of noxious smoke from fires, any lithium BESS should be located over 500m from residences particularly those downwind in the dominant wind direction.

The dominant wind directions in the area are likely to be from the east and then the north and west.

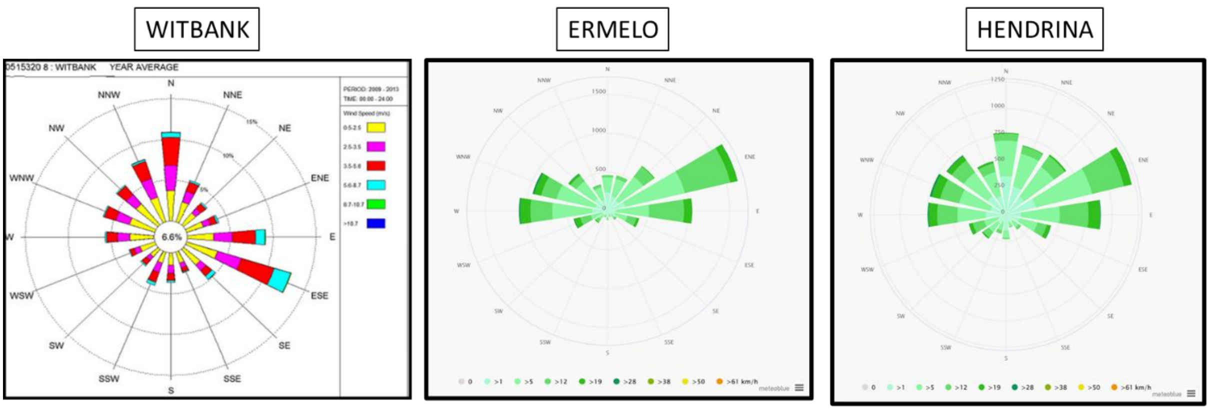


Figure 7-40 - Wind Rose Information for the broader area

Figure 7-41 shows the location of farmhouses / occupied facilities with a 500m red circle around each. It also shows power lines and main public roads for which suitable separation distances should also be applied, e.g. road 100 – 150m and power lines 30m, or as required by Eskom.

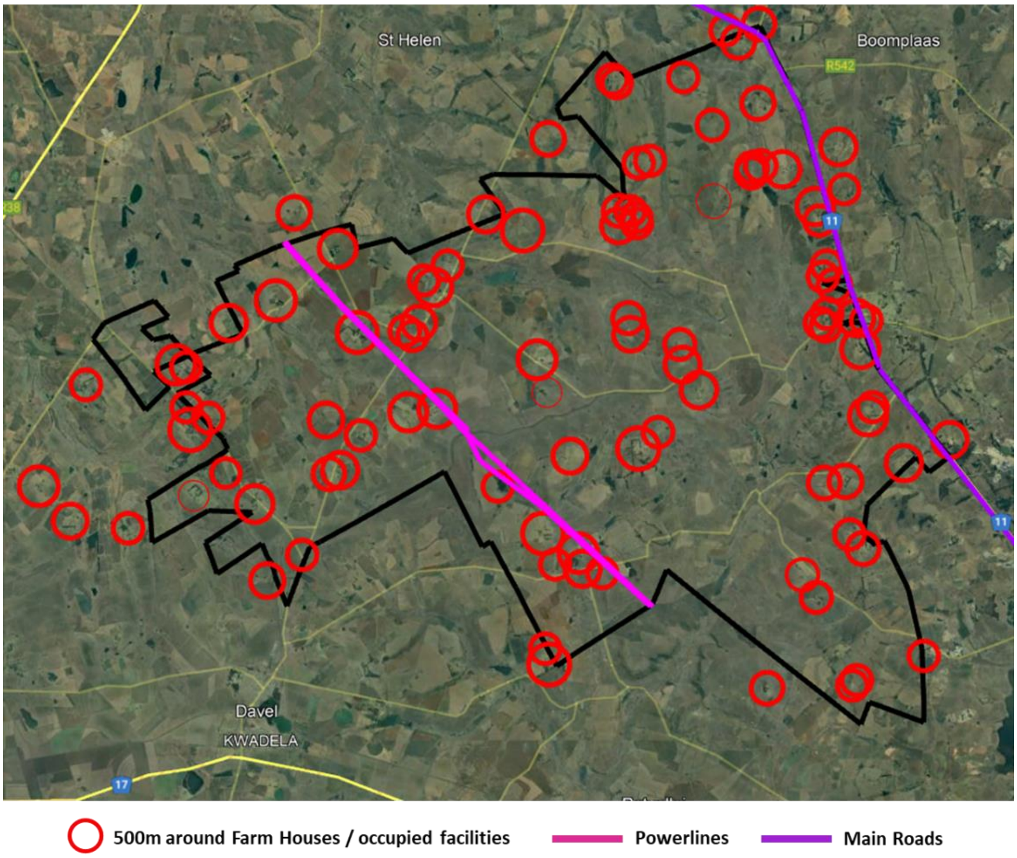


Figure 7-41 - Satellite Image of the area showing the location of farmsteads / buildings (red circles) etc in relation to the proposed Phefumula Emoyeni One footprint.

Supplies of water should be protected from possible chemical contamination. Should redox flow batteries be the chosen technology, it is suggested that the facilities be located a suitable distance away from water courses/sources. With lithium containers, large releases of liquids would only occur in the event of battery fire and emergency services applying fire water to a container which is unlikely in a remote location.

It is suggested that the BESS facilities be located a suitable distance away from water courses/sources, e.g. 100m from rivers, wetlands etc and 50m from boreholes – or as suggested by the aquatic specialists.

Two possible BESS technology below have been proposed along with possible impacts.

The safety and health risks associated with vanadium redox flow batteries will likely be lower than for the lithium-ion battery type for both employees and members of the public outside the facility. Lithium batteries pose a higher fire and explosion risk as well as the possibility of generating noxious smoke under these circumstances. However, the environmental risks of aquatic contamination with the vanadium type batteries will likely be higher than for solid state batteries, due to the presence of liquids.

Lithium-ion BESS:

- noxious smoke
- fires/explosions

Vanadium redox flow BESS:

- suitable secondary spill containment for the large volume of electrolyte

General:

- agricultural areas have been identified within the project site.
- small scale commercial interests, e.g. guest houses have been identified in the area.
- location of farmsteads and water resources in close proximity to the BESS installation.
- commercial mining has been identified farther to the east of the proposed project site.

8 SITE SENSITIVITY AND VERIFICATION

8.1 DFFE WEB-BASED ENVIRONMENTAL SCREENING TOOL

DFFE has developed the National Web-based Environmental Screening Tool in order to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of Regulation 16 (1)(v) of the EIA Regulations (2014, as amended). *The Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN 960 of July 2019)* states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, published under Government Notice No. R982 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations, 2014 (as amended) as of 04 October 2019.

The Screening Report generated by the National Web-based Environmental Screening Tool contains a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint as well as the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A screening report for the proposed project was generated on 04 September 2024 and is attached as **Appendix I**. The Screening Report for the project identified various sensitivities for the site. The report also generated a list of specialist assessments that should form part of the S&EIA based on the development type and the environmental sensitivity of the site. Assessment Protocols in the report provide minimum information to be included in a specialist report to facilitate decision-making.

Table 8-1 below provides a summary of the sensitivities identified for the development footprint.

Table 8-1 – Sensitivities identified in the DFFE Screening Report

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agricultural Theme	✓			
Animal Species Theme		✓		
Aquatic Biodiversity Theme	✓			
Archaeological and Cultural Heritage Theme		✓		
Avian Theme				✓
Bats Theme		✓		
Civil Aviation Theme		✓		
Defence Theme				✓

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Flicker Theme	✓			
Landscape	✓			
Palaeontology Theme	✓			
Noise Theme	✓			
Plant Species Theme			✓	
RFI Theme	✓			
Terrestrial Biodiversity Theme	✓			
Vulture Species Theme			✓	
Vulture Species Theme			✓	

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening tool (please refer to Section 2.2.1 below for the EAP motivation applicable to this list):

- Agricultural Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Landscape/Visual Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Freshwater Impact Assessment
- Avifauna Impact Assessment
- Bat Impact Assessment
- Social Impact Assessment
- Defence Assessment
- Noise Impact Assessment
- Traffic Impact Assessment
- Flicker Assessment
- Geotechnical Assessment
- Civil Aviation Impact Assessment
- RFI Assessment
- Plant Species Assessment
- Animal Species Assessment.

8.1.1 MOTIVATION FOR SPECIALIST STUDIES

The report recognises that “it is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the footprint situation.”

As summarised in **Table 3-1** above, the following specialist assessments have been commissioned for the project based on the environmental sensitivities identified by the Screening Report:

- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Impact Assessment;
- Visual Impact Assessment (inclusive of Flicker assessment) ;
- Biodiversity Impact Assessment (inc'usive of terrestrial biodiversity, plant species and animal species);
- Surface water Assessment;
- Avifauna Impact Assessment;
- Bat Impact Assessment;
- Environmental Acoustic (Noise) Impact Assessment;
- Social Impact Assessment;
- Qualitative Risk Assessment (specific to the BESS);
- Desktop Geotechnical Assessment; and
- Desktop Traffic Assessment.

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e., "the Protocols"), or Appendix 6 of the EIA Regulations, depending on which legislation apply to the assessment under consideration. A summary of the DFFE screening tool, the applicable legislation as well as the specialist sensitivity verification are detailed in **Table 8-2** below The site sensitivity verification report is included in **Appendix J**..

Table 8-2 - Assessment Protocols and Site Sensitivity Verifications

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Motivation for Exclusion
Agricultural Impact Assessment	Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more	Very High Sensitivity	Confirmed High and Medium Sensitivity	N/A
Landscape/Visual Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific	Very High Sensitivity	Confirmed moderate to high Sensitivity	N/A

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Motivation for Exclusion
	Assessment Protocol has been prescribed			
Archaeological and Cultural Heritage Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	High Sensitivity	Confirmed low, medium and high Sensitivity	N/A
Palaeontology Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Very High Sensitivity	Confirmed low sensitivity	N/A
Terrestrial Biodiversity Impact Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Very High Sensitivity	Very High/High in areas of primary grassland and wetland habitat and areas designated as CBA Irreplaceable and CBA Optimal. Low/ Medium in areas of secondary grassland habitat. Very Low in areas of modified habitat.	N/A
Aquatic Biodiversity Impact Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Very High Sensitivity	Confirmed very High Sensitivity	N/A
Civil Aviation Assessment	Protocol For The Specialist Assessment And Minimum Report Content Requirements For Environmental Impacts On Civil Aviation Installations	High Sensitivity	Confirmed Low Sensitivity	A formal Civil Aviation Assessment will not be undertaken as part of the S&EIA Process. Nevertheless, the relevant Authorities have been included on the project stakeholder

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Motivation for Exclusion
				database. As of the 1st of February 2022, ATNS has been appointed as the new Obstacle application Service Provider for Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Solar assessments. A wind turbine Obstacles application has been submitted to ATNS for the project and the required permits will be obtained prior to the development of the project. The South African Civil Aviation Authority (SACAA) has been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought. This theme has been identified as a high sensitivity, and a compliance statement has been undertaken by the EAP.
Defence Assessment	Protocol For The Specialist Assessment And Minimum Report Content Requirements For Environmental Impacts On Defence installations	Low Sensitivity	Confirmed Low Sensitivity	The Department of Defence has been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought. As this theme has been identified as a

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Motivation for Exclusion
				low sensitivity, no compliance statement is required.
RFI Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Very High Sensitivity	Confirmed Low Sensitivity	An RFI Study will not be undertaken. The SAWS and relevant telecommunications stakeholders will be engaged with as part of the Public Participation Process. This theme has been identified as a very high sensitivity, and a compliance statement has been made by the EAP.
Geotechnical Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	No sensitivity identified by the screening tool	N/A	A detailed Geotechnical Assessment will not be undertaken as this will be undertaken during the design phase.
Socio Economic Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	No sensitivity identified by the screening tool	N/A	N/A
Plant Species Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species	Medium Sensitivity	Confirmed Medium Sensitivity Medium in areas of primary grassland and wetland habitat.	N/A
Animal Species Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species	High Sensitivity	Confirmed High Sensitivity High in areas of grassland and wetland habitat.	N/A

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification	Motivation for Exclusion
Bat assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Bats	High Sensitivity	Confirmed High Sensitivity	N/A
Avifauna Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Low Sensitivity	Confirmed High Sensitivity	N/A
Vulture Species theme	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Bats	Medium Sensitivity	Confirmed Low Sensitivity	N/A
Flicker Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Flicker installations	Very high Sensitivity	Confirmed High Sensitivity	N/A
Noise Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Noise impacts	Very high Sensitivity	Confirmed Very High Sensitivity	N/A

8.2 CONSOLIDATED SITE SENSITIVTY

The sensitivity input provided by specialists during the scoping phase was utilised to compile a no-go map (**Figure 8-1**) which was utilised to prepare the revised layout for assessment in the EIA Phase.

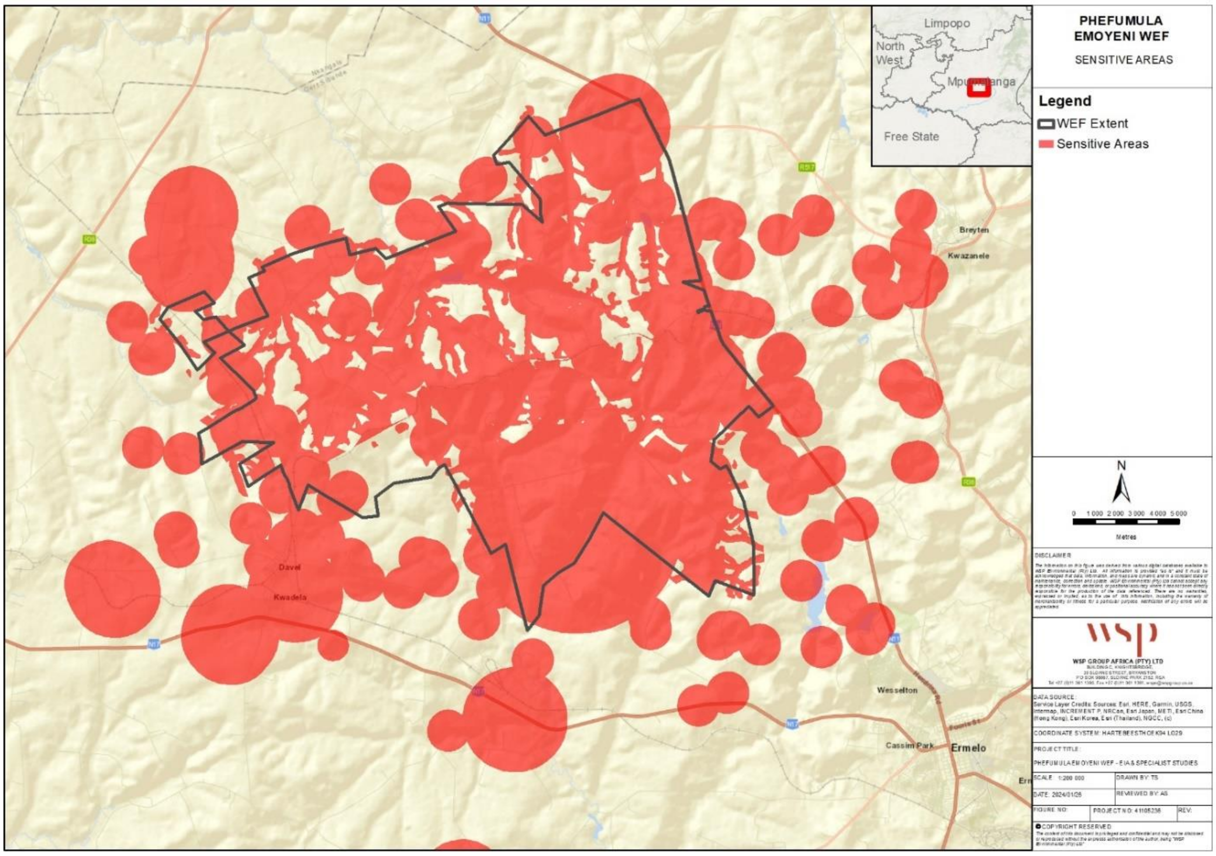


Figure 8-1 - Phefumula Emoyeni One WEF No-go map

The preliminary and revised layouts are illustrated in **Figure 8-13** and **Figure 8-3.**

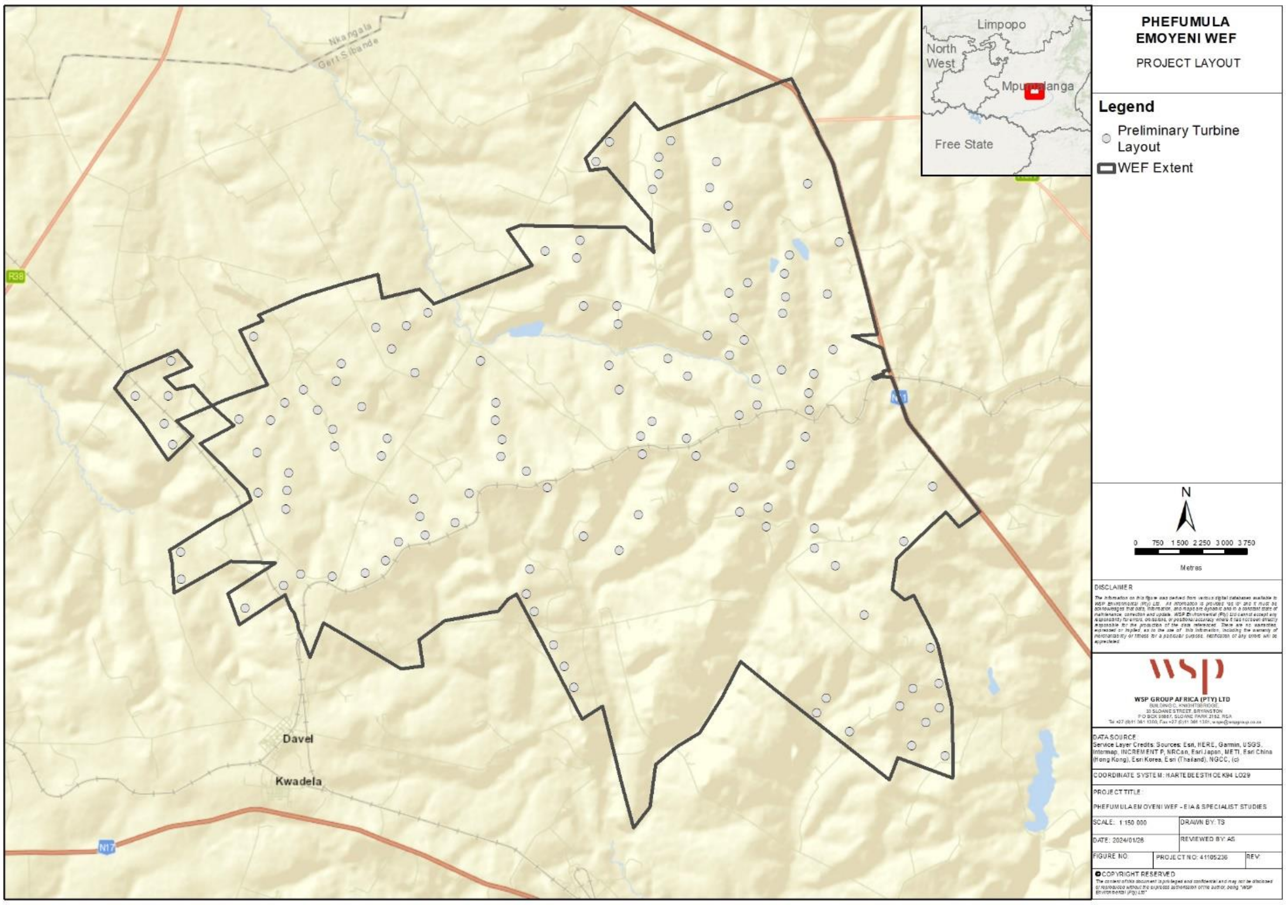


Figure 8-2 - Phefumula Emoyeni One WEF - Preliminary Project Layout (135 turbines)

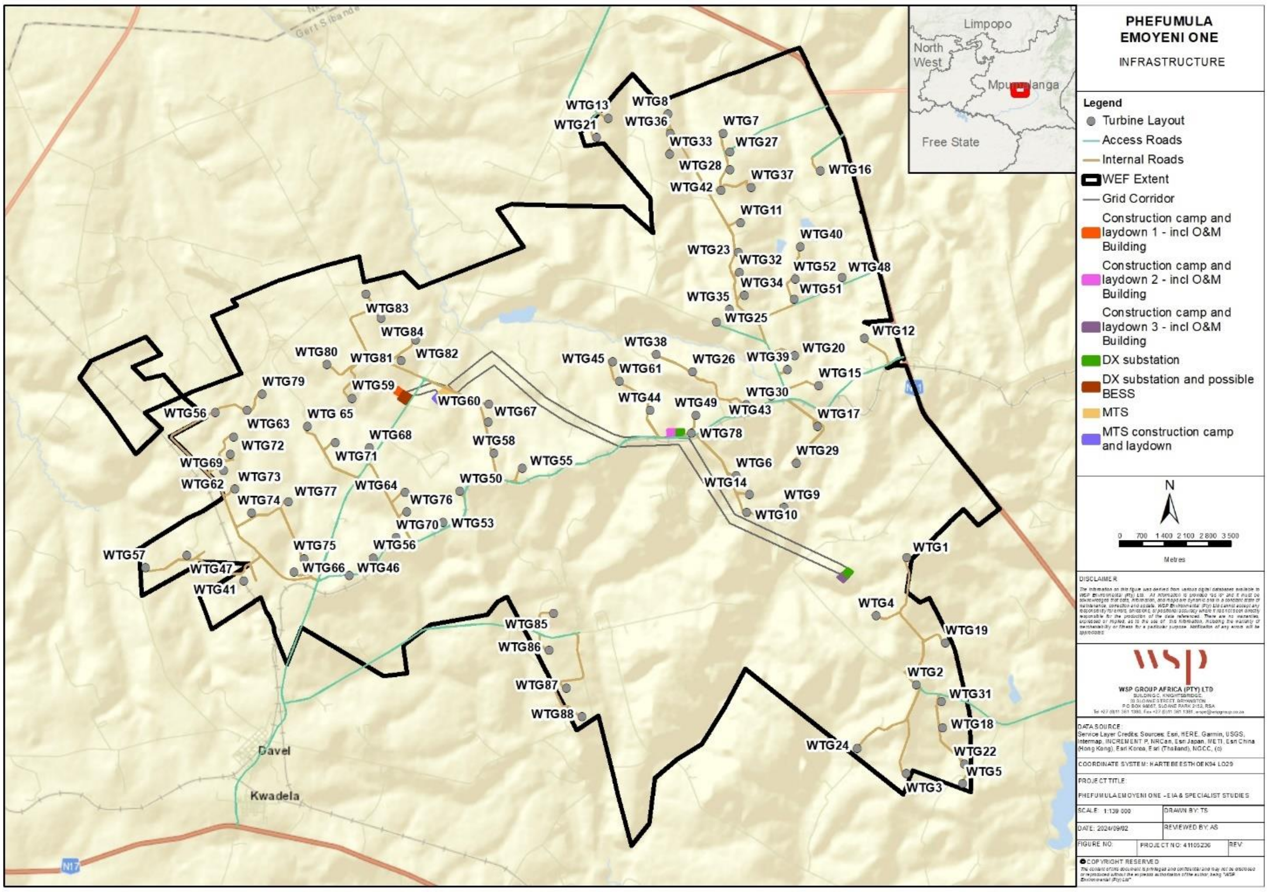


Figure 8-3 - Phefumula Emoyeni One WEF - Revised Layout (88 Turbines)

Figure 8-4 below shows the consolidated site sensitivities with the revised WEF layout overlain.

The sensitivity layers were updated by the specialists during the course of the EIA phase to again optimise the layout. **Figure 8-5** illustrates the updated consolidated site sensitivities with the optimised WEF layout overlain.

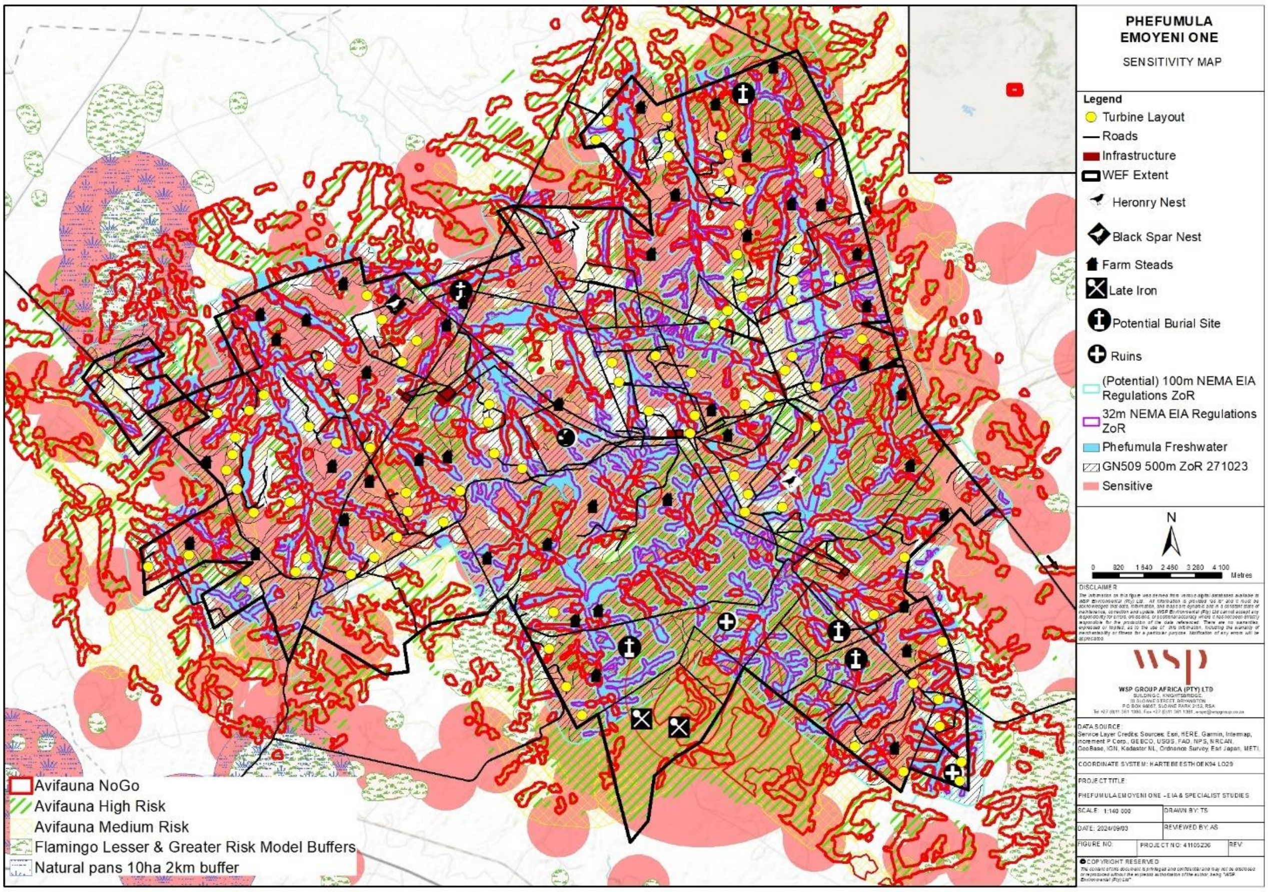


Figure 8-4 - Consolidated site sensitivity map overlain on the Revised Layout Map

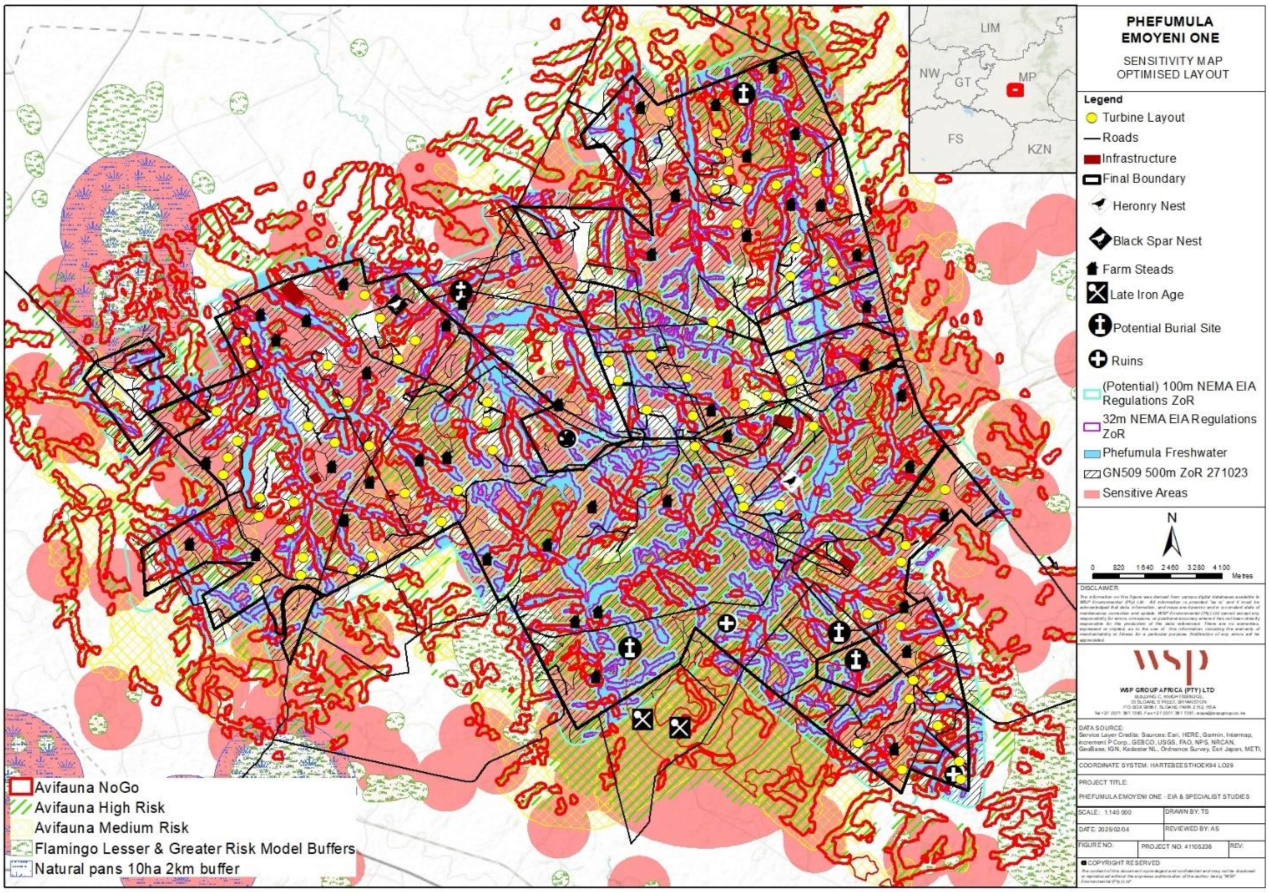


Figure 8-5 - Consolidated site sensitivity map overlain on the optimised Layout Map

9 ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined in **Section 3.3**. The issues identified stem from those aspects presented in **Section 7 and 8** of this document as well as the Project description provided in **Section 4**.

Furthermore, a decommissioning assessment will be considered as part of the decommissioning process that will be subject to a separate authorisation and impact assessment process. Any decommissioning impacts will be assessed at this stage. The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GNR 326.

9.1 PHASE OF DEVELOPMENT

Potential impacts have been identified and preliminarily assessed according to the phases of the project's development. For the purpose of this project, these phases have been generically defined below.

- Construction Phase:
  - The construction phase includes the preparatory works/activities typically associated with the creation of surface infrastructure, access and electrical power. The activities most relevant to this phase include:
    - Topsoil stripping;
    - Cut and fill activities associated with site preparation (if required); and
    - Construction of the surface infrastructure including turbine foundations, turbines, invertors, access roads, site substation and internal powerlines.
- Operational Phase:
  - The operational phase includes the daily activities associated with the wind energy facility.
- Decommissioning:
  - The decommissioning phase includes the activities associated with the removal/dismantling of machinery/equipment/infrastructure no longer necessary to the operation

9.2 ACTIVITIES MATRIX

The impacts below have been assessed according to environmental categories. Table 9 1 provides an indication of how these environments are linked to the various NEMA listed activities outlined in Chapter 6.

Table 9-1 - Activities Matrix (C - Construction, O - Operation, D - Decommissioning)

Listed Activity	Agriculture	Aquatic	Avifauna	Bats	Animal Species	Terrestrial Biodiversity	Plant Species	Geotechnical	Heritage	Noise	SHE Risk	Social	Traffic	Visual
GNR 983- Listing Notice 1														
11 (i)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
12(ii)(a)(c)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
14	C	C D	C D	C D	C D	C D	C D	C	C D	C D	C O D	C D	C D	C D
19	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
24 (ii)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
28 (ii)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
30	C	C D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
48(i)(a)(c)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D

Listed Activity	Agriculture	Aquatic	Avifauna	Bats	Animal Species	Terrestrial Biodiversity	Plant Species	Geotechnical	Heritage	Noise	SHE Risk	Social	Traffic	Visual
56(i)(ii)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
GNR 984- Listing Notice 2														
1(a)	C	C O D	C O D	C O D	C O D	C O D	C O D	C	C D	C O D	-	C O D	C D	C O D
9(a)(b)(c)(d)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
15 (i)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
GNR 985 Listing Notice 3														
4(f)(i)(cc)(ee)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
10(f)(i)(cc)(ee) (hh)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	C O D	C D	C D	C D
12(f)(i)(ii)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
14(ii)(a)(c)(f)(i) (dd)(ff)	C	C O	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D

Listed Activity	Agriculture	Aquatic	Avifauna	Bats	Animal Species	Terrestrial Biodiversity	Plant Species	Geotechnical	Heritage	Noise	SHE Risk	Social	Traffic	Visual
		D												
18(f)(i)(cc)(ee)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D
23(ii)(a)(c)(f)(i) (cc)(ee)	C	C O D	C D	C D	C D	C D	C D	C	C D	C D	-	C D	C D	C D

9.3 AGRICULTURE ASSESSMENT

There is only ever a single agricultural impact of any development, and it is a net change to the future agricultural production potential of land. It occurs as a result of different mechanisms, some of which decrease production potential (for example exclusion of agriculture from land) and some of which increase it (for example increased financial security). Change to the future agricultural production potential of land takes place over the lifetime of a development. What is of relevance is the net change from pre-development to post-development. It is not helpful to distinguish different levels of impact during the different phases of the development such as design, construction, and operation. The total integrated impact is what matters.

In most developments the decrease in production potential is primarily caused by the exclusion of agriculture from the footprint of the development. Soil erosion and degradation may also contribute to loss of agricultural production potential, but these can be managed so as not to cause impact. The significance of a loss of agricultural production potential is a direct function of the following three factors:

- the size of the footprint of land from which agriculture will be excluded (or the footprint that will have its potential decreased)
- the baseline production potential (particularly cropping potential) of that land
- the length of time for which agriculture will be excluded (or for which potential will be decreased).

In the case of wind farms, the first factor, size of footprint, is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has, and regardless of the duration of the impact. This is because the required spacing between turbines means that the amount of land excluded from agricultural use is extremely small in relation to the surface area over which a wind farm is distributed. Wind farm infrastructure (including all associated infrastructure and roads) typically occupies less than 2% of the surface area, according to the typical surface area requirements of wind farms in South Africa (DEA, 2015). Most wind energy facilities, for which I have recently done assessments, occupy less than 1% of the surface area. All agricultural activities can continue unaffectedly on all parts of the farmland other than this small footprint, from which agriculture is excluded, and the actual loss of production potential is therefore insignificant.

As identified in the study, it is important to note that wind farms have both positive and negative effects on the production potential of land. It is the net sum of these positive and negative effects that determines the extent of the change in future production potential. The positive effects are:

- increased financial security for farming operations - Reliable and predictable income will be generated by the farming enterprises through the lease of land to the energy facility. This will increase financial security and could improve farming operations and productivity through increased investment into farming.
- improved security against stock theft and other crime due to the presence of security infrastructure and security personnel at the energy facility.
- an improved road network, with associated storm water handling system. The wind farm will construct turbine access roads of a higher standard than the existing farm roads which will give farming vehicles better access to farmlands. This will be especially relevant during wet periods when access to croplands for spraying etc is limited by the current farm roads.

There are two additional effects, but because they are highly unlikely to influence agricultural production, they are not considered further. They are:

- Prevention of crop spraying by aircraft over land occupied by turbines – ground based or using drones for spraying are effective, alternative methods that can be used without implications for production or profitability.
- Interference with farming operations - Construction (and decommissioning) activities are likely to have some nuisance impact for farming operations but are highly unlikely to have an impact on agricultural production.

The loss of agricultural potential by soil degradation can effectively be prevented for renewable energy developments by generic mitigation measures that are all inherent in the project engineering and/or are standard, best-practice for construction sites. Soil degradation does not therefore pose a significant impact risk.

Due to the facts that the energy facility will exclude only an insignificantly small area of land from agricultural production and that its negative impact is offset by economic and other benefits to farming, the overall negative agricultural impact of the development (loss of future agricultural production potential) is assessed here as being of low significance and as acceptable.

Table 9-2 - Agricultural production potential of land

Potential Impact: Agricultural production potential of land	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	5	2	**26**	**Low**	(-)
With Mitigation	3	2	3	5	2	**26**	**Low**	(-)
Mitigation and Management Measures	- Mitigation measures: - A system of storm water management, which will prevent erosion on and downstream of the site, will be an inherent part of the engineering design on site. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there. As part of the system, the integrity of the existing contour bank systems of erosion control on croplands, where they occur on steeper slopes, must be kept intact. - Any excavations done during the construction phase, in areas that will be re-vegetated at the end of the construction phase, must separate the upper 30 cm of topsoil from the rest of the excavation spoils and store it in a separate stockpile. When the excavation is back-filled, the topsoil must be back-filled last, so that it is at the surface. Topsoil should only be stripped in areas that are excavated. Across the majority of the site, including construction lay down areas, it will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire cut surface							

9.4 AQUATIC BIODIVERSITY IMPACT ASSESSMENT

9.4.1 CONSTRUCTION PHASE

Table 9-3 - Clearing of Vegetation and Terrain Levelling (Bulk Earthworks) related to Turbines, hardstands and other infrastructure including new access roads outside of 100m radius of wetland boundaries . (All Turbines except for Turbine42)

Potential Impact: ▪ Transformation of freshwater vegetation, associated habitat and ecosystem services within freshwater ecosystems not proposed to be directly impacted from indirect impacts; ▪ Transportation of construction materials can result in disturbances to soils, and increased risk of sedimentation/erosion; ▪ Risk of AIP proliferation in disturbed areas that could colonise the adjacent wetland areas; and ▪ Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	3	42	Moderate	(-)
With Mitigation	3	2	3	5	2	26	Low	(-)
Mitigation and Management Measures	▪ It is recommended that Turbine 42 be relocated to the north to be located outside of the 15m non-development buffer of the seep wetland to the south as a minimum. ▪ All construction areas must be clearly demarcated prior to the start of site clearing to prevent any accidental clearing of vegetation or construction impacts from adversely impacting areas outside of the development footprint (layout). ▪ All construction and site clearing should ideally take place during the dry season to limit potential impacts to downgradient freshwater ecosystems as a result of construction activities; ▪ A designated contractor laydown area(s) that is located outside the freshwater ecosystems and outside of a 100m radius of any wetland should be approved by the Environmental Control Officer (ECO) prior to use; ▪ An ECO must be appointed in order to ensure all water related aspects are adequately mitigated for the duration of the construction phase; ▪ All development footprint areas to remain within the approved development footprint and vegetation clearing to be limited to what is essential within those approved footprints; ▪ Retain as much indigenous vegetation as possible; ▪ Where clearing of vegetation at a large scale is to be undertaken, no large-scale indiscriminate clearing of vegetation from the entire footprint must be undertaken. Rather blocks of vegetation must be systematically							

	cleared of vegetation to avoid the creation of large volumes of dust and to control stormwater runoff during construction. - All vegetation removed as part of the site clearing activities (specifically where large areas need to be cleared) must be transported from the construction site (may not be stockpiled) and disposed of at a registered waste disposal facility

Table 9-4 - Clearing of Vegetation and Terrain Levelling (Bulk Earthworks) related to Turbines, hardstands and other infrastructure including new access roads outside of the delineated wetland boundary and within 100m radius of wetland boundaries . (Turbine 42)

Potential Impact - Transformation of freshwater vegetation, associated habitat and ecosystem services within downgradient freshwater ecosystems related to indirect impacts, including hydrological alteration due to stormwater discharges, increased erosion or development of new erosion, and deposition of increased sediment from dust or transported by stormwater; - Transportation of construction materials can result in disturbances to soils, increased risk of sedimentation/erosion and dust generation; and - Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles. Risk of AIP proliferation in disturbed areas that could colonise the adjacent wetland areas.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	5	2	70	High	(-)
With Mitigation	4	2	3	5	5	70	High	(-)
Mitigation and Management Measures	- During construction of the surface infrastructure regular spraying of non-potable water or the use of chemical dust suppressants, that are approved for use near freshwater ecosystems must be implemented to reduce dust and to ensure no smothering of vegetation within the freshwater ecosystems occurs from excessive dust settling. It is recommended that a suitably qualified specialist be consulted for approval of the product and conditions for use; - As soon as areas of vegetation are cleared, construction-phase stormwater controls must be implemented on the downgradient side of the cleared areas to mitigate the risk of stormwater transporting sediment towards wetlands; - The freshwater ecosystems outside the construction footprint not having authorised road crossings must be considered as no-go areas. No construction vehicles, nor construction personnel or vehicles may traverse							

	through these freshwater ecosystems (except on approved road crossings); ▪ As far as possible, existing roads must be utilised to gain access to construction sites; ▪ All vehicle re-fuelling is to take place in specifically designated re-fuelling areas that must be located outside of a 100m radius of wetlands.

Table 9-5 - Construction of surface infrastructure (all Turbines and Hardstands except for Turbine 42,) and including new access roads outside of 100m radius of wetland boundaries .

Potential Impact: ▪ Earthworks and exposure of soil could result in sedimentation of downgradient wetlands, which may be transported as runoff into the downgradient wetlands and may smother wetland vegetation; ▪ Altered water quality in downgradient wetlands (if surface water is present) as a result of pollution as a result of oils (e.g. from spills) and concrete mixing; and ▪ Proliferation of alien and/or invasive vegetation as a result of disturbances.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	2	3	**30**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ During excavation activities, the topsoil and vegetation must be stockpiled separately from other material outside the delineated extent of the freshwater ecosystems; ▪ Excavated materials must not be contaminated, and it must be ensured that the minimum surface area is taken up by any stockpiled materials. The mixture of the lower and upper layers of the excavated soil must be kept to a minimum, so as for later use as backfill material after construction has commenced; ▪ All exposed soils must be protected from wind using tarpaulins for the duration of the construction phase to prevent potential erosion and sedimentation of the freshwater ecosystems; ▪ Suitable drainage must be ensured within construction areas (including contractor laydown areas, material storage facilities, etc.) in order to ensure that water does not pond or drain in a concentrated manner into the downgradient freshwater ecosystems. Consideration must be given to ensuring that stormwater is allowed to diffusely spread across the landscape, by ensuring adequate surface roughness of the surrounding terrestrial/freshwater area;								

Table 9-6 - Construction of surface infrastructure (Turbines and Hardstands 42) and new access roads) between the delineated wetland boundary and a 100m radius of wetland boundaries.

Potential Impact: ▪ Earthworks and exposure of soil could result in sedimentation of downgradient wetlands, which may be transported as runoff into the downgradient wetlands and may smother wetland vegetation; ▪ Altered water quality in downgradient wetlands (if surface water is present) as a result of pollution as a result of oils (e.g. from spills) and concrete mixing; and ▪ Proliferation of alien and/or invasive vegetation as a result of disturbances.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	2	5	**50**	**Moderate**	(-)
With Mitigation	3	2	3	2	5	**50**	**Moderate**	(-)
Mitigation and Management Measures	▪ No concentrated runoff from the surface infrastructure construction areas must enter the freshwater ecosystems. This must be achieved by installing silt traps or placing hay bales downgradient of the construction footprint (until suitable basal vegetation cover has been restored) to ensure no sediment laden or concentrated runoff generates from the construction footprint; and ▪ It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction. With regards to concrete mixing on site: Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal must minimise or eliminate discharges into the freshwater ecosystems. High alkalinity associated with cement, can dramatically affect and contaminate both soil and ground water. The following measures must be adhered to: ▪ Fresh concrete and cement mortar must not be mixed near the freshwater ecosystems. Mixing of cement may be done within the construction camp, however, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be given to the use of ready mix concrete; ▪ No mixed concrete may be deposited directly onto the ground within the freshwater ecosystems (outside of the designated area) or associated riparian habitat. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; ▪ A washout area must be designated outside of the freshwater ecosystems, and wash water must be treated on-site or discharged to a suitable sanitation system; ▪ Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must								

	be disposed of through the hazardous substance waste stream; and - Spilled or excess concrete must be disposed of at a suitable landfill site. Chain of custody documentation must be provided. With regards to backfilling of excavated areas: - Stockpiled material must be used as backfill material; - All excavated areas must be backfilled to the natural ground level with excavated material; and - Soil must be suitably compacted, and all construction material must be removed from the site upon the completion of construction or used in the rehabilitation process.

Table 9-7 - Construction of Turbine and Hardstand 5 within the delineated wetland boundary .

Potential Impact: - Earthworks associated with the turbine foundation and laying of sub-surface concrete would result in disturbances to sub-surface movement of water within the wetland; - Earthworks could result in sedimentation of the downstream wetland, which may smother wetland vegetation; - Altered water quality (if surface water is present) as a result of spills associated with vehicles or other construction activities, especially concrete mixing; and - Proliferation of alien and/or invasive vegetation as a result of disturbances.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	- No concentrated runoff from the surface infrastructure construction areas must enter the freshwater ecosystems. This must be achieved by installing silt traps or placing hay bales downgradient of the construction footprint (until suitable basal vegetation cover has been restored) to ensure no sediment laden or concentrated runoff generates from the construction footprint; and - It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction. With regards to concrete mixing on site: Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal must minimise or eliminate discharges into the freshwater ecosystems. High alkalinity associated with cement, can dramatically affect and contaminate both soil and ground water. The following measures must be adhered to:							

	- Fresh concrete and cement mortar must not be mixed near the freshwater ecosystems. Mixing of cement may be done within the construction camp, however, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be given to the use of ready mix concrete; - No mixed concrete may be deposited directly onto the ground within the freshwater ecosystems (outside of the designated area) or associated riparian habitat. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; - A washout area must be designated outside of the freshwater ecosystems, and wash water must be treated on-site or discharged to a suitable sanitation system; - Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of through the hazardous substance waste stream; and - Spilled or excess concrete must be disposed of at a suitable landfill site. Chain of custody documentation must be provided. With regards to backfilling of excavated areas: - Stockpiled material must be used as backfill material; - All excavated areas must be backfilled to the natural ground level with excavated material; and Soil must be suitably compacted, and all construction material must be removed from the site upon the completion of construction or used in the rehabilitation process.

Table 9-8 - Potential upgrading of existing access roads within freshwater ecosystems:

Potential Impact: - Earthworks and exposure of soil could result in sedimentation of the downstream wetland, which may be transported as runoff into the downstream wetland areas and may smother wetland vegetation; - Potential spillage of pollutants such as oil and or liquified cement which could damage wetland habitat and biota; - Movement of heavy machinery within the wetland adjacent to the crossing structure which would damage wetland soils and vegetation; - Proliferation of alien and/or invasive vegetation as a result of disturbances.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	4	2	3	4	5	65	High	(-)
Mitigation and Management Measures	- The design of upgraded crossing structures must improve ecological and hydrological connectivity through the increased number of culverts;							

	▪ The construction footprint must be limited to a construction 10m wide construction Right of Way; ▪ Upgrading of (informal) roads and tracks must take cognisance of the delineated extent of the freshwater ecosystem traversed by the existing informal access road and that located within close proximity to the road; ▪ Material to be used (gravel – if applicable) as part of the upgrading of the existing roads / development of new crossings must be stockpiled outside the delineated extent of the freshwater ecosystems and outside the freshwater ecosystem non development buffer to prevent sedimentation thereof and to avoid any other vegetation being impacted by the construction activities. These stockpiles may not exceed a height of 2 m and must be protected from wind using tarpaulins; ▪ The disturbed area surrounding the road must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring; ▪ An alien vegetation management plan must be implemented concurrently with the commencement of construction; and ▪ All existing alien and invasive vegetation must be removed. All material must be disposed of at a registered garden refuse site and may not be burned or mulched on site. ▪ Silt controls must be implemented downstream / downgradient of the works area; ▪ Should flows be encountered in wetlands during construction periods the construction methodology must account for this with the use of coffer dams, etc. where needed; ▪ All mobile machinery that could leak oil must operate on a drip tray; ▪ Vehicles involved in construction must be regularly checked for leaks and removed if found to be non-compliant and the leak immediately repaired; ▪ See above regarding excavation and trenching; ▪ See above for control measures specific to concrete works

Table 9-9 – Development of new road crossings of wetlands, involving: Site preparation prior to construction activities including movement of construction equipment / vehicles within the freshwater ecosystems and removal of vegetation;:

Potential Impact: ▪ Destruction of a certain area of wetland habitat in the footprint of the crossing structure; ▪ Earthworks and exposure of soil could result in sedimentation of the downstream wetland, which may be transported as runoff into the downstream wetlands and may smother wetland vegetation; ▪ Altered water quality (if surface water is present) as a result of vehicle movement and construction activities; ▪ Loss of ecological connectivity; ▪ Potential hydrological impacts associated with crossing structures, including increased saturation and ponding upstream of the crossing structure, as well as deprivation of downstream reaches of water and sediment, which may lead to erosion in the long term; and ▪ Proliferation of alien and/or invasive vegetation as a result of disturbances.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	4	2	3	4	5	65	High	(-)
Mitigation and Management Measures	▪ It is imperative that all construction works within the freshwater ecosystems be undertaken during dry periods when there is no flow within the freshwater ecosystems, and thus no diversion of flow would be necessary. It is also recommended that existing crossings through freshwater ecosystems be prioritised for upgrading rather than development of new crossings, where possible; ▪ The throughflow structures must be designed to ensure that the structures are geotechnically sound and that they are hydraulically stable, even if a 1:100 year flood event was to occur. The designs must include box culverts installed intermittently to ensure a free draining landscape at various flood levels. It is recommended that a suitably qualified hydrologist be consulted to provide guidance on the relevant sizes and width requirements to ensure that the hydraulic functioning of the system is maintained and the design should be signed off by a suitably qualified freshwater ecologist; ▪ In addition, the crossings must be designed such that they remain stable in the event of over-topping during high-flow events and do not lead to excessive downstream erosion and incision. It must be ensured that the final design accounts for appropriate wetting frequencies and patterns are maintained in the pre-							

	development condition (with input from the freshwater ecologist, where necessary). - The reaches of the freshwater ecosystems where no activities are planned to occur must be considered no-go area; - A 10m construction Right of Way (RoW) is proposed at road crossings that would allow for construction personnel, and equipment or vehicles (if applicable) to enter the freshwater ecosystem; - Should saturated soils be encountered within the footprint of the works area a form of running track to prevent heavy vehicles from damaging wetland substrate may need to be laid down where vehicles need to access wetland areas; - The clearing of vegetation within the footprint area must be kept to a minimum to avoid unnecessary disturbance - within the active channel; - The removed vegetation must be stockpiled outside of the delineated boundary of the freshwater ecosystem. The footprint areas of these stockpiles must be kept to a minimum, and may not exceed a height of 2 m. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site; - With regards to excavation, trenching and soil compaction activities within the freshwater ecosystems, the following are applicable with regards to excavation works and any concrete related activities: - During the excavation activities, any soil/sediment or silt removed from the freshwater ecosystem may be temporarily stockpiled in the construction RoW but outside the delineated extent of the freshwater ecosystem. These stockpiles may not exceed 2 m in height, and their footprint must be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of construction at a particular site) and - must be disposed of at a registered waste disposal facility; - During trenching activities, seepage water may be present within the trench - invariably this will be filled with silt and be muddy. Therefore, any seepage must not be discharged straight into the river channel but through a silt trapping area first before entering the downstream reach; - Excavated materials must not be contaminated, and it must be ensured that the minimum surface area is taken up. Mixture of the lower and upper layers of the excavated soil must be kept to a minimum, for later usage as backfill material or as part of rehabilitation activities; - Excavated topsoil must be stored separately and may not be contaminated. Furthermore, the soil layers must be placed in the same order and the topsoil returned last;

	- Care must be taken to ensure that no scouring or erosion occurs as a result of the proposed road crossings. Installation of riprap or gabion mattresses and/or concrete aprons associated with any culverts must be included in design; - All construction material (with specific mention of prefabricated culvert structures) must be stockpiled in the laydown area and must only be imported to the construction site when required; - Construction equipment/vehicles used to install culvert structures must be parked on the existing road surface and may not enter the freshwater ecosystems; and - Reno-mattresses or riprap must be installed at the outlet side of the culvert/bridge structures to ensure energy dissipation and prevent concentrated runoff into the downstream freshwater feature. The reno mattress/riprap must be installed flush with the culvert outlet. - See above for control measures specific to concrete works.

9.4.2 OPERATION PHASE

Table 9-10 - Hydrological alteration due to stormwater discharges related to operation and maintenance of the surface infrastructure located outside the delineated freshwater ecosystems

Potential Impact: Hydrological alteration and erosion	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	2	3	4	4	**44**	**Moderate**	(-)
With Mitigation	2	2	3	4	2	**22**	**Low**	(-)
Mitigation and Management Measures	- No indiscriminate movement of maintenance equipment or vehicles through the freshwater ecosystems may be permitted during standard operational activities or maintenance activities. Use must be made of the existing road crossings only; - Unnecessary disturbances surrounding the perimeter of the surface infrastructure must be avoided; - Vehicles used in the development site must be regularly washed (on a non-permeable surface or off-site) to avoid the dispersal of seeds on any alien or invasive species into the freshwater ecosystems; - Should erosion be noted at the base of the hardstands that may potentially impact on a freshwater ecosystem, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation;							

	▪ The surface infrastructure areas must be inspected to ensure that no concentrated runoff from these areas form erosion gullies leading to erosion and sedimentation of the receiving freshwater ecosystems. Should these impacts be noted, these gullies/preferential flow paths must be infilled with in situ material and appropriately stabilised and/or revegetated; ▪ Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically at the hardstands. Should alien and invasive plant species be identified, they must be removed and disposed of as per an alien and invasive species control plan and the area must be revegetated with suitable indigenous vegetation. ▪ Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings/instream infrastructure. Such maintenance activities must specifically be undertaken after high rainfall events; ▪ Stormwater runoff from the road crossings must be monitored, to ensure it does not result in erosion of the freshwater ecosystems. Stormwater must be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the freshwater feature (through vegetation and rocky areas); ▪ Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the freshwater ecosystems may be permitted.

Table 9-11 - Operation and maintenance of the proposed main access roads

Potential Impact: Operation and maintenance of the proposed main access roads and other existing roads traversing freshwater ecosystems	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
With Mitigation	3	2	3	4	2	**24**	**Low**	(-)
Mitigation and Management Measures	▪ No indiscriminate movement of maintenance equipment or vehicles through the freshwater ecosystems must be permitted during standard operational activities or maintenance activities. Use must be made of the existing road crossings only; ▪ Unnecessary disturbances surrounding the perimeter of the surface infrastructure must be avoided; ▪ Vehicles used in the development site must be regularly washed (on a non-permeable surface or off-site) to avoid the dispersal of seeds on any alien or invasive species into the freshwater ecosystems; ▪ Ensure that routine inspections and monitoring of any instream infrastructure are undertaken to monitor any build-up of debris that will impact on structure integrity or lead to erosion and sedimentation. Furthermore,							

	monitoring to determine the establishment of indigenous vegetation and the presence of any alien or invasive plant species; ▪ Hot spots for the accumulation of debris and excess sediment must be identified and when necessary, debris/excess sediment must be removed by hand to prevent future flooding and potential damage to infrastructure; ▪ Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings/instream infrastructure. Such maintenance activities must specifically be undertaken after high rainfall events; ▪ Stormwater runoff from the road crossings must be monitored, to ensure it does not result in erosion of the freshwater ecosystems. Stormwater must be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the freshwater feature (through vegetation and rocky areas); ▪ During periodic maintenance activities of the roads, monitoring for erosion must be undertaken; and ▪ Should erosion be observed, caused by the road crossings/instream infrastructure, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation. Use can also be made of rocks collected from the surrounding area to infill any area prone to erosion (however, these must be sustainably sourced not taken from the surrounding freshwater ecosystems including rivers in the local area).

9.4.3 DECOMMISSIONING PHASE

Table 9-12 - Potential Direct and Indirect impacts related to removal of all surface infrastructure from the project area.

Potential Impact: Potential Direct and Indirect impacts related to removal of all surface infrastructure from the project area.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	27	Low	(-)
With Mitigation	2	2	3	2	2	18	Low	(-)
Mitigation and Management Measures	▪ No indiscriminate movement of construction equipment in the freshwater ecosystems may be permitted. Use must be made of the existing roads during the decommissioning phase; ▪ If applicable, for infrastructure within the non-perennial drainage line that is to be decommissioned, all materials must be removed from the freshwater ecosystems and may be stored/ stockpiled temporarily outside of the							

	delineated extent of the freshwater ecosystems and their associated 32m buffer, whereafter it must be removed from site and disposed of at a registered disposal facility; ▪ High flood peaks from the decommissioning footprint areas can be mitigated by ensuring that no concentrated runoff from the surface infrastructure area and subsequent cleared area enters the freshwater ecosystems. The velocity of surface water flow from these areas must be reduced by the strategic placement of silt traps of hay bales as a means to obstruct flow but still allow flow to percolate at a reduced velocity and encourages a diffuse flow pattern. In this regard it is recommended at an alien and invasive plant species management plan be implemented during the decommissioning phase to specifically prevent the spread of any such species into the sensitive ecological areas; ▪ Areas where surface infrastructure have been decommissioned and removed must be suitably compacted/ripped and revegetated to ensure that no erosion occurs which may contribute to the sediment load of the freshwater ecosystems; ▪ Should erosion gullies be noted, these areas must be rehabilitated by infilling them with suitable soil and ensuring the area is vegetated. The increased surface roughness will discourage concentrated flow paths to develop and ensure diffuse flow patterns; Should road crossings be decommissioned, road footprint areas within a freshwater feature must be levelled to the same level and shape as that of the upstream and downstream reaches. This will ensure a continuous bed level and prevent any concentration of surface flow from occurring; ▪ Channel banks associated with the freshwater ecosystems must be suitably rehabilitated (shaped end revegetated) to prevent any erosion from occurring; ▪ Follow up revegetation must take place where initial revegetation is not successful; and ▪ Post-closure monitoring of the freshwater ecosystems (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken.

9.5 AVIFAUNA IMPACT ASSESSMENT

The impacts wind farms have on bird populations are dependent upon a range of factors, including the specification of the development, the local/regional topography, the habitats affected, the abundance, species diversity, and characteristics of birds present.

Potential impacts can be:

- discrete – acting in isolation of other impacts (i.e., priority species response to wind farms are idiosyncratic).
- cumulative – exacerbating other the severity of other impacts (i.e., wind turbines and overhead power lines may pose similar collision risks to a given bird population).

- counter-active – reducing the severity of other impacts (i.e., bird population reduction through habitat loss lowers collision mortality rates)

The multi-faceted impacts that wind farms have on bird populations necessitates that new developments should be assessed on a case-by-case basis. The major concerns surrounding the impacts of wind farms on birds are detailed below:

- Mortality due to collisions with the wind turbines
- Displacement due to disturbance during construction and operation of the wind farm
- Displacement due to habitat change and loss at the wind farm
- Mortality due to electrocution and collisions with the medium voltage overhead lines

It should be noted that environmental impact assessments are localised to the present-day pre-construction conditions of a given development site. Impacts to the regional landscape are not considered as the extent and nature of future developments (not only wind energy development) are unknown at this stage. It is, however, highly unlikely that the land use will change in the near future due to climatic limitations.

9.5.1 CONSTRUCTION PHASE

The scale of permanent habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, in general, it is likely to be small per turbine base. Typically, actual habitat loss amounts to 2–5% of the total development site [Fox et al. (2006) as cited by Drewitt & Langston (2006)], with a further 3-14% of airspace altered by turbines (Marques et al., 2020). The effects of habitat loss could be more widespread where developments interfere with hydrological patterns or flows on wetland or peatland sites (unpublished data). Some changes could also be beneficial. For example, habitat transformation following the development of the Altamont Pass Wind Farm in California led to increased mammal prey availability for some species of raptor, such as higher abundance of Pocket Gophers Thomomys bottae burrows around turbine bases), although this may also have increased collision risk [Thelander et al., (2003) as cited by Drewitt & Langston (2006)].

Despite overall habitat loss resulting from wind farm development being limited, the associated infrastructure such as roads and power lines fragment previously continuous habitat. Beyond the increased mortality risks to local bird populations posed by such infrastructure, the resulting habitat fragmentation can degrade adjacent habitats, potentially changing the way birds interact within the immediate environment (Fletcher et al., 2018). It remains disputed whether habitat fragmentation is always an environmental detriment (Fahrig et al., 2019), yet the effects of this landscape change have been observed in bird species vulnerable to wind farms. Lane et al. (2001) noted that Great Bustard Otis tarda flocks in Spain were significantly larger further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard Neotis ludwigii in South Africa generally avoid the immediate proximity of roads within a 500m buffer. Bidwell (2004) found that Blue Cranes in South Africa select nesting sites away from roads.

The physical encroachment increases the disturbance and barrier effects that contribute to the overall habitat fragmentation effect of the infrastructure (Raab et al., 2011). It has been shown that fragmentation of natural grassland in Gauteng (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Allan et al., 1997).

Table 9-13 - Noise pollution and environmental disruption from construction activity

Potential Impact: Displacement of priority species from breeding/feeding/roosting areas	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	5	50	Moderate	(-)
With Mitigation	4	1	2	2	5	45	Moderate	(-)
Mitigation and Management Measures	▪ All-Infrastructure Exclusion Zones should be implemented and maintained. No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity. ▪ Restrict construction to the immediate infrastructural footprint. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Minimise removal of natural vegetation and rehabilitate natural vegetation post-construction where possible. ▪ Prioritise upgrading existing roads (where the requisite roads authority permission has been issued) over constructing new roads. ▪ Apply noise and dust control measures according to best practice in the industry. ▪ Strictly implement the recommendations of ecological and botanical specialists to reduce the level of habitat loss.								

9.5.2 OPERATIONAL PHASE

Total or partial displacement of avifauna due to habitat transformation associated with the operation of the wind turbines and associated infrastructure

This impact relates to bird mortalities because of potential collisions with the wind turbines. This impact is rated as negative, with a site-specific spatial extent and a long-term duration due to the extended timeframe of the operational phase (lifetime estimated at 20 years).

Wind energy generation has experienced rapid worldwide development over recent decades as its environmental impacts are considered to be relatively lower than those caused by traditional energy sources, with reduced environmental pollution and water consumption (Saidur et al., 2011). However, bird fatalities due to collisions with wind turbines have been consistently identified as a major ecological drawback to wind energy (Drewitt & Langston, 2006).

Collisions with wind turbines kill fewer birds than collisions with other man-made infrastructure, such as power lines, buildings, or even traffic (Erickson et al., 2005). Nevertheless, estimates of bird deaths from collisions with wind turbines worldwide range from 0-40 deaths per turbine per year (Sovacool, 2013). Bird mortality rates vary across sites, as do the number of sensitive bird species impacted (Hull et al., 2013; May, 2015). Estimated mortalities are likely lower than the true number of bird deaths from wind farm infrastructure, given that studies may fail to account for detection biases caused by scavenging, search efficiency and search radius (Bernardino et al., 2013; Erickson et al., 2005; Huso et al., 2015, 2021). Additionally, even for low mortality rates, collisions with wind turbines may disproportionately affect certain species. For long-lived species with low reproductivity and slow maturation rates (e.g. raptors), even low mortality rates can have a significant impact at the population level (Carrete et al., 2009; De Lucas et al., 2008; Drewitt & Langston, 2006). The situation is even more critical for species of conservation concern and those with restricted distributions, which sometimes are most at risk (Osborn et al., 1998).

High bird mortality rates at several wind farms have raised concerns among the industry and scientific community. High profile examples include the Altamont Pass Wind Resource Area (APWRA) in California because of high fatality of Golden eagles Aquila chrysaetos, Tarifa in Southern Spain for Griffon vultures Gyps fulvus, Smøla in Norway for White-tailed eagles Haliaeetus albicilla, and the port of Zeebrugge in Belgium for Larus gulls and Sterna terns (Barrios & Rodríguez, 2004; Drewitt & Langston, 2006; Huso et al., 2015; Stienen et al., 2008; Thelander et al., 2003). Due to their specific features and location, and characteristics of their bird communities, these wind farms have been responsible for many fatalities that culminated in the deployment of additional measures to minimize or compensate for bird collisions. However, currently, no simple formula can be applied to all sites; in fact, mitigation measures must inevitably be defined according to the characteristics of each wind farm and the diversity of species occurring there (Hull et al., 2013; Marques et al., 2014) An understanding of the factors that explain bird collision risk and how they interact with one another is therefore crucial to proposing and implementing valid mitigation measures. In southern Africa, vultures – followed by larger eagle species – are highlighted as being especially susceptible to collisions with wind turbines (McClure et al., 2021).

The potential impact is allocated a severe consequence and highly likely probability, which will render the impact significance as high without the implementation of mitigation measures. The impact will be reduced to moderate with the implementation of mitigation measures. The severity of impact for this risk will vary according to species- and site-specific factors.

Table 9-14 - Habitat transformation resulting from the wind turbines and associated infrastructure

Potential Impact: Displacement of priority species from breeding/feeding/roosting areas	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	4	1	3	4	5	60	Moderate	(-)
Mitigation and Management Measures	▪ All-Infrastructure Exclusion Zones should be implemented and maintained. No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity.							

	▪ Restrict construction to the immediate infrastructural footprint. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Once operational, vehicle and pedestrian access to the site should be controlled and restricted to the facility footprint as much as possible to prevent unnecessary destruction of vegetation. ▪ Formal live-bird monitoring should commence following initial turbine operation, as per the Best Practice Guidelines (Jenkins et al. 2015), to determine the extent to which priority species displacement has occurred. Operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated every five years thereafter for the operational lifetime of the facility.

Bird mortality and injury from collisions with the wind turbines

This impact relates to bird mortalities because of potential collisions with the wind turbines. This impact is rated as negative, with a site-specific spatial extent and a long-term duration due to the extended timeframe of the operational phase (lifetime estimated at 20 years).

Wind energy generation has experienced rapid worldwide development over recent decades as its environmental impacts are considered to be relatively lower than those caused by traditional energy sources, with reduced environmental pollution and water consumption (Saidur et al., 2011). However, bird fatalities due to collisions with wind turbines have been consistently identified as a major ecological drawback to wind energy (Drewitt & Langston, 2006).

Collisions with wind turbines kill fewer birds than collisions with other man-made infrastructure, such as power lines, buildings, or even traffic (Erickson et al., 2005). Nevertheless, estimates of bird deaths from collisions with wind turbines worldwide range from 0-40 deaths per turbine per year (Sovacool, 2013). Bird mortality rates vary across sites, as do the number of sensitive bird species impacted (Hull et al., 2013; May, 2015). Estimated mortalities are likely lower than the true number of bird deaths from wind farm infrastructure, given that studies may fail to account for detection biases caused by scavenging, search efficiency and search radius (Bernardino et al., 2013; Erickson et al., 2005; Huso et al., 2015, 2021). Additionally, even for low mortality rates, collisions with wind turbines may disproportionately affect certain species. For long-lived species with low reproductivity and slow maturation rates (e.g. raptors), even low mortality rates can have a significant impact at the population level (Carrete et al., 2009; De Lucas et al., 2008; Drewitt & Langston, 2006). The situation is even more critical for species of conservation concern and those with restricted distributions, which sometimes are most at risk (Osborn et al., 1998).

High bird mortality rates at several wind farms have raised concerns among the industry and scientific community. High profile examples include the Altamont Pass Wind Resource Area (APWRA) in California because of high fatality of Golden eagles Aquila chrysaetos, Tarifa in Southern Spain for Griffon vultures Gyps fulvus, Smøla in Norway for White-tailed eagles Haliaeetus albicilla, and the port of Zeebrugge in Belgium for Larus gulls and Sterna terns (Barrios &

Rodríguez, 2004; Drewitt & Langston, 2006; Huso et al., 2015; Stienen et al., 2008; Thelander et al., 2003). Due to their specific features and location, and characteristics of their bird communities, these wind farms have been responsible for many fatalities that culminated in the deployment of additional measures to minimize or compensate for bird collisions. However, currently, no simple formula can be applied to all sites; in fact, mitigation measures must inevitably be defined according to the characteristics of each wind farm and the diversity of species occurring there (Hull et al., 2013; Marques et al., 2014) An understanding of the factors that explain bird collision risk and how they interact with one another is therefore crucial to proposing and implementing valid mitigation measures. In southern Africa, vultures – followed by larger eagle species – are highlighted as being especially susceptible to collisions with wind turbines (McClure et al., 2021).

The potential impact is allocated a severe consequence and highly likely probability, which will render the impact significance as high without the implementation of mitigation measures. The impact will be reduced to moderate with the implementation of mitigation measures.

Table 9-15 - Bird mortality and injury resulting from collisions with the wind turbines

Potential Impact: Population reduction of priority species	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	5	2	4	5	75	High	(-)
With Mitigation	4	5	2	4	4	60	Moderate	(-)
Mitigation and Management Measures	▪ All-Infrastructure Exclusion Zones should be implemented and maintained. No turbines should be constructed in the turbine exclusion buffer zones as indicated in the sensitivity. ▪ Formal live-bird monitoring and carcass searches should be conducted in the operational phase, as per the Best Practice Guidelines at the time (Jenkins et al. 2015) to assess collision rates. ▪ A biodiversity management plan for the site must be developed prior to commercial operation, potential biological removal (PBR) values for all priority species on-site will be determined. The calculation of PBR values will consider population sizes of the species and thus determine annual fatality thresholds for the site. If fatality numbers exceed these annual thresholds, additional mitigation measures must be implemented as part of the adaptive management strategy. The choice of additional mitigation measures will be dependent on the measures in place at the time and could involve the implementation of additional SDoD measures or selective curtailment of specific turbines during high-risk periods.								

	▪ If estimated annual collision rates indicate unacceptable mortality levels of priority species exceeding mortality thresholds as determined by the avifaunal specialist in consultation with other experts (e.g., BLSA), additional measures must be implemented, such as shut down on demand or other proven measures (if available at the time). ▪ All wind turbines must have one blade painted according to a South African Civil Aviation Authority (SACAA) approved pattern to reduce the risk of raptor collisions. While blade painting as a mitigation strategy is still in its experimental phase in South Africa, international research shows that it has a promising potential to reduce raptor mortality. Research conducted in Norway, as explained in Simmons et al. 2021, supports this finding. ▪ It is recommended that all wind turbines (WTGs) be subjected to either Observer-led Shutdown on Demand (OSDoD), Auto SDoD (ASDoD) or similar technology during daylight hours and radar flight detection technology for flocks of target species at night. ▪ A Radar-based Shutdown on Demand (SDoD) system (or similar suitable alternative), operated by trained personnel is recommended for use to identify flocks of priority bird species at the site. Turbines that could pose a risk to these flocks will be shut down to reduce the likelihood of collisions. This type of system will also detect nocturnal movements of species such as flamingos, which often fly in flocks, and trigger turbine shutdowns when such movements are observed at night. The system's ability to differentiate specific species based on their unique size and flight characteristics, such as potentially Secretarybirds and Blue Cranes, will be used to initiate appropriate turbine shutdowns. ▪ Given the lack of Secretarybird nest site fidelity, and in order to manage the risk of known shifts in nest sites across breading seasons, we recommend a proactive adaptive risk management plan that is underpinned by routine and systematic nest surveys in medium risk areas identified through habitat and flight risk modelling for this species. The proposed approach includes hierarchal tiers of risk management. ▪ Prior to the Operational Phase of the WEF all tree structures across the Project Site will be mapped by generating a canopy height model and applying a tree structure criteria-based model (Appendix K, Tier 0, action 1). Secretarybird management zones across the WEF site will be delineated (tier 0 action 2) using the mapped tree structures, known nests sites and flight risk modelled outputs. During the operational phase of the WEF monthly orthophoto assessments will be

	conducted to monitor the prioritized management zones to identify active nest and roost structures (Appendix K, tier 1). If active nests/roosts are identified SDoD and/or automated curtailment will be implemented.

Electrocution of priority species in the on-site substations and internal 33kV network

This impact deals with the potential electrocution of priority species in the on-site substations and any overhead sections of the 33kV power lines. This impact is rated as negative, with a local spatial extent and a long-term duration due to the extended timeframe of the operational phase (lifetime estimated at 20 years).

Electrocution refers to instances where birds perch, or attempt to perch, upon electrical structure in a manner that physically bridges the air gap between live components and/or live and earthed components, causing a fatal electrical short circuit through the birds (Bevanger, 1994; van Rooyen, 2000). The electrocution risk is largely determined by the design of the electrical hardware, with medium voltage electricity poles posing a potential electrocution risk to raptors (Cole & Dahl, 2013; Haas et al., 2006; Loss et al., 2014).

The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence but unlikely probability, which will result in an impact significance of moderate, without the implementation of mitigation measures. With the implementation of mitigation measures (i.e., reactive insulation of electrical hardware), the significance of the impact is reduced to very low.

Table 9-16 - Electrocution of priority species on the on-site sub-stations and internal 33kV network

Potential Impact Population reduction of priority species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	5	1	4	4	52	Moderate	(-)
With Mitigation	3	5	1	4	2	26	Low	(-)
Mitigation and Management Measures	▪ Use underground cabling as much as is practically possible. ▪ Where the use of overhead lines is unavoidable, raptor-friendly pole design should be used, with appropriate mitigation measures for complicated pole structures (e.g., insulation of live components to prevent electrocutions on terminal structures and pole transformer), as recommended by the Avifaunal Specialist. ▪ Apply insulation reactively in the substation if significant electrocutions of SCC are recorded.							

Collision of priority species with the internal 33kV network

A related concern to that addressed in Section 6.6 is bird collisions with medium voltage overhead power lines. Overhead line collisions are arguably the greatest threat posed by overhead lines to birds in southern Africa (van Rooyen, 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures (Shaw et al., 2010; van Rooyen, 2004). These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (van Rooyen, 2004).

Power line collisions are generally accepted as a key threat to bustards (Raab et al. 2009; Raab et al. 2010; Jenkins & Smallie 2009; Barrientos et al. 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices (spirals and bird flappers) were approximately equally effective (Shaw et al. 2017).

The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and high probability, which will result in a high impact significance, without the implementation of mitigation measures. With the implementation of mitigation measures (i.e., marking of line with bird flight diverters), the significance of the impact is reduced to low.

Table 9-17 - Collisions of priority species with the internal 33kV network.

Potential Impact: Population reduction of priority species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	5	2	4	5	75	High	(-)
With Mitigation	4	5	2	4	3	45	Moderate	(-)
Mitigation and Management Measures	▪ Use underground cabling as much as is practically possible.							

	▪ All above-ground internal medium voltage lines must be marked with Eskom approved Bird Flight Diverters according to the applicable Eskom standard.

9.5.3 DECOMMISSIONING PHASE

The noise and movement associated with the potential decommissioning activities will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site-specific spatial extent and a short-term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and highly likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low.

Table 9-18 - Noise pollution and environmental disruption during the decommissioning phase

Potential Impact Total/partial displacement of priority species from breeding/feeding/roosting areas	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	5	50	High	(-)
With Mitigation	3	1	2	2	4	32	Moderate	(-)
Mitigation and Management Measures	▪ Restrict dismantling to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of priority species. This recommendation especially applies within the very high and high sensitivity areas depicted in the sensitivity map. ▪ Apply noise and dust control measures according to best practice in the industry. ▪ Prioritise the use of existing access roads during the decommissioning phase and avoid construction of new roads where feasible. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.							

9.6 BAT MONITORING AND IMPACT ASSESSMENT

9.6.1 CONSTRUCTION PHASE

During construction of the proposed WEF, bat roosts (roosting bats and/or roost sites) in buildings, rocky outcrops, and/or woody vegetation, could be disturbed or destroyed (e.g., from vegetation clearing, demolishment of old buildings, blasting, excavation works, human activity, and noise) if overlooked and/or not adequately avoided. Given the presence of multiple well-established roosts on site, this potential impact was rated with High significance, without mitigation.

Table 9-19 - Impacts on Bat roosts

Potential Impact: Disturbance of bat roosts	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	3	3	5	4	**64**	**High**	(-)
With Mitigation	3	2	3	4	2	**24**	**Moderate**	(-)
Mitigation and Management Measures	▪ Avoid high sensitive areas, in particular, buildings with confirmed roosts, and potential roosts in other buildings, rocky outcrops, and dense woody vegetation, and the prescribed buffers around these ▪ Avoid Medium high sensitive areas where possible, in particular, the 2.5-5 km buffer around the building roost near the PH4 monitoring location, where very high levels of bat activity were recorded. ▪ Avoid blasting within 2 km of a confirmed roost. Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Consult a Bat Specialist if a bat roost is encountered during any phase of the WEF, and refrain from disturbing the roost until appropriate advice has been obtained.								

Construction of the WEF will cause widespread destruction, degradation, and fragmentation of terrestrial habitat (potentially including threatened grassland), which support insect populations that the predominant aerial-foraging insectivorous bat species prey upon. Without careful planning, there could during construction also be destruction or disturbance of drainage lines and wetland areas, which currently provide bats with essential drinking water, concentrated insect prey, and/or which may represent important beacons or pathways for bat navigation and commuting.

Table 9-20 - Impacts on Bat habitat

Potential Impact: Terrestrial habitat loss, and possible displacement of bats	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	5	**64**	**High**	(-)

With Mitigation	2	1	3	3	5	**45**	**Moderate**	(-)
Mitigation and Management Measures	▪ Avoid High sensitive areas, in particular, hydrological features and woody vegetation, and the prescribed buffers around these. ▪ Avoid Medium-High sensitive areas where possible, in particular, remaining patches of threatened, native grassland, and the 2.5-5 km buffer around the PH4 monitoring location where very high levels of bat activity were recorded. ▪ Minimise the length and breadth of proposed roads to thus minimise the loss and fragmentation of terrestrial (bat foraging) habitat. ▪ Minimize the number of proposed turbines to potentially reduce the extent of the road network and the overall extent of the wind farm and thus, the extent of terrestrial habitat loss and possible displacement of bats. ▪ Minimise the degradation of terrestrial habitat by implementing and maintaining effective dust, stormwater, erosion, sediment, and invasive alien plant control measures. ▪ Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Rehabilitate disturbed terrestrial habitat by comprehensively and diligently implementing effective rehabilitation measures based on consultation with an appropriate vegetation specialist.							

9.6.2 OPERATION PHASE

During operation of the WEF, there will be inevitable fatality of bats from their collision with turbines and possibly to some extent, from barotrauma. If the fatality rate of impacted species exceeds their rate of successful reproduction and survival, population declines will occur.Table 9-21 - Bat fatalities

Potential Impact: Bat fatalities from collision with turbines, and possible population declines	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	3	5	4	5	**85**	**Very High**	(-)
With Mitigation	3	2	3	4	5	**60**	**Moderate**	(-)
Mitigation and Management Measures	▪ Avoid High sensitive areas, including all bat significant features and the buffers around these. No turbine,							

	including its full rotor swept area and a 2 m pressure buffer around this, should occur in High sensitive areas. ▪ Avoid Medium-High sensitive areas where possible, in particular, the 2.5-5 km buffer around the PH4 monitoring location where very high levels of bat activity were recorded. Should turbines be proposed in Medium-High sensitive areas, IWS recommends that these should be curtailed for the first three hours after sunset, below a cut-in wind speed of 6.5 m/s when temperatures of 11-25 ˚C prevail (as measured at 65 m a.g.l.). Alternatively, if turbines in Medium-High sensitive areas are each fitted with a Wildlife Acoustics SMART bat detector, curtailment could be limited to specific turbines and periods where and when elevated bat activity is recorded. ▪ Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Monitor bat fatalities as soon as the first turbine is operational – as per the latest SABAA guideline for this (Aronson et al. 2020 or later) and the latest (2023 or later) IFC Good Practice Handbook on post-construction bird and bat fatality monitoring for onshore WEFs in emerging market countries. At the very least, bat fatality monitoring should be conducted during the WEF's first two years of operation, and then every fifth year thereafter. The monitoring and data analysis are to be conducted to a high standard so that there is confidence in the estimated numbers of actual bat fatalities. ▪ Conduct passive monitoring of live bat activity as soon as the first turbine is operational, and whenever bat fatality monitoring is performed during the WEF's operation. The operational passive monitoring should represent a repeat of the pre-construction passive monitoring, so far as this is possible. This will allow for comparison of operational bat activity levels with pre-construction bat activity levels and operational bat fatalities, and it will help to assess the efficacy of any implemented bat fatality mitigation measures. ▪ Mitigate bat fatalities adaptively by consulting the latest SABAA guideline for this (Aronson et al. 2018 or later), and the best available relevant scientific information. Taxon-specific differences should be taken into consideration if/when fatality mitigation measures are implemented. The calculation of bat fatality thresholds (as described by MacEwan et al. 2018) is dependent, inter alia, on the final (constructed) layout of turbines. Adequate financial provision should be made to permit effective monitoring, management, and mitigation of bat fatalities throughout the life of the WEF.

	▪ Forward all (live and fatality) bat monitoring data to the database recommended by the South African Bat Assessment Association (SABAA) to expand the scientific knowledge base for more informed decision making and mitigation.

If bat populations in the study area start declining because of roost disturbance, loss of and/or displacement from foraging habitat, and/or high bat fatalities, the ecosystem services that the bats provide will be impacted. Local bat eco-services possibly include population control of maize pest and various other insect species. The plant pollination, seed dispersal, and habitat regeneration services provided by fruit bats could be impacted if the WEF causes fatalities of fruit bats – which might not reside but could possibly commute through the area.

Table 9-22 - Ecosystem services

Potential Impact: If high bat fatalities lead to declines in certain species populations, the ecosystem services that these populations provide will be compromised.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	3	3	4	5	75	High	(-)
With Mitigation	2	3	3	4	3	35	Moderate	(-)
Mitigation and Management Measures	▪ Avoid high sensitive areas, in particular, buildings with confirmed roosts, and potential roosts in other buildings, rocky outcrops, and dense woody vegetation, and the prescribed buffers around these ▪ Avoid Medium high sensitive areas where possible, in particular, the 2.5-5 km buffer around the building roost near the PH4 monitoring location, where very high levels of bat activity were recorded. ▪ Avoid blasting within 2 km of a confirmed roost. Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Consult a Bat Specialist if a bat roost is encountered during any phase of the WEF, and refrain from disturbing the roost until appropriate advice has been obtained.							

9.6.3 DECOMMISSIONING PHASE

Table 9-23 - Bat roosts

Potential Impact: Disturbance of bat roosts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	5	4	65	High	(-)
With Mitigation	3	2	3	4	2	24	Low	(-)
Mitigation and Management Measures	▪ Avoid high sensitive areas, in particular, buildings with confirmed roosts, and potential roosts in other buildings, rocky outcrops, and dense woody vegetation, and the prescribed buffers around these ▪ Avoid Medium high sensitive areas where possible, in particular, the 2.5-5 km buffer around the building roost near the PH4 monitoring location, where very high levels of bat activity were recorded. ▪ Avoid blasting within 2 km of a confirmed roost. Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Consult a Bat Specialist if a bat roost is encountered during any phase of the WEF, and refrain from disturbing the roost until appropriate advice has been obtained.								

Table 9-24 - Bat habitat

Potential Impact: Terrestrial habitat loss, and possible displacement of bats	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	24	Low	(-)
With Mitigation	2	1	3	3	3	24	Low	(-)
Mitigation and Management Measures	▪ Avoid High sensitive areas, in particular, hydrological features and woody vegetation, and the prescribed buffers around these. ▪ Avoid Medium-High sensitive areas where possible, in particular, remaining patches of threatened, native grassland, and the 2.5-5 km buffer around the PH4							

	monitoring location where very high levels of bat activity were recorded. ▪ Minimise the length and breadth of proposed roads to thus minimise the loss and fragmentation of terrestrial (bat foraging) habitat. ▪ Minimize the number of proposed turbines to potentially reduce the extent of the road network and the overall extent of the wind farm and thus, the extent of terrestrial habitat loss and possible displacement of bats. ▪ Minimise the degradation of terrestrial habitat by implementing and maintaining effective dust, stormwater, erosion, sediment, and invasive alien plant control measures. ▪ Minimise artificial lighting on site (excluding compulsory civil aviation lighting) – especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at substations, offices, and turbines (to avoid disturbing roosts of certain sensitive bat species). All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion-sensitive lights should be used. ▪ Rehabilitate disturbed terrestrial habitat by comprehensively and diligently implementing effective rehabilitation measures based on consultation with an appropriate vegetation specialist.

9.7 ANIMAL SPECIES IMPACT ASSESSMENT

9.7.1 CONSTRUCTION PHASE

During the construction phase, it is anticipated that habitat loss and disturbance will result through vegetation clearing and bulk earth works. These impacts can negatively impact the viability of local fauna populations, including SCC. It is noted that 20 of the proposed 88 turbines are located fully or partly in areas of natural habitat, specifically Mixed Dry Grassland and Rocky Shrubland habitat. These comprise important habitats for fauna SCC. The remainder of the turbines are located in modified habitat (i.e., Cultivated Fields and Old Lands).The impact prior to further mitigation is considered to be of very high magnitude. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of “high” significance.

Table 9-25 – Impacts on fauna habitat

Potential Impact: Direct loss and disturbance of natural habitat.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	3	1	3	4	3	33	Moderate	(-)

Mitigation and Management Measures	▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; ▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; ▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ Stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; ▪ Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and ▪ Grass species used during rehabilitation should be indigenous, locally-occurring perennial species.

Table 9-26 - Impacts on fauna habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	3	2	3	4	3	36	Moderate	(-)
Mitigation and Management Measures	▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat;							

	▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; ▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ Stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; ▪ Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; ▪ Grass species used during rehabilitation should be indigenous, locally-occurring perennial species; and ▪ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and micro-sited to already disturbed sites.

Table 9-27 – Impact on fauna SCC

Potential Impact: Injury, mortality and disturbance of fauna	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	3	2	4	**48**	**Moderate**	(-)
With Mitigation	4	1	1	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions; ▪ As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped; ▪ Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat; ▪ A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions;							

	▪ The handling, poisoning and killing of on-site fauna by contractors must be strictly prohibited; ▪ General noise abatement equipment should be fitted to construction machinery and vehicles; ▪ Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs; ▪ The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training; and ▪ An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements. ▪ Refer to the Avifauna Specialist Assessment for mitigation and management measures concerning birds.

Table 9-28 - Impact on fauna SCC

Potential Impact: Loss of fauna species of conservation concern.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Low**	(-)
Mitigation and Management Measures	▪ An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions; ▪ As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped; ▪ Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat; ▪ A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; ▪ The handling, poisoning and killing of on-site fauna by contractors must be strictly prohibited; ▪ General noise abatement equipment should be fitted to construction machinery and vehicles; ▪ Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs; ▪ The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training; and ▪ An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements.								

	▪ Refer to the Avifauna Specialist Assessment for mitigation and management measures concerning birds.

9.7.2 OPERATION PHASE

Potential impacts associated with the operational phase include potential causes of death, injury and disturbance to fauna during and vibration from operating wind turbines. The potential death impact prior to mitigation is considered to be of high magnitude and will have a medium-term effect since it could occur throughout the operational lifetime of the project. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "moderate" significance. With mitigation, magnitude is reduced to low, and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of "Low" significance.

Regarding vibrations from operating wind turbines, before mitigation, impact magnitude is high, while duration is permanent, and it has a medium probability. The spatial extent is local. Prior to mitigation, this is rated an impact of "moderate" significance.

Table 9-29 – Impacts on fauna, including SCC

Potential Impact: Injury and mortality of fauna, including SCC.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	3	3	**36**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Low**	(-)
Mitigation and Management Measures	▪ No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes. ▪ A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; ▪ The handling, poisoning and killing of on-site fauna by maintenance personnel must be strictly prohibited; ▪ The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.							

Table 9-30 - Impacts on fauna, including SCC

Potential Impact: Vibrations from operating wind turbines disturbing fauna.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	3	**42**	**Moderate**	(-)
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)

Mitigation and Management Measures	▪ The Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options; ▪ Based on the findings of new research, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures and these should be implemented on-site.

9.7.3 DECOMMISSIONING PHASE

The dismantling and removal of Project infrastructure during decommissioning may result in incidences of fauna death and injury. Common causes may include, inter alia:

- Vehicle and machinery collisions along access roads and at infrastructure sites where decommissioning activities are occurring; and
- Increased hunting and snaring by workers involved in decommissioning activities are occurring.

The impact prior to mitigation is considered to be of high magnitude and will have a short-term effect. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of “medium” significance.

With mitigation, magnitude is reduced to medium, and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of “Low” significance.

Table 9-31 - Impacts on fauna, including SCC

Potential Impact: Injury and mortality of fauna, including SCC.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	2	3	**33**	**Moderate**	(-)
With Mitigation	3	1	1	2	2	**14**	**Low**	(-)
Mitigation and Management Measures	▪ No off-road driving is permitted for vehicles and mobile machinery used during decommissioning phases activities; ▪ A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; ▪ The handling, poisoning and killing of on-site fauna by on-site workers must be strictly prohibited; ▪ The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.							

9.8 TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

9.8.1 CONSTRUCTION PHASE

The potential terrestrial biodiversity impacts associated with the WEF during the construction phase include habitat loss and disturbance. These impacts can negatively impact ecosystem functioning and integrity, and the viability of local fauna and flora populations. It is noted that 8 of the proposed

76 turbines are located fully or partly in areas of natural habitat, specifically Mixed Dry Grassland and Rocky Shrubland habitat. The remainder of the turbines are located in modified habitat (i.e., Cultivated Fields and Old Lands). With respects to CBA's, 8 turbines are located directly in, or have the potential to impact designated CBA's. The impact prior to further mitigation is considered to be of very high magnitude. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of "high" significance.

Table 9-32 – Impacts on terrestrial habitat

Potential Impact: Direct loss and disturbance of natural habitat.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	3	1	3	4	3	33	Moderate	(-)
Mitigation and Management Measures	▪ If possible, proposed Project infrastructure footprints should be further repositioned to avoid areas designated CBA and ESA; ▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; ▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; ▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ Stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; ▪ Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and								

	▪ Grass species used during rehabilitation should be indigenous, locally-occurring perennial species. ▪ Following finalisation of the exact Project infrastructure layout and quantification of habitat losses, it is likely that a biodiversity offset programme in line with the NEMBA National Biodiversity Offset Guideline (2023) may be required to offset the losses of CBA's and mapped remaining areas of threatened vegetation types. This should be developed under consultation with the Mpumalanga Parks and Tourism Agency (MPTA).

Table 9-33 - Impacts on terrestrial habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	3	2	3	4	3	36	Moderate	(-)
Mitigation and Management Measures	▪ See mitigation measures for Direct loss and disturbance of natural habitat, and ▪ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and micro-sited to already disturbed sites.							

Table 9-34 - Impacts on terrestrial habitat

Potential Impact: Establishment and spread of alien invasive species.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	52	Moderate	(-)
With Mitigation	2	1	3	2	2	16	Low	(-)
Mitigation and Management Measures	▪ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and micro-sited to already disturbed sites. ▪ If possible, proposed Project infrastructure footprints should be further repositioned to avoid areas designated CBA and ESA (refer to Table 11 for recommendations concerning repositioning of turbines); ▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat;							

	▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; ▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ Stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; ▪ Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and ▪ Grass species used during rehabilitation should be indigenous, locally-occurring perennial species. ▪ Following finalisation of the exact Project infrastructure layout and quantification of habitat losses, it is likely that a biodiversity offset programme in line with the NEMBA National Biodiversity Offset Guideline (2023) may be required to offset the losses of CBA's and mapped remaining areas of threatened vegetation types. This should be developed under consultation with the Mpumalanga Parks and Tourism Agency (MPTA).

Table 9-35 - Impacts on terrestrial habitat

Potential Impact: Increased soil erosion and sedimentation.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ An alien invasive species control and eradication plan must be developed for the Project that focuses on controlling and eradicating invasive species occurring at sites disturbed by project activities in the study area. The plan must include: • Identification of AIS management units; • Prioritisation of sites and species requiring control;							

	- Targets and indicators of success; - Scheduling of invasive species control; - Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and - Provision for follow-up treatments, as informed by regular invasive species monitoring. - All sites disturbed by construction activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and - Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion.

9.8.2 OPERATION PHASE

The potential establishment and spread of alien invasive species in the study area will continue to be an impact of concern during the operational phase Before mitigation, impact magnitude is high, while duration is long term, and the impact has a medium probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of "moderate" significance.

Further to the above, wildfires are considered a natural and important disturbance agent in grassland ecosystems and are essential to the maintenance of biodiversity patterns and ecological processes. They are also important in maintaining grassland productivity for local livestock farmers. An increase in unplanned or undesirable wildfires from faulty Project infrastructure or accidental/intentional fire-setting by Project workers may negatively impact ecological processes, which may affect terrestrial biodiversity and grassland productivity.

Before mitigation, this impact is considered to be of medium magnitude, with a long-term duration affecting terrestrial biodiversity within and potentially adjacent to the development footprint (local). It is also considered to have a medium probability, resulting in an impact of "Moderate" significance

Table 9-36 - Impacts on terrestrial habitat

Potential Impact: Establishment and spread of alien invasive species.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	3	**39**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	- Active alien invasive species control should continue throughout the operational phase, as per the approved alien invasive species control and eradication programme.							

Table 9-37 - Impacts on terrestrial habitat

Potential Impact: Increase in wildfires from Project workers or faulty infrastructure.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	36	Moderate	(-)
With Mitigation	2	2	1	2	1	7	Very Low	(-)
7Mitigation and Management Measures	▪ The Project proponent should approach all relevant farmers and the local fire protection association (FPA) to investigate developing a co-ordinated Grassland Burning Management Programme for the study area; ▪ As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and ▪ Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires.							

9.8.3 DECIMMISSIONING PHASE

As Project infrastructure is dismantled and removed from site during the decommissioning phase, the associated disturbances are likely to facilitate alien invasive species colonisation in, and immediately adjacent to, the study area.

Before mitigation, impact magnitude is high, while duration is long term, and the impact has a high probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of "moderate" significance.

Table 9-38 - Impacts on terrestrial habitat

Potential Impact: Establishment and spread of alien invasive species.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	52	Moderate	(-)
With Mitigation	2	1	3	2	2	16	Low	(-)
Mitigation and Management Measures	▪ Active alien invasive species control should continue on an annual basis during the decommissioning phase and annual follow-up control should be carried out for a five-year period following decommissioning.							

Table 9-39 - Impacts on terrestrial habitat

Potential Impact: Increased soil erosion and sedimentation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	52	Moderate	(-)
With Mitigation	2	1	3	2	2	16	Low	(-)
Mitigation and Management Measures	▪ All sites disturbed by decommissioning activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and ▪ Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion.							

9.9 PLANT SPECIES IMPACT ASSESSMENT

9.9.1 CONSTRUCTION PHASE

The identified potential impact prior to further mitigation is considered to be of very high magnitude. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of “high” significance

Table 9-40 - Direct loss and disturbance of natural habitat

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	2	1	3	4	3	33	Low	(-)
Mitigation and Management Measures	▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; ▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;							

	▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction. The protocol should include: • Stockpiling of topsoil that was cleared from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Grass species used during rehabilitation should be indigenous, locally-occurring perennial species.

Table 9-41 - Impacts on flora habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
Mitigation and Management Measures	▪ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and micro-sited to already disturbed sites. ▪ As far as possible other proposed permanent Project infrastructure (e.g., O&M Office and Batching Plant) should be located in areas of modified habitat (i.e., Cultivated Fields, Old Lands); ▪ All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; ▪ A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed footprints and other relevant management measures. ▪ All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;							

	▪ The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; ▪ No heavy vehicles should travel beyond the marked works zone; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. ▪ A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction. The protocol should include: ▪ Stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; ▪ Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and ▪ Grass species used during rehabilitation should be indigenous, locally-occurring perennial species.

Table 9-42 – Impacts on flora SCC

Potential Impact: Loss of flora of conservation concern	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	5	1	4	**52**	**Moderate**	(-)
With Mitigation	3	1	3	1	2	**16**	**Low**	(-)
Mitigation and Management Measures	Avoidance and Minimisation ▪ A pre-construction walkdown/survey of the proposed development footprints should be conducted during the wet/growing season to determine the identity and number of potentially impacted flora SCC; ▪ Data from the survey/walkdown should then be to inform: • The micro-siting of proposed Project infrastructure; and. • The scope of a Flora SCC Management strategy with respects to obtaining permits should from the relevant authority to rescue and relocate impacted plants.							

Table 9-43 – Impacts on flora habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ An alien invasive species control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by project activities in the study area. The plan must include: ▪ Identification of invasive species management units ▪ Prioritisation of sites and species requiring control; ▪ Targets and indicators of success; ▪ Scheduling of invasive species control; ▪ Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and ▪ Provision for follow-up treatments, as informed by regular invasive species monitoring.							

9.9.2 OPERATION PHASE

Before mitigation, impact magnitude is high, while duration is long term and the impact has a medium probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of "moderate" significance.

With the continued implementation of an active alien species control programme during the operational phase this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and probability at low. After mitigation, this impact is rated to be of "Low" significance.

Table 9-44 – Impacts on flora habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	3	**39**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Active alien invasive species control should continue throughout the operational phase, as per the approved invasive species control and eradication programme.							

9.9.3 DECOMMISSIONING PHASE

As Project infrastructure is dismantled and removed from site during the decommissioning phase, the associated disturbances are likely to facilitate alien invasive species colonisation in, and immediately adjacent to, the study area.

Before mitigation, impact magnitude is high, while duration is long term and the impact has a high probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance.

Table 9-45 – Impact on flora habitat

Potential Impact: Establishment and spread of alien invasive species	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Active alien invasive species control should continue throughout the operational phase, as per the approved invasive species control and eradication programme. ▪ To limit the potential for alien invasive species encroachment, soil erosion and dust generation, all project footprints and sites that were disturbed during decommissioning, should be actively rehabilitated using local-occurring perennial indigenous flora species.							

9.10 GEOTECHNICAL ASSESSMENT

Geotechnical impacts need to be taken into account as part of the WEF development. The identified risks can typically be mitigated by the implementation of an appropriate and effective plan. Mitigation measures must be implemented to avoid or reduce negative impacts during the construction, operation and decommissioning phases.

Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the Phefumula Emoyeni One WEF was found to be “Negative very low to moderate impact - The anticipated impact will have negative effects and will require mitigation.” After mitigation the impact will be “negative very low.

9.10.1 CONSTRUCTION PHASE

Table 9-46 – Soil Erosion Impacts

Potential Impact: ▪ Increased stormwater velocity. ▪ Increase in soil and wind erosion due to clearing of vegetation. ▪ Creation of drainage paths along access tracks. ▪ Sedimentation of non-perennial features and excessive dust.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	12	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Rehabilitation of affected areas (such as revegetation). ▪ Construction of temporary berms and drainage channels to divert surface water. ▪ Minimize earthworks and fills. ▪ Use existing road network and access tracks. ▪ Correct engineering design and construction of gravel roads and water crossings. ▪ Control stormwater flow							

Table 9-47 – Groundwater Impacts

Potential Impact: Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	12	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. ▪ Frequent checks and conditional monitoring							

Table 9-48 - Disturbance of fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	**30**	**Moderate**	(-)
With Mitigation	2	1	1	2	12	**12**	**Very Low**	(-)

Mitigation and Management Measures	▪ Limit and control excavations.

Table 9-49 - Slope stability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	3	2	18	Low	(-)
With Mitigation	1	1	3	2	2	14	Very Low	(-)
Mitigation and Management Measures	▪ Avoid steep slope areas. ▪ Design cut slopes according to detailed geotechnical analysis.							

Table 9-50 - Seismic activity

Potential Impact: Damage of proposed development	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	4	1	12	Very Low	(-)
With Mitigation	2	1	3	3	1	9	Very Low	(-)
Mitigation and Management Measures	▪ Design according to expected peak ground acceleration.							

9.10.2 DECOMMISSIONING PHASE

Table 9-51 – Soil Erosion Impacts

Potential Impact: ▪ Increased stormwater velocity. ▪ Increase in soil and wind erosion due to clearing of vegetation. ▪ Creation of drainage paths along access tracks. ▪ Sedimentation of non-perennial features and excessive dust.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	3	4	48	Moderate	(-)
With Mitigation	2	1	1	2	12	12	Very Low	(-)
Mitigation and Management Measures	▪ Use existing road network and access tracks.							

	- Use of temporary berms and drainage channels to divert surface water. - Minimize earthworks and demolish footprints. - Rehabilitation of affected areas (such as revegetation). - Reinstate channelized drainage features. - Strip, stockpile and re-spread topsoil.

Table 9-52 – Groundwater Impacts

Potential Impact: Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	12	**12**	**Very Low**	(-)
Mitigation and Management Measures	- Vehicle and construction machinery repairs to be undertaken in designated areas with - proper soil protection. - Frequent checks and conditional monitoring							

Table 9-53 - Disturbance of fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	**30**	**Moderate**	(-)
With Mitigation	2	1	1	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	- Limit and control excavations.							

Table 9-54 - Slope stability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	3	2	**18**	**Low**	(-)
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)
Mitigation and Management Measures	- Avoid steep slope areas. - Design cut slopes according to detailed geotechnical analysis.							

9.11 HERITAGE IMPACT ASSESSMENT

The main cause of impacts to archaeological resources is physical disturbance of the material itself and its context during removal of topsoil and vegetation as well as the excavations associated with the establishment of infrastructure. In terms of this project the main source of impacts will happen during the following activities:

- Establishment of new roads and upgrade of existing roads;
- Excavations of foundations for the turbines at WEF;
- Flicker effect associated with rotating blades of the WEF towers on the surrounding landscape;
- Visual impact of the WEF towers on the landscape and sense of place;
- Establishment of laydown areas;
- Excavation and levelling of the WEF footprint;
- Trenches for cables and erection of powerlines;
- Excavations during construction of the sub stations;

Burial site PF007 will be impacted by the access road which leads to WTG58. It is always preferable to avoid all burial sites with a 30m buffer zone. If avoidance of these burial sites is not possible, the graves can be moved with the relevant permits. A Grave management plan for the burial sites will also have to be compiled as well as access provided to burial sites for family members wishing to visit the graves. PFM011 is a possible burial site and if the site cannot be avoided with a 30m buffer further investigation will be required to determine whether it is indeed a grave. Although the other burial sites and medium significance sites will not be impacted by the current layout, they must be added to development plans and avoided with a 30m buffer zone

9.11.1 CONSTRUCTION PHASE

Table 9-55 - Impact to graves in burial sites

Potential Impact: Loss of heritage and palaeontological resources.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	2	5	5	3	**48**	**Moderate**	(-)
With Mitigation	4	2	5	5	1	**16**	**Very Low**	(-)
Mitigation and Management Measures	▪ Monitoring of the Project area by the ECO during pre-construction and construction phases for chance finds, if chance finds are encountered to implement the Chance Find Procedure for the project. ▪ Development activities must be confined to the approved development footprint only. ▪ The ruins and semi-circular stone enclosures should preferably be added to development plans and avoided with a 30m buffer zone. If the site cannot be avoided, it must be mapped and recorded prior to the application of a destruction permit.							

9.11.2 OPERATION PHASE

Table 9-56 - Impact to graves in burial sites

Potential Impact: Impact to graves in burial sites	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	5	5	3	**48**	**Moderate**	(-)
With Mitigation	4	2	5	5	1	**16**	**Very Low**	(-)
Mitigation and Management Measures	▪ Avoidance of the burial sites is preferable with a 30 m buffer zone and demarcation of the features. An access protocol should be compiled for Next of Kin (NoK) who might want to visit the site as well as a grave management plan to ensure the site is protected. If the burial sites cannot be avoided, the graves can be relocated with the necessary approvals. ▪ A Grave Management Plan should be compiled for the burial sites present within the Project area.							

9.11.3 DECOMMISSIONING PHASE

Table 9-57 - Impact to graves in burial sites

Potential Impact: Impact to graves in burial sites	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	5	5	3	**48**	**Moderate**	(-)
With Mitigation	4	2	5	5	1	**16**	**Very Low**	(-)
Mitigation and Management Measures	▪ Avoidance of the burial sites is preferable with a 30 m buffer zone and demarcation of the features. An access protocol should be compiled for Next of Kin (NoK) who might want to visit the site as well as a grave management plan to ensure the site is protected. If the burial sites cannot be avoided, the graves can be relocated with the necessary approvals. ▪ A Grave Management Plan should be compiled for the burial sites present within the Project area.							

9.12 NOISE IMPACT ASSESSMENT

9.12.1 CONSTRUCTION PHASE

During the construction phase of the facility various noise sources will be present onsite including earth-moving equipment (trucks, cranes, scrapers and loaders), compressors and generators, pumps, rotary drills, concrete mixers and materials handling activities, among others. All of these sources will generate substantial amounts of noise and may impact on neighbouring sensitive receptors. As such, mitigation interventions are advised during the construction phase.

Table 9-58 – Noise impacts

Potential Impact: Nuisance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	1	3	**21**	**Low**	(-)
With Mitigation	2	2	1	4	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Plan construction activities in consultation with landowners/land occupiers so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance. Information regarding construction activities should be provided to identified and nearby receptors likely to be affected. Such information includes: • Proposed working times. • Anticipated duration of activities. • Explanations on activities to take place and reasons for activities. • Contact details of a responsible person on site should complaints arise. ▪ When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible. ▪ Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines. ▪ Selecting equipment with the lowest possible sound power levels whilst still being suitable for the specific task. ▪ Ensuring equipment is well-maintained to avoid additional noise generation.								

9.12.2 OPERATION PHASE

The impact assessment results indicate that predicted L_{A90} noise levels during both day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at 75 of the 123 receptors. This indicates that noise from the turbines could create a nuisance or impact at those locations above this threshold. However, being a low noise environment, with reference to the Energy Technology Support

Unit' (ETSU) daytime limit range of 35-40 dB(A), L_{A90} noise levels at 104 of the 123 receptor locations are below this threshold. Additionally, at night, LA90 levels at 121 of the 123 receptor locations are below the ETSU 43 dB(A) threshold. It is, however, understood that all of the receptors within the Project boundary have direct interest and are vested in the Project, thus a blanket threshold value of 45 dB(A) (day and night) applies. Predicted L_{A90} noise levels at all onsite receptor locations are below this 45 dB(A) threshold.

Receptors outside of the Project boundary are not directly vested in the Project and as such, noise levels must comply with the ETSU 40 dB(A) threshold. Predicted L^{A90} noise levels at all receptors outside of the Project boundary, except for receptors 45 and 46, are below the ETSU 40 dB(A) threshold.

Table 9-59 – Noise impacts

Potential Impact: Nuisance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	4	4	**36**	**Moderate**	(-)
With Mitigation	2	2	1	4	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ Operating turbines in reduced noise mode should any complaints be received. ▪ Selecting turbines with lower noise level specifications. ▪ Building walls/appropriate noise barriers around potentially affected buildings. ▪ Limiting turbine operations above the wind speed at which turbine noise becomes unacceptable in the project-specific circumstances. ▪ Relocating these two receptors or offering them financial incentives.							

9.12.3 DECOMMISSIONING PHASE

Since similar equipment used during the construction phase will be utilised during the decommissioning phase, the same impacts and mitigation recommendations provided for the construction phase are applicable to the decommissioning phase.

Table 9-60 – Noise impacts

Potential Impact: Nuisance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	1	3	**21**	**Low**	(-)
With Mitigation	2	2	1	4	2	**12**	**Very Low**	(-)

Mitigation and Management Measures	▪ Planning decommissioning activities in consultation with landowners/land occupiers so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance. Information regarding construction activities should be provided to identified and nearby receptors likely to be affected. Such information includes: • Proposed working times. • Anticipated duration of activities. • Explanations on activities to take place and reasons for activities. • Contact details of a responsible person on site should complaints arise. ▪ When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible. ▪ Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines. ▪ Selecting equipment with the lowest possible sound power levels whilst still being suitable for the specific task.

9.13 SAFETY HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

9.13.1 CONSTRUCTION PHASE

Table 9-61 – Impacts on human health

Potential Impact:	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	1	3	4	4	**44**	**Moderate**	(-)
With Mitigation	1	1	3	4	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ The construction phase should be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. ▪ SHEQ policy should be in place. ▪ A detailed construction Risk Assessment prior to work. ▪ SHE procedure in place. ▪ PPE to be specified. ▪ SHE appointees in place. ▪ Contractor's safety files in place and up to date. ▪ All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas. ▪ SHE monitoring and reporting programs in place.							

	▪ Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.

Table 9-62 – Impacts on human health

Potential Impact: Exposure to noise	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	5	5	4	**56**	**Moderate**	(-)
With Mitigation	2	1	5	5	2	**26**	**Low**	(-)
Mitigation and Management Measures	▪ Health Risk Assessment to determine if equipment noise exceeds 85dB at workstation and 61dB at boundary of the site ▪ Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.							

Table 9-63 – Impacts on human health

Potential Impact: Exposure to temperature extremes and/or humidity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	1	2	**18**	**Low**	(-)
With Mitigation	2	2	3	1	1	**8**	**Very Low**	(-)
Mitigation and Management Measures	▪ Construction site facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. ▪ Adequate potable water for employees to be provided during all phases of the project. Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.							

Table 9-64 – Impacts on human health

Potential Impact: Exposure to psychological stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

Without Mitigation	2	3	3	2	2	**20**	**Low**	(-)
With Mitigation	2	3	3	2	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ Adopt all mitigation measures as listed in the Social Impact Assessment study.							

Table 9-65 – Impacts on human health

Potential Impact: Exposure to ergonomic stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	3	**30**	**Low**	(-)
With Mitigation	4	1	3	2	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ Training in lifting techniques to be conducted. ▪ Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. Otherwise employees may revert to unsafe practices. Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning. ▪ First aid provision on site.							

Table 9-66 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to fire radiation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)
With Mitigation	4	2	3	5	2	**28**	**Low**	(-)
Mitigation and Management Measures	▪ Fuels stored on site in dedicated, demarcated and bunded areas. ▪ Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc. ▪ The company responsible for the facility at this stage is to have: • Emergency plan to be in place prior to commencement of construction. • Fuel spill containment procedures and equipment to be in place. • Hot-work permit and management system to be in place.							

Table 9-67 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to fire radiation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	2	**34**	**Moderate**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	▪ Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. ▪ Propagation tests for systems, e.g., heat insulating materials between cells/modules. ▪ Factory acceptance test prior to prior to leaving manufacture. Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood so as to assess the risk during transport and storage. ▪ The company responsible for the battery installation should ensure suitably competent transport companies are appointed. The company responsible for transportation should ensure: ▪ Compliance with National Road Traffic Act regulation 8 dangerous goods. ▪ Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical suppliers (Tesla) indications, the containers are classified as IMDG Class 9 the containers will not receive any special care in the ports and may be stored next to flammables. Port emergency response in particular need training on mitigating battery hazards. ▪ Prior to bringing any containers into the country, the company responsible for the battery installation (possibly via appointed contractors) should ensure that an emergency response plan is in place for the full route from the ship to the site. Drivers trained in the hazards of containerized batteries. • The Emergency plan must determine and address: • What gases would be released in a fire and are there inhalation hazards. • What initial fire extinguishing medium should be used. • Whether there are any secondary gases or residues from use of extinguishers. • If water is appropriate, determine if the system needs outside connections to sprinklers inside the container. • First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. • Must the container be left unopened or opened. • PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat. • Containment of residues/water/damaged equipment.								

	• Suitable safe making and disposal plan for after the event i.e. how do responders deal with partially charged damage units, contaminated surfaces (e.g., HF residues).

Table 9-68 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to explosion over pressures	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	4	5	5	3	**57**	**Moderate**	(-)
With Mitigation	5	4	5	5	1	**19**	**Low**	(-)
Mitigation and Management Measures	▪ During transport this is only likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out. For simplicity one transport route would be preferable. The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc. ▪ Once an import route has been chosen, e.g., Richards Bay or Durban and along N2/N3/N11 etc, then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. Emergency response planning and training referred to above may be important for key locations such as the mountain passes / tunnels.							

Table 9-69 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to acute toxic **chemical and biological agents**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	2	3	**33**	**Moderate**	(-)
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. ▪ Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. ▪ Awareness training for persons on site, safety ▪ Induction to include animal hazards. ▪ First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc.							

	▪ Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.

Table 9-70 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to acute toxic **chemical and biological agents**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	3	3	**45**	**Moderate**	(-)
With Mitigation	4	3	3	5	2	**30**	**Low**	(-)
Mitigation and Management Measures	▪ Appointed transport company to ensure transport in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods. ▪ The applicant is not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities and prescription found in SANS 10228/29 and international codes for battery transport etc. ▪ Transport in sealed packages that are kept upright, protected from movement damage etc. Additionally transported material should be packaged to ensure no short-circuiting during transportation. ▪ Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning. ▪ Pre-assembled containers will most likely be supplied. These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc. ▪ Route selection to consider possible incidents along the way and suitable response, e.g., satellite tracking, mobile communication, 24/7 helpline response. ▪ Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load.								

Table 9-71 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to violent release of kinetic or potential energy	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	5	5	4	**64**	**High**	(-)

With Mitigation	5	1	5	5	1	**16**	**Low**	(-)
Mitigation and Management Measures	▪ The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. ▪ SHEQ policy in place. ▪ A detailed construction Risk Assessment prior to work. ▪ SHE procedure in place. ▪ PPE to be specified. ▪ SHE appointees in place. ▪ Contractors safety files in place and up to date. ▪ SHE monitoring and reporting programs in place. ▪ Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. ▪ Civil and building structures to adhere to National Building Regulations and building Standards Act 103 of 1977 SANS 10400 and other relevant codes, and other constructions such as roads, sewers etc also to relevant SANS standards. ▪ All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins. ▪ Emergency response plan to be in place before construction begins.							

Table 9-72 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to electromagnetic waves	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	▪ Standard maintenance of condition of electrical equipment and safe operating instructions. Ability to shut off power to systems in use on site. ▪ If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. ▪ Lightning strike rate in the study area is very high. Outside work must be stopped during thunderstorms. ▪ Lighting conductors may be required for the final installation, to be confirmed during design phase.							

Table 9-73 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to electromagnetic waves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	▪ Standard maintenance of condition of electrical equipment and safe operating instructions. ▪ Ability to shut off power to systems in use on site. ▪ If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. ▪ Lightning strike rate in the study area is very high. Precaution measure must be put in place. Outside work must be stopped during thunderstorms. ▪ Lighting conductors may be required for the final installation, to be confirmed during design phase.							

Table 9-74 – Impacts on the environment

Potential Impact: Emissions to air	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	1	4	**28**	**Low**	(-)
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Use dampening on roads etc. as per normal construction practices. ▪ Use specified PPE (dust masks) for specific construction work.							

Table 9-75 – Impacts on the environment

Potential Impact: Emissions to water	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Normal construction site practices for preventing and containing fuels/paint/oil etc spills must be practiced. ▪ Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. ▪ Spill clean-up procedures to be in place before ▪ commencing construction. ▪ Sewage and any kitchen liquids - containment and suitable treatment/disposal e.g. septic tank and soak away system.							

Table 9-76 – Impacts on the environment

Potential Impact: Emissions to earth	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	1	2	3	3	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.							

Table 9-77 – Impacts on the environment

Potential Impact: waste of resources e.g., **water, power etc**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	1	4	**28**	**Low**	(-)
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Water usage to be monitored on site during construction. ▪ Handling protocols to be provided by battery supplier. ▪ End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. ▪ Water management plan and spill containment plans to be in place.							

Table 9-78 – Impacts on public aesthetic

Potential Impact: waste of resources e.g., water, power etc	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	30	Low	(-)
With Mitigation	2	2	3	3	3	30	Low	(-)
Mitigation and Management Measures	▪ Adopt all mitigation measures as listed in the Visual Impact Assessment study.							

Table 9-79 – Impacts on Investors

Potential Impact: Financial risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	3	4	3	39	Moderate	(-)
With Mitigation	3	1	3	4	2	22	Low	(-)
Mitigation and Management Measures	▪ Design by experienced contractors using internationally recognized and proven technology. Project management with deviation monitoring.							

Table 9-80 – Impacts on Employees and investors

Potential Impact: Security risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	4	40	Moderate	(-)
With Mitigation	3	1	3	2	3	27	Low	(-)
Mitigation and Management Measures	▪ Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. ▪ The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. ▪ Isolated location both helps and hinders security. ▪ Night lighting to be provided both indoors and outdoors where necessary.							

Table 9-81 – Impacts on Employees

Potential Impact: Security risk and Emergencies	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)
With Mitigation	4	2	3	5	3	**28**	**Low**	(-)
Mitigation and Management Measures	▪ Emergency procedures need to be practiced prior to commencement of construction. ▪ If batteries are stored at 50% charge, thermal runaway can happen while in storage on site waiting for installation. In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered. ▪ The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route.							

Table 9-82 – Legal Impacts

Potential Impact: Legal impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	3	4	**40**	**Moderate**	(-)
With Mitigation	2	1	3	3	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. ▪ Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc..							

Table 9-83 – Emergencies

Potential Impact: Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)
With Mitigation	4	2	3	5	2	**28**	**Low**	(-)
Mitigation and Management Measures	▪ Emergency procedures need to be practiced prior to commencement of construction. ▪ If batteries are stored at 50% charge, thermal runaway can happen while in storage on site waiting for installation. In addition, if involved in an external fire thermal runaway can happen even with uncharged batteries. ▪ Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered. ▪ The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. E.g., if purchased from Tesla where does hand over occur to the South African contractor / owner, at the factory door in USA, at the port in RSA, at the site fence. For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments..								

9.13.2 OPERATION PHASE

From the details of accidents that have happened both with BESS installations Wand chemical plants in general, it is clear that many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and all controls, procedures, mitigation measures etc that would be in place for full operation should be in place before commissioning commences.

Table 9-84 – Impacts on human health

Potential Impact: chronic exposure to toxic chemical or biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	4	5	**50**	**Moderate**	(-)

With Mitigation	1	1	3	4	2	**18**	**Low**	(-)

Mitigation and Management Measures	▪ The operation and maintenance phase should be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993. ▪ SHEQ policy in place. ▪ A detailed Risk Assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning. ▪ SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring. SHE appointees in place. ▪ Training of staff in general hazards on site. ▪ All necessary health controls/ practices to be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place. ▪ Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as: • appointment of emergency controller, • emergency isolation systems for electricity, • emergency isolation and containment systems for electrolyte, • provision of PPE for hazardous materials response, • provision of emergency facilities for staff at the main office building, • provision of first aid facilities, • first responder contact numbers

Table 9-85 – Impacts on human health

Potential Impact: chronic exposure to toxic chemical or biological agents	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	1	3	5	4	**48**	**Moderate**	(-)
With Mitigation	1	1	3	5	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ Solid state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container. ▪ Maintenance procedures will be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop etc. PPE will be specified for handling battery parts and other equipment on site. ▪ Training of staff in hazards of chemicals on site. ▪ Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers.							

	- Labelling of all equipment. - Confined space entry procedures if entering tanks. - There need to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly after a BMS shutdown where there may be flammable or toxic gases present, a fire etc. - Safety Data Sheets (SDSs) to be available on site. - Operating manuals to be provided including start-up, shutdown, steady state, monitoring requirements. - Maintenance manuals with make safe, decontamination and repair procedures. - Proposed maintenance schedules e.g., checklists for weekly, monthly, annual etc. - Provided portable equipment for calibration and for testing/verification of defective equipment, e.g., volt/current meters, infrared camera

Table 9-86 – Impacts on human health

Potential Impact: Exposure to noise	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	5	5	4	**52**	**Moderate**	(-)
With Mitigation	2	1	5	5	2	**26**	**Low**	(-)
Mitigation and Management Measures	- Ensure continuous noise does not exceed 85dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc. - Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.							

Table 9-87 – Impacts on human health

Potential Impact: Exposure to temperature extremes and/or humidity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	1	2	**20**	**Low**	(-)
With Mitigation	3	2	3	1	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	- Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces.							

	▪ Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range. ▪ Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary. ▪ Adequate potable water to be provided during all phases of the project. ▪ Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. ▪ PPE for operations and maintenance staff to be suitable for the weather conditions.

Table 9-88 – Impacts on human health

Potential Impact: Exposure to psychological stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	3	2	2	**20**	**Low**	(-)
With Mitigation	1	3	3	2	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	▪ Staff rotation to other activities within the site may be necessary. ▪ Performance monitoring of inspections / maintenance tasks in particular will be necessary. ▪ Adopt all mitigation measures as listed in the Social Impact Assessment study.							

Table 9-89 – Impacts on human health

Potential Impact: Exposure to ergonomic stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	3	2	3	**33**	**Moderate**	(-)
With Mitigation	4	1	3	2	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ Training in lifting techniques to be conducted. ▪ If equipment is at height (see OHS Act General Safety Regulation 6), ensure suitable safe (electrically and physically) ladders / harnesses etc. are available. ▪ Working at height procedure to be in place.							

Table 9-90 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to fire radiation	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	1	5	5	4	**64**	**High**	(-)
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Grass cutting and fire breaks around the BESS installations to prevent veld fires. W ▪ No combustible materials to be stored in or near the batteries or electrical infrastructure. Separation of site diesel tank, transformers from BESS and vice versa. ▪ Testing as part of commissioning of each unit and the overall system. Abuse tests conducted by supplier. ▪ BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/building unit or module/rack/container, if variations in voltage. Diagnostics easily accessible. Diagnostics able to distinguish cell from stack or cell from module faults. Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery trips actually work. ▪ Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers. ▪ Suitable ingress protection level provided for ▪ electrical equipment, e.g., IP55 - 66. If air cooling into container, suitable dust filters to be provided. Smoke detectors linked to BMS & alerts in control room. ▪ Effects of battery aging to be considered. Solid state battery life starts to be impacted above 40˚C and significant impacts above 50˚C with thermal runaway starting at 65-70˚C. BMS trips system at 50˚C. ▪ Temperature monitoring to be in place. ▪ Regular infrared scanning. Data needs to be stored ▪ for trend analysis. ▪ Data indicates an event frequency of 0.001 per installation and with 100 units this would mean an event once 10 years, i.e. a low probability event. ▪ Prior to commencement of cold commissioning, emergency plan from transport and construction phase to be extended to operational phase and to include the hazards of the electrically live system. ▪ Procedure to address solid state container must be in place ▪ A planned fire response to prevent escalation to an explosion or an environmental event must be in place ▪ Suitable supply of fire extinguishing medium and cooling medium ▪ Consider fire water for cooling equipment adjacent to BESS units.								

	- Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures. - Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.

Table 9-91 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to fire radiation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	4	**68**	**High**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	- Modern lithium container design put the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS is another container altogether.							

Table 9-92 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to explosion over pressures	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	5	5	2	**32**	**Moderate**	(-)
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)
Mitigation and Management Measures	- Electrical equipment will be specified to suit application. - Emergency response plan and employee training referred to above is to be in place. - Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment, due to possible leaks of electrolyte or generation of flammable gases under thermal runaway. Emergency response plan and employee training referred to above is critical. - Suitable training of selected emergency responders who may be called out to the facilities is critical.							

Table 9-93 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to acute toxic chemical and biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	2	3	**30**	**Moderate**	(-)
With Mitigation	3	1	2	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ All necessary good hygiene practices to be in place, e.g., provision of toilets, eating areas, infectious disease controls. ▪ Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. ▪ Awareness training for persons on site, safety ▪ Induction to include animal hazards. ▪ First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. ▪ Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.							

Table 9-94 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to acute toxic chemical and biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	3	3	**45**	**Moderate**	(-)
With Mitigation	3	3	3	5	2	**28**	**Low**	(-)
Mitigation and Management Measures	▪ Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. ▪ PPE to be increased (e.g., full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g., sampling, maintenance. ▪ All operators/maintenance staff trained in the hazards of chemicals on site. ▪ Batteries contained, modules contained and all inside ▪ a container that acts as bund. ▪ Standard dangerous goods requirements for Hazmat labels. ▪ All operators/maintenance staff trained in the hazards.							

Table 9-95 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to violent release of kinetic or potential energy	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	5	5	3	**48**	**Moderate**	(-)
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)
Mitigation and Management Measures	▪ Apart from pumps, no major moving parts during operation. ▪ Maintenance equipment to be serviced and personnel suitably trained in the use thereof. ▪ Traffic signs, rules etc in place on site. ▪ All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc to be in place. ▪ Emergency response plan must be present on site ▪ Civil design to take seismic activity into account.							

Table 9-96 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to electromagnetic waves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	▪ Codes and guidelines for electrical insulation. ▪ Suitable PPE to be specified. ▪ Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). ▪ Ensure trained personnel and refer to guideline – IEE 1657 – 2018. ▪ Ensure compliance with Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. ▪ Software must be kept as update to date as reasonably practicable. ▪ Consider suitably located Emergency stop buttons for the facility and the other equipment on site. ▪ PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials.							

	▪ The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and ▪ how to protect personnel who may enter to respond. ▪ Lightning strike rate in proposed development area is ▪ very high. All outside work must be stopped during thunderstorms. ▪ Lighting conductors may be required for the installation, to be confirmed during design

Table 9-97 – Impacts on Human and Equipment Safety

Potential Impact: Exposure to electromagnetic waves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)
Mitigation and Management Measures	▪ Standard maintenance of condition of electrical equipment and safe operating instructions. ▪ Ability to shut off power to systems in use on site. ▪ If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. ▪ Lightning strike rate in the study area is very high. Precaution measure must be put in place. Outside work must be stopped during thunderstorms. ▪ Lighting conductors may be required for the final installation, to be confirmed during design phase.							

Table 9-98 – Impacts on the environment

Potential Impact: Emissions to air	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	1	3	**18**	**Low**	(-)
With Mitigation	3	1	1	1	1	**6**	**Very Low**	(-)
Mitigation and Management Measures	▪ Container could be treated as entering a confined space and similar procedures could be in place, e.g., do not enter alone, gas testing prior to entering, ensure adequate ventilation							

Table 9-99 – Impacts on the environment

Potential Impact: Emissions to water	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)
With Mitigation	2	2	3	2	2	**18**	**Very Low**	(-)
Mitigation and Management Measures	▪ Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. ▪ Procedures for dealing with damaged/leaking equipment as well as clean-up of spills should be in place. ▪ Normal site practices for preventing and containing ▪ diesel/paint etc spills. ▪ Waste management plan to be in place e.g., liquid waste treatment or suitable removal and disposal will be provided. ▪ Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. ▪ The National Environment Management Act (NEMA) has a list of substances with Reportable spill quantities, ensure compliance with this.							

Table 9-100 – Impacts on the environment

Potential Impact: Emissions to earth	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	1	2	3	3	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	▪ Waste segregation (e.g., electronic equipment, chemicals) practices and management on site must be followed							

Table 9-101 – Impacts on the environment

Potential Impact: waste of resources e.g., water, power etc	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	2	4	**20**	**Low**	(-)
With Mitigation	1	1	1	2	2	**10**	**Very Low**	(-)
Mitigation and Management Measures	▪ Water usage to be monitored on site. ▪ Handling protocols to be provided by supplier of batteries. ▪ Water management plan and spill containment plans to be in place. ▪ Investigate end of Life plan for solid state batteries - reuse / recovery / reconditioning.							

Table 9-102 – Impacts on public aesthetic

Potential Impact: waste of resources e.g., water, power etc	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	4	4	2	**22**	**Low**	(-)
With Mitigation	1	2	4	4	2	**22**	**Low**	(-)
Mitigation and Management Measures	▪ Adopt all mitigation measures as listed in the Visual Impact Assessment study. ▪ Refer to Visual Impact Assessment which is to include the BESS installation once design details are available.							

Table 9-103 – Impacts on Investors

Potential Impact: Financial risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	3	4	3	**39**	**Moderate**	(-)
With Mitigation	3	1	3	4	2	**22**	**Low**	(-)
Mitigation and Management Measures	▪ Design by experienced contractors using internationally recognized and proven technology. Project management with deviation monitoring.							

Table 9-104 – Impacts on Employees and investors - Security

Potential Impact: Security risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	2	4	**36**	**Moderate**	(-)
With Mitigation	3	1	3	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	▪ Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. ▪ Consider motion detection lights and CCTV. ▪ The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. ▪ Isolated location both helps and hinders security. ▪ Night lighting to be provided both indoors and outdoors where necessary.							

Table 9-105 – Impacts on Employees and investors (cyber security)

Potential Impact: Security risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	3	1	4	**48**	**Moderate**	(-)
With Mitigation	4	4	3	1	2	**24**	**Low**	(-)
Mitigation and Management Measures	▪ Cyber security needs monitoring. ▪ Remote access to system needs to be negotiated and controlled. ▪ Password controls, levels of authority etc. Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS. ▪ Cyber emergency procedures – should be in place prior to commissioning.							

Table 9-106 – Impacts on Employees - Emergencies

Potential Impact: Security risk and Emergencies	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	3	**39**	**Moderate**	(-)
With Mitigation	4	2	3	4	2	**26**	**Low**	(-)
Mitigation and Management Measures	▪ Emergency procedures need to be practiced prior to commencement of operations. ▪ Escape doors should swing open outwards and not into the container. Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing. ▪ More than one exit from buildings. ▪ Storage of spare batteries (e.g., in stores on site or elsewhere) also needs to consider possible thermal runaway.							

Table 9-107 – Legal Impacts

Potential Impact: Legal impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	3	4	**40**	**Moderate**	(-)
With Mitigation	3	1	3	3	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. ▪ Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc.							

9.13.3 DECOMMISSIONING PHASE

Battery components may have a limited lifespan. There could already be "waste" on the first day of commissioning and plans should be in place to deal with this. Ideally an End-of-Life plan needs to be in place before the first container / equipment is brought on site. All decommissioning activities must comply with the relevant regulations at the time. Decommissioning will ultimately need to be informed by the regulatory requirements at the time, which may be different to present requirements. The impact ratings are not possible to determine now given the uncertainties in mitigations applicable at that time, hence they have been left as neutral.

Table 9-108 – Impacts on human health

Potential Impact: chronic exposure to toxic chemical or biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-109 – Impacts on human health

Potential Impact: chronic exposure to noise	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-110 – Impacts on human health

Potential Impact: chronic exposure to temperature extremes and/or humidity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-111 – Impacts on human health

Potential Impact: chronic exposure to psychological stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-112 – Impacts on human health

Potential Impact: exposure to ergonomic stress	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-113 – Impacts on human health and equipment safety

Potential Impact: Exposure to fire radiation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-114 – Impacts on Human and Equipment Safety

Potential Impact: exposure to explosion over pressures	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-115 – Impacts on Human and Equipment Safety

Potential Impact: exposure to acute toxic chemical and biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-116 – Impacts on Human and Equipment Safety

Potential Impact: exposure to violent release of kinetic or potential energy	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-117 – Impacts on Human and Equipment Safety

Potential Impact: exposure to electromagnetic waves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-118 – Impacts on environment

Potential Impact: Emission to air	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-119 – Impacts on environment

Potential Impact: Emission to water	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-120 – Impacts on environment

Potential Impact: Emission to earth	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	5	4	**60**	**Moderate**	(-)
With Mitigation	4	3	3	5	2	**30**	**Low**	(-)
Mitigation and Management Measures	▪ End of Life shutdown procedure including a Risk Assessment of the specific activities involved. ▪ Where possible re-purpose the solid-state batteries / containers and equipment with associated environmental impact considered. ▪ Disposal according to local regulations and other directives such as the European Batteries Directive. ▪ End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to determine if it has been reached. .							

Table 9-121 – Impacts on environment

Potential Impact: waste of resources e.g., water, power etc	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-122 – Impacts on public aesthetic

Potential Impact: nuisance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
With Mitigation	1	1	1	1	4	**4**	**Very Low**	(-)

Mitigation and Management Measures	▪ As per construction and operational phases.

Table 9-123 – Impacts on Investors

Potential Impact: financial risks	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	4	Very Low	(-)
With Mitigation	1	1	1	1	4	4	Very Low	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-124 – Impacts on Employees and investors - security

Potential Impact: security risk	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	4	Very Low	(-)
With Mitigation	1	1	1	1	4	4	Very Low	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-125 – Impacts on Employees

Potential Impact: Security risk and Emergencies	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	1	1	4	Very Low	(-)
With Mitigation	1	1	1	1	4	4	Very Low	(-)
Mitigation and Management Measures	▪ As per construction and operational phases.							

Table 9-126 – Legal Impacts

Potential Impact: Legal impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	1	3	4	40	Moderate	(-)
With Mitigation	3	1	3	3	3	30	Low	(-)
Mitigation and Management Measures	▪ Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.							

9.14 SOCIAL IMPACT ASSESSMENT

9.14.1 CONSTRUCTION PHASE

The project's construction phase is labour intensive, and there is, therefore, more potential to influence the social change of the project environment. The activities required are the construction camp, site offices, material laydown area, construction of internal roads, Operations and Management Office Building, three, excavations of turbine foundations, three substations and internal powerlines construction. These construction activities will require a labour force

Table 9-127 – Local Jobs

Potential Impact: Increase in local employment, training and business opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	3	3	39	Moderate	(+)
With Mitigation	5	4	3	4	4	64	High	(+)
Mitigation and Management Measures	▪ Preparation and implementation of a stakeholder engagement plan (SEP) prior and during the construction phase. ▪ Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. ▪ The proponent should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP.							

Table 9-128 – Influx of job seekers

Potential Impact: Increased number of people seeking for jobs	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	48	Moderate	(-)
With Mitigation	2	2	1	2	2	14	Vey Low	(-)
Mitigation and Management Measures	▪ The proponent, in consultation with the LM, should investigate the option of establishing a MC to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MC should also include the other proponents of solar energy projects in the area. ▪ The proponent should implement a “locals first” policy, specifically with regard to un-skilled and low-skilled opportunities. ▪ The proponent should implement a policy that no employment will be available at the gate. ▪ The proponent and the contractor should implement an HIV/AIDS, communicable diseases and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase							

Table 9-129 – Wildfires

Potential Impact: Increased Risk to Wildfires due construction activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	27	Low	(-)
With Mitigation	2	1	3	2	2	16	Low	(-)
Mitigation and Management Measures	▪ Preparation and implementation of a SEP prior to and during the construction phase. ▪ The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. ▪ Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. ▪ Smoking on site should be confined to designated areas. ▪ Contractor should ensure that construction-related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce							

	the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high-risk dry, windy summer months. ▪ Contractor should provide adequate fire-fighting equipment on-site, including a fire-fighting vehicle. ▪ Contractor should provide fire-fighting training to selected construction staff. In the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.

Table 9-130 – Loss of agricultural land and damage to farm infrastructure

Potential Impact: Risk to safety, loss of agricultural land and damage to farm infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	4	3	3	33	Moderate	(-)
With Mitigation	2	1	3	3	3	27	Low	(-)
Mitigation and Management Measures	▪ The project should limit constructing infrastructure during planting and harvesting season. ▪ Disturbed areas should be rehabilitated post-construction phase. ▪ Preparation and implementation of a SEP prior to and during the construction phase. ▪ The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. ▪ All farm gates must be closed after passing through. ▪ Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. ▪ The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. ▪ The proponent should implement a Grievance Mechanism that provides local farmers with an effective and efficient mechanism to address issues related to report issues related to damage to farm infrastructure, stock theft and poaching etc. ▪ The Environmental Management Plan must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.								

Table 9-131 – Community Health, safety and security

Potential Impact: Threat to Community health, safety and Security	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	3	1	2	18	Moderate	(-)
With Mitigation	2	2	1	2	2	14	Very Low	(-)
Mitigation and Management Measures	▪ The project should employ security personnel onsite during construction to implement security. The project should include monthly health talks and coordinate health and safety campaigns to educate personnel and the community on general health, safety and security issues.							

Table 9-132 – Environmental Health Impact

Potential Impact Noise and dust generated from construction vehicles	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	27	Moderate	(-)
With Mitigation	2	1	3	1	2	14	Very Low	(-)
Mitigation and Management Measures	▪ The project must implement the measures in the EMPr to mitigate dust emission, noise, and visual impacts. The project must establish onsite complaints register to record and address complaints regarding noise and dust impacts from the facility's construction. ▪ The proponent should implement a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction-related impacts, including damage to local gravel farm roads. ▪ Implementation of a road maintenance programme throughout the construction phase to ensure that the affected roads maintained in a good condition and repaired once the construction phase is completed. ▪ Maintain and repair of all affected road portions during the construction period where required. ▪ Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers. ▪ All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.							

9.14.2 OPERATION PHASE

The project activities will be operational during this phase, whereby renewable energy will be produced, stored, and supplied to the consumers.

Table 9-133 – Job Creation and Business Opportunities

Potential Impact: Increase in local employment	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	3	42	Moderate	(+)
With Mitigation	4	3	3	4	4	56	Moderate	(+)
Mitigation and Management Measures	▪ The project and its employees will require procurement of goods and services for the operations phase. Local procurement must be emphasised. Such an approach will increase the local economic growth when the local entrepreneurs and businesses are procured for the supplies and services. Job Creation and Business Opportunities Mitigation Measures ▪ To enhance job creation, the project should prioritise local recruitment for low-skilled workers and invest in skills development for locals to improve their competitiveness in the job market. Mitigation measures mentioned in Section 8.1.1 must be applied during the operational phase. Additionally, local businesses should be prioritised to supply goods and services to the project during operations							

Table 9-134 – Influx of job seekers

Potential Impact: Increased number of people seeking for jobs	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	3	42	Moderate	(-)
With Mitigation	2	2	3	3	2	20	Low	(-)
Mitigation and Management Measures	▪ Recruitment procedures should prioritise local employment to limit influx. Local skill development programmes must be implemented to improve the local skill pool to be more competitive in the labour market. Phefumula Emoyeni One WEF could partner with the municipality to implement community programmes and facilities to ease the pressure on municipal services and infrastructure.							

Table 9-135 – Community Health, safety and security

Potential Impact: Threat to Community health, safety and Security	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)
Mitigation and Management Measures	▪ The project should employ security personnel during the operational phase to secure the project and its assets. The project should train its personnel in health and safety. The staff should also receive training on how to interact with locals. Additionally, the mitigation measures mentioned in Section 8.1.5 should be considered.							

Table 9-136 – Environmental Health Impact

Potential Impact Noise and dust generated from construction vehicles	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	4	2	**20**	**Low**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ The project will have to refer to the approved EMPr to mitigate dust emission, and noise impacts. Furthermore, the project must establish complaints register on site to record and address complaints on noise, dust and visual impacts arising from the project. Refer to Section 8.1.5 for additional mitigation measures.							

Table 9-137 – Visual Impacts

Potential Impact: Obstruction of natural scenic view	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	4	2	**20**	**Low**	(-)
With Mitigation	2	1	1	3	2	**14**	**Low**	(-)
Mitigation and Management Measures	▪ The recommendations contained in the Visual Impact Assessment should be implemented.							

Table 9-138 – Energy Generation

Potential Impact: Provision of more reliable, stable energy source	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	1	4	5	**60**	**Moderate**	(+)
With Mitigation	4	4	3	4	5	**75**	**High**	(+)
Mitigation and Management Measures	▪ Operations management systems must be planned, monitored, and evaluated regularly to ensure that production, financial, human resources and other Key Performance Indicators targets are routinely achieved.							

9.14.3 DECOMMISSIONING PHASE

The decommissioning phase is a phase in the project where the projection operational activities cease to operate.

Table 9-139 – Employment

Potential Impact: Retrenchment	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	3	5	3	**48**	**Moderate**	(-)
With Mitigation	N/A	N/A	N/A	N/A	N/A	**0**	N/A	N/A
Mitigation and Management Measures	▪ It is recommended that the project establishes a structured employment forum consisting of representatives of employees, and organised labour, i.e. Labour Unions and Human Resource experts. The forum will have to be established during the operational phase for effectiveness. The forum will be responsible for planning fair retrenchment compensation packages, including financial compensation or alternative employment opportunities elsewhere for the retrenched employees. Furthermore, skills development programmes must be incorporated within the retrenchment packages for eligible retrenched employees.							

Table 9-140 – Livelihood

Potential Impact: loss of livelihood (increase in poverty)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	4	4	4	64	High	(-)
With Mitigation	3	3	2	3	3	33	Moderate	(-)
Mitigation and Management Measures	▪ It is recommended to include skills development programs in the retrenchment packages offered to eligible employees. This will equip them to compete more effectively with other job seekers in the market. ▪ In addition, creating a community engagement forum comprising community leaders, municipal LED representatives, and local business representatives could be effective.							

9.15 TRAFFIC IMPACT ASSESSMENT

9.15.1 CONSTRUCTION PHASE

The construction phase will generate traffic including transportation of people, construction materials, water, and equipment (abnormal trucks transporting turbine components). It is therefore expected that both these phases are similar in nature in regard to the traffic demand expected. The exact number of trips generated will be determined by appointed the haulage company. Based on the high-level screening of impacts, a moderate significance rating can be expected during the construction phase.

Table 9-141 – Traffic Impact

Potential Impact: Increase in development trips for the duration of the construction/decommissioning phase; associated noise and dust pollution. Possible damage to road surfaces by construction vehicles.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	3	2	4	48	Moderate	(-)
With Mitigation	2	4	2	2	3	30	Low	(-)
Mitigation and Management Measures	▪ Stagger component delivery to site ▪ Stagger the construction phase * Use of quarries in close proximity to the site to decrease the impact on the surrounding road network ▪ Staff and general trips should occur outside of peak traffic periods as much as possible ▪ Maintenance of haulage routes ▪ Design and maintenance of internal roads. ▪ Provide several access points to the site to split construction vehicle trips and reduce the risk of congestion at a single access.							

	▪ Maintenance and repairs of road sections of the N11 and, respectively, D383, D1102 and D1217 that have been damaged by construction vehicles. Any damage needs to be closely monitored to decide on the responsible party to repair it.

9.15.2 OPERATION PHASE

The traffic generated during this phase will have a nominal impact on the surrounding road network.

Table 9-142 – Traffic Impact

Potential Impact: Slight increase in trips due to transport of permanent staff to site; irregular periodical maintenance.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	4	2	**16**	**Low**	(-)
With Mitigation	1	2	1	4	2	**16**	**Low**	(-)
Mitigation and Management Measures	▪ No mitigation required							

9.15.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

9.16 VISUAL IMPACT ASSESSMENT

The following potential visual impacts that may occur during the construction, operational and decommissioning/closure phases of the project were identified. The expected visual impacts of the construction and decommissioning phases are assessed together, as they will largely be the same, albeit with the latter essentially occurring in reverse:

9.16.1 CONSTRUCTION PHASE IMPACTS

- Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape.
- Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape.

Table 9-143 – Airborne dust

Potential Impact: Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	1	4	**40**	**Moderate**	(-)
With Mitigation	3	3	3	1	2	**20**	**Low**	(-)

Mitigation and Management Measures	▪ Water down construction roads and large bare areas as frequently as is required to minimise airborne dust ▪ Enforce a 40 km/h speed limit on site for all vehicles ▪ Monitor dust fallout if any complaints are received, using appropriate dust monitoring programme.

Table 9-144 – Construction activities

Potential Impact: Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	2	5	65	High	(-)
With Mitigation	5	3	3	2	4	52	Moderate	(-)
Mitigation and Management Measures	▪ Ensure all construction areas are appropriately maintained and kept in tidy order ▪ Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed ▪ Remove accumulated waste material and unused equipment from site as frequently as is feasible ▪ Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species							

9.16.2 OPERATION PHASE IMPACTS

The following are the anticipated impacted associated with the operation phase:

- Reduction in visual resource value due to the presence of visually intrusive wind turbines and other project infrastructure in the landscape.
- Shadow flicker nuisance from spinning turbine blades.
- Flicker nuisance from spinning blades if one or more are painted to mitigate avifaunal impacts.
- Light pollution at night due to safety lighting on top of turbines, and security lighting.

Table 9-145 – Presence of turbines, other infrastructure

Potential Impact: Reduction in visual resource value due to presence of visually intrusive wind turbines and other project infrastructure in the landscape	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	5	4	5	85	Very High	(-)
With Mitigation	5	3	5	4	5	85	Very High	(-)

Mitigation and Management Measures	▪ Employ micro-siting and orientation of turbines and other infrastructure to group with existing infrastructure and already disturbed areas

Table 9-146 – Shadow flicker

Potential Impact: Flicker nuisance from painted spinning blades	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)
With Mitigation	2	2	3	4	1	**11**	**Very Low**	(-)
Mitigation and Management Measures	▪ Employ micro-siting and orientation adjustment of individual towers to ensure glare and flicker impacts to resident receptors (on-site and adjacent landowners) or transient receptors (roads bordering the site) are reduced ▪ In the event that nuisance from shadow flicker is experienced by specific receptors, adjust operating times of individual turbines to not be active during timeslots that shadows are cast over affected buildings/locations							

Table 9-147 – Blade flicker

Potential Impact: Flicker nuisance from painted spinning blades	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	3	5	4	3	**48**	**Moderate**	(-)
With Mitigation	4	3	5	4	3	**48**	**Moderate**	(-)
Mitigation and Management Measures	▪ Employ micro-siting and orientation adjustment of individual towers to ensure glare and flicker impacts to resident receptors (on-site and adjacent landowners) or transient receptors (roads bordering the site) are reduced ▪ In the event that nuisance from shadow flicker is experienced by specific receptors, adjust operating times of individual turbines to not be active during timeslots that shadows are cast over affected buildings/locations							

Table 9-148 – Light pollution

Potential Impact: Light pollution at night due to turbine safety and project site security lighting	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	4	5	70	High	(-)
With Mitigation	4	3	5	4	4	56	Moderate	(-)
Mitigation and Management Measures	▪ Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination ▪ Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination ▪ Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination ▪ Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance ▪ Avoid up-lighting of structures by rather directing lighting downwards and focussed on the area to be illuminated ▪ Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible								

9.16.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

10 CUMULATIVE IMPACT ASSESSMENT

Although the objective of the NEMA S&EIA process is to undertake an impact and risk assessment process, inclusive of cumulative impacts, which is essential to assessing and managing the environmental and social impacts of projects, it may be insufficient for identifying and managing the incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- Effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- Best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process "*will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence" including "master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant*."

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC GPH).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC's Performance Standards specify that "*Risks and impacts will be analysed in the context of the project's area of influence. This area of influence encompasses…areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location."* (IFC 2006).

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed Phefumula Emoyeni One WEF. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Therefore, a number of renewable energy developments within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved and others now operational). It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

The surrounding projects that have not already been awarded Preferred Bidder (PB) status under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or the Risk Mitigation IPP procurement programme (RMIPPPP), are still subject to the REIPPPP bidding process or subject to securing an off taker of electricity through an alternative process. Some of the surrounding proposed WEFs secured EAs several years ago but have not obtained PB status (or a private off taker agreement) and as such have not been developed.

These existing surrounding projects of varying approval status have been detailed in Error! Reference source not found..

The proposed Phefumula Emoyeni One WEF and related grid infrastructure is not located within one of the promulgated Renewable Energy Development Zones (REDZ).

Table 10-1 outlines the Renewable Energy Projects within 100km radius of the project site, as included in the Renewable Energy Environmental Authorisation Database 2024_Q3 developed by the DFFE.

Table 10-2 outlines the Renewable Energy Projects within 100km radius of the project site, as included in the database received from the MTPA, dated October 2024.

In terms of the information provided, there is approximately 8 984MW of renewable energy either approved or in process within 100km radius of the Phefumula Emoyeni One Project Site, of which 4 187MW are wind projects requiring a total of 403 turbines.

It is assumed that all the developments will require some form of grid connection, unfortunately information pertaining to gridline authorisations is not readily available.

Table 10-1 - Renewable Energy Projects within 100km radius of the project site (REEA 2024_Q3)

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
30km Radius					
14/12/16/3/3/1/2657	The Proposed Construction and Operation of the Hendrina North 132kV Powerline to Hendrina Power Station, within the jurisdiction of Steve Tshwete Local Municipality, in Nkangala District Municipality, Mpumalanga Province	ENERTRAG South Africa (Pty) Ltd	SiVEST SA (Pty) Ltd	Wind	Approved
14/12/16/3/3/1/452	Proposed Forzando North Coal Mine photovoltaic solar fascility in Emalahleni Local Municipality, Mpumalanga Province	Total Coal South Africa	GCS (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2068	The Halfgewonnen solar photovoltaic (PV) facilities on portions 7,8,9 and 16 of the farm Halfgewonnen 190 IS, Govan Mbeki LM, Gert Sibannde District Municipality, Mpumalanga Province	Dreamworks Haven Investments (Pty) Ltd	Cabanga Environmental	Solar PV	Refused
14/12/16/3/3/2/2130	The proposed Hendrina Renewable Energy Complex: North Wind Energy Facility (WEF), Mpumalanga Province	Hendrina North Wind Energy Facility (RF) (Pty) Ltd	Cabanga Concepts CC (trading as Cabanga Environmental)	Wind	Approved
14/12/16/3/3/2/2131	The proposed Hendrina Renewable Energy Complex: South Wind Energy Facility (WEF), Mpumalanga Province	Hendrina South Wind Energy Facility (RF) (Pty) Ltd	Cabanga Concepts CC (trading as Cabanga Environmental)	Wind	Approved
14/12/16/3/3/2/2134	The proposed Camden up to 400kV Grid Connection, Common Collector Substation and associated infrastructure, near Ermelo, Mpumalanga Province	ENERTRAG South Africa (Pty) Ltd	WSP Enviromental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2136	The proposed Camden I Solar Energy Facility (SEF) and associated infrastructure, near Ermelo, Mpumalanga Province	Camden I Solar (RF) Pty Ltd	WSP Enviromental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2137	The proposed Camden I Wind Energy Facility (WEF) and associated infrastructure, near Ermelo, Mpumalanga Province	Camden I Wind (RF) Pty Ltd	WSP Enviromental (Pty) Ltd	Wind	Approved

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
14/12/16/3/3/2/2160	The proposed Ummbila Emoyeni wind energy facility, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2161	The proposed Ummbila Emoyeni solar energy facility, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2162	The proposed Ummbila Emoyeni electrical grid infrastructure, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2456	The proposed establishment of a Solar Photovoltaic (PV) Energy Facility, Battery Energy Storage System (BESS) Facilities and associated infrastructure at the Komati Power Station, Mpumalanga Province within the Steve Tshwete Local Municipality and Nkang	Eskom Holdings SOC Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Approved
55km Radius					
1/3/1/16/1 G-236	The proposed development and related operation of 19.99 MWac Becrux solar photovoltaic (PV) energy facility on portion 6 of the farm Goedehoop 290 IS, Secunda, Govan Mbeki Local Municipality	Becrux Solar PV Project One (Pty) Ltd	To Review	Solar PV	Approved
1/3/1/16/1G-253	Proposed development of the 300MW Vhuvhili Solar Energy Facility and associated infrastructure, Secunda, Govan Mbeki Local Municipality	Vhuvhili Solar RF (Pty) Ltd	To Review	Solar PV	Approved
1/3/1/16/1G-272	The proposed development of a 132 kV overhead power line and supporting infrastructure for the proposed Vhuvhili solar photovoltaic energy facility	Vhuvhili Solar RF (Pty) Ltd	To Review	Solar PV	Approved
12/12/20/2018	Proposed establishment of the Haverfontein wind energy facility near Carolina, Mpumalanga Province	Terra Wind Energy-Haverfontein (Pty) Ltd	Coastal and Environmental Services	Wind	Approved

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
12/12/20/2018/AM1	Proposed establishment of the Haverfontein wind energy facility near Carolina, Mpumalanga Province	Terra Wind Energy-Haverfontein (Pty) Ltd	Coastal and Environmental Services	Wind	Approved
12/12/20/2018/AM2	Proposed establishment of the Haverfontein wind energy facility near Carolina, Mpumalanga Province	Terra Wind Energy-Haverfontein (Pty) Ltd	To Review	Wind	Approved
14/12/16/3/3/1/2657	The Proposed Construction and Operation of the Hendrina North 132kV Powerline to Hendrina Power Station, within the jurisdiction of Steve Tshwete Local Municipality, in Nkangala District Municipality, Mpumalanga Province	ENERTRAG South Africa (Pty) Ltd	SiVEST SA (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2135	The proposed Camden II Wind Energy Facility (WEF) and associated infrastructure, near Ermelo, Mpumalanga Province	Camden II Wind (RF) Pty Ltd	WSP Enviromental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2160	The proposed Ummbila Emoyeni wind energy facility, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2161	The proposed Ummbila Emoyeni solar energy facility, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/2162	The proposed Ummbila Emoyeni electrical grid infrastructure, Mpumalanga Province	Emoyeni Renewable Energy Farm	Savannah Environmental (Pty) Ltd	Wind	Approved
14/12/16/3/3/2/754	65.9 MW Tutuka Photovoltaic (PV) Energy Facility and Its associated Infrastructure on portion 4, 10, 11 and 12 of the Farm Pretorius Vley 374 is near Standerton within Lekwa, Mpumalanga Province	Eskom Holdings SOC Limited	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/759	Proposed installation of a Solar photovoltaic power plant at ESKOM Duvha power station	Eskom Holdings SOC Limited	ILISO Consulting (Pty) Ltd	Solar PV	Approved

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
14/12/16/3/3/2/760	Eskom Arnot PV Facility at the Arnot Power Station on Remainder of Portion 24 of Reitkuil 491 JS near Middleburg in Mpumalanga	Eskom Holdings SOC Limited	ILISO Consulting (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2812	The proposed development of the Roos Solar Renewable Energy Facility and associated Electrical Grid Infrastructure near Belfast within the Emakhazeni Local Municipality in the Mpumalanga Province.	JUWI Renewable Energies (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2298	The proposed establishment of a Solar Photovoltaic (PV) Energy Facility, Battery Energy Storage System (BESS) Facilities and associated infrastructure at the Komati Power Station, Mpumalanga Province.	Eskom Holdings SOC Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Refused
14/12/16/3/3/2/2339	The proposed Tournée 1 Solar PV Facility and associated infrastructure, near Standerton, Mpumalanga Province.	Tournée 1 Solar (Pty) Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2340	The proposed Tournée 2 Solar PV Facility and associated infrastructure, near Standerton, Mpumalanga Province.	Tournée 2 Solar (Pty) Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2392	The proposed Mukondeleli 1 Solar Photovoltaic Facility (Up to 300 MW) and associated infrastructure, Mpumalanga Province	Mukondeleli Solar (RF) Pty Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2447	The Proposed Welanga Solar Photovoltaic Solar Energy Facility and Grid Connection Infrastructure near Charl Cilliers, Mpumalanga Province	Welanga Solar PV Project One (Pty) Ltd	Blue Crane Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/2456	The proposed establishment of a Solar Photovoltaic (PV) Energy Facility, Battery Energy Storage System (BESS) Facilities and associated infrastructure at the Komati Power Station, Mpumalanga Province within the Steve Tshwete Local Municipality and Nkang	Eskom Holdings SOC Ltd	WSP Group Africa (Pty) Ltd	Solar PV	Approved
100km Radius					

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
14/12/16/3/3/1/2888	The Proposed ABO Serval Solar Energy Facility 1 (SEF) and associated infrastructure located near Middelburg in the eMakhazeni Local Municipality and the Nkangala District, in the Mpumalanga Province	ABO Serval Solar Energy Facility 1 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2889	The proposed ABO Serval Solar Energy Facility 3 (SEF) and associated infrastructure located near Middelburg in the eMakhazeni Local Municipality and the Nkangala District, in the Mpumalanga Province	ABO Serval Solar Energy Facility 3 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2890	The ABO Serval Solar Energy Facility 4 (SEF) and associated infrastructure located near Middelburg in the eMakhazeni Local Municipality and the Nkangala District, in the Mpumalanga Province	ABO Serval Solar Energy Facility 4 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2891	The ABO Serval Solar Energy Facility 7 (SEF) and associated infrastructure located near Middelburg in the Steve Tshwete Local Municipality and the Nkangala District, in the Mpumalanga Province	ABO Serval Solar Energy Facility 7 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2892	The ABO Serval Solar Energy Facility 9 (SEF) and associated infrastructure located near Middelburg in the eMakhazeni Local Municipality and the Nkangala District, in the Mpumalanga Province.	ABO Serval Solar Energy Facility 9 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2893	The ABO Serval Solar Energy Facility 10 (SEF) and associated infrastructure located near Middelburg in the Steve Tshwete Local Municipality and the Nkangala District, in the Mpumalanga Province	ABO Serval Solar Energy Facility 10 (Pty) Ltd	SiVEST SA (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/2907	Proposed Renewable Energy Generation Project (Photovoltaic Plant) on Portion 2 (Remaining Extent) and Portion 196 of the Farm Rondebosch 403 JS, located within the Steve Tshwete Local Municipality, Nkangala District Municipality, Mpumalanga Province	Sculptor Energy (Pty) Ltd	Exigent Engineering Consultants cc	Solar PV	Approved

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
14/12/16/3/3/1/2926	The proposed Renewable Energy Generation Project (Photovoltaic Plant) on Portion 195 and Portion 196 of the Farm Rondebosch 403 JS, located within the Steve Tshwete Local Municipality, Nkangala District Municipality, Mpumalanga Province	Rigel Energy (Pty) Ltd	Exigent Engineering Consultants cc	Solar PV	Approved
14/12/16/3/3/3/97	The proposed Transalloys power plant and associated infrastructure within Emalahleni Local Municipality in Mpumalanga Province.	Transalloys (Pty) Ltd	Savanah Environmetal (Pty) Ltd	Wind	Approved
12/12/20/1865	Proposed Development of an Energy Recovery Plant at the Samancor Chrome Middelburg Ferrochrome Plant, Middelburg	Samancor Chrome (Pty) Ltd	SLR Consulting (Pty) Ltd	Petroleum	Approved
12/12/20/1865/AM1	Proposed Development of an Energy Recovery Plant at the Samancor Chrome Middelburg Ferrochrome Plant, Middelburg	Samancor Chrome (Pty) Ltd	SRK Consulting (Pty) Ltd	Petroleum	Approved
12/12/20/1866	The proposed development of a Energy Recovery Plant at Samancor Chrome, Ferrometals Plant, eMalahleni, Mpumalanga Province	Samancor Chrome (Pty) Ltd	SRK Consulting (Pty) Ltd	Petroleum	Approved
12/12/20/2455	Proposed enrgy recovery plant at Samancor Chrome, Middelburg Ferrochrome, Middelburg, Mpumalanga	Samancor Chrome (Pty) Ltd	SRK Consulting (Pty) Ltd	Petroleum	Approved
14//12/16/3/3/2/752	Proposed 65MW solar PV fascility at Majuba Power Station in Mpumalanga Province	Eskom Holdings SOC Limited	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/738	Proposed Machadodorp PV1 solar energy fascility, Mpumalanga Province	Machadodorp1 PV Project (Pty) Ltd	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/738/AM1	Proposed Machadodorp PV1 solar energy fascility, Mpumalanga Province	Machadodorp1 PV Project (Pty) Ltd	Savannah Environmental (Pty) Ltd	Solar PV	Approved

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECH	PROJ_STATUS
14/12/16/3/3/1/738/AM2	Proposed Machadodorp PV1 solar energy fascility, Mpumalanga Province	Machadodorp1 PV Project (Pty) Ltd	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/738/AM3	The construction of the 14MW Machadodorp PV1 solar energyfacility on portin 8 of tthe farm De Kroon 363 in the Emakhazeni Local Municipality in Mpumalanga Province	Machadodorp1 PV Project (Pty) Ltd	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/1/738/AM4	The construction of the 14MW Machadodorp PV 1 solar energy facility on portion 8 0f the farm De Kroon 363 in Mpumalanga Province	Machadodorp1 PV Project (Pty) Ltd	Savannah Environmental (Pty) Ltd	Solar PV	Approved
14/12/16/3/3/2/752	65 MW Majuba Photovoltaic (PV) Energy Facility and Its associated Infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 Hs, Amersfoort, within the Dr Pixley Ka Seme Local Municipality, Mpumalanga Province	Eskom Holdings SOC Limited	Savannah Environmental (Pty) Ltd	Solar PV	Approved

Table 10-2 - Renewable Energy Projects within 100km radius of the project site (MTPA, October 2024)

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
30km Radius													
Forzando North Coal Mine photovoltaic solar facility in Emalahleni		Solar PV	GCS (Pty) Ltd	Total Coal South Africa	Approved	N	9.5	399.6	0.0	0.0	0.0	0.0	0
Hendrina South Wind Energy Facility (WEF)	ENERTRAG South Africa (Pty) Ltd	Wind	Cabanga Concepts CC (trading as Cabanga Environmental)	Hendrina South Wind Energy Facility (RF) (Pty) Ltd	Approved	N	0	2836.2	0.0	0.0	1071.8	0.0	25
Camden I Solar Energy Facility (SEF) and associated infrastructure	ENERTRAG South Africa (Pty) Ltd	Solar PV	WSP Enviromental (Pty) Ltd	Camden I Solar (RF) Pty Ltd	Approved	N	100	690.4	99.9	0.0	0.1	167.3	0
Camden I Wind Energy Facility (WEF)	ENERTRAG South Africa (Pty) Ltd	Wind	WSP Group Africa (Pty) Ltd	Camden Green Energy (Pty) Ltd	Approved	N	210	6526.9	36.6	0.0	1196.5	2089.7	37
Ummbila Emoyeni Phase One Wind Energy Facility	Seriti Green	Wind	Savannah Environmental	Emoyeni Renewabale Energy Farm (Pty) Ltd	Approved	N	155	24467.0	0.0	96.0	6799.3	2245.7	100

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
Camden 1 Green Hydrogen and Ammonia Facility	ENERTRAG South Africa (Pty) Ltd	Green Hydrogen	WSP Group Africa (Pty) Ltd	Camden Green Energy (RF) (Pty) Ltd	Approved	N	0	1620.6	48.5	0.0	286.8	223.2	0
ELDERS SOLAR PHOTOVOLTAIC PLANT	Anglo American Inyosi Coal (Pty) Ltd	Solar PV	Setala Enviro (Pty) Ltd	Anglo American Inyosi Coal (Pty) Ltd	Approved	N	0	751.3	0.0	0.0	212.0	0.0	0
Green Hydrogen Facility	Dreamworks Haven Investments (Pty) Ltd	Green Hydrogen	Phuka tsa Nong (Pty) Ltd	Dreamworks Haven Investments (Pty) Ltd	In Progress	N	0	300.8	0.0	0.0	50.9	0.0	0
Komati Power station Solar PV Facility	Eskom Holdings SOC Ltd	Solar PV	WSP GROUP AFRICA (PTY) LTD	Eskom Holdings SOC Ltd	In Progress	N	100	663.8	0.0	0.0	35.2	0.0	0
Zephyr Wind Energy Facility		Wind	SiVEST or EAP is Biodiversity Africa	Unknown at this stage	In Progress	N	0	15877.8	1.0	82.0	2448.2	3932.2	47
Ummbila Emoyeni Five Wind Energy Facility	Seriti Green	Wind	Savannah Environmental	Ummbila Emoyeni Five (Pty) Ltd	In Progress	N	136	4397.8	0.0	100.0	1954.3	0.0	22
Hendrina North Wind Energy Facility (WEF)	ENERTRAG South Africa (Pty) Ltd	Wind	Cabanga Concepts CC (trading as Cabanga Environmental)	Hendrina North Wind Energy Facility (RF) (Pty) Ltd	Approved	N	0	3658.4	0.0	0.0	298.1	0.0	27

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
Opt C Dorsfontein Solar PV Plant	Dreamworks Haven Investments (Pty) Ltd	Solar PV	Phuka tsa Nong Environmental Consultant		In Progress	N	500	523.9	0.0	0.0	223.8	234.3	0
Hendrina Green hydrogen and ammonia facility and associated infrastructure	Enertrag South Africa (Pty) Ltd	Green Hydrogen	WSP Group Africa (Pty) Ltd		Approved	N	0	25.0	0.0	0.0	0.0	0.0	0
55km Radius													
Becrux solar photovoltaic (PV) Energy Facility (SEF)		Solar PV	Savannah Environmental (Pty) Ltd	Becrux Solar PV Project One (Pty) Ltd	Approved	N	19.99	431.7	0.0	0.0	39.0	0.0	0
Vhuvhili Solar Energy Facility and associated infrastructure	Enertrag South Africa (Pty) Ltd	Solar PV	Council for Scientific and Industrial Research (CSIR)	Vhuvhili Solar Energy (RF) (Pty) Ltd	Approved	N	300	3282.2	0.0	0.0	1466.5	0.1	0
Camden II Wind Energy Facility (WEF) and associated infrastructure	ENERTRAG South Africa (Pty) Ltd	Wind	WSP Enviromental (Pty) Ltd	Camden II Wind (RF) Pty Ltd	Approved	N	200	4711.7	37.8	10.0	2111.0	299.8	45
Ummbila Emoyeni Phase One Wind Energy Facility	Seriti Green	Wind	Savannah Environmental	Emoyeni Renewabale Energy Farm (Pty) Ltd	Approved	N	155	24467.0	0.0	96.0	6799.3	2245.7	100

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
Tutuka Photovoltaic (PV) Energy Facility and Its associated Infrastructure	Eskom Holdings SOC Limited	Solar PV	Savannah Environmental (Pty) Ltd	Eskom Holdings SOC Limited	Approved	N	65.9	256.4	0.0	0.0	0.0	0.0	0
Solar photovoltaic power plant at ESKOM Duvha power station		Solar PV	ILISO Consulting (Pty) Ltd	Eskom Holdings SOC Limited	Approved	Yes	24	1356.3	0.0	0.0	301.9	0.0	0
Eskom Arnot PV Facility at the Arnot Power Station		Solar PV	ILISO Consulting (Pty) Ltd	Eskom Holdings SOC Limited	Approved	Yes	17.2	893.2	0.0	0.0	48.3	0.0	0
Komati Power station Solar PV Facility	Eskom Holdings SOC Ltd	Solar PV	WSP GROUP AFRICA (PTY) LTD	Eskom Holdings SOC Ltd	In Progress	N	100	663.8	0.0	0.0	35.2	0.0	0
Mukondeleli 1 Solar Energy Facility (SEF)	ENERTRAG South Africa (Pty) Ltd	Solar PV	WSP GROUP AFRICA (PTY) LTD	Mukondeleli Solar (RF) (Pty) Ltd	In Progress	N	300	2391.0	0.0	0.0	673.1	240.7	0
Mukondeleli Wind Energy Facility and associated infrastructure	ENERTRAG South Africa (Pty) Ltd	Wind	WSP Group Africa (Pty) Ltd	Mukondeleli Wind (RF) (Pty) Ltd	Approved	N	300	3592.4	0.0	0.0	1057.1	674.8	42
Tournee 1 Solar PV facility and associated infrastructure	Red Rocket	Solar PV	WSP GROUP AFRICA (PTY) LTD	TOURNEE 1 SOLAR (PTY) LTD	Approved	N	150	246.6	0.0	0.0	0.4	0.0	0

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
TOURNEE 2 SOLAR PV FACILITY AND ASSOCIATED INFRASTRUCTURE	Red Rocket	Solar PV	WSP GROUP AFRICA (PTY) LTD	TOURNEE 2 SOLAR (PTY) LTD	Approved	N	150	375.1	0.0	0.0	0.3	0.0	0
WELANGA SOLAR PHOTOVOLTAIC SOLAR ENERGY AND GRID CONNECTION	WELANGA SOLAR PV PROJECT ONE (PTY) LTD	Solar PV	BLUE CRANE ENVIRONMENTAL (PTY) LTD	WELANGA SOLAR PV PROJECT ONE (PTY) LTD	In Progress	N	160	1915.8	0.0	0.0	1168.3	597.2	0
Imvuselelo Solar Photovoltaic (PV) - Tutuka Cluster	SOUTH AFRICA MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD	Solar PV	Jones and Wagener (Pty) Ltd	South Africa Mainstream Renewable Power Developments (Pty) Ltd	In Progress	N	130	323.7	0.0	0.0	206.1	66.8	0
Rochdale WEF - Mulilo	Rochdale Wind Energy Facility (Pty) Ltd	Wind	ERM		In Progress	N	240	2346.5	79.7	0.0	1251.7	140.4	16
Emvelo WEF - Mulilo	Emvelo Wind Energy Facility (Pty) Ltd	Wind	ERM		In Progress	N	200	6963.5	21.4	43.0	1163.7	2272.5	35
Sheepmoor WEF- Mulilo	Sheepmoor Wind Energy Facility (Pty) Ltd	Wind	ERM		In Progress	N	360	5898.7	9.3	84.0	1331.5	2143.2	23

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
ABO Ujekamanzi Wind Energy Facility 1 and Associated Infrastructure	ABO Ujekamanzi Wind Energy Facility 1 (Pty) Ltd	Wind	SiVEST		In Progress	N	300	4323.8	0.0	0.0	727.2	2090.4	30
ABO Ujekamanzi Wind Energy Facility 2 and Associated Infrastructure	ABO Ujekamanzi Wind Energy Facility 2 (Pty) Ltd	Wind	SiVEST		In Progress	N	1000	2591.6	0.0	0.0	1508.1	1162.0	10
Ummbila Emoyeni Five Wind Energy Facility	Seriti Green	Wind	Savannah Environmental	Ummbila Emoyeni Five (Pty) Ltd	In Progress	N	136	4397.8	0.0	100.0	1954.3	0.0	22
Renewstable @ Kopano	Renewstable Mpumalanga (Pty) Ltd	Green Hydrogen	Savannah Environmental	HDF	In Progress	N	27	118.6	0.0	0.0	4.5	0.0	0
Renewstable @ Matla	Renewstable Mpumalanga (Pty) Ltd	Green Hydrogen	Savannah Environmental	HDF	In Progress	N	34	176.7	0.0	0.0	21.4	0.1	0
Renewstable @ Intlantsi	Renewstable Mpumalanga (Pty) Ltd	Green Hydrogen	Savannah Environmental	HDF	In Progress	N	47	172.2	0.0	0.0	0.0	0.0	0
Renewstable @ Anzani	Renewstable Mpumalanga (Pty) Ltd	Green Hydrogen	Savannah Environmental	HDF	In Progress	N	34	137.7	0.0	0.0	0.0	0.0	0

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
JUWI Renewable Energies (Pty) Ltd	JUWI Renewable Energies (Pty) Ltd	Solar PV	SiVEST SA (Pty) Ltd		Approved	Yes	50	569.9	59.5	0.0	250.6	0.0	0
Nalithuba Solar Photovoltaic (PV) - Tutuka Cluster	South Africa Mainstream Renewable Power Developments (Pty) Ltd	Solar PV	Jones and Wagener (Pty) Ltd	South Africa Mainstream Renewable Power Developments (Pty) Ltd	In Progress	N	120	290.8	0.0	0.0	1.3	0.0	0
Opt B Dorsfontein Solar PV Plant	Dreamworks Haven Investments (Pty) Ltd	Solar PV	Phuka tsa Nong Environmental Consultant		In Progress	N	500	638.1	0.0	0.0	126.8	0.0	0
Opt A Dorsfontein Solar PV Plant	Dreamworks Haven Investments (Pty) Ltd	Solar PV	Phuka tsa Nong Environmental Consultant		In Progress	N	500	651.8	0.0	0.0	105.0	0.0	0
Ntabande WEF	EDF Renewables (Pty) Ltd	Wind	SLR Consulting (South Africa)	Ntabande Wind Power (Pty) Ltd	In Progress	N	240	12980.7	17.5	100.0	2935.8	4910.9	56
Haverfontein WEF	Terra Wind Energy-Haverfontein (Pty) Ltd	Wind	Coastal and Environmental Services	Terra Wind Energy-Haverfontein (Pty) Ltd	Approved	N	75	1151.0	0.0	0.0	939.8	781.6	27
100km Radius													

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
Majuba Photovoltaic (PV) Energy Facility and Its associated Infrastructure		Solar PV	SRK Consulting (Pty) Ltd	Eskom Holdings SOC Limited	Approved	N	65	1324.3	0.0	48.0	183.1	39.7	0
Machadodorp PV1 solar energy facility		Solar PV	Savannah Environmental (Pty) Ltd	Machadodorp 1 PV Project (Pty) Ltd	Approved	N	14	109.3	100.0	0.0	0.0	102.1	0
Proposed 65MW solar PV fascility at Majuba Power Station in Mpumalanga Province	Eskom Holdings SOC Limited	Solar PV	Savannah Environmental (Pty) Ltd	Eskom Holdings SOC Limited	Approved	N	65	538.3	0.0	26.0	121.1	39.8	0
ABO Serval Solar Energy Facility 10 near Middelburg	ABO Serval Solar Energy Facility 10 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 10 (Pty) Ltd	In Progress	Yes	50	326.8	0.0	0.0	2.8	0.0	0
ABO Serval Solar Energy Facility 1 near Middelburg	ABO Serval Solar Energy Facility 1 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 1 (Pty) Ltd	In Progress	Yes	200	986.5	0.0	0.0	223.7	0.0	0
ABO Serval Solar Energy Facility 3 near Middelburg	ABO Serval Solar Energy Facility 3 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 3 (Pty) Ltd	In Progress	Yes	80	949.9	68.9	0.0	405.9	525.3	0

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
ABO Serval Solar Energy Facility 4 near Middelburg	ABO Serval Solar Energy Facility 4 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 4 (Pty) Ltd	In Progress	Yes	50	1446.0	26.6	0.0	240.1	436.6	0
ABO Serval Solar Energy Facility 9 (near Middelburg	ABO Serval Solar Energy Facility 9 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 9 (Pty) Ltd	In Progress	Yes	160	1276.5	23.4	0.0	5.9	4.1	0
ABO Serval Solar Energy Facility 7 near Middelburg	ABO Serval Solar Energy Facility 7 (Pty) Ltd	Solar PV	SiVest SA (Pty) Ltd	ABO Serval Solar Energy Facility 7 (Pty) Ltd	In Progress	Yes	180	1265.7	0.0	0.0	163.8	647.4	0
Transalloys (Pty) Ltd		Solar PV	Savannah Environmental (Pty) Ltd	Transalloys (Pty) Ltd	Approved	Yes	55	353.5	0.0	0.0	93.9	0.0	0
Impumelelo WEF		Wind			In Progress	N	0	1920.7	100.0	39.0	858.5	771.4	13
Rigel Energy (Pty) Ltd	Rigel Energy (Pty) Ltd	Solar PV	Exigent Engineering Consultants cc		Approved	Yes	240	852.8	0.0	0.0	0.0	0.0	0
Renewable Energy Generation Project	Knabtiw (Pty) Ltd	Solar PV			Approved	Yes	150	322.7	0.0	0.0	157.2	0.0	0

PROJECT TITLE	DEVELOPER	TECH	EAP	APPLICANT_	PROJECT STATUS	REDZ	MW	Size (Ha)	KBA %	IBA %	CBA (Ha)	Intact Patch (Ha)	Turbine No.
Ntabande WEF	EDF Renewables (Pty) Ltd	Wind	SLR Consulting (South Africa)	Ntabande Wind Power (Pty) Ltd	In Progress	N	240	12980.7	17.5	100.0	2935.8	4910.9	56
Daggafoort WEF	EDF Renewables (Pty) Ltd	Wind	SLR Consulting (South Africa)	SLR Consulting (South Africa)	In Progress	N	240	22044.2	1.8	97.0	4893.5	6114.7	69
Eland Solar Photovoltaic Plant and associated infrastructure	JUWI Renewable Energies (Pty) Ltd	Solar PV	Legacy Environmental Consulting		In Progress	No	50	143.9	100.0	0.0	0.0	20.7	0

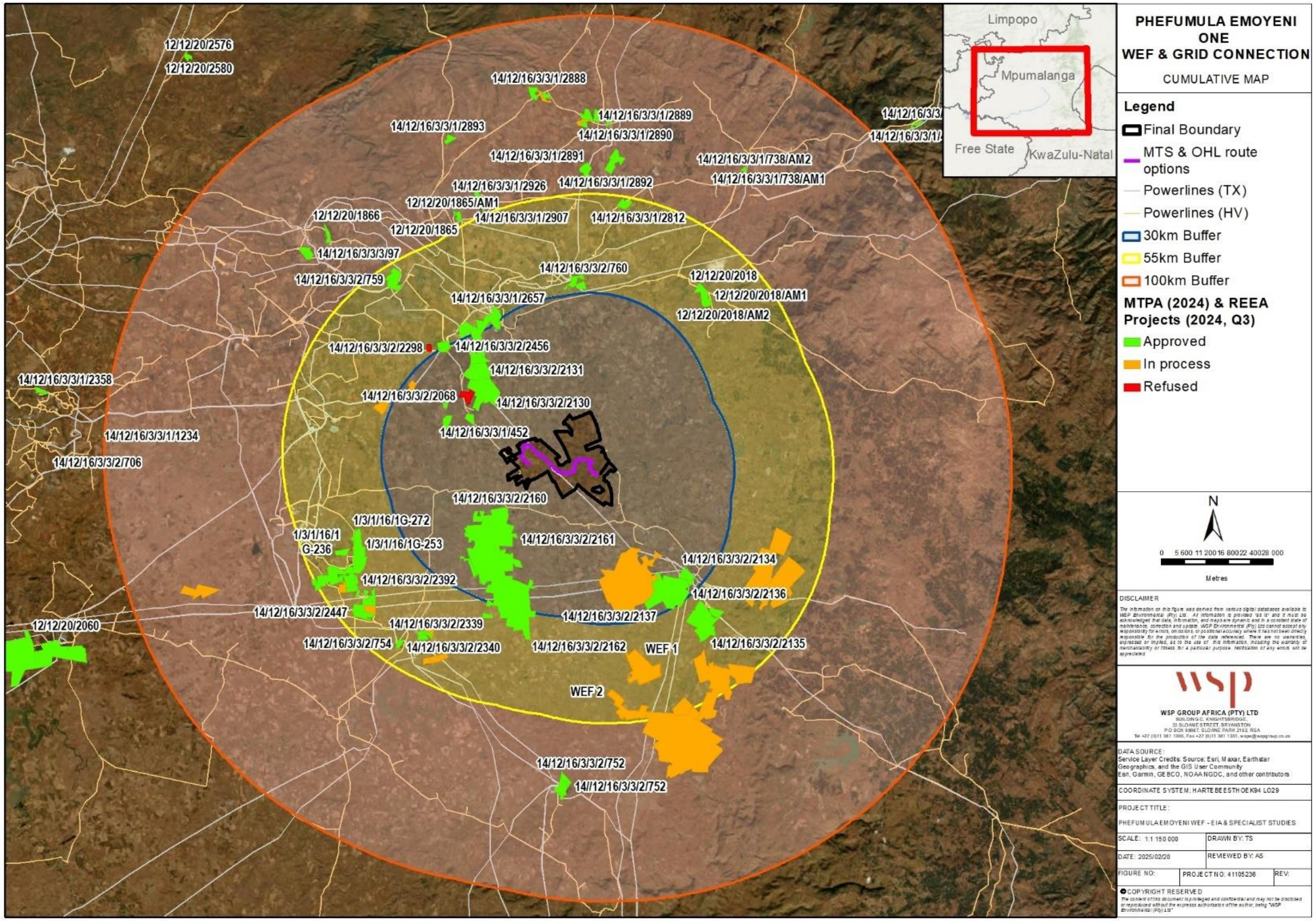


Figure 10-1 - Renewable Energy Projects within 100km of the Phefumula Emoyeni One WEF and Grid Connection

10.1 AGRICULTURAL POTENTIAL

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant. (including by degradation) of future agricultural production potential.

The potential cumulative agricultural impact of importance is a regional loss(including by degradation) of future agricultural production potential. All the projects contributing to cumulative impact for this assessment have the same agricultural impacts in a very similar agricultural environment, and therefore the same mitigation measures apply to all. The loss of agricultural potential by soil degradation can effectively be prevented for renewable energy developments by generic mitigation measures that are all inherent in the project engineering and/or are standard, best-practice for construction sites. Soil degradation does not therefore pose a cumulative impact risk.

Due to all the considerations discussed above, the cumulative impact of loss of future agricultural production potential is assessed as low. It will not have an unacceptable negative impact on the agricultural production capability of the area, and it is therefore recommended, from a cumulative agricultural impact perspective, that the development be approved.

10.2 AQUATIC IMPACT ASSESSMENT

The development of the Phefumula Emoyeni One WEF will impact freshwater resources, primarily in terms of the creation of new crossings of certain wetlands in the study area. A number of mitigation measures have been stipulated to reduce the overall significance of the impact but transformation of a certain area of wetland habitat will occur. Such transformation will be highly localised at the scale of the individual crossing, but cumulatively this will represent a larger area of wetland habitat loss. If mitigation measures as stipulated in this report are implemented, the impacting of upstream and downstream reaches of rivers crossed and of wetland reaches downgradient of turbine and other infrastructure locations will be greatly minimised or even avoided. The proposed development will result in impacts to a number of reaches, that together, and in combination with other impacts in the three respective quaternary catchments in which the study area is located will constitute a cumulative impact. However, provided that the mitigation measures as recommend in aquatic impact assessment report are implemented, the degree of impact on the freshwater resources in the study area would be considered acceptable.

10.3 AVIFAUNA IMPACT ASSESSMENT

The following are the identified avifauna cumulative impacts associated with the Phefumula Emoyeni One WEF:

- Total or partial displacement due to disturbance and habitat transformation associated with the construction and decommissioning of the WEF and associated infrastructure.
- Total or partial displacement due to habitat transformation associated with the operation of the wind turbines.
- Collisions with the wind turbines.
- Electrocutions and collisions with the on-site substations and internal 33kV network.

The total affected land parcel area taken up by other renewable energy projects within the 100 km radius is approximately 1,979 km² (197,898 ha). The total land parcel area affected by the Phefumula Emoyeni One Wind Energy Facility equates to approximately 337 km² (33 660 ha). The combined land parcel area affected by authorised or proposed renewable energy developments within the 100 km radius of similar habitat around the proposed Phefumula Emoyeni Wind Energy Facility, inclusive of the Phefumula Emoyeni Wind Energy Facility, thus equals approximately 2,316 km² (231,558 ha). Of this, the proposed Phefumula Emoyeni One WEF project constitutes ~14.5%. The cumulative impact of the proposed Phefumula Emoyeni One WEF is thus anticipated to be moderate to high after mitigation.

The total area within a 100 km radius around the proposed projects equates to about 31,416 km² (3,141,593 ha) of similar habitat. The total combined size of the land parcels potentially affected by renewable energy projects will equate to ~7.4% of the available habitat in a 100 km radius. The actual physical footprint of the renewable energy facilities will be smaller than the land parcel areas themselves.

It is acknowledged that, ideally, cumulative impact assessments (CIAs) should be informed by government-led regional assessments that establish guiding principles and minimum standards. However, in the absence hereof, it is advocated for the establishment of government-led CIAs by the authorities and NGOs to determine targets and thresholds to address the challenge of evaluating impacts linked to other developments. Once available, these can be integrated into Biodiversity Management Plans (BMPs) to measure the impact of projects. Effective CIAs could inform spatial planning, project mitigation, and conservation actions, with targets based on biodiversity goals. Further, we acknowledge effective collaboration through stakeholder consultation with other project proponents, environmental NGOs, and civil society as being crucial for implementing collective mitigation, compensation, and monitoring actions at appropriate spatial scales.

Furthermore, each of these projects must still be subject to a competitive bidding process where only the most competitive projects will win a power purchase agreement required for the project to proceed to construction. The cumulative impact of all the proposed renewable energy projects is estimated to be moderate to high.

It is imperative that ALL Wind Energy Facilities within the region strictly apply the mitigation measures as outlined in their respective Avifaunal Specialist Studies and that compliance with the recommended mitigation measures be audited by the governing Authorities (such as DFFE).. .

10.4 BAT MONITORING AND IMPACT ASSESSMENT

Of greatest concern is the potential cumulative impact on bats on the Mpumalanga Highveld from expanding and intensifying anthropogenic forms of land-use in the region, particularly, commercial crop cultivation (involving e.g. pesticide spraying), coal mining and burning (involving e.g. blasting, excavations, and water pollution), urban settlement (involving e.g. persecution of bats in rooves, and light pollution), and rapidly expanding renewable energy development including several approved solar and wind energy facilities. The WEFs include: i) the Ummbila Emoyeni WEF (up to 900 MW; DFFE Ref: 14/12/16/3/3/2/2160) located ~10 km to the southwest; ii) the Hendrina North and South WEFs (up to 200 MW each; DFFE Ref: 14/12/16/3/3/2/2160 and 2161) located ~16 km to the northwest; iii) the Camden I and II WEFs (up to 200MW each; DFFE Ref: 14/12/16/3/3/2/2137 and 2135) located ~28 km and 35 km to the southeast, respectively; and iv) the Haverfontein WEF (DFFE Ref: 12/12/20/2018/AM2) located ~40 km north-east. Without very diligent monitoring and mitigation of bat fatalities and other impacts (e.g. roost disturbance) at all WEFs in the region, their potential cumulative impact on bat habitats, populations, and ecosystem services was rated with Very High significance. Only with proper bat fatality monitoring and adaptive management of bat fatalities using turbine curtailment and other secondary mitigation measures, may the cumulative impact of these WEFs on bats be reduced to Moderate significance.

Table 10-3 - Other WEFs

Potential Impact: Cumulative impact of renew able energy developments in the area.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	4	5	5	5	95	Very High	(-)
With Mitigation	3	4	3	4	4	**55**	**Moderate**	(-)
Mitigation and Management Measures	▪ Only with proper bat fatality monitoring and adaptive management of bat fatalities using turbine curtailment and other secondary mitigation measures, may the cumulative impact of these WEFs on bats be reduced to Moderate significance							

10.5 ANIMAL SPECIES ASSESSMENT

The landscape in which the study area is located is already modified and fragmented as a consequence of historic and current agriculture, and other land use activities such as mining. The current degree of existing habitat modification and fragmentation in the landscape places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support viable populations of SCC.

Although the proposed Project is not located within a promulgated Renewable Energy Development Zone (REDZ), several renewable energy developments are, or may be, taking place in the broader region surrounding the study area. Some of the main developments within a 55 km radius of the study area include inter alia; Halfgewonnen solar photovoltaic (PV) facilities, Forzando North Coal Mine Solar PV Facility, Eskom Arnot PV Facility, Haverfontein WEF, Camden I WEF, Camden I Solar, Camden II WEF, Hendrina North WEF, Hendrina South WEF and Ummbila Emyonei WEF.

Collectively, these projects will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is much greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to fauna SCC and the proposed Project

Prior to any form of mitigation, the cumulative impact on fauna SCC resulting from habitat loss, disturbance and fragmentation is rated 'high'. The project contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions, which could include offsets. The cumulative impact on fauna SCC can be thus reduced to 'Low' significance.

The cumulative development of the various renewable energy projects mentioned above, will result in a higher number of construction locations, construction workers, and higher levels of vehicle activity across the surrounding landscape. This is likely to increase the potential for, and number of, fauna SCC that may be killed, injured or disturbed.

Prior to any form of mitigation, the cumulative impact on fauna SCC from injury, mortality or disturbance is rated 'medium'. With the implementation of the management and mitigation measures presented in this report, the Project contribution to cumulative impacts on terrestrial fauna SCC can be reduced to 'Low' significance.

Table 10-4 – Impacts on fauna habitat & SCC

Potential Impact: Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	5	5	80	High	(-)
With Mitigation	3	3	3	4	2	26	Low	(-)
Mitigation and Management Measures	▪ Same as operation phase mitigation.							

Table 10-5 - Impacts on fauna SCC

Potential Impact: Cumulative impact of fauna SCC due to Injury, mortality and disturbance of fauna.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	3	5	5	80	High	(-)
With Mitigation	2	3	3	3	2	22	Low	(-)
Mitigation and Management Measures	▪ Same as operation phase mitigation.							

10.6 TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

The landscape in which the study area is located is already modified and fragmented as a consequence of historic and current agriculture, and other land use activities such as mining. The current degree of existing habitat modification and fragmentation in the landscape places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support terrestrial biodiversity.

Although the proposed Project is not located within a promulgated Renewable Energy Development Zone (REDZ), several renewable energy developments are, or may be, taking place in the broader region surrounding the study area. Collectively, these projects will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is much greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to terrestrial biodiversity and the proposed Project.

Table 10-6 - Terrestrial habitat

Potential Impact: Cumulative impact of loss, disturbance and fragmentation of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	5	5	80	High	(-)
With Mitigation	3	3	3	4	2	26	Low	(-)
Mitigation and Management Measures	▪ Same as operation phase mitigation.							

10.7 PLANT SPECIES IMPACT ASSESSMENT

Table 10-7 - Terrestrial habitat

Potential Impact: Cumulative impact of loss, disturbance and fragmentation of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	3	5	5	80	High	(-)
With Mitigation	2	3	3	4	2	22	Low	(-)
Mitigation and Management Measures	▪ Same as operation phase mitigation.							

10.8 GEOTECHNICAL ASSESSMENT

Table 10-8 – Erosion Impact

Potential Impact: The displacement of natural earth material and overlying vegetation leading to: • Exposure of upper soil layer. • Increase in stormwater velocity • Soil washed downslope into drainage channels leading to sedimentation. • The erosion of these slopes will be exacerbated during periods of heavy rainfall.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	3	4	44	Moderate	(-)
With Mitigation	2	1	1	2	2	12	Very Low	(-)
Mitigation and Management Measures	▪ Use existing road network and access tracks. ▪ Use of temporary berms and drainage channels to divert surface water.							

	▪ Minimize earthworks and demolish footprints. ▪ Rehabilitation of affected areas (such as revegetation). ▪ Reinstate channelized drainage features. ▪ Strip, stockpile and re-spread topsoil..

Table 10-9 – Groundwater Impacts

Potential Impact: Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	3	1	2	**14**	**Ver y Low**	(-)
Mitigation and Management Measures	▪ Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. ▪ Frequent checks and conditional monitoring							

Table 10-10 - Disturbance of fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	**30**	**Moderate**	(-)
With Mitigation	2	1	1	2	12	**12**	**Very Low**	(-)
Mitigation and Management Measures	▪ Limit and control excavations.							

Table 10-11 - Slope stability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	3	2	**18**	**Low**	(-)
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)
Mitigation and Management Measures	▪ Avoid steep slope areas. ▪ Design cut slopes according to detailed geotechnical analysis.							

Table 10-12 - Seismic activity

Potential Impact: Damage of proposed development	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	4	1	12	Very Low	(-)
With Mitigation	2	1	3	3	1	9	Very Low	(-)
Mitigation and Management Measures	▪ Design according to expected peak ground acceleration.							

10.9 HERITAGE IMPACT ASSESSMENT

Cumulative impacts within the region are expected to rise with the accumulation of renewable projects within the 55km radius of the Project area. Cumulative impacts to the Project can be mitigated to an acceptable level as only four heritage resources will be impacted on the current layout, all of which can be mitigated through recommendations in the HIA report.

Table 10-13 - Cumulative impacts to heritage and palaeontological resources

Potential Impact: Cumulative impacts to heritage and palaeontological resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	5	5	3	48	Moderate	(-)
With Mitigation	4	2	5	5	1	16	Low	(-)
Mitigation and Management Measures	▪ A Grave Management Plan should be compiled for the burial sites present within the Project area.							

10.10 PALAEONTOLOGY IMPACT ASSESSMENT

As far as the palaeontology is concerned, there are no cumulative impacts, firstly because there are no fossils in the footprint and not likely to be. Second, each site is unique and may or may not have fossils. Fossil bones may be scattered over the landscape but their distribution is erratic and unpredictable. If a bone-bed or plant outcrop occurs this would be an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to add any impact on this project.

10.11 NOISE IMPACT ASSESSMENT

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed Phefumula Emoyeni One WEF. While one project may not have a significant negative impact on sensitive receptors, the collective impact of the projects may increase the severity of the potential impacts. Therefore, a number of renewable energy developments within the surrounding area, which have submitted applications for environmental authorisation (EA) (some of which have been approved) have been considered. It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

Based on the distances (>10 km) of all of the other renewable projects within 55km of the project location, cumulative impacts on receptors will not be perceived. Additionally, there are no other immediate activities (industrial or mining) located around the Phefumula Emoyeni One WEF site.

10.12 SAFETY HEALTH AND ENVIROMENTAL RISK ASSESSMENT

Unless another BESS is installed within 500m of the BESS location proposed for this project, cumulative impacts of other developments in the greater area do not affect the safety and health of employees, contractors of members of the public within the BESS impact zone. The same can be said for the BESS electrical infrastructure and grid connection.

10.13 SOCIAL IMPACT ASSESSMENT

The cumulative impacts are identified as sense of place which result as a result of visual change of scenic views because of a number of solar PV and wind energy facilities within the sight of a viewer. Local services and accommodation could negatively affect the local municipality service delivery due to limited resources. Socio-Economic opportunities may rise as a result of increased renewable energy facilities within the municipality.

10.13.1 SENSE OF PLACE

The potential cumulative impacts on the area's sense of place will be linked mainly to potential visual impacts. These issues relate to wind energy facilities and their associated infrastructure. The relevant issues identified include:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail).
- The visual compatibility of different energy facilities in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

Cumulative impacts need to be considered from dynamic and static viewpoints. For example, the experience of driving along a tourist road is regarded as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time. Still, each successive stretch of the road is dominated by views of renewable energy facilities, which can be argued to have a cumulative visual impact (Environmental Protection and Heritage Council, 2010).

There are several renewable energy projects located within a 55 km range of the project site.

There is, therefore, the possibility of combined and sequential impacts. However, given the site's location, the potential impact of the proposed energy-generating facilities and associated infrastructure on the area's sense of place is likely to be limited. The cumulative impacts are also expected to be low with mitigation, specifically given the site's location.

10.13.2 LOCAL SERVICES AND ACCOMMODATION

The development of multiple renewable energy projects has the potential to put a strain on local services and accommodations, particularly during the construction phase. The goal will be to source as many un-skilled and semi-skilled employees from the local municipality as possible during the construction and operational phases of the project. Sourcing skills locally will relieve the strain on local services, accommodations, and the nearby town of Ermelo. However, considering the construction phase's brief duration, the potential impact is expected to be limited.

The potential impact should also be considered in light of the possible beneficial cumulative effects on the local economy linked with the planned facilities and accompanying renewable energy projects in the local municipality. Such benefits will generate chances for investment in the municipality, such as upgrading and expanding existing services and building new residences

10.13.3 LOCAL ECONOMY

In addition to the potential negative impacts, establishing renewable energy facilities and associated infrastructure will create several socio-economic opportunities for the Msukaligwa Local Municipality. The positive cumulative economic opportunities include the creation of employment, skills development and training opportunities, and downstream business opportunities.

The potential cumulative benefits for the local and regional economy are associated with the construction and operational phases of renewable energy projects and related infrastructure, extending over 20-25 years. However, steps must be taken to maximise employment opportunities for local community members and support skills development and training programmes.

10.14 TRAFFIC IMPACT ASSESSMENT

To assess a cumulative impact, it was assumed that projects of similar nature within a 55 km radius, currently proposed or authorized, would be constructed at the same time. This is a precautionary approach as in reality; these projects would be subject to a highly competitive bidding process and not all the projects may be selected to enter into a Power Purchase Agreement. Even if all the facilities are constructed and/or decommissioned at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable. The construction and decommissioning phases of a WEF are the only significant traffic generators. The duration of these phases is short term, i.e., the potential impact of the traffic generated during the construction and decommissioning phases on the surrounding road network, is temporary and WEFs, when operational, do not add significant traffic to the road network.

Table 10-14 - Additional Traffic Impact

Potential Impact: Further increase in development trips during the construction phase	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	3	2	4	**52**	**Moderate**	(-)
With Mitigation	4	4	2	2		**36**	**Moderate**	(-)

Mitigation and Management Measures	▪ Same as for the Construction phase. However, it is noted that it is unlikely that the developments will be constructed at the same time. For the event that the developments have similar construction periods, it is recommended to agree on a delivery schedule between the respective projects if possible.

10.15 VISUAL IMPACT ASSESSMENT

The region is predominantly an agricultural landscape, although several small to moderately sized towns occur within the cumulative impact assessment study area, which is also bordered by Secunda and lies just outside of the Sasol industrial complex to the west. Several small mines, various rural businesses and lodges, and farmsteads also occur in this study area.

The visual impact associated with the proposed PEO WEF project will therefore be the introduction of an additional expanse of visually intrusive renewable energy generation infrastructure into the visual landscape, thereby transforming a notable additional section of the mostly rural, agricultural study area towards energy generation. The cumulative effect together with that of the various other proposed renewable projects if developed, will be the further degradation and fragmentation of the existing rural character of the study area, which may act as catalyst for further similar development in the vicinity. The cumulative visual impact of the project is assessed below:

- Magnitude: Numerous other future projects of a similar nature may take place in the region, several of which could be within visible distance of the PEO WEF project. Only a relatively small percentage of the overall project footprint area will physically be transformed as part of the project, which in turn will encompass roughly 3.5% of the total 55 km radius cumulative impact assessment study area. However, from a visual perspective the development will be visible from within a much larger percentage of the cumulative impact assessment study area, and the project viewshed may also partially overlap with that of other proposed WEFs. For these reasons, the magnitude of the cumulative visual impact of the project is estimated to be moderate (3).
- Extent: The cumulative visual impact will be of regional scale (3), as the impact will extend beyond the site boundaries to the regional surroundings, but is not expected to be significant on a larger (i.e. provincial) scale.
- Reversibility: The visual impacts associated with the project once constructed will persist and remain unchanged for the entire duration of the operation phase, as will be the case with other projects of a similar nature if approved, and in most instances limited to no mitigation (depending on the impact) is likely to be feasible, and therefore deemed irreversible (5).
- Duration: As this is an operational-phase impact that will be present for the lifespan of the project, the duration has been rated as long-term (4).

Probability: Given the proximity of several of the proposed other developments, the probability of a cumulative visual impact caused by the presence of the project infrastructure in the landscape has been rated as highly likely occurring.

Table 10-15 - Cumulative visual impacts

Potential Impact: Further degradation and fragmentation of the existing rural character of the study area through the introduction of an additional expanse of visually intrusive infrastructure into the landscape.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	5	4	4	**60**	**Moderate**	(-)
With Mitigation	-	-	-	-	-	**-**	**N/A**	(-)
Mitigation and Management Measures	▪ Same as for the Construction phase and operation phase.							

11 ENVIRONMENTAL IMPACT STATEMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that “development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…”. NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA’s preventative principle, potentially negative impacts on the environment and on people’s environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of “reasonable measures”.

In assessing the environmental feasibility of the proposed construction of the proposed Project, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, and the relevant legislation (where applicable).

The conclusions of this Draft EIA Report are the result of comprehensive assessments. These assessments were based on issues identified through the S&EIA process and public participation undertaken to date. The Draft EIA will be subject to public review, which will be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The Draft EIA will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

11.1 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed project is provided in **Table 11-1**.

Table 11-1 – Impact Summary

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Agriculture	Agricultural production potential of land	C/O	(-)	Low	Low
Aquatic Biodiversity	Hydrological alteration due to stormwater discharges, increased erosion or development of new erosion, and deposition of increased sediment due to vegetation clearance	C	(-)	Moderate	Low
	Destruction of a certain area of wetland habitat, sedimentation and water quality impacts related to clearing of Vegetation and Terrain Levelling	C	(-)	High	High

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Hydrological alteration due to stormwater discharges, increased erosion or development of new erosion, and deposition of increased sediment from dust or transported by stormwater due to construction of surface infrastructure	C	(-)	Low	Very Low
	Hydrological alteration due to stormwater discharges, increased erosion or development of new erosion, and deposition of increased sediment from dust or transported by stormwater due to construction outside of the delineated wetland boundary	C	(-)	Low	Low
	Potential pollution (water quality impacts), impacts on wetland soils, hydrology and vegetation	C	(-)	Moderate	Moderate
	Water Quality impacts and damage to wetland soils and vegetation	C	(-)	Low	Low
	Permanent loss of a certain area of wetland habitat		(-)	High	High
	Hydrological alteration due to stormwater discharges related to operation and maintenance of the surface infrastructure located outside the delineated freshwater ecosystems	O	(-)	Moderate	Low
	Operation and maintenance of the proposed main access roads and other existing roads traversing freshwater ecosystems	O	(-)	Moderate	Low
	Potential Direct and Indirect impacts related to removal of all surface infrastructure from the project area	D	(-)	Low	Low
Avifauna	Noise pollution and environmental disruption : Displacement of priority species from breeding/feeding/roosting areas	C	(-)	Moderate	Moderate
	Habitat transformation: Displacement of priority species from breeding/feeding/roosting areas	O	(-)	High	Moderate
	Bird mortality and injury: Population reduction of priority species	O	(-)	High	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Electrocution of priority species on the on-site sub-stations and internal 33kV network	O	(-)	Moderate	Low
	Collisions of priority species with the internal 33kV network	O	(-)	High	Moderate
	Noise pollution and environmental disruption: Total/partial displacement of priority species from breeding/feeding/roosting areas	D	(-)	High	Moderate
Bat Monitoring and Impact Assessment	Disturbance of bat roosts	C	(-)	High	Moderate
	Terrestrial habitat loss, and possible displacement of bats	C	(-)	High	Moderate
	Bat fatalities from collision with turbines, and possible population declines	O	(-)	Very High	Moderate
	Declines in certain species populations, the ecosystem services	O	(-)	High	Moderate
	Disturbance of bat roosts	D	(-)	High	Low
	Terrestrial habitat loss, and possible displacement of bats	D	(-)	Low	Low
Animal Species	Direct loss and disturbance of natural habitat.	C	(-)	High	Moderate
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	High	Moderate
	Impact on fauna SCC: Injury, mortality and disturbance of fauna	C	(-)	Moderate	Low
	Impact on fauna SCC: Injury and mortality of fauna, including SCC	O	(-)	Moderate	Low
	Impact on fauna SCC: Vibrations impacts from operating wind turbines disturbing fauna	O	(-)	Moderate	Low
	Impact on fauna SCC: Injury and mortality of fauna, including SCC	D	(-)	Moderate	Low
Terrestrial Biodiversity	Direct loss and disturbance of natural habitat	C	(-)	High	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	High	Moderate
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low
	Increased soil erosion and sedimentation	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
	Increase in wildfires from Project workers or faulty infrastructure	O	(-)	Moderate	Low
	Establishment and spread of alien invasive species	D	(-)	Moderate	Low
	Increased soil erosion and sedimentation	D	(-)	Moderate	Low
Plant Species	Direct loss and disturbance of natural habitat	C	(-)	High	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	High	Moderate
	Loss of flora of conservation concern	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
	Establishment and spread of alien invasive species	D	(-)	Moderate	Low
Geotechnical	Soil Erosion Impacts	C	(-)	Moderate	Very Low
	Contamination of ground and surface water resources	C	(-)	Moderate	Very Low
	The displacement of natural earth material and overlying vegetation leading to erosion	C	(-)	Moderate	Very Low
	Slope instability around structures.	C	(-)	Low	Very Low
	Seismic activity	C	(-)	Vey Low	Very Low
	Soil Erosion Impacts	D	(-)	Moderate	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Contamination of ground and surface water resources	D	(-)	Moderate	Very Low
	The displacement of natural earth material and overlying vegetation leading to erosion	D	(-)	Moderate	Very Low
	Slope instability around structures	D	(-)	Low	Vey Low
Heritage	Loss of heritage resources	C	(-)	Moderate	Very low
	Impact to graves in burial sites	C	(-)	Moderate	Very Low
	Loss of heritage resources	O	(-)	Moderate	Very Low
	Impact to graves in burial sites	O	(-)	Moderate	Very Low
	Loss of heritage resources	D	(-)	Moderate	Very Low
	Impact to graves in burial sites	D	(-)	Moderate	Very Low
Noise	Nuisance	C	(-)	Low	Vey Low
	Nuisance	O	(-)	Moderate	Low
	Nuisance	D	(-)	Low	Very Low
Traffic	Increase in Development Trips	C	(-)	Moderate	Low
	Slight increase in trips due to transport of permanent staff to site	O	(-)	Low	Low
	Increase in Development Trips	D	(-)	Moderate	Low
Visual	Visual Impacts - Airborne dust	C	(-)	Moderate	Low
	Visual Impacts - Presence of visually intrusive construction related activities and equipment in the landscape	C	(-)	High	Moderate
	Visual Impact - Reduction in visual resource value	O	(-)	Very High	Very High
	Visual Impacts - Flicker nuisance from painted spinning blades	O	(-)	Low	Very Low
	Visual Impacts -Flicker nuisance from painted spinning blades	O	(-)	Moderate	Moderate
	Light pollution at night due to turbine safety and project site security lighting	O	(-)	High	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Visual Impacts - Airborne dust	D	(-)	Moderate	Low
	Visual Impacts - Presence of visually intrusive construction	D	(-)	Moderate	Low
Social	Increase in local employment, training and business opportunities	C	(+)	Moderate	High
	Influx of job seekers: Increased number of people seeking for jobs	C	(-)	Moderate	Vey Low
	Increased risk of grass fires	C	(-)	Low	Low
	Threat to Community health, safety and Security	C	(-)	Moderate	Vey Low
	Risk to safety, loss of agricultural land and damage to farm infrastructure	C	(-)	Moderate	Low
	Threat to Community health, safety and Security	C	(-)	Moderate	Very Low
	Environmental Health: Noise and dust generated from construction vehicles	C	(-)	Moderate	Very Low
	Increase in local employment	O	(+)	Moderate	Moderate
	Influx of job seekers	O	(-)	Moderate	Low
	Threat to Community health, safety and Security	O	(-)	Low	Low
	Environmental Health: Noise and dust generated from construction vehicles	O	(-)	Low	Low
	Visual Impacts: Obstruction of natural scenic view	O	(-)	Low	Low
	Energy Generation: Provision of more reliable, stable energy source	O	(+)	Moderate	High
	Retrenchment	D	(-)	Moderate	N/A
	Loss of livelihood (increase in poverty)	D	(-)	High	Moderate
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Very Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human Health - chronic exposure to toxic chemical or biological agents	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to fire radiation	O	(-)	High	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Low
	Public - Aesthetics	O	(-)	Low	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors - Security	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Employees and investors - Security	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	N/A	N/A
	Human Health - exposure to noise	D	(-)	N/A	N/A
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	N/A	N/A
	Human Health - exposure to psychological stress	D	(-)	N/A	N/A
	Human Health - exposure to ergonomic stress	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to fire radiation	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	N/A	N/A
	Environment - emissions to air	D	(-)	N/A	N/A
	Environment - emissions to water	D	(-)	N/A	N/A
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	N/A	N/A
	Public - Aesthetics	D	(-)	N/A	N/A
	Investors - Financial	D	(-)	N/A	N/A
	Employees and investors - Security	D	(-)	N/A	N/A

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Emergencies	D	(-)	N/A	N/A
	Investors - Legal	D	(-)	Moderate	Low

11.2 SPECIALIST CONCLUSIONS

11.2.1 AGRICULTURAL POTENTIAL

The overall conclusion of this assessment is that the proposed development is desirable from an agricultural perspective because it offers a valuable, win-win opportunity for a renewable energy facility to be integrated with agricultural production in a way that provides benefits to agriculture and leads to very little loss of agricultural land with no loss of future agricultural production potential.

The screening tool classifies the assessed area as ranging from low to very high agricultural sensitivity. This assessment disputes some of the detail of the sensitivity classification by the screening tool. It rates those parts of the site, on which there are currently viable croplands as being of high agricultural sensitivity (or very high for pivot areas) and the rest of the site as being of medium agricultural sensitivity with a land capability of <8. The footprint of the proposed facility has deliberately avoided all areas of verified very high agricultural sensitivity.

In general, the soils across more than half of the site have insufficient capability for viable crop production and those on the remaining proportion are suitable for viable cropping. Soil limitations that prevent crop production are predominantly the result of limited depth due to underlying bedrock, clay, or hardpan, or the result of poor drainage. The crop-suitable versus unsuitable soils have been identified over time through trial and error. All the deep, well-drained, suitable soils are generally cropped, and uncropped soils that are used for grazing can fairly reliably be considered to have various limitations that make them unsuitable for crop production.

In general, the agricultural production potential of the site is high, and it is within an area that makes a significant contribution to food production in the country. Due to the favourable climate, crop yields are high on the suitable soils with average maize yields of around 7 tons per hectare.

An agricultural impact is a change to the future agricultural production potential of land. This is primarily caused by the exclusion of agriculture from the footprint of a development. In the case of wind farms, the amount of land excluded from agriculture is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has, and regardless of the duration of the impact. Furthermore, wind farms have both positive and negative effects on the production potential of land, and it is the net sum of these positive and negative effects that determines the extent of the change in future production potential. The positive effects include increased financial security for farming operations; improved security; and an improved road network.

Due to the facts that the proposed development will exclude agricultural production from only an insignificantly small area of land and that its negative impact is offset by economic and other benefits to farming, the overall negative agricultural impact of the development (loss of future agricultural production potential) is assessed here as being of low significance and as acceptable

11.2.2 AQUATIC BIODIVERSITY

The results of the field verification indicated that there is a high density of drainage (natural freshwater ecosystems) in the study area. The state of wetlands varies according to the impacts acting on the respective reach, but valley bottom wetlands were generally assessed to be in a largely natural state with a high EIS, while seep wetlands were generally assessed to be in a moderately modified condition and displaying a moderate EIS.

The proposed development in terms of the latest iteration of the proposed roads and turbine locations layout would directly impact certain freshwater features, especially in the context of various new internal roads that would need to cross freshwater ecosystems. The latest layout provided by the project proponent indicates that all turbines have been placed outside of the delineated freshwater ecosystem boundaries with the exception of one that has been placed within a seep wetland. A recommendation has been made to relocate this turbine to outside the wetland and the requisite 15m non development buffer. Similarly recommendations to realign a number of access roads to avoid the crossing of wetlands have been made.

It is the reasoned opinion of the freshwater specialist that the proposed Phefumula Emoyeni One WEF development can be granted environmental authorisation. The freshwater related sensitivities of the study area as outlined in the scoping phase freshwater assessment have been adequately considered in the latest iteration of the development layout and all proposed turbine locations except one have avoided being placed within any freshwater ecosystem or associated 15m non-development buffer, except one. A recommendation has been made that this turbine be relocated outside of the wetland and associated buffer. In addition a number of road realignment recommendations have been made to avoid the unnecessary impacting of wetlands. As the current layout does not indicate the position of proposed underground cabling, and other construction and operation infrastructure such as laydown areas, construction camps and BESS infrastructure, the finalised position of this infrastructure as well as of turbine locations and proposed roads must be assessed as part of a walkdown assessment of this infrastructure by a freshwater specialist. Should these recommendations be actioned and provided that all other mitigation measures as stipulated in this report are adhered to, the proposed development can be considered acceptable in a freshwater environment context.

11.2.3 AVIFAUNA IMPACT ASSESSMENT

The proposed Phefumula Emoyeni One WEF will have high and medium impacts on avifauna that could be reduced to medium and low impacts through the implementation of appropriate mitigation measures. During the EIA Phase of the Project individual turbine locations were assessed and evaluated on a case-by-case basis to determine the best placement in order to avoid high risk zones. No fatal flaws are expected; however, the mitigation measures listed in the avifauna report should be strictly applied and adhered to.

11.2.4 BAT MONITORING AND IMPACT ASSESSMENT

Following the first submission of this report, the proposed layout of infrastructure for the Phefumula Emoyeni One WEF was revised to comprise up to 88 (not 120) turbine. The turbine dimensions and other infrastructure details described have remained unchanged.

The 88 proposed turbine positions avoid High sensitive features but:

- Turbine 11, T12, T13, T27, T44, T47, T48, T49, T53, T56, T63, T68, T81, T82, and T88 have rotor sweep areas that encroach on High sensitivity buffers. These turbines will have to be moved.

- Turbine 7, T8, T21, T23, T25, T26, T28, T32, T33, T34, T35, T36, T37, T38, T42, T45, and T61 are proposed in the 2.5-5 km Medium-High sensitive buffer around the PH4 monitoring location, where very high bat activity was recorded. To reduce bat fatalities at these turbines, the prescribed blanket curtailment must be implemented, unless SMART detectors are used for smart curtailment in response to real time bat activity.
- Turbine 4, T29, T40, T51, T52, T59, T65, T66, T73, T79, T80, T83, and T84, which are located in other Medium-High sensitive areas, will also require the prescribed blanket or smart curtailment.
- Turbine 9, T14, T15, T16, T17, T20, T50, T55, T58, T70, T71, T75 and T85 which are positioned in Medium sensitive areas, have rotor sweep areas that encroach on Medium-High sensitive areas. Where possible, these turbines should be shifted slightly to avoid encroachment into Medium-High sensitive areas.

It can be noted that all the above-mentioned turbines were micro-sited during the layout optimisation and only one turbine is left inside a high sensitivity area (T63). This turbine is currently being micro-sited and the final position will be presented in the Final Layout.

It should be noted that although the total number of turbines has decreased from 120 to 88, which is better for bats, there has been an increase in the number of turbines located in High or Medium-High sensitive areas from 37 to 45, which is worse for bats.

Given the high recorded level of bat activity around the PH4 bat monitoring location and the rapid expansion of renewable energy developments in the immediate surrounds and further afield, bat fatality mitigation is essential for the proposed Phefumula Emoyeni One WEF. Turbine curtailment remains the most effective means of mitigating bat fatalities at WEFs (Arnett *et al.* 2013; Adams *et al.* 2021; Bennett *et al.* 2022). If done correctly, curtailment can have a minor or even negligible impact on energy generation by a WEF (Arnett *et al*. 2016; Hayes *et al.* 2019; Bennett *et al.* 2022). IWS advises that it will be most sensible and feasible to install bat deterrents on problematic turbines only if/when the operational bat fatality data reveal specific turbines which are most problematic (Good *et al.* 2022) – if these will adequately mitigate fatalities.

Going forward, the Client is strongly advised to carefully evaluate the feasibility of the prescribed curtailment and to ensure that there is adequate financial planning and provision for the curtailment. All bat impact mitigation measures recommended in this report must, so far as applicable, be followed and included in the Wind farm's Environmental Management Programme (EMPr). This includes the details of the prescribed curtailment, which must be diligently implemented as soon as each turbine starts spinning. Additionally, it must be explicitly stated in the EMPr that if smart curtailment is not successfully implemented, the affected turbine(s) must be prevented from spinning at night until a suitable alternative form of bat fatality mitigation, recommended by an appropriately experienced bat specialist, is fully operational.

11.2.5 ANIMAL SPECIES SPECIALIST ASSESSMENT

The study area is large and characterised by extensive tracts of natural dry- and moist grassland and shrubland habitat. Although various forms of linear infrastructure, such as formal roads, railway lines, farm tracks and farm fences, and the presence of modified habitat patches (e.g., Cultivated Fields and Alien Tree Plantations) have caused habitat fragmentation, the general level of habitat connectivity across the landscape remains high. Remaining areas of natural habitat within the study area therefore provide suitable habitat and a network of movement and dispersal corridor for many fauna species.

The continued integrity and functioning of natural habitat in the study area is therefore important in maintaining the metapopulation dynamics of fauna, including SCC.

During the field survey, several fauna SCC were documented in the study area, including the following:

- Four mammal species of conservation concern:
  - Serval - Near Threatened;
  - Mountain Reedbuck - Endangered;
  - Cape Clawless Otter - Near Threatened;
  - Swamp Musk Shrew – Near Threatened;
- Six bird species of conservation concern:
  - Blue Crane - Near Threatened;
  - Lesser Flamingo - Near Threatened;
  - Greater Flamingo - Near Threatened;
  - Southern Bald Ibis - Vulnerable;
  - Yellow-billed Stork - Endangered; and
  - Blue Korhaan - Vulnerable (NEMBA ToPS, 2007).

The National Web Based Screening Tool rated the Animal Species Theme for the study area as 'High' Sensitivity on account of the potential presence of several threatened fauna species, of which, two species were confirmed in the study area during the field survey, namely Southern Bald Ibis and Yellow-billed Stork. Based on the findings of this study, the 'High' sensitivity rating for the study area is therefore confirmed.

The proposed Project will result in habitat loss, disturbance and fragmentation through vegetation clearing, and this will impact local fauna and metapopulation dynamics. Moreover, it is also likely that some fauna may be killed, injured or disturbed during the various Project phases through inter alia, vehicle collisions, hunting/snaring and sensory disturbances from noise, dust and turbine vibrations.

The loss, disturbance and fragmentation of natural fauna habitat can be mitigated by the implementation of the recommended management measures, which include inter alia 1) micro-siting as much of the proposed permanent and temporary Project infrastructure in areas of modified habitat (e.g., Cultivated Fields), 2) clearing only the minimum areas required for construction activities, and 3) actively rehabilitating all disturbance footprints. Direct impacts on individual fauna can also be mitigated through the appointment of an ECO on-site during the construction phase to manage any human-fauna interactions, and through the implementation of several responsible operation and land use practices, such as inter alia, enforcing a speed limit for construction vehicles, banning hunting/snaring by on-site workers, and implementing dust suppression.

It is contended that the proactive implementation of the management measures outlined in this report, will provide effective mitigation and ensure minimal impacts on fauna SCC as a result of the proposed Project. It is therefore recommended that all mitigation measures are included in the proposed Project's environmental management plan (EMP).

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation. In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed

Project, is not deemed to present significant negative ecological issues or impacts, and it should thus be authorised.

11.2.6 TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT

The study area is located within the Eastern Highveld Grassland and Soweto Highveld Grassland vegetation types, which according to the NEMBA Threatened Ecosystems (2021), are listed as Endangered and Vulnerable, respectively. The study area is not located within a delineated SWSA, but according to the mapping of FEPA's, the central/southern portion of the study area is located in a FEPA, while the far south of the study area is designated as an Upstream Management Area.

From a biodiversity conservation planning perspective, large tracts of natural habitat in the study area are delineated as CBA Irreplaceable (CBA 1), while many other patches of habitat are delineated as CBA Optimal (CBA 2). The study area is not located within, or contain, a protected area. However, large portions of the study area have been mapped as Priority Focus Areas for protected area expansion, as per the National Protected Area Expansion Strategy (2018), with the Mpumalanga Protected Area Expansion – 20 Year Plan showing a similar spatial distribution of land designated as Priority 2 and Priority 3. Land designated as such, aligns with patches of natural habitat that comprise Mixed Dry Grassland, Moist Grassland and Rocky Shrubland. These habitats were assessed to provide important habitat for flora and fauna, and contribute to broader habitat connectivity, which is an important component of maintaining various landscape-scale ecological processes and terrestrial biodiversity.

The National Web-based Environmental Screening Tool rates the Terrestrial Biodiversity Theme for the proposed Project as 'Very High' sensitivity on account of several conservation planning features. It is noted that the portions of the study area that have been modified by active and historic crop farming (i.e., Cultivated fields and Old Lands) and severely encroach by AIS (i.e., Alien Tree Plantations), do not support this sensitivity rating. However, remaining patches of natural habitat in the study area are of high biodiversity importance with respect to the sensitivity features mentioned above and support the 'Very High' sensitivity rating of the screening tool.

The loss, disturbance and fragmentation of natural habitat from vegetation clearing during construction is the primary impact of concern, particularly where CBA areas are impacted. Vegetation clearing coupled with earth works are also likely to be accompanied by other indirect impacts, such as AIS colonisation and erosion, all of which are likely to negative affect on-site terrestrial biodiversity

The impact significance rating for habitat loss and disturbance prior to mitigation is 'high'. This can be reduced to a residual impact significance of 'Medium' by the implementation of the measures outlined in this report. Key measures include: 1) as far as possible, avoiding CBAs and ESAs, as well as wetlands and their associated buffers (as delineated in the wetland assessment specialist report; 2) micro-siting as much of the proposed Project infrastructure in areas that have already been modified (i.e., croplands); 3) clearing only the minimum footprint areas required for construction activities; and 4) actively rehabilitating all disturbance footprints and controlling alien invasive species colonisation and erosion post-construction.

A suite of terrestrial biodiversity management measures has been recommended for inclusion in the proposed Project's environmental management plan (EMP). The successful implementation of each measure will effectively mitigate negative impacts on terrestrial biodiversity that may result from the proposed Project. It is noted however, that based on the final Project infrastructure layout and quantification of habitat losses, it is likely that additional conservation measures, such as the development of a biodiversity offset programme, will still be necessary to offset the loss of CBA's and mapped remaining areas of threatened vegetation types in line with the NEMBA National Biodiversity Offset Guideline (2023). The biodiversity offset programme should be developed under consultation with the MPTA.

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation. In accordance with the outcomes of the impact assessment and taking cognisance of the baseline conditions and impact management measures presented herein, the proposed Project is not deemed to present significant negative ecological issues or impacts, and it should thus be authorised.

11.2.7 PLANT SPECIES SPECIALIST ASSESSMENT

The study area is located within the Eastern Highveld Grassland and Soweto Highveld Grassland vegetation types, which according to the NEMBA Threatened Ecosystems (2021), are listed as Endangered and Vulnerable, respectively.

Six habitat units have been identified in the study area. These comprise both natural habitats and modified habitats. Modified habitats (i.e., Cultivated Fields, Alien Tree Plantations and Old Lands), are of little conservation value and have Site Ecological Importance ratings of 'Very Low'. The natural habitat units (i.e., Mixed Dry Grassland, Moist Grassland and Rocky Shrubland) provide important habitat for flora, and they contribute to broader habitat connectivity, which is an important component of maintaining landscape-scale ecological processes and terrestrial biodiversity. These have Site Ecological Importance ratings of 'High'.

No flora species listed as Near Threatened or threatened on the national Red List were recorded in the study area during the field survey, although one species that is listed as Near Threatened on the Mpumalanga Red List was recorded, viz. *Kniphofia ensifolia subsp. ensifolia*. Habitat suitability assessments however, suggest that it is likely that a number of nationally threatened taxa may be present in the study area.

Several flora species that are listed as protected at a provincial level, as per the Mpumalanga Nature Conservation Act (Act No. 10 of 1998), were recorded in the study area. It is likely that some of these will occur within the proposed infrastructure footprints, and therefore may be lost/damaged during the construction phase vegetation clearing and associated earth works.

The National Web Based Screening Tool rated the Plant Species Theme for the study area as 'Medium' sensitivity, based on the potential presence of several flora SCC. The findings of this current study confirm this sensitivity rating.

Key mitigation and management measures that are recommended for the proposed Project with respects to minimising impacts on potential flora SCC, include inter alia,1) micro-siting as much of the proposed Project infrastructure as possible in areas that have already been completely transformed (i.e., Cultivated Fields, Alien Tree Plantations) or disturbed areas of grassland (i.e., Old Lands), 2) conducting a wet/growing season survey of the study area to identify and locate any flora SCC and inform micro-siting options and the SCC rescue and relocation requirements, and 3) implementing an alien invasive species control programme for the duration of the Project.

The successful implementation of the management measures presented in this report can effectively mitigate the identified impacts, resulting in 'Low' residual impact scores. It is recommended that all mitigation and management measures should be incorporated into the proposed Project's environmental management plan (EMP).

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation. In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project, is not deemed to present significant negative ecological issues or impacts on terrestrial plant species, and it should thus be authorised

11.2.8 GEOTECHNICAL IMPACT ASSESSMENT

Based on WSP's geotechnical desktop study, the proposed Phefumula Emoyeni One WEF site is suitable for the operation of a wind energy facility. A "very low to medium" negative impact was assessed, from a geotechnical perspective. Post-mitigation, the assessed impact decreases significantly to "very low." A geotechnical site investigation must be undertaken to provide detailed geotechnical information for the design of the proposed structures and roads.

11.2.9 HERITAGE IMPACT ASSESSMENT

The Project area is situated within a large, open landscape of which large sections have been used for agricultural activities as well as cattle farming. Many farmsteads are also situated throughout the Project area, with some still being occupied.

Due to layout changes to the Project after the initial survey was conducted, the final layout of the Project including final Turbine positions, and ancillary infrastructure was subject to an additional survey by two archaeologists. During the surveys, a total of 47 sites were recorded which includes multiple burial sites, farmsteads, ruins, circular stone enclosures, and possibly Historically planted trees. Informal settlements and labour housing and ruins thereof are found across the Project area and these sites pose the risk of associated graves and should preferably be avoided.

Burial site PF007 will be impacted by the access road which leads to WTG58. It is always preferable to avoid all burial sites with a 30m buffer zone. If avoidance of these burial sites is not possible, the graves can be moved with the relevant permits. A Grave management plan for the burial sites will also have to be compiled as well as access provided to burial sites for family members wishing to visit the graves. PFM011 is a possible burial site and if the site cannot be avoided with a 30m buffer further investigation will be required to determine whether it is indeed a grave.

According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area is of insignificant, and very high palaeontological sensitivity and an independent study was commissioned for this aspect (Bamford 2024).

The impact to heritage resources can be mitigated to an acceptable level provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval..

The following recommendations for Environmental Authorisation apply and the Project may only proceed based on approval from SAHRA:

- If the site at PFM011 cannot be avoided with a 30m buffer zone, the presence of a grave at PFM011 should be confirmed through Ground Penetrating Radar (GPR) and test excavations. If confirmed to be a grave, it can be removed with the necessary permits;

- Burial sites which will be impacted by access roads (PF007, PFM011) should preferably be avoided with a 30m buffer zone with access provided to family members
  - If avoidance is not possible, the graves can be moved with the necessary permits.
- All sites of medium and high significance should be added to development plans and avoided with a 30m buffer zone;
- Although of low significance, ruins should preferably be avoided as they have the risk of having associated graves present;
- A Grave Management Plan should be implemented for the burial sites present within the Project area;
- Development activities must be confined to the approved development footprint only;
- Monitoring of the Project area by the ECO during pre-construction and construction phases for heritage and palaeontology chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9 of the HIA report.
- The overall impact of the Project with the recommended mitigation measures is acceptable and residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the Project

11.2.10 NOISE IMPACT ASSESSMENT

Based on the IFC EHS Guidelines for Wind Energy, a preliminary modelling exercise was executed using a simple model, which assumes hemispherical propagation of noise from each turbine to determine potential impact on receptors within a 2 km radius of the turbines. If L_{A90} noise levels at all sensitive receptors are below 35 dB(A) at a wind speed of 10 m/s (at a height of 10 m) during day and night times, this would be sufficient to assess the noise impact of the proposed facility, offering adequate protection of amenity at these receptors. If L_{A90} levels at any receptor location are above 35 dB(A), then impacts at these receptors may be perceived and potential turbine relocations may need to be considered. In low noise environments, the ETSU-R-97 report itself, however, stipulates that noise from wind farms should be limited to a range between 35 and 40 dB(A) (daytime). Additionally, a fixed limit of 43 dB(A) should be implemented during night-time. This should increase to 45 dB(A) (day and night) if the potential receptors have financial investments in the facility. With the Phefumula Emoyeni One WEF being located within a low noise environment a combination of the IFC and ETSU methodology was followed in this assessment. One hundred and twenty-three (123) sensitive receptors (farmhouses) were identified within 2 km of the Phefumula Emoyeni One WEF site. Based on WSP's preliminary model (following the IFC methodology), the following was determined for the operational phase (the construction and decommissioning phases have not been quantified):

- Results indicate that predicted LA90 noise levels during both day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at 75 of the 123 receptors.
- However, being a low noise environment, with reference to the ETSU daytime limit range of 35-40 dB(A), LA90 noise levels at 104 of the 123 receptor locations are below this threshold.
- Additionally, at night, LA90 levels at 121 of the 123 receptor locations are below the ETSU 43 dB(A) threshold.
- It is, however, understood that all of the receptors within the Project boundary have direct interest and are vested in the Project, thus a blanket threshold value of 45 dB(A) (day and night) applies. Predicted LA90 noise levels at all onsite receptor locations are below this 45 dB(A) threshold.

- Predicted LA90 noise levels at all receptors outside of the Project boundary, except for receptors 45 and 46, are below the ETSU 40 dB(A) threshold. As such, complaints may be anticipated at these two receptors as a result of the operation of the Phefumula Emoyeni One WEF.

The resultant environmental acoustic risks associated with the construction and decommissioning phases of the Project are anticipated to be "low" to "very low" with general mitigation options employed. For the operational phase, impacts are anticipated to be "moderate" especially at receptors 45 and 46. Should the nearby turbine be relocated slightly, or financial incentives provided to these receptors, impacts are anticipated to become "low". From an environmental noise perspective, it is therefore advised that the Phefumula Emoyeni One WEF be authorised, provided one of the above recommendations is applied.

11.2.11 HIGH LEVEL SAFETY HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

- This Risk Assessment has found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a Safety, Health and Environment (SHE) perspective no fatal flaws were found with either type of technology for the BESS installation at the proposed Phefumula Emoyeni WEF 1 near Ermelo.
- At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels. State-of-the-art technology should be used, i.e., not old technology, such as liquid phase lithium ion batteries, that may have been prone to fire and explosion risks.
- The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

Lithium Solid State Containerized Batteries

- 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. There have been numerous such incidents around the world with lithium-ion batteries at all scales and modern technology providers include many preventative and mitigative features in their designs, e.g. solid state electrolytes being one of these improvements. 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.
- The flammable gases generated may ignite leading to a fire which accelerates the runaway process and may spread the fire to other parts of the BESS or other equipment located near-by.
- If the flammable gases accumulate within the container before they ignite, they may eventually ignite with explosive force. This type of event is unusual with solid state batteries, but has happened with an older technology container installed at McMicken in the USA in 2019.
- Due to a variety of causes, thermal runaway could happen at any point during transport to the facility, during construction or operation / maintenance at the facility or during decommissioning and safe making for disposal.
- Due to the containerized approach as well as the usual good practice of separation between containers, which should be applied on this project, and therefore the likely restriction of events to

one container at a time, the main risks are close to the containers i.e., to transport drivers, employees at the facilities and first responders to incidents.

- In terms of a worst conceivable case container fires, the significant impact zone is likely to be limited to within 10m of the container and mild impacts to 20m. Based on the current proposed layouts, impacts at the closest isolated farmhouses or mining facilities are not expected.
- In terms of a worst conceivable case explosion, the significant impact zone is likely to be limited to with 10m of the container and minor impacts such as debris within 50m. Based on the current proposed layouts, impacts at the closest isolated farmhouses or mining facilities are not expected.
- In terms of a worst reasonably conceivable toxic smoke scenario, provided the units are placed suitably far apart to prevent propagation from one unit to another and large external fires are prevented, the amount of material burning should be limited to one container at any one time. In this case, beyond the immediate vicinity of the fire, the concentrations of harmful gases within the smoke should be low.
- For the Phefumula Emoyeni WEF 1, the BESS location is over 500m from any occupied farmhouse and in this context the location is therefore considered suitable in terms of toxic gas risks.

Vanadium Redox Flow Battery Installations

- The most significant hazard with VRF battery units is the possibility of spills 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. (Refer to tables in section 4 under preventative and mitigative measures).
- For the Phefumula Emoyeni WEF 1, the BESS location is over 250m from any water course and is therefore considered suitable in terms of spill management.
- VRF batteries 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.

Technology And Location Of Bess Facilities

- From a safety and health point of view, the above Risk Assessment shows that risks posed by VRFB systems may be slightly lower than those of SSL facilities, particularly with respect to fire and explosion risks. From an environmental spill and pollution point of view the VRFB systems present higher short-term risks than the SSL systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as SSL technology and therefore there is not as much operating experience and accident information available for the VRFB. Overall, from and SHE RA points of view, there is no specific preference for a type of technology.
- From a SHE risk assessment point of view, where there is a choice of location that is further from public roads, water courses, isolated farmhouses or other occupied facilities, this would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and SSL batteries to fires producing toxic smoke and fire fighting which may result in contaminated of firewater runoff. One would not want these liquids to enter water courses nor the smoke to pass close to houses / industries public traffic. The current chosen location is suitably far from the above with a very low risk of any significant impacts.

11.2.12 SOCIAL IMPACT ASSESSMENT

The SIA baseline findings show that the project will positively impact the community, including power generation, employment, and economic benefits. The negative impacts include visual, loss of livelihood, community health, safety and security. phase. The assessments and mitigations of the impacts are based on secondary data and primary data.

11.2.13 TRAFFIC IMPACT ASSESSMENT

Feasible accessibility of the site was assessed in line with required sight lines, access spacing and road safety principles. However, to ensure sight line are kept, it is advised to allow for a setback distance of any obstructions, i.e., cutting back of vegetation/trees, and accommodating convex roadside mirrors where/if necessary.

It is expected that non-motorised transportation (NMT) is a dominant mode of transportation in the environment of the site, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the developer of a renewable energy project will provide shuttle buses for workers during the construction phase.

The highest trip generator for the site is expected during the construction phase. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting etc. The decommissioning phase is expected to generate similar trips as the construction phase. The traffic impact during the operational phase is considered low.

For the construction and decommissioning phases, the impact expected to be generated by the vehicle trips is an increase in traffic and the associated noise, dust, and exhaust pollution. Based on the high-level screening of impacts and mitigation, the site is expected to have a low negative significance during the construction and decommissioning stage, and a low negative significance during the operational stage.

11.2.14 VISUAL IMPACT ASSESSMENT

The PEO WEF project site is located in a largely rural, agricultural setting, with large areas of farmland interspersed by several towns, roads and other linear infrastructure, and localised areas of mining development. Several larger towns are also located further away from the site, within the outer edges of the 10 km study area and beyond. As such, the potential visual receptor base to the proposed development is large and diverse.

Furthermore, the visual resource value of the site within the context of the surrounding study area is generally considered to be high, owing mainly to the low prevailing levels of development, topographical character, and presence of various water bodies, and therefore also has a low ability to absorb visual change.

The proposed project will have negative impacts on the visual environment, mainly due to the introduction of very tall, visible, and visually intrusive elements into the landscape, in the form of the turbines, as well as other associated support infrastructure. The significance of these impacts is expected to be moderate to high in the context of the existing visual setting, and limited visual mitigation is generally feasible and mainly relevant to the construction and decommissioning phases.

Several applications for similar projects have also already been lodged and in some instances approved in the area. A cumulative visual impact is therefore expected to occur if the project proceeds, and further similar development does take place in the greater region. However, although the project will result in a permanent negative visual impact for the lifespan of the WEF, the study area is not considered highly unique in terms of visual character. This impact also needs to be considered within the context of the country's worsening energy generation and supply outlook, and accordingly can be supported from a visual perspective.

11.3 FINALISED LAYOUT

During the course of the EIA phase, the optimised layout was further refined and finalised based on specialist inputs. These inputs included the following recommendations:

- Aquatic biodiversity assessment
  - It is strongly recommended that Turbine 42 be relocated so that no part of its footprint is located within the delineated wetland boundary or associated 15m buffer.
  - a number of road realignment recommendations have been made to avoid the unnecessary impacting of wetlands.
- Bats:
  - Turbine T63 encroaches on a High sensitivity buffer. This turbine will have to be moved.

The above-mentioned recommendations are currently being considered by the applicant's engineering team. The final location of Turbine 42 and 63 will be presented in the Final EIA Report.

The optimised layout is illustrated in **Figure 11-1 and Figure 11-2**.

The co-ordinates for the following infrastructure included in the Final Layout are outlined in **Appendix M**:

- Final Property boundary;
- Optimised Turbine locations;
- Three IPP Substations and BESS; and
- Construction Camp and Laydown areas.

Appendix N includes a description of the revised layout positions and subsequent adjustment of each turbine in the optimised layout.

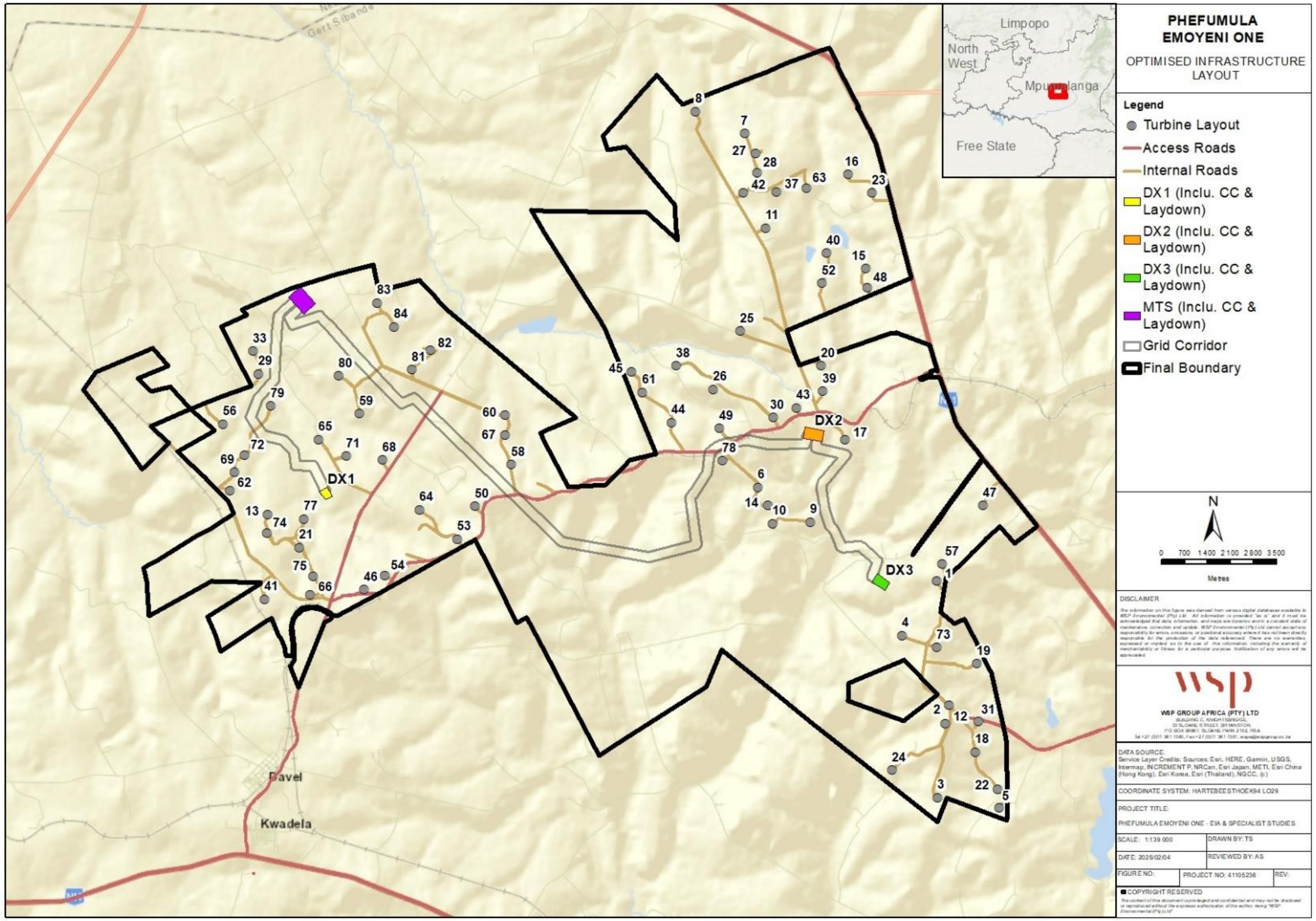


Figure 11-1 – Optimised Layout and Property Boundary

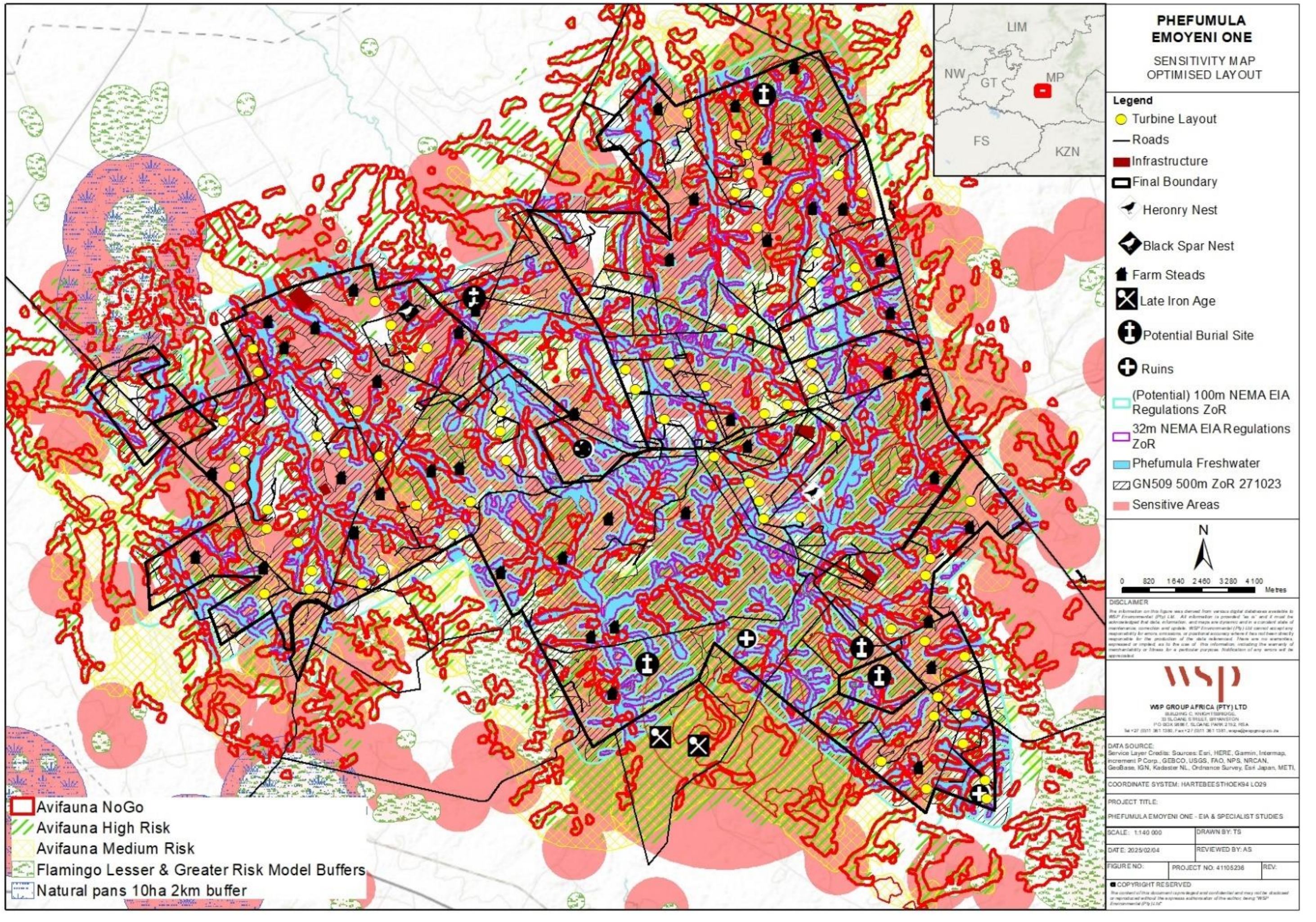


Figure 11-2 - Optimised Layout Sensitivity Map

11.4 ALTERNATIVES ASSESSMENT

Project alternatives in terms of activity, technology, location and layout were considered as part of this EIAR process. The revised layout avoids sensitivities as much as possible.

Table 11-2 outlines the preferred alternatives considered feasible and preferred from an environmental perspective (that is, as per the input from the Specialists).

Table 11-2 – Preferred Site Alternatives

Alternative	Preferred	Comment
Site	Phefumula Emoyeni One WEF (Figure 11.1)	There is no site alternative for the Phefumula Emoyeni One WEF. The location of the project infrastructure was subjected to a site selection process as described in **Section 4.1**.
Activity	Wind Technology	Wind technology has been identified as the preferred activity in terms of generating electricity from a renewable resource.
Layout and Design	Optimised Layout (76 turbines)	The Phefumula Emoyeni One WEF layout, including the associated infrastructure was revised during the Scoping Phase, from the initial 132 turbines to 88 turbines. The turbine layout was revised in order to avoid sensitive features and buffer areas. The revised layout has been further optimised, reducing the turbines to 76. This optimised layout is proposed as the Final Layout for approval.
IPP Substation and BESS	Vanadium Redox flow – Alternative 1 Lithium Battery Technologies – Alternative 2	▪ From a visual perspective, no fatal flaws were identified for either of the proposed site alternatives for the substation / BESS for Phefumula Emoyeni One WEF and both alternatives were found to be favourable. ▪ From a SHE risks assessment point of view, risks posed by VRFB systems may be slightly lower than those of SSL facilities. Overall, from and SHE RA points of view, there is no specific preference for a type of technology. ▪ It is requested that both technologies are authorised for use.

11.4.1 NO-GO ALTERNATIVE

In the “no project” alternative, the proposed project will not be developed. In this scenario, there could be a missed opportunity to address the need for increase in renewable energy generation in an effort to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, negative environmental impacts of the project (as outlined in Section 9) associated with the development of the Phefumula Emoyeni one WEF would be avoided, and the current status quo will continue. This includes continued use of the land for agriculture.

Specialists have considered the no-go alternative and the following has been concluded:

- Agriculture:
  The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The development compliments agriculture by providing an additional income source, without excluding agriculture from the land, or decreasing production. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, purely from an agricultural impact perspective, the proposed development is the preferred alternative between the development and the no-go. In addition, the no-go option would prevent the proposed development from contributing to the environmental, social, and economic benefits associated with the development of renewable energy in South Africa.

- Bats
  High bat sensitive areas represent No-Go areas for the construction of WEF infrastructure especially turbines, substations, buildings, construction camps, laydown areas, and possible quarries (to avoid disturbing key bat roosting, foraging, and/or commuting habitat, and to avoid high bat fatalities in these areas where high bat activity is anticipated). No turbine, including its full rotor swept area and a 2m pressure buffer around this, should occur in High sensitive areas. Consequently, turbines should be located a minimum of one blade length plus 2 m away from High sensitive areas. Construction of linear infrastructure such as roads and underground powerlines and cabling is only permissible in High Bat Sensitive Areas if this will not result in destruction or disturbance of bat roosts.

- Terrestrial Biodiversity (including Animal and Plant Species):
  If the proposed Project does not proceed, it is anticipated that the current agricultural land use status quo will continue across most of the study area into the future. The tracts of grassland and wetland habitat in the study area will continue to be used for livestock (cattle) production and game farming, and the croplands will continue to be actively cultivated to produce maize and other crop types. Certain portions of the study area are subject to heavy grazing and trampling by cattle, and it is possible that overtime, the condition of grassland and wetland habitat with respects to flora species diversity and ability to carry livestock (productivity) may deteriorate due to the effects of long-term overgrazing. This may compromise the agricultural profitability of on-site farming operations. With respects to biodiversity, overgrazing is likely to drive the homogenisation of habitats and fauna diversity, including the persistence of SCC.

- Risk

  - From a health and safety point of view, and ignoring the fact that this project may help to mitigate possible adverse impacts of climate change, the No-Go option will always be a preferred option since there are no health and safety risks associated with not doing a project.

- Traffic
  This alternative considers the option of ‘do nothing’ and maintaining the status quo. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will

remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist. It needs to be highlighted, that the actual WEF design would have a nominal impact on the findings of the TIA report, unless significantly altered.

- Visual

  From a visual perspective, the “no-go” alternative, i.e. whereby the Phefumula Emoyeni One WEF will not be developed, would in principle be favoured, as this would mean that none of the visually detrimental elements would be introduced into the landscape and thereby retaining the existing visual resource value of the project site. However, the significance of the site as a visual asset needs to be weighed against other socio-economic considerations, such as the current and future energy requirements of the nation, to determine whether the proposed project should be supported. Furthermore, several other similar projects are also planned and, in some instances, already approved for development in the region, which means that the visual character of the area will be changing significantly in the near future.

11.5 RECOMMENDATIONS

The following key aspects are recommended to be included as conditions of authorisation:

- The Development Envelope and associated layout must avoid all the no-go areas identified by the specialists;
- The EMPr and EIA mitigation measures must be adhered to;
- The final EMPr must form part of all contractual documents with contractors during construction and operational phases of the project. Furthermore, a dedicated Environmental Control Officer (ECO) must be appointed to ensure compliance to all EA conditions and EMPr commitments throughout the construction phase;
- Appropriate permits in terms of the Transvaal Nature Conservation Ordinance (No. 12 of 1983) must be obtained before commencement; and
- Where required, water use authorisation under NWA is to be obtained from the Department of Water and Sanitation prior to construction.

The following specialist recommendations have been made in respect of the project and have been included in the EMPr (**Appendix L**):

- Bats
  - Turbines, which are located in Medium-High sensitive area, will require the prescribed blanket or smart curtailment.
- The Risk
  - There are numerous different battery technologies, but using one consistent battery technology system for the BESS installations associated with all the developments in the Ermelo area would allow for ease of training, maintenance, emergency response and could significantly reduce risks.
- Heritage

- If the site at PFM011 cannot be avoided with a 30m buffer zone, the presence of a grave at PFM011 should be confirmed through Ground Penetrating Radar (GPR) and test excavations. If confirmed to be a grave, it can be removed with the necessary permits;
- Burial sites which will be impacted by access roads (PF007, PFM011) should preferably be avoided with a 30m buffer zone with access provided to family members
- If avoidance is not possible, the graves can be moved with the necessary permits.
- All sites of medium and high significance should be added to development plans and avoided with a 30m buffer zone;
- Although of low significance, ruins should preferably be avoided as they have the risk of having associated graves present;
- A Grave Management Plan should be implemented for the burial sites present within the Project area;
- Development activities must be confined to the approved development footprint only;
- Monitoring of the Project area by the ECO during pre-construction and construction phases for heritage and palaeontology chance finds, if chance finds are encountered to implement the Chance Find Procedure.

- Palaeontology
  Much of the area is indicated as very highly sensitive based on the presence of the Vryheid Formation that does preserve fossils in some areas. The areas underlain by dolerite do not have surface or underground fossils. The potentially highly sensitive areas do not have fossils visible on the soils that cover the basal rocks. Since it is not possible to determine if indeed fossils are present below the soils until excavations for foundations and infrastructure commence, a fossil chance find protocol should be added to the EMPr and followed during the CONSTRUCTION phase only. This way any impact on the fossils heritage can be effectively mitigated.
- Risk

  - Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g., draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.
  - There are no fatal flaws associated with the proposed Phefumula Emoyeni battery installation for either technology type.
  - The overall design should be subject to a full Hazop prior to finalization of the design.
  - For the VRFB systems an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g., can it be returned to the supplier for re-conditioning.
  - Prior to bringing any solid-state battery containers into the country, the contractor should ensure that:

    – An Emergency Response Plan is in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
    – An End-of-Life plan is in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, modules and containers.

  - The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.

- Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc. The current proposed BESS location is over 500m from isolated farmhouses / other occupied facilities and is therefore suitable. The risks of significant impacts is very low.
- Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. It should be noted that the location is well over 100m from the closest stream and will likely be suitable.
- Finally, it is suggested once the technology has been chosen and more details of the actual design are available, the necessary updated Risk Assessments should be in place.

▪ Geotechnical

- A detailed site-specific intrusive site investigation is recommended, prior to construction, to further characterize site conditions, to better understand the key geotechnical risks characteristics and to provide input into the design. The detailed geotechnical investigation should include:
  - Determination of the founding conditions for all structures. This will require the excavation of test pits, the possible drilling of rotary cored boreholes and subsequent laboratory testing.
  - Investigation of subgrade conditions for service roads.
  - Investigation for materials to be used during construction.
  - Non-intrusive investigation techniques, such as geophysical (seismic refraction) surveys, thermal and electrical resistivity for ground earthing requirement..

▪ Noise

- The closest wind turbine to these receptors (WTG88) be located slightly northwards, away from the receptors, so that noise levels remain below the 40 dB(A) threshold; or
- Receptor 45 and 46 be offered incentives if the current layout is to be approved.

11.6 EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires “where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised” must be included in the EIA Report.

The EA is required to be valid for a period of 10 years from the date of issuance of the EA. This is considered a reasonable period to allow the Applicant time to conduct relevant internal processes which can only begin after issuance of the EA.

12 CONCLUSION

The overall objective of the S&EIA Process is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed Project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for DFFE to make an informed decision for the environmental authorisation being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the_site specific and generic EMPrs (**Appendix L**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the environmental aspects is expected to be acceptable. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

13 WAY FORWARD

Phefumula Emoyeni One (Pty) Ltd is proposing the development of the 550 MW Phefumula Emoyeni One WEF located near Ermelo, Mpumalanga. This report provides a description of the proposed Project and details the aspects associated with the construction and operation. The report also includes the methodology followed to undertake the S&EIA process. A detailed description on the existing environment (biophysical as well as socio-economic) is provided based on findings from the specialist surveys and existing information. Stakeholder engagement undertaken from the onset of the assessment to date, has been conducted in a transparent and comprehensive manner.

The draft EIAR is available for public review from **11 April 2025** to **16 May 2025**.

All issues and comments submitted to WSP during the scoping phase have been incorporated in the SER (**Appendix F**). This Draft EIR will be submitted to the DFFE, as the competent authority, following the public review and addressing of comments, where necessary.

If you have any further enquiries, please feel free to contact:

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