DFFE REFERENCE NUMBER: 14/12/16/3/3/2/2667

Kromhof Wind Power(Pty) Ltd

KROMHOF WIND ENERGY FACILITY (UP TO 300MW), LOCATED NEAR VERKYKERSKOP IN THE FREE STATE PROVINCE

Draft Environmental Impact Assessment Report

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Kromhof Wind Power(Pty) Ltd

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Draft Environmental Impact Assessment Report

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PROJECT INFORMATION

Applicant
Kromhof Wind Energy Farm (Pty) Ltd

Project Name
Kromhof Wind Energy Facility located near Verkykerskop in the Free State Province

DFFE Reference Number
14/12/16/3/3/2/2667

WSP Project Number
41106247

Report Type
Draft Environmental Impact Assessment Report

GENERAL SITE INFORMATION

Technical details of the proposed Kromhof Wind Energy Facility (WEF) located near Verkykerskop in the Free State Province			
Location of Site	North east of Harrismith in the Phumelela Local Municipality and Thabo Mofutsanyane District Municipality, near the town of Verkykerskop, in the Free State Province of South Africa		
Description of all affected farm portions and 21-digit SG Codes	Farm Name	Portion Number	21-Digit SG Code
	Remaining Extent of Farm Leiden No. 2	0	F01500000000000200000
	Remaining Extent of Farm Myn-Burg No. 3	0	F01500000000000300000
	Remaining Extent of Farm Naauw Kloof No. 4	0	F01500000000000400000
	Remaining Extent of Farm Krom Hof No. 530	0	F01500000000053000000
	Remaining Extent of Farm Puntje No. 1240	0	F01500000000124000000
	Remaining Extent of Farm Aanfield No. 253	0	F01500000000025300000
	Portion 1 of Farm Aanfield No. 253	1	F01500000000025300001
	Remaining extent of Farm Ox Hoek No. 98	0	F01500000000009800000
	Portion 1 of Farm Ox Hoek No. 98	1	F01500000000009800001
	Portion 2 of Farm Ox Hoek No. 98	2	F01500000000009800002
	Portion 3 of Farm Ox Hoek No. 98	3	F01500000000009800003
	Remaining Extent of Farm Markgraaff's Rest No. 478	0	F01500000000047800000
Central coordinates of the site and activity location	27°58'40.33"S 29°32'14.33"E		
Total Area of Applicable farm Portions	7 269 ha		
Design Specifications			
Total Buildable Area (i.e. likely footprint area)	Approximately 150ha. (Subject to finalization based on technical and environmental requirements)		
Export Capacity	Up to 300MW (Subject to finalization based on technical and environmental requirements)		
Technology	Wind		
Number of Wind Turbines	Up to 55		

Technical details of the proposed Kromhof Wind Energy Facility (WEF) located near Verkykerskop in the Free State Province	
Rotor Diameter	Up to 200m
Hub Height	Up to 150m
Hard Standing Footprint	Up to 0,8 ha per turbine
Turbine Foundations	■ Excavation up to 4 m deep, constructed of reinforced concrete to support the mounting ring. ■ Once tower established, footprint of foundation is covered with soil.
Substation	1 x 33kV/132kV onsite collector substation (IPP Portion), each being up to 2ha.
Powerlines	33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical and ecologically acceptable
Construction camp and laydown area	Construction compounds including site office inclusive of ■ Concrete Batching plant of up to 1ha ■ Site office of 4 ha ■ Laydown area of 8ha
Internal Roads	■ Up to 8m in width
O&M Building	■ O&M office of up to 1ha (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14m wide including v-drains and trenching for cabling)
BESS	■ Battery Energy Storage System (BESS) (200MW/800MWh). ■ Pre-assembled solid state batteries ■ Export Capacity of up to 800MWh ■ Total storage capacity 200MW ■ Storage capacity of up to 6-8 hours The BESS will be housed in containers covering a total approximate footprint of up to 7ha

GLOSSARY

Abbreviation	Definition
AIS	Alien and Invasive Species
ATNS	Air Traffic and Navigation Services
BESS	Battery Energy Storage System
CA	Competent authority
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CBA	Critical Biodiversity Area
CSP	Concentrated Solar Power
DC	Direct current
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DR	District roads
DSR	Draft Scoping Report
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act 73 of 1989
ECO	Environmental Control Officer
EHS	Environmental Health and Safety
EI&ES	Ecological Importance and Ecological Sensitivity
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ERA	Electricity Regulation Act (No. 4 of 2006)
ESA	Ecological Support Area
FI	Financial institutions
FSR	Final Scoping Report
GA	General Authorisation

Abbreviation	Definition
GIIP	Good international industry practice
GNR	Government Notice Regulation
ha	Hectares
HIA	Heritage Impact Assessment
IBA	Important Bird & Biodiversity Area
ICAO	International Civil Aviation Organisation
IEP	National Integrated Energy Plan
IFC	International Finance Corporation
IRP	Integrated Resource Plan
LSA	Local Study Area
LUPA	Land Use Planning Act (Act 3 of 2014)
MW	Megawatt
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMPAA	National Environmental Management Protected Areas Act (No. 57 of 2003)
NHRA	National Heritage Resource Act (Act No. 25 of 1999)
NID	Notification of Intent to Develop
NPAES	National Protected Area Expansion Strategy 2010
NR	National Routes
NWA	National Water Act, 1998 (Act No. 36 of 1998)
O&M	Operational and maintenance
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
PPP	Public Participation Process
PS	Performance Standards
REDZ	Renewable Energy Development Zones
RSA	Regional Study Area
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
S&EIA	Scoping and EIA
SABS	South African Bureau of Standards

Abbreviation	Definition
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SAHRA	South African Heritage Resources Agency
SALA	Subdivision of Agricultural Land Act
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency
SANS	South African National Standards
SARPs	Standards and Recommended Practices
SAWS	South African Weather Service
SDF	Spatial Development Frameworks
SDG	Sustainable Development Goals
SEP	Stakeholder Engagement Plan
SER	Stakeholder Engagement Report
SG	Surveyor General
SPV	Special Purposed Vehicle
TOPs	Threatened or Protected Species
WBG	World Bank Group
WSP	WSP Group Africa (Pty) Ltd
WUA	Water Use Authorisation
WUL	Water Use License

1 INTRODUCTION

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Kromhof Wind Power(Pty) Ltd (Kromhof WEF) 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 Kromhof Wind Energy Facility (WEF), located near the town of Harrismith in the Free State Province.

The proposed development is subject to a Scoping and Environmental Impact Reporting (S&EIR) Process in terms of NEMA (as amended) and Appendix 2 and 3 of the EIA Regulations, 2014 and GNR 983 (as amended), GNR 984 (as amended) and GNR 985 (as amended). The competent authority for this S&EIR Process is the national Department of Forestry, Fisheries and Environment (DFFE).

The Kromhof WEF (hereafter referred to as “the Project”) will include the following main components:

- Wind Turbines;
- Onsite substations;
- 33kV cabling powerlines;
- Construction camp and laydown area;
- Operations & Maintenance (O&M) Building;
- Battery Energy Storage System (BESS); and
- Internal Roads.

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 a proposed activity and how those impacts can be mitigated.

The environmental impact report (EIR) (this report) 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 to be addressed in the environmental assessment, and the consultation process undertaken through the EIA process.

1.2 BACKGROUND INFORMATION

Mulilo Renewable Project Developments (Pty) Ltd (Mulilo) are proposing the development of the Verkykerskop WEF Cluster in the Free State Province.

The Verkykerskop WEF Cluster is divided into 3 projects which require full S&EIR Processes:

- Groothoek WEF (up to 300MW);
- **Kromhof WEF (up to 300MW) (Applicable to this Report and Application)**; and
- Normandien WEF (up to 300MW).

Each project will be applied for under a sperate Special Purposed Vehicle (SPV):

- Groothoek Wind Power (Pty) Ltd
- Kromhof Wind Power (Pty) Ltd

- Normandien Wind Power (Pty) Ltd

The following related projects will require separate Basic Assessment (BA) Process:

- Groothoek up to 132kV Grid Connection;
- Kromhof up to 132kV Grid Connection; and
- Normandien up to 132kV Grid Connection.

The focus of this Application is the proposed Kromhof WEF (up to 300MW).

The Project is located in the Thabo Mofutsanyane District Municipality and Phumelela Local Municipality (Ward 5), northeast of the town of Harrismith, in the Free State Province of South Africa (**Figure 4-1**).

The Project will be developed to allow for up to 300 MW for export from the facility. The proposed development footprint (buildable area) is approximately 150 hectares (ha) (subject to finalisation based on technical and environmental requirements), and the extent of the project area of applicable farm portions is approximately 7 269 ha. The development footprint includes the wind turbines, and all associated infrastructures as indicated in the table below.

Table 1-1 - Key Technical Details for the proposed Kromhof WEF

Aspect	Details
Total Buildable Area (I.e. likely footprint area)	• Approximately 150ha. • (Subject to finalization based on technical and environmental requirements)
Export Capacity	• Up to 300MW • (Subject to finalization based on technical and environmental requirements)
Technology	• Wind
Number of Wind Turbines	• Up to 55
Rotor Diameter	• Up to 200m
Hub Height	• Up to 150m
Hard Standing Footprint	• Up to 0,8 ha per turbine
Turbine Foundations	• Excavation up to 4 m deep, constructed of reinforced concrete to support the mounting ring. • Once tower established, footprint of foundation is covered with soil.
Substation	• 1 x 33kV/132kV onsite collector substation (IPP Portion), being up to 2ha.
Powerlines	• 33kV cabling to connect the wind turbines to the onsite collector substation, to be laid underground where practical and ecologically acceptable.
Construction camp and laydown area	• Construction compounds including site office inclusive of • Concrete Batching plant of up to 1ha • Site office of 4 ha • Laydown area of 8ha

Aspect	Details
Internal Roads	• Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14m wide including v-drains and trenching for cabling)
O&M Building	• O&M office of up to 1ha.
BESS	• Battery Energy Storage System (BESS) (200MW/800MWh). • Pre-assembled solid-state batteries • Export Capacity of up to 800MWh • Total storage capacity 200MW • Storage capacity of up to 6-8 hours • The BESS will be housed in containers covering a total approximate footprint of up to 7ha

As a result of specialist recommendations an updated project description has been developed and is included in 11 and **Section 12.5** of this DEIR.

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)).

It must be noted that the Kromhof WEF has been awarded Strategic Infrastructure Project (SIP) Status. Proof of award is included in Appendix J.

1.3 DETAILS OF KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Kromhof Wind Power (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the Kromhof WEF. **Table 1-2** provides the relevant details of the project proponent.

Table 1-2 – Details of Project Proponent

Proponent:	Kromhof Power(Pty) Ltd
Company Registration	201301654207
Contact Person:	Greg Midlane/ Shannon Bolton
Postal Address	21st Floor, Portside, 5 Buitengracht Street, Cape Town, 8001
Telephone:	27 21 685 3240
Email:	grmi@mulilo.com/ shbo@mulilo.com

1.3.2 COMPETENT AUTHORITY (CA)

Section 24C(2)(a) of NEMA stipulates that the Minister of Forestry, Fisheries and the Environment (“the Minister”) must be identified as the competent authority 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 Kromhof WEF is related to the IRP, DFFE is the CA for the proposed project.

Table 1-3 provides the relevant details of the competent authority on the Project.

Table 1-3 – Competent Authority

Aspect	Competent Authority	Contact Details
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Mr Lunga Dlovu Integrated Environmental Authorisations Email: LDlova@dffe.gov.za DFFE Ref: 14/12/16/3/3/2/2667

1.3.3 COMMENTING AUTHORITY OR ENTITIES

The commenting authorities for the project include:

- Department of Forestry, Fisheries, and the Environment (DFFE);
- DFFE – Directorate: Biodiversity and Conservation
- Free State Department of Economic, Small Business Development, Tourism & Environmental Affairs (DESTEA);
- DFFE: National Vulture Task Force (in terms of section 43(2) and 43(3)(c) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), the Minister has assigned the responsibility for implementation of the Multi-species Biodiversity Management Plan for Vultures in South Africa to the National Vulture Task Force).
- Department of Water and Sanitation (DWS);
- Department of Mineral and Petroleum Resources (DMPR);
- Petroleum Agency of South Africa (PASA);
- Department of Agriculture, Land Reform and Rural Development (DALRRD);
- Department of Public Works;
- Department of Defence;
- National Department of Transport;
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA);
- South African Civil Aviation Authority (CAA);
- Square Kilometre Array (SKA);
- South African Radio Astronomical Observatory (SARAO);
- South African Weather Service (SAWS);
- Relevant Local Government Authorities in respect of zoning, water services related activities;
- BirdLife South Africa;
- VulPro;
- Endangered Wildlife Trust; and
- South African National Parks.

Refer to the Public Participation Report (PPR) in **Appendix C** for a full list of commenting authorities.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

WSP was appointed in the role of Independent EAP to undertake the S&EIR process for the proposed project. The CV of the EAP is available in **Appendix A.1**. The EAP declaration of interest and undertaking is included in **Appendix A.2**. Table 1-4 details the relevant contact details of the EAP.

Table 1-4 – Details of the EAP

EAP:	WSP Group Africa (Pty) Ltd
Contact Person:	Ashlea Strong
Physical Address:	Building 1, Maxwell Office Park, Magwa Crescent West, Waterfall City, Midrand, 1685
Postal Address:	PO Box 6001, Halfway House, 1685
Telephone:	011 361 1392
Fax:	011 361 1301
Email:	Ashlea.Strong@wsp.com
EAP 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 Environmental Authorisation (EA). The details of the specialists are provided in Table 1-5 below. The specialist studies are attached in **Appendix G** and their declarations in **Appendix B.2**.

Table 1-5 – Details of Specialists

Assessment	Name of Specialists	Company	Sections in Report
Agriculture	Johann Lanz	Johann Lanz (Independent Consultant)	▪ Section 3.5.2 ▪ Section 7.1.1 ▪ Section 8.1.1 ▪ Section 10.1 ▪ Section 12.2.1 ▪ **Appendix G.1**
Geotechnical Desk Study	Heather Davis	WSP Africa (Pty) Ltd	▪ Section 3.5.3

Assessment	Name of Specialists	Company	Sections in Report
			- Section 7.1.2 - Section 8.1.1 - Section 9 - Section 10.2 - Section 12.2.2 - **Appendix G.2**
Terrestrial Biodiversity	Rudolph Greffrath	WSP Africa (Pty) Ltd	- Section 3.5.4 - Section 7.2.1 - Section 8.1.1 - Section 9 - Section 10.3 - Section 12.2.3 - **Appendix G.3**
Aquatic Biodiversity	Tebogo Khoza	WSP Africa (Pty) Ltd	- Section 3.5.5 - Section **7.2.1.5** - Section 8.1.1 - Section 9 - Section 10.4 - Section 12.2.4 - **Appendix G.4**
Plant Species	Rudolph Greffrath	WSP Africa (Pty) Ltd	- Section 3.5.6 - Section 7.2.3 - Section 8.1.1 - Section 9Section 10.5 - Section 12.2.5 - **Appendix G.5**
Animal Species	Rudolph Greffrath	WSP Africa (Pty) Ltd	- Section 3.5.7Section 0 - Section 8.1.1 - Section 9 - Section 10.6 - Section 12.2.6 - **Appendix G.6**
Avifauna	Tyron Clark, Ryno Kemp & Andrew Husted	The Biodiversity Company	- Section 3.5.8 - Section 7.2.5 - Section 8.1.1 - Section 9Section 10.7 - Section 12.2.5 - **Appendix G.7**
Bats	Dr. Caroline Lotter	Inkululeko Wildlife Services	- Section 3.5.9 - Section **7.2.6** - Section 9 - Section 10.6 - Section 10.8

Assessment	Name of Specialists	Company	Sections in Report
			- **Appendix G.8**
Heritage	Lara Kraljević	Beyond Heritage (Pty) Ltd	- Section 3.5.10 - Section **7.3.1** - Section 9 - Section 10.6 - Section 10.9 - Section 12.2.9 - **Appendix G.9**
Palaeontology	Lara Kraljević	Beyond Heritage (Pty) Ltd	- Section 3.5.10 - Section 7.3.2 - Section 8.1.1 - Section 9 - Section 10.5 - Section 12.2.9 - **Appendix G.9**
Traffic	Iris Wink	iWink Consulting (Pty) Ltd	- Section 3.5.11 - Section **7.3.3** - Section 8.1.1 - Section 9 - Section 10.5 - Section 12.2.10 - **Appendix G.11**
Visual	Johan Bothma	WSP Africa (Pty) Ltd	- Section 3.5.12 - Section **7.3.4** - Section 8.1.1 - Section 9 - Section 10.5 - Section 12.2.12 - **Appendix G.12**
Socio-economic	Stephen Horak	WSP Africa (Pty) Ltd	- Section 3.5.13 - Section **7.3.5** - Section 8.1.1 - Section 9 - Section 10.5 - Section 12.2.13 - **Appendix G.13**
Noise	Kirsten Collett	WSP Africa (Pty) Ltd	- Section 3.5.14 - Section **7.3.6** - Section 8.1.1 - Section 9 - Section 10.5 - Section 12.2.14 - **Appendix G.14**
SHE Risk Assessment	Debra Mitchell	ISHECON	- Section 3.5.15

Assessment	Name of Specialists	Company	Sections in Report
			Section 8.1.1 Section 9 Section 12.2.15 **Appendix G-15**

1.4 IMPACT ASSESSMENT TERMS OF REFERENCE

The 2014 Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, identifies the proposed Kromhof 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.

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 on 07 March 2025. The DFFE acceptance of the FSR and authorisation to proceed with the EIR was received on 22 April 2025 (**Appendix C**). The final EIR is due to the DFFE on 11 August 2025.

This Draft EIAr (DEIAr) will be made available for public comment from **2 July 2025 to 1 August 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**):
  - 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 1-6 cross-references the sections where the legislated requirements as per Appendix 3 of GNR 982 of 2014 can been located within the EIR.

Table 1-6 - 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-	

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	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
	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 **12.3**
(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-	

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	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 **0**
	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 **12.2**
(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 **12.3**
(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 13
(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-	

Appendix 3	Legislated requirements as per the NEMA GNR 982	Relevant Report Section
	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
	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 22 January 2025 with the (Draft Scoping Report) DSR. The application form was acknowledged on 27 January 2025.

The DFFE reference number allocated to this application is 14/12/16/3/3/2/2667. 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 PPR (**Appendix C**).

The Draft Scoping Reports were placed on public review for a period of 30 days from 22 January 2025 to 21 February 2025. The submission of the final scoping report was within 44 days of receipt of the application by the DFFE as required by GNR 982, and was submitted on 7 March 2025, for their review and approval. Subsequently, the approval of the FSR for the EIA was received on 22 April 2025 and is included in **Appendix C.**

2.2 AUTHORITY CONSULTATION

A virtual pre-application meeting was held on 06 February 2024 with the DFFE to discuss the Project. The minutes of the meeting are included in **Appendix H**. In addition, WSP notified a number of commenting authorities of the Proposed Project via a

- DFFE;
- DFFE – Directorate: Biodiversity and Conservation
- Free State DESTEA;
- DFFE: National Vulture Task Force (in terms of section 43(2) and 43(3)(c) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), the Minister has assigned the responsibility for implementation of the Multi-species Biodiversity Management Plan for Vultures in South Africa to the National Vulture Task Force).
- DWS;
- DMPR;
- PASA;
- DALRRD;
- Department of Public Works;
- Department of Defence;
- National Department of Transport;
- SANRAL;
- SAHRA;
- CAA;
- SKA;
- SARAO;
- SAWS;
- Relevant Local Government Authorities in respect of zoning, water services related activities;
- BirdLife South Africa;
- VulPro;
- Endangered Wildlife Trust; and

- South African National Parks.

WSP received comments on the DSR from the DFFE on 07 March 2025, and approval of the FSR on 22 April 2025. The comments and responses are included in Section 3 of the PPR(Appendix C).

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 PPR.

2.3.1 STAKEHOLDER NOTIFICATION

2.3.1.1 Direct Notification

Notification of the Project was issued to potential and existing Stakeholders, via direct correspondence (i.e., site notices, emails, SMSs, etc.) on **22 January 2025**. Proof of notification is included in the SER (**Appendix C**).

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 has been included in PPR(**Appendix C**). The advertisement publication details are provided in **Table 2-1**.

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

Newspaper	Distribution Type	Language	Reach	Publication Date
Northern Natal News	Newspaper	English and Afrikaans	Dundee, Newcastle, Volkrust, Vryhied, Madadeni, Escourt, Danhause, Utrecht, Paul Pieterburg, Glencoe, Colenso, Ladysmith, Bergville, Winterton, Weenen, Mooiriver	4 October 2024

Newspaper	Distribution Type	Language	Reach	Publication Date
Eastern Free State Issue	Newspaper	English and Sesotho	Bethlehem, QwaQwa, Setsing, Witsieshoek, Harrismith, Kestell, Reitz, Senekal, Ficksburg	3 October 2024

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 22 January 2025. Proof of placement is included in the PPR(**Appendix C**).

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 **22 January 2025 to 21 February 2025** at the venues as follows:

- Hard Copy: Verkykerskop: VKB Verkykerskop, Between Harrismith & Memel on R722 Road;
- Hard Copy: Memel: Zamani Library, Eeufees Street
- Hard Copy: Harrismith: Harrismith Library, 27 Murray Street;
- Hard Copy: Newcastle: Newcastle Library, 66 Scott St, Newcastle CBD
- Electronic Copy: WSP Website (https://www.wsp.com/en-ZA/services/public-documents); and
- Electronic Copy: 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 DFFE on **7 March 2025**. The FSR was made available as follows:

- Electronic Copy: WSP Website (https://www.wsp.com/en-ZA/services/public-documents); and
- Electronic Copy: Datafree Website (https://wsp-engage.com/).

2.4 SUMMARY OF IMPACT SIGNIFICANCE SCREENING

This section presents a summary outlining the likely significance of potential impacts identified for the construction phase (**Table 2-2**), operational phase (**Table 2-3**), 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 was used as a guide to determine whether additional assessment may be required in the EIA phase. Any such assessments were then completed in the EIA phase. Impacts were refined and assessed during the EIA phase.

Table 2-2 - Significance of potential construction phase impacts (Scoping Phase)

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Soil, Land use and Land Capability	Soil and land capability	Negative	2	2	**Low**
Plant Species	Direct Loss of natural habitat and associated flora SCC	Negative	3	4	**High**
	Disturbance of natural habitat and associated flora SCC	Negative	3	2	**Medium**
	Establishment and spread of AIS	Negative	3	2	**Medium**
Animal Species	Disturbance and fragmentation of faunal habitat	Negative	3	2	**Medium**
Aquatic Biodiversity	Water quality deterioration	Negative	4	3	**High**
	Increased sediment load	Negative	4	3	**High**
	Establishment and spread of AIS	Negative	3	2	**Medium**
Wetlands	Direct Loss of wetland habitat	Negative	4	4	**High**
	Soil Erosion	Negative	3	3	**Medium**
	Establishment and spread of AIS	Negative	3	3	**Medium**
	Changes in wetland health/functioning	Negative	3	3	**Medium**
	Contamination of riparian habitat systems	Negative	4	3	**High**
Avifauna	Loss or Alteration of Habitat	Negative	4	3	**High**
	Roadkill and other mortalities	Negative	2	2	**Low**
	Sensory disturbance during construction	Negative	2	2	**Low**
Bats	Roost disturbance or destruction.	Negative	3	3	**High**
	Foraging habitat	Negative	3	3	**High**
	Negative	Negative	3	3	**High**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Noise	Acoustic impacts on surrounding sensitive receptors	Negative	3	1	**Low**
Archaeology	Impacts of the proposed development to archaeological resources	Negative	2	2	**Medium**
Traffic	Temporary increase in traffic	Negative	2	2	**Low**
	Dust and Noise pollution	Negative	2	2	**Low**
Visual	Airborne Dust	Negative	3	2	**Medium**
	Presence of visually intrusive components	Negative	3	2	**Medium**
Social	Job Creation	Positive	4	4	**Very High**
	The influx of Job Seekers	Negative	3	2	**Medium**
	Procurement from Local Businesses	Positive	3	2	**Medium**
	Loss of Farmlands	Negative	2	2	**Low**
	Income for Affected Landowners	Positive	3	2	**Medium**
	Community Health, Safety, and Security	Negative	2	2	**Low**
	Environmental Health	Negative	2	2	**Low**
Geotechnical	Soil Erosion	Negative	2	2	**Low**
	Disturbance of Fauna and Flora	Negative	3	2	**Medium**
	Oil Spillages from Heavy Plant	Negative	2	3	**Medium**
	Slope Stability	Negative	2	2	**Low**
	Seismic Activity	Negative	1	1	**Very Low**
	Groundwater	Negative	2	1	**Low**

Table 2-3 - Significance of potential operational phase impacts (Scoping Phase)

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Avifauna	Collisions with turbines	Negative	4	4	**Very High**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure	Negative	3	3	**Medium**
	Sensory Disturbance	Negative	3	4	**High**
	Effect on migratory and congregatory species	Negative	3	3	**High**
Animal Species	Fragmentation of habitats, barriers to movements.	Negative	3	2	**Medium**
	Injury and mortality of fauna SCC	Negative	3	2	**Medium**
Plant Species	Spread of AIS	Negative	3	2	**Medium**
Aquatic Biodiversity	Water quality deterioration	Negative	3	2	**Medium**
	Increased sediment load	Negative	3	2	**Medium**
	Establishment and spread of AIS	Negative	3	2	**Medium**
Bats	Bat fatalities	Negative	3	3	**High**
Wetlands	Erosion	Negative	2	3	**Medium**
	Establishment and spread of AIS	Negative	3	2	**Medium**
	Contamination of riparian habitat systems	Negative	3	2	**Medium**
Transport		Negative	1	1	**Very Low**
Noise	Acoustic impacts on surrounding sensitive receptors	Negative	3	2	**Medium**
Visual	Presence of turbines, other infrastructure	Negative	3	4	**High**
	Glare, flicker	Negative	3	4	**High**
	Light pollution	Negative	3	4	**High**
Social	Job Creation	Positive	3	4	**High**
	An influx of Job Seekers	Negative	3	2	**Medium**
	Procurement from Local Businesses	Positive	3	2	**Medium**
	Community Health, Safety and Security	Negative	2	2	**Low**
	Environmental Health	Negative	2	2	**Low**
	Energy Generation	Positive	3	4	**High**

Table 2-4 – Significance of potential decommissioning phase impacts (Scoping Phase)

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Traffic	Temporary increase in traffic	Negative	2	2	**Low**
	Dust and Noise pollution	Negative	2	2	**Low**
Noise/ Acoustic	Acoustic impacts on surrounding sensitive receptors	Negative	3	1	**Low**
Social	Loss of Employment	Negative	3	2	**Medium**
	Loss of Livelihoods	Negative	3	4	**High**
Geotechnical	Soil erosion	Negative	2	2	**Low**
	Disturbance of Fauna and Flora	Negative	3	2	**Medium**
	Oil Spillages from Heavy Plant	Negative	2	2	**Low**
	Seismic Activity	Negative	1	1	**Low**

Table 2-5 – Initial Cumulative Impacts (Scoping Phase)

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Traffic	Temporary increase in traffic	Negative	3	2	**Medium**
	Dust and Noise pollution	Negative	2	2	**Low**
Social	Sense of Place	Negative	3	2	**Medium**
	Loss of Employment	Negative	3	2	**Low**
	Loss of Livelihoods	Positive	3	4	**Medium**
Geotechnical	Soil erosion	Negative	3	2	**Medium**
	Potential Oil Spillages	Negative	3	2	**Medium**
	Disturbance of fauna and flora	Negative	2	1	**Low**
	Slope stability	Negative	2	1	**Low**
	Seismic activity	Negative	1	1	**Very Low**
Visual	Alteration of the existing rural character	Negative	3	2	**Medium**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Avifauna	Avifaunal Cumulative Impacts	Negative	4	4	**Very High**
Terrestrial Biodiversity (Including Plants and Animal species)	Cumulative Biodiversity Impacts	Negative	4	3	**High**

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 **06 February 2024** with the DFFE to discuss the Project. The minutes of the meeting (inclusive of the proposed public participation plan) are included in **Appendix H**. The application to the DFFE was submitted on the **22 January 2025**. The DFFE confirmed receipt of the application on **24 February 2025** and allocated the following reference number to the application - **14/12/16/3/3/2/2666**.

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 (both wet and dry seasons), between **March 2024 and July 2024**, and between **February and March 2025,** and again in **August 2024** to identify sensitive features on site that informed the sensitivity mapping (see **Section 8**) for the proposed project. It must be noted that the avifauna pre-construction monitoring was undertaken over two and half years (2.5) years. Additionally, the bat specialists undertook seven (7) site visits and fourteen (14) months of passive monitoring of local bat call activity which commenced in **May 2023** and ended in **July 2024**.

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.

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[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.

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
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**	**Medium**	**High**	**Very High**

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[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.

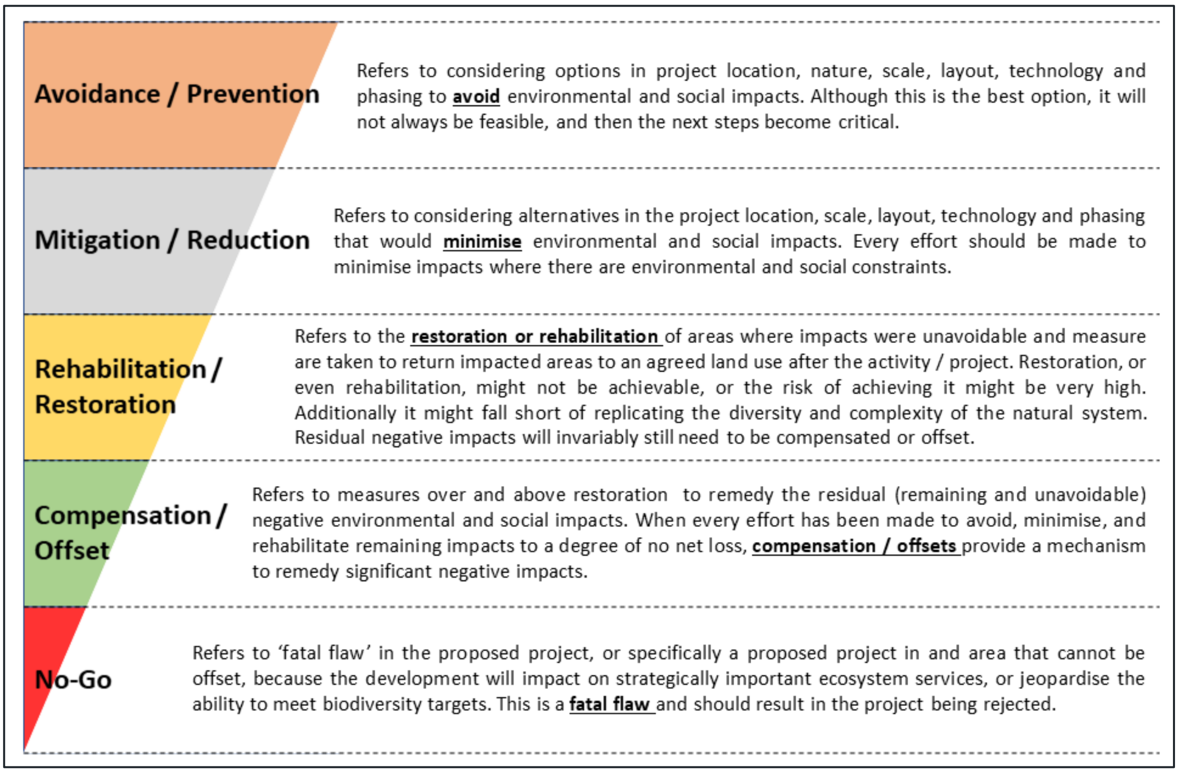
Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Medium**	**High**	**Very High**

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.



Avoidance / Prevention

Refers to considering options in project location, nature, scale, layout, technology and phasing to **avoid** environmental and social impacts. Although this is the best option, it will not always be feasible, and then the next steps become critical.

Mitigation / Reduction

Refers to considering alternatives in the project location, scale, layout, technology and phasing that would **minimise** environmental and social impacts. Every effort should be made to minimise impacts where there are environmental and social constraints.

Rehabilitation / Restoration

Refers to the **restoration or rehabilitation** of areas where impacts were unavoidable and measure are taken to return impacted areas to an agreed land use after the activity / project. Restoration, or even rehabilitation, might not be achievable, or the risk of achieving it might be very high. Additionally it might fall short of replicating the diversity and complexity of the natural system. Residual negative impacts will invariably still need to be compensated or offset.

Compensation / Offset

Refers to measures over and above restoration to remedy the residual (remaining and unavoidable) negative environmental and social impacts. When every effort has been made to avoid, minimise, and rehabilitate remaining impacts to a degree of no net loss, **compensation / offsets** provide a mechanism to remedy significant negative impacts.

No-Go

Refers to 'fatal flaw' in the proposed project, or specifically a proposed project in and area that cannot be offset, because the development will impact on strategically important ecosystem services, or jeopardise the ability to meet biodiversity targets. This is a **fatal flaw** and should result in the project being rejected.

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 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 PPR has been included in **Appendix C** 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 PPR in **Appendix C**.

3.4.1.1 Availability of the Draft Environmental Impact Assessment Report

The Draft EIR will be made available for public review for a period of at least 30 days from **2 July 2025** to **1 August 2025**, at the venues as follows:

- Hard Copy: Verkykerskop: VKB Verkykerskop, Between Harrismith & Memel on R722 Road;
- Hard Copy: Memel: Zamani Library, Eeufees Street
- Hard Copy: Harrismith: Harrismith Library, 27 Murray Street;
- Hard Copy: Newcastle: Newcastle Library, 66 Scott St, Newcastle CBD
- Electronic Copy: WSP Website (https://www.wsp.com/en-ZA/services/public-documents); and
- Electronic Copy: 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

3.5.1 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, will be representative of comments from the broader community; and
- Based on the Pre-Application meeting and subsequent minutes, the CA would not require additional specialist input, in order to make a decision regarding the application.

3.5.2 SOIL, LAND USE AND LAND CAPABILITY:

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

3.5.3 DESKTOP GEOTECHNICAL ASSESSMENT:

- Your attention is drawn to Appendix E of the Geotechnical Assessment (**Appendix G.2**).
- The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimize the risks associated with the groundworks for this project. The document is not intended to reduce the level of responsibility accepted by WSP, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

3.5.4 TERRESTRIAL BIODIVERSITY ASSESSMENT:

- Field work was conducted over a five-day period in July 2024 and a five-day period in March 2025. The timing of the field surveys therefore covered the mid-winter dry season period and the mid-summer wet season period:
  - The surveys coincided with periods of high fauna presence and activity, and were therefore optimal to assess fauna community composition;
  - The March survey followed sufficient rainfall, resulting in active vegetation growth and flowering. Conditions were therefore optimal to assess vegetation character and flora species composition;
  - Seasonality is therefore not considered a study limitation with respects to flora and fauna sampling;
- Surveying sites were chosen to represent the range of on-site habitats. However, the RSA is extensive and topographically complex, and accordingly not all areas of natural habitat or proposed development footprints could be surveyed during the field programme;
- In line with the above, it is possible that certain cryptic 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 programme;
- 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 programme;
- 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.

3.5.5 AQUATIC ASSESSMENT:

- This study is considered as a once off assessment, which can only take into consideration the current condition with some speculation of historical events based on evidence observed in field and with the aid of satellite imagery. Since vegetation and habitats often vary temporally and spatially, there must be recognition that certain aspects or features may not have been present on the day of site visit.
- Due to the large extent of the study area, the wetlands and watercourses were mapped at a desktop level, with limited on-site verification focused on ground truthing accessible wetland habitats within the footprints of assessed infrastructures and a 500m buffer thereof.
- The hydrogeomorphic units on site were assessed in their entirety, however regions that were deemed a health & safety hazard (excess flows) or inaccessible during the site survey; were assessed from aerial imagery with limited infield verification.
- All wetland delineation verification was done using a GPS system. The precision of such systems is generally limited to 5m and therefore this error must be taken into account when utilising the GPS coordinates.
- Whilst the assessment techniques applied in this report are used to standardise and 'objectify' the assessment of the systems' function, potential impacts and services, it must be noted that much of the information is subjectively collected based on the assessor's experience and training. The assessor will, if additional information or counter arguments are provided and verified, hold the right to amend the report if need be.
- The road network connecting the wind turbines was not made available at the time of the field surveys or at the time of compiling this report and is therefore excluded from this specialist assessment.
- The powerline connections (132kV) will be assessed as part of a separate process and therefore are not addressed as part of this study scope of work.
- Resource Quality Objectives (RQOs) for the catchment within which the watercourses of focus occur were not available at the time of writing, therefore the RQOs referred to in this report are those for the adjacent Integrated Unit of Analysis (IUA): UC2 (Wilge River and tributaries) within the resource unit II.

3.5.6 PLANT SPECIES

- The flora field survey was conducted in March 2025. 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;
- Surveying sites were chosen to represent the range of on-site habitats. However, the RSA is extensive and topographically complex, and accordingly not all areas of natural habitat or proposed development footprints could be surveyed during the field programme;
- In line with 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 based on a combined approach, using a study of composite aerial imagery, field observations, and supplementary land cover 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.

3.5.7 ANIMAL SPECIES

- Field work was conducted over a five-day period in July 2024 and a five-day period in March 2025. The timing of the field surveys therefore covered the mid-winter dry season and the mid-summer wet season periods, and accordingly, seasonality is not considered a limiting factor. This notwithstanding, considering the duration of field work, it is possible that certain rare, cryptic, migrating, or transient fauna species may not have been present and/or observed during the field surveys;
- Surveying sites were chosen to represent the range of on-site habitats. However, the RSA is extensive and topographically complex, and accordingly not all areas of natural habitat or proposed development footprints could be surveyed during the field programme;
- Considering the duration of field work, it is possible that certain rare, cryptic, migrating, or transient fauna species may not have been present and/or observed during the field surveys;
- 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.

3.5.8 AVIFAUNAL ASSESSMENT:

- Access was only arranged for survey work within the VWC;
- No information has yet been provided on the location and length of the linear grid connection infrastructure. Kromhof Wind Power (Pty) Ltd notes that this still needs to be finalised and represent a separate scope of work for assessment;
- Flight paths were visually assessed and manually drawn onto topographical field maps for later digitisation. There are inherent human limitations associated with accurately translating visual observations into mapped flight paths. Efforts were made to identify landmarks in different cardinal directions of known distance from the Vantage Points. Flight path maps were made with concentric radial buffers of different distances from the VP to assist in georeferencing;
- Flight corridors were manually delineated in an attempt to best intersect with the available data in a way that is both intuitive and biologically meaningful. This included flight paths, the flight path density intersection model (kernel density estimation), species occurrence density model (kernel density estimation), Vulpro (2025) flight data (point cloud), Martial Eagle core use areas (kernel density estimation). It is, however, acknowledged that although the resultant flight corridor shapefile represents the best fit to these various datasets it does not fit them absolutely and should not be considered a static end result, nor should it be considered entirely comprehensive. It is also important to note that the above-mentioned models use a relative scale which limits their contextualisation relative to other parts of South Africa. Flights of priority species are dynamic and vary both spatially and temporally. As such these risk estimation areas may just as easily under-represent risk as they may over predict it;

- An update was published by BirdLifeSA (in the form of an Ebook and updated checklist) on the conservation status of the birds of South Africa, Lesotho and Eswatini. This update came after the completion of the draft report. An effort has, however, been made to ensure that all conservation statuses as presented in this report and the appendices reflect these new red-list classifications. However, as data analysis was completed prior to the publication of the red-list the 10 recently added species are acknowledged but excluded from the initial set of priority species shortlisted for detailed assessment in this report. These species include African Darter, Black-crowned Night Heron, Black-winged Kite, Cape Shoveler, Great Egret, Hamerkop, Knob-billed Duck, Red-billed Teal, Southern Pochard and White-backed Duck.
- With regards to the Martial Eagle tracking, it is acknowledged by EWT that the methods behind the calculation of flight height could be refined by improving GPS calibration and through the use more precise digital elevation models;
- Although the Cape Vulture tracking data provides a reliable representation of vulture movement patterns and has been collected from several birds over multiple years, Vulpro (2025) highlight the following;
  - *"…inherent limitations of GPS technology—such as signal loss, positioning errors, and variations in logging intervals—may result in certain birds being overrepresented or underrepresented in the dataset. This data is provided exclusively to support environmental assessments and planning processes and is intended to complement, not replace, fieldwork and on-site evaluations".*
  - *"It includes data obtained using various GPS tracking devices, each with different logging intervals and study regimes."*
  - *"Vulpro's GPS tracking data for the Eastern Free State is less comprehensive than in other parts of South Africa and may not fully reflect the species' activity in this region."*

3.5.9 BATS ASSESSMENT:

- Not all cave and possible mine tunnel locations are necessarily known in the region;
- Information on bat migration in South Africa is limited; and
- Bat activity in an area can fluctuate dramatically between years in response to changes in weather, land use, and other factors.

3.5.10 HERITAGE AND PALEAONTOLOGY 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).
- This 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.

- This 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.
- The final layout (Figure 8.1of the study) was finalised after the heritage survey and a Heritage Walk-Down of the final pylon positions and roads will be required prior to construction.

3.5.11 TRAFFIC ASSESSMENT:

- This 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 the WEF is estimated to be up to 37;
- 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; and
- A 18–24-month construction period is assumed with some of the construction period dedicated to site prep and civil works.

3.5.12 VISUAL ASSESSMENT:

- The layout of individual project components, specifically the locations of individual wind turbines, O&M building, substation, BESS, and temporary batching plants may not be finalised yet, and the findings of this VIA are based on the available development description. Recommendations regarding the location of specific project infrastructure, including proposed mitigation measures as included in this report, may therefore need to be revised based on the final project infrastructure layout and/or designs;
- Similarly, selection of specific technology 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 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; and
- 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.

3.5.13 SOCIAL ASSESSMENT:

- The information provided by the applicant is up-to-date and accurately represents the Project;
- At the time of the compilation of this SIA report, the estimated number of people employed in the Project was not disclosed;
- WSP was not provided with the estimated period of each project phase, namely the construction, operational and decommissioning phases;
- The public participation process has not been concluded yet. Once this process is completed, it will inform this SIA further; and
- The secondary data is assumed to reflect the local social context accurately.

3.5.14 NOISE 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. It was not possible to confirm whether every one of these identified receptors is currently inhabited. As such, in order to represent a worst-case assessment, it was assumed that they are all inhabited;
- Baseline monitoring was not required as part of the IFC screening methodology. As such, based on a desktop assessment of the surrounding land use, the site was assumed to be a low noise environment and subsequently a combination of the IFC and ETSU methodology was used in the assessment; and
- It was assumed that those receptors within the Project boundary will be financially vested in the Project.

3.5.15 SHE RISK ASSESSMENT

- This 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.

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 Kromhof WEF is located near the town of Harrismith in Ward 5 of the Phumelela Local Municipality (PLM) and in the Thabo Mofutsanyana District Municipality (TMDM) in the Free State Province (**Figure 4-1** and **Figure 4-2**).

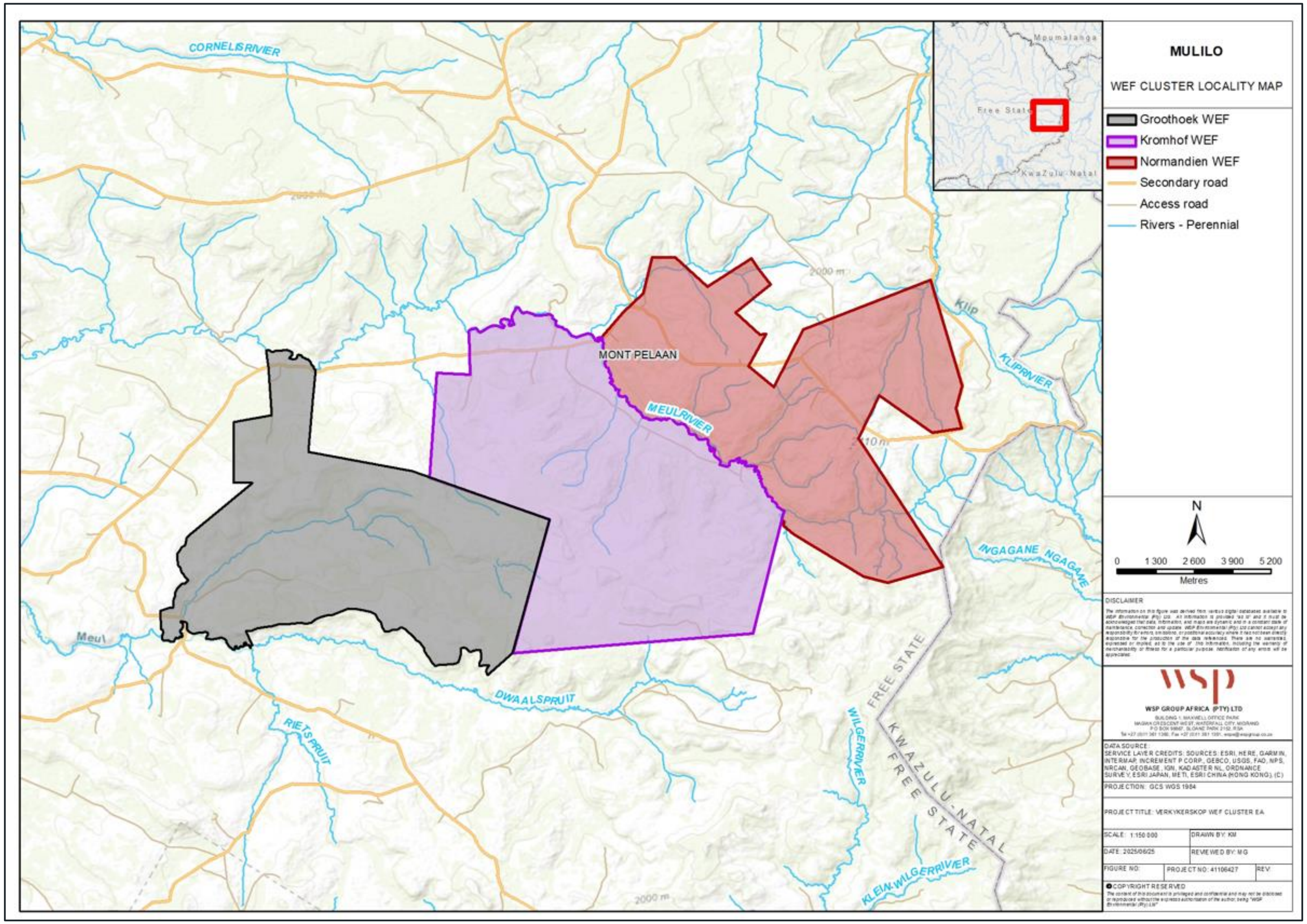


Figure 4-1 – Regional locality map for the Verkykerskop WEF Cluster and the Kromhof WEF (purple polygon)

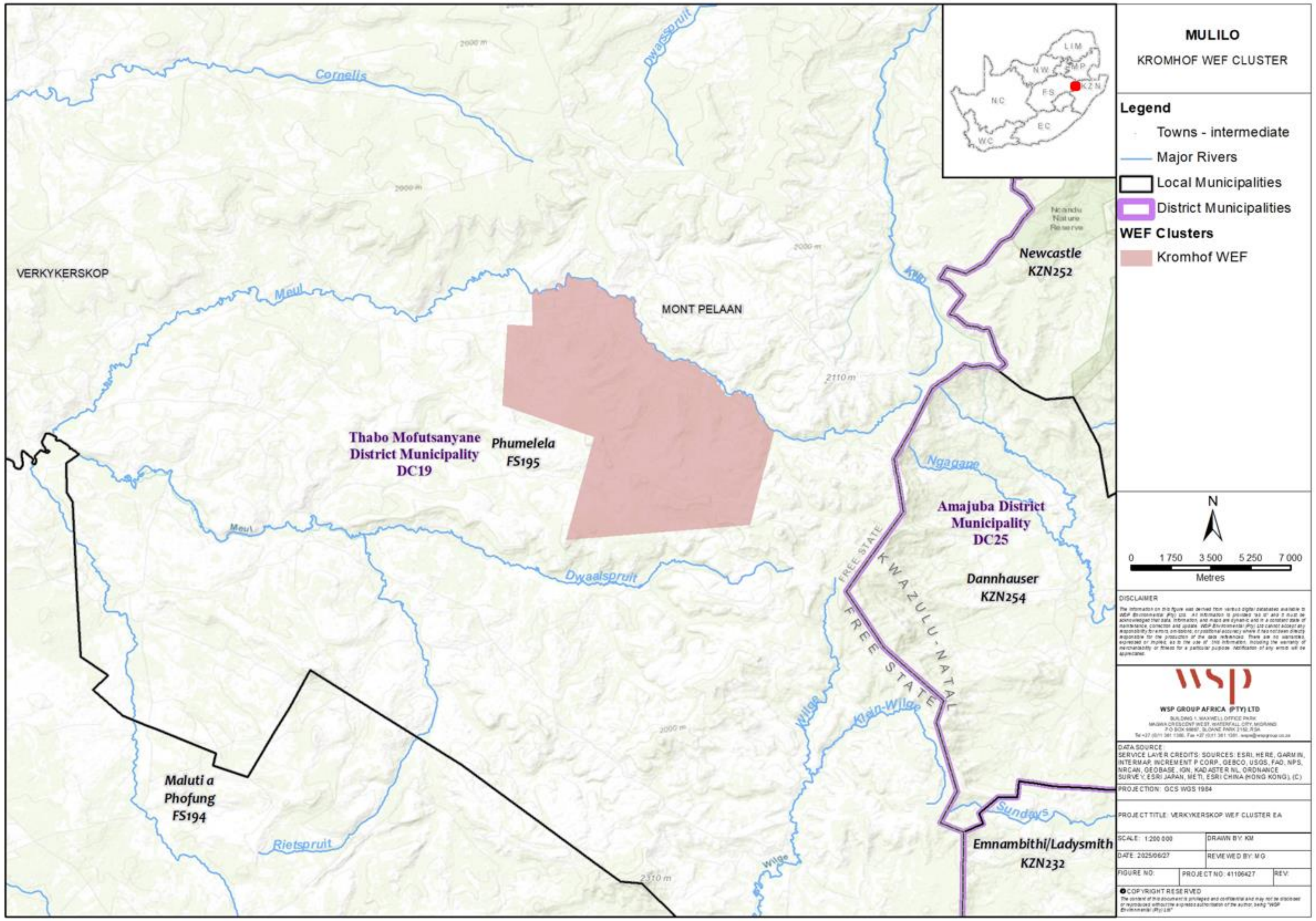


Figure 4-2 – Regional locality map of Kromhof WEF

The details of the property associated with the Project , including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 4-1.** The co-ordinates of the cadastral land parcels are included in **Table 4-2**, and the coordinates of the property boundaries associated with the proposed Project are shown in **Figure 4-3**.

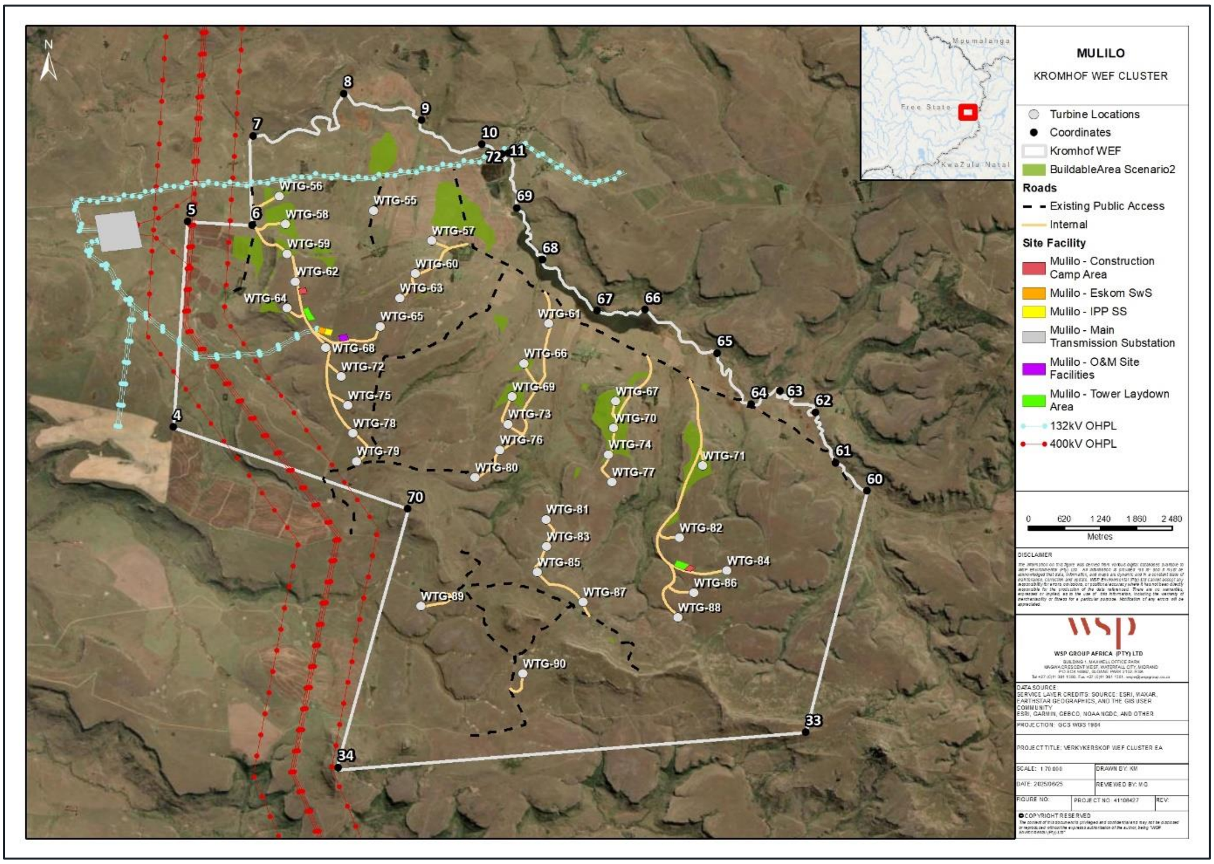


Figure 4-3 – Coordinates of the boundary of the properties associated with the proposed Kromhof WEF

Table 4-1 – Kromhof WEF Affected Farm Portions

Farm Name	21 Digit Surveyor General Code of Each Cadastral Land Parcel
Remaining Extent of Farm Leiden No. 2	F01500000000000200000
Remaining Extent of Farm Myn-Burg No. 3	F01500000000000300000
Remaining Extent of Farm Naauw Kloof No. 4	F01500000000000400000
Remaining Extent of Farm Krom Hof No. 530	F01500000000053000000
Remaining Extent of Farm Puntje No. 1240	F01500000000124000000
Remaining Extent of Farm Aanfield No. 253	F01500000000025300000
Portion 1 of Farm Aanfield No. 253	F01500000000025300001

Remaining extent of Farm Ox Hoek No. 98	F01500000000009800000
Portion 1 of Farm Ox Hoek No. 98	F01500000000009800001
Portion 2 of Farm Ox Hoek No. 98	F01500000000009800002
Portion 3 of Farm Ox Hoek No. 98	F01500000000009800003
Remaining Extent of Farm Markgraaff's Rest No. 478	F01500000000047800000

Table 4-2 – Coordinate Points of the Cadastral Land Parcel

Point	Longitude	Latitude
4	27°58'24.20" S	29°28'51.21" E
5	27°56'29.35" S	29°28'59.03" E
6	27°56'31.26" S	29°29'35.04" E
7	27°55'41.41" S	29°29'35.84" E
8	27°55'17.73" S	29°30'26.27" E
9	27°55'32.56" S	29°31'9.75" E
10	27°55'46.13" S	29°31'43.40" E
11	27°55'51.47" S	29°31'54.83" E
33	27°59'9.43" S	29°35'16.39" E
34	28° 1'14.75" S	29°34'44.58" E
60	27° 58' 59.850" S	29° 35' 18.814" E
61	27° 58' 44.134" S	29° 35' 1.325" E
62	27° 58' 15.962" S	29° 34' 49.917" E
63	27° 58' 3.769" S	29° 34' 30.149" E
64	27° 58' 11.455" S	29° 34' 14.049" E
65	27° 57' 42.768" S	29° 33' 55.138" E
66	27° 57' 18.494" S	29° 33' 14.850" E
67	27° 57' 19.045" S	29° 32' 48.030" E
68	27° 56' 50.506" S	29° 32' 17.519" E
69	27° 56' 21.675" S	29° 32' 3.040" E

Point	Longitude	Latitude
70	27° 59' 9.891" S	29° 31' 2.067" E
72	27° 55' 50.854" S	29° 31' 58.562" E

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 4-4 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.

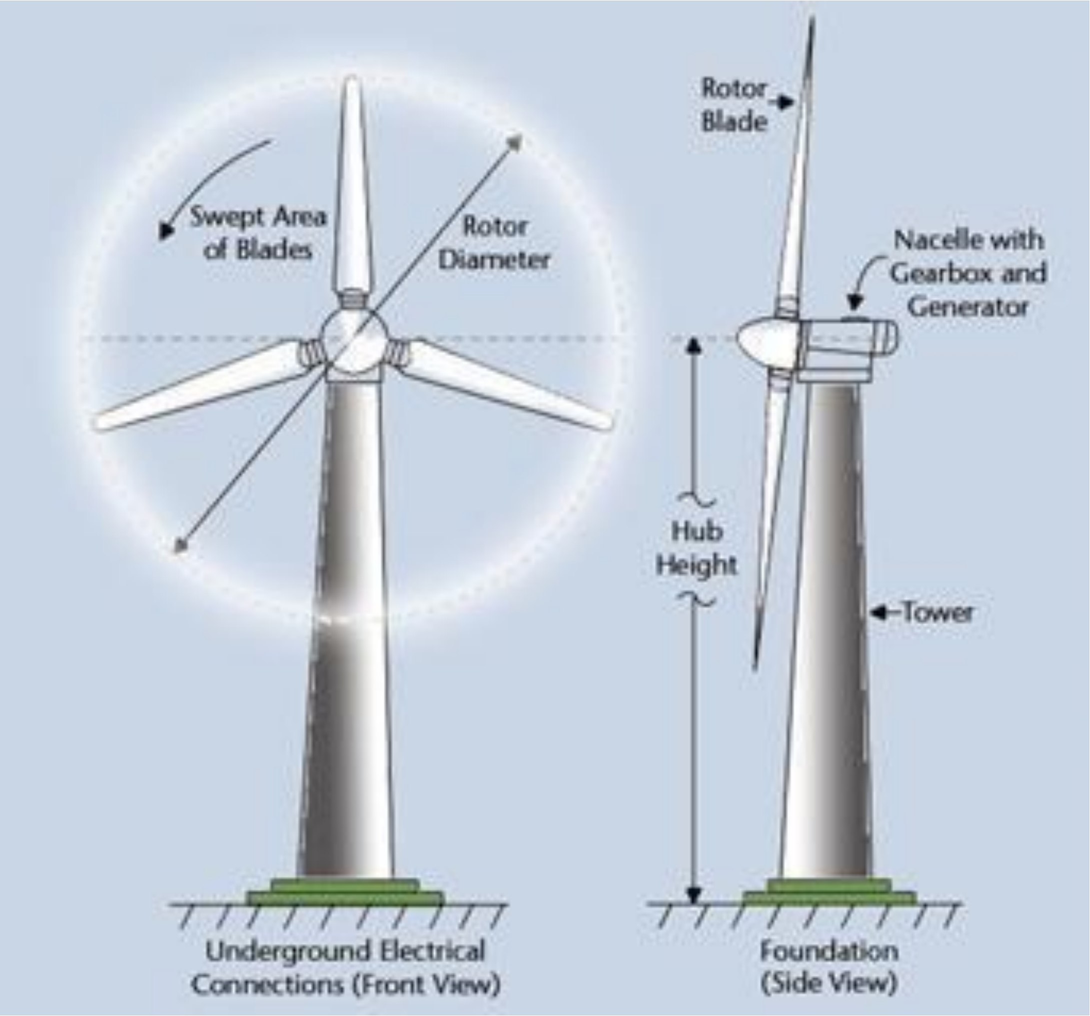


Figure 4-4 - Illustration of the main components of a wind turbine

4.3 PROJECT INFRASTRUCTURE

The Kromhof WEF will be developed to allow for up to 300 MW for export from the facility. The proposed development footprint (buildable area) is approximately 150 ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 7 269 ha (i.e. the area of the applicable farm portions associated with the Project). The development footprint includes the wind turbines, and all associated infrastructures as indicated in **Table 4-3**.

Table 4-3 – Technical details of the Kromhof WEF

Aspect	Details
Total Buildable Area (I.e. likely footprint area)	• Approximately 150ha. • (Subject to finalization based on technical and environmental requirements)
Export Capacity	• Up to 300MW • (Subject to finalization based on technical and environmental requirements)
Technology	• Wind

Aspect	Details
Number of Wind Turbines	• Up to 55
Rotor Diameter	• Up to 200m
Hub Height	• Up to 150m
Hard Standing Footprint	• Up to 0,8 ha per turbine
Turbine Foundations	• Excavation up to 4 m deep, constructed of reinforced concrete to support the mounting ring. • Once tower established, footprint of foundation is covered with soil.
Substation	• 1 x 33kV/132kV onsite collector substation (IPP Portion), being up to 2ha.
Powerlines	• 33kV cabling to connect the wind turbines to the onsite collector substation, to be laid underground where practical and ecologically acceptable.
Construction camp and laydown area	• Construction compounds including site office inclusive of • Concrete Batching plant of up to 1ha • Site office of 4 ha • Laydown area of 8ha
Internal Roads	• Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14m wide including v-drains and trenching for cabling)
O&M Building	• O&M office of up to 1ha.
BESS	• Battery Energy Storage System (BESS) (200MW/800MWh). • Pre-assembled solid-state batteries • Export Capacity of up to 800MWh • Total storage capacity 200MW • Storage capacity of up to 6-8 hours • The BESS will be housed in containers covering a total approximate footprint of up to 7ha

As a result of specialist recommendations an updated project description has been developed and is included in **Section 11** and **Section 12.5** of this DEIR.

- **Typical Turbine hard standing areas:**

The typical turbines hard standing areas is illustrated in **Figure 4-5** below.

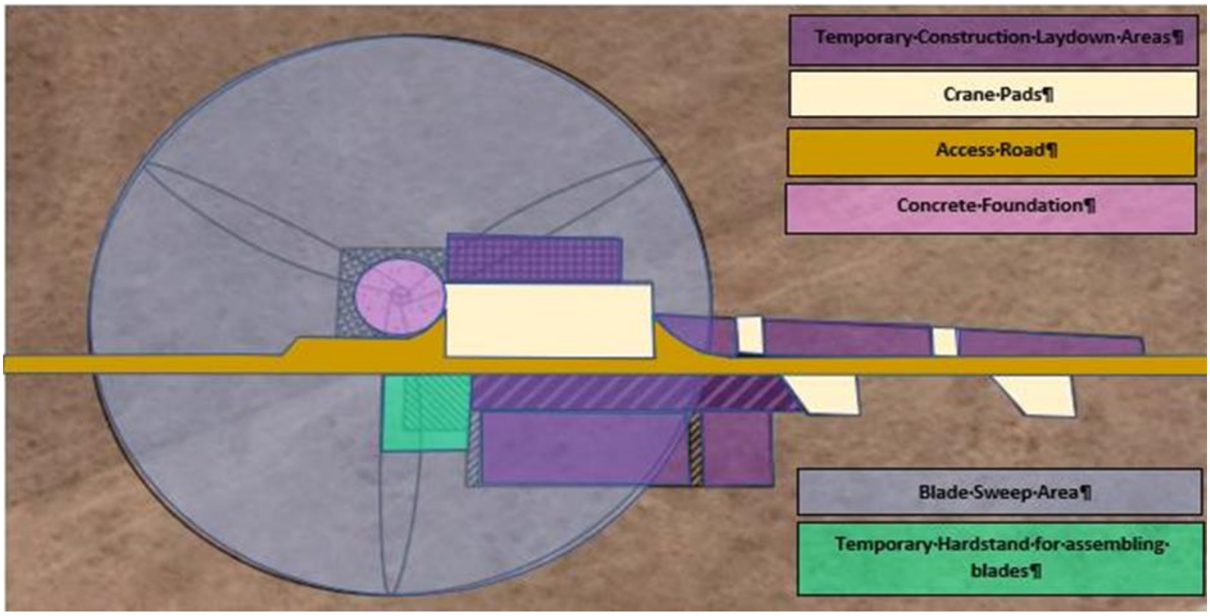


Figure 4-5 - Typical Turbine Hard Standing Requirements (illustration purposes only)

- **Tower Laydown Areas:**

The tower laydown areas are illustrated in **Figure 4-6** below, and the respective coordinate points is listed in **Table 4-4** below.

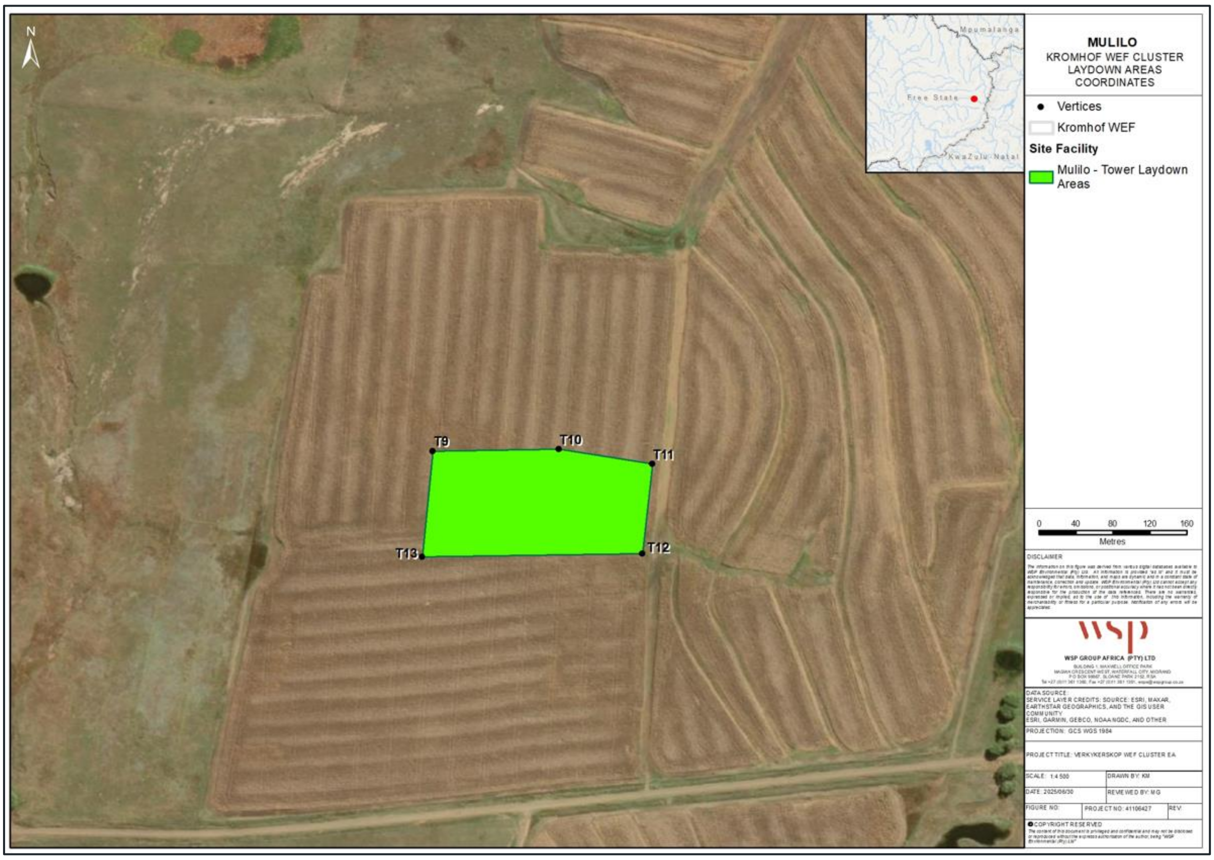


Figure 4-6 - Tower Laydown Areas associated with the Kromhof WEF

Table 4-4 – Coordinate Points of the Tower Laydown area associated with the Kromhof WEF

Point	Longitude	Latitude
T9	29° 30' 44.588" E	27° 55' 51.812" S
T10	29° 30' 49.005" E	27° 55' 51.752" S
T11	29° 30' 52.272" E	27° 55' 52.269" S
T12	29° 30' 51.920" E	27° 55' 55.409" S
T13	29° 30' 44.206" E	27° 55' 55.513" S

- **Construction Camp Areas:**

The construction camp areas are illustrated in **Figure 4-7** below, and the respective coordinate points is listed in **Table 4-5** below.

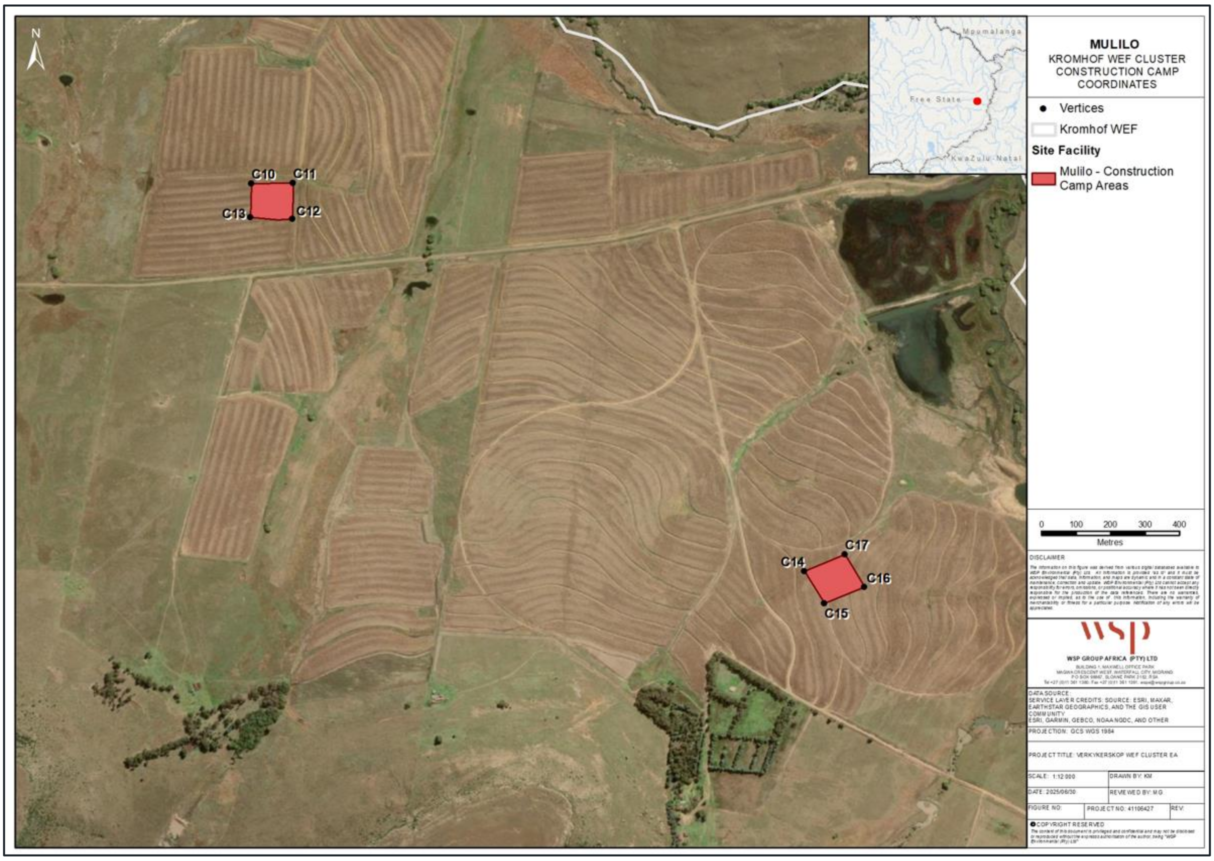


Figure 4-7 - Construction Camp Areas associated with the Kromhof WEF

Table 4-5 – Coordinate Points of the Construction Camp Areas associated with the Kromhof WEF

Point	Longitude	Latitude
C10	29° 30' 47.971" E	27° 55' 55.632" S
C13	29° 30' 47.866" E	27° 55' 58.787" S
C11	29° 30' 51.851" E	27° 55' 55.610" S
C12	29° 30' 51.821" E	27° 55' 58.957" S
C14	29° 31' 39.793" E	27° 56' 31.961" S
C15	29° 31' 41.672" E	27° 56' 34.957" S
C16	29° 31' 45.428" E	27° 56' 33.439" S
C17	29° 31' 43.601" E	27° 56' 30.397" S

- **IPP Substations and Operations and Maintenance Site Facilities:**

The IPP Substations are illustrated in below **Figure 4-8**, and the respective coordinate points is listed in **Table 4-6** below.

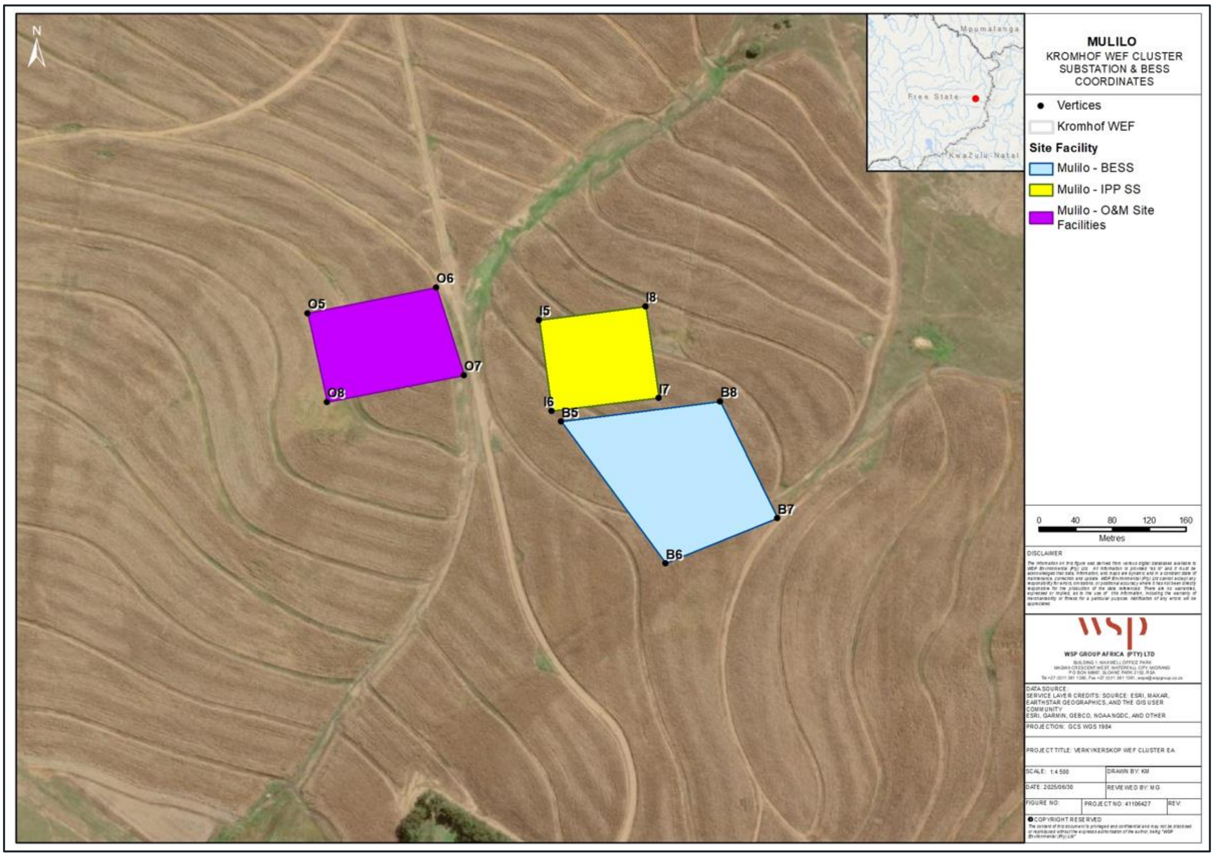


Figure 4-8 - IPP Substations (yellow polygon) and O&M Site Facilities (purple polygon) associated with the Kromhof WEF

Table 4-6 – Coordinate Points of the IPP Substations and O&M Site Facilities associated with the Kromhof WEF

Point	Longitude	Latitude
I5	29° 31' 35.476" E	27° 56' 22.859" S
I6	29° 31' 35.920" E	27° 56' 26.052" S
I7	29° 31' 39.708" E	27° 56' 25.603" S
I8	29° 31' 39.242" E	27° 56' 22.371" S
O5	29° 31' 27.322" E	27° 56' 22.618" S
O6	29° 31' 31.863" E	27° 56' 21.714" S
O7	29° 31' 32.832" E	27° 56' 24.803" S
O8	29° 31' 28.000" E	27° 56' 25.740" S

4.3.1 BESS TECHNOLOGY

The Project includes the development of a BESS (**Figure 4-9**). There is a growing need for renewable energy technologies, such as solar and wind, to be able to supply a reliable source of electricity to the grid. Since solar and wind technology depend on whether the sun is shining or the wind is blowing, respectively, these technologies are only efficient when these sources are available. Battery storage systems allow for fluctuating renewable energy sources to be as stable as conventional systems and also provide a means to decouple generation of electricity from its use (i.e. provide electricity to the grid during peak demand) and therefore minimising supply and demand related issues.

Given the ongoing improvement in battery storage technology and the significant advantages of combining battery storage with wind farms, it makes sense to include a battery facility with WEF.

The location of BESS is illustrated in **Figure 4-9** and the respective coordinates is listed in **Table 4-7**.

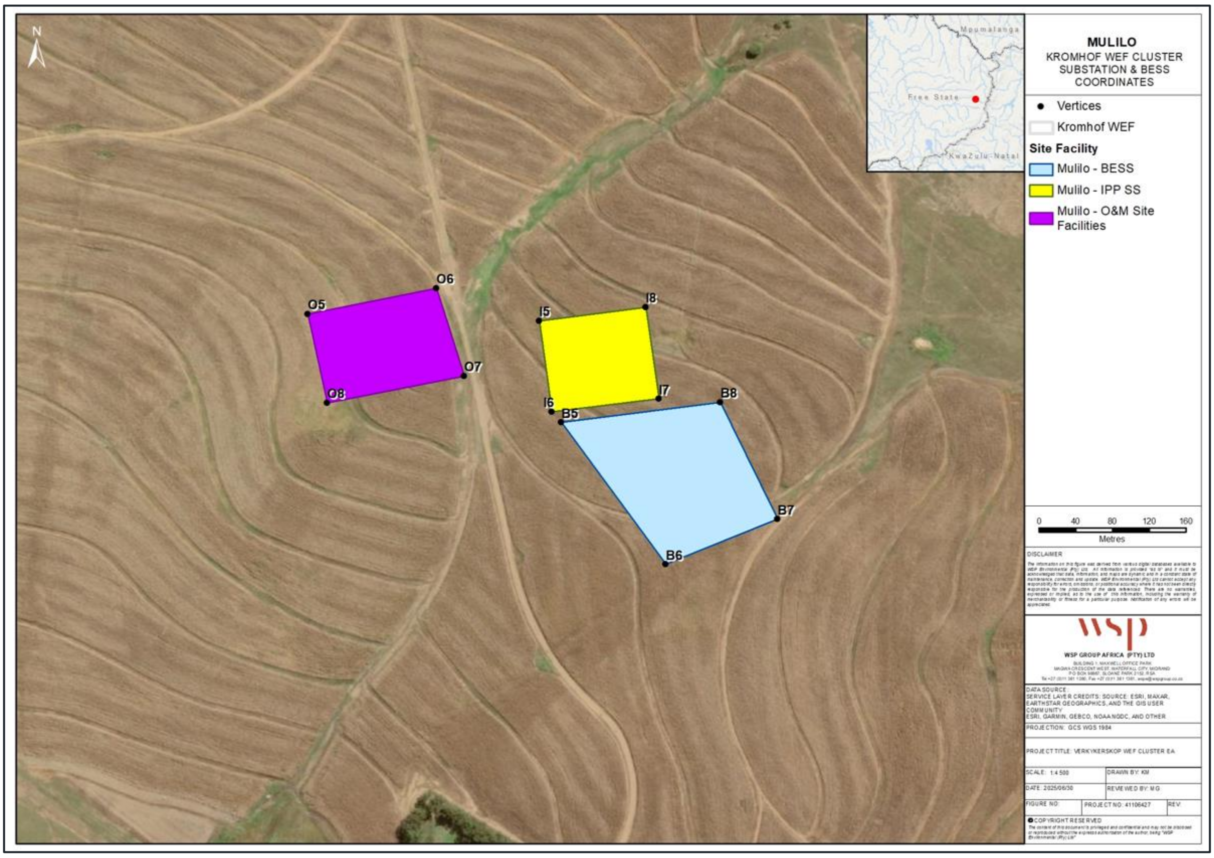


Figure 4-9 – Kromhof WEF - Location of BESS (blue polygon)

Table 4-7 –Kromhof WEF- Coordinate Points of the BESS

Point	Longitude	Latitude
B5	29° 31' 36.257" E	27° 56' 26.435" S
B6	29° 31' 39.942" E	27° 56' 31.430" S
B7	29° 31' 43.884" E	27° 56' 29.840" S
B8	29° 31' 41.860" E	27° 56' 25.720" S

4.3.1.1 Battery Type

It is proposed that Lithium Battery Technologies will be considered as the preferred battery technology. This is due to them being a mature and safe technology with regard to potential impacts on the environment in a WEF, modular and easy to install and due to their technical characteristics, will work well as energy storage systems for wind facilities, as well as supporting grid stability. Lithium Battery Technologies arrive on site pre-assembled.

BESS consist of two main parts: battery modules and the accompanying Battery Management System (BMS), and a Power Conditioning System (PCS) used to enable the interface of the batteries to the grid. Individual battery cells are connected in a series/parallel arrangement in order to obtain the desired nominal voltage for highest efficiency and required storage capacity. The PCS is a bidirectional power conversion device (inverter), enabling AC power from the grid to be converted to DC to charge the batteries in a controlled manner, and discharge DC battery power to feed AC power onto the grid (**Figure 4-10**).

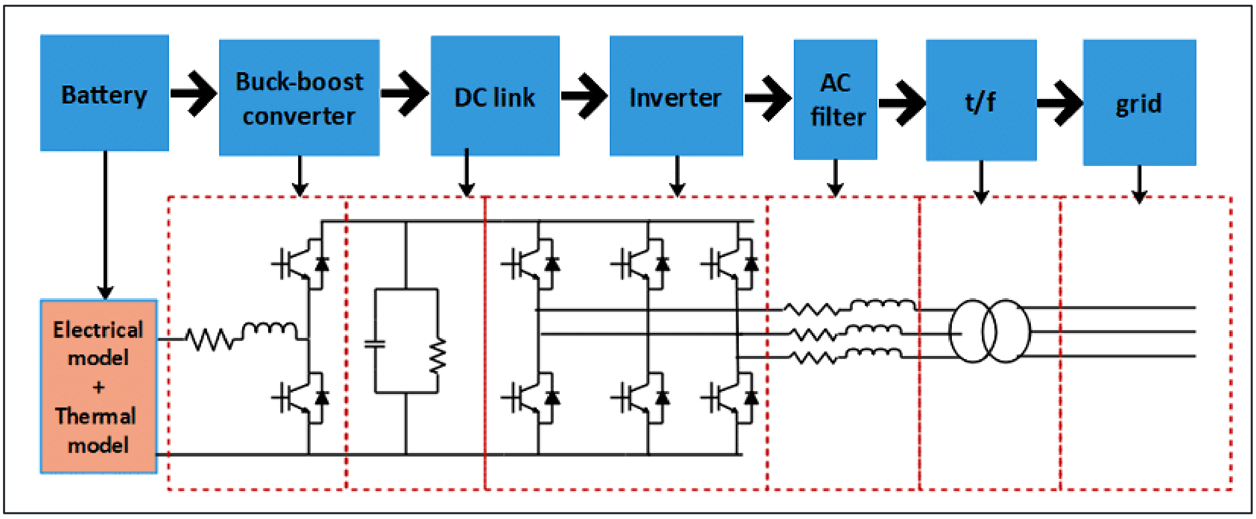


Figure 4-10 - BESS components Schematic

Source: www.researchgate.net

4.3.1.2 Compliance with local and international standards

The cells, modules, racks and the complete facility will be compliant with all local laws and regulations and health and safety requirements governing such battery facilities. Over and above that they will comply with international standards such as UN 38.3 (Transportation Testing for Lithium Batteries), UL 1642 (Standard for Safety – Lithium-ion Batteries) and IEC 62619 (Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries, for use in industrial applications). Furthermore, the battery facility will also comply with standards such as UL 1973 (Batteries for Use in Stationary Applications) and IEC 62619-2017 including thermal runaway non-propagation and safety zone region operation limits and a failure mode analysis. The design will be compliant with UL 9540 (Energy Storage Systems and Equipment): this standard defines the safety requirements for battery installation in industrial and grid connected applications.

4.4 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

4.4.1 CONSTRUCTION PHASE

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 4-8.**

Table 4-8 – Construction activities

Activity	Description
Establishment of access and internal roads	Internal gravel roads will be developed for access to the proposed Kromhof WEF. The roads will be up to 8m in width when completed and operational. During construction, the footprint will be approximately 14m wide and extending up to 50m either side for cut and fill where roads traverse steep slopes.
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, concrete wind tower factory, 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 (masts, 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:

Activity	Description
	▪ Excavation of foundation holes to a depth of approximately 4.5m, and pouring of concrete foundations of approximately 2500m3 from the batching plant. Concrete foundations will be constructed at each turbine location ▪ 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. ▪ Earthworks for access roads and crane pads will be performed as per the turbine' specific transport, delivery and erection requirements.
Construction of wind turbines, site 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 site. Cranes of varying sizes may be required depending on the size of the components. An IPP substation will be constructed on the site. The wind turbines will be connected to the IPP 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.
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.

4.4.2 OPERATIONAL PHASE

During operation the key activities will include inspection and maintenance of the wind turbines, substations, BESS, and other associated infrastructure.

4.4.3 DECOMMISSIONING PHASE

Following the initial 20-year operational period of the WEF, the continued economic viability will be investigated. If the facility is still deemed viable, the life of the facility will be extended. The facility will only be decommissioned once it is no longer economically viable. If a decision is made to completely decommission the facility, this will be subject to a separate authorisation and impact assessment process, all the components will be disassembled, reused and recycled or disposed.

The decommissioning phase will include activities similar to that of the construction phase as indicated in **Table 4-8**.

The site will be rehabilitated and returned to its current use i.e., agriculture.

4.5 NEED AND DESIRABILITY

The proposed activity is a direct result of the growing demand for electricity and the need for renewable energy in South Africa. According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development.

South Africa is the seventh highest 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 Project has been considered from an international, national, and regional perspective.

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 project 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 to affordable and clean energy. The proposed project qualifies as a clean technology that will generate up to 150MW 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.

At COP27 President Sameh Shoukry announced the Sharm el-Sheikh Adaptation Agenda[6], enhancing resilience for people living in the most climate-vulnerable communities by 2030. The cover decision, known as the Sharm el-Sheikh Implementation Plan, highlights that a

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[6] https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries

global transformation to a low-carbon economy is expected to require investments of at least USD 4-6 trillion a year. The Sharm el-Sheikh Implementation Plan emphasises the urgent need for reduced global greenhouse gas emissions through the use of renewable energy, just energy transition partnerships and other cooperative actions. The Plan further highlights that this is a critical decade of action that requires rapid transformation towards renewable energy.

This renewable energy project aligns with the goals of the Sharm el-Sheikh Implementation Plan and the need to reduce greenhouse gas emissions and rapidly transform towards renewable energy.

4.5.2 NATIONAL PERSPECTIVE

The South African Government, through the IRP (2010-2030), 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 in order 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 Kromhof WEF 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.

The Project will pave the way for the Just Energy Transition (JET) in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The Project 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 Project will also aid in overcoming possible future power . In 2022, South Africa witnessed its longest recorded hours of load shedding, with the power being off for 1 949 hours between January and September 2022 as shown in **Figure 4-11**. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPP, but it is still expected that the country will undergo more load shedding. Over the years the construction of Solar and 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. Renewable energy is a key factor in the national energy mix and will assist in ensuring that load shedding is prevented in South Africa.

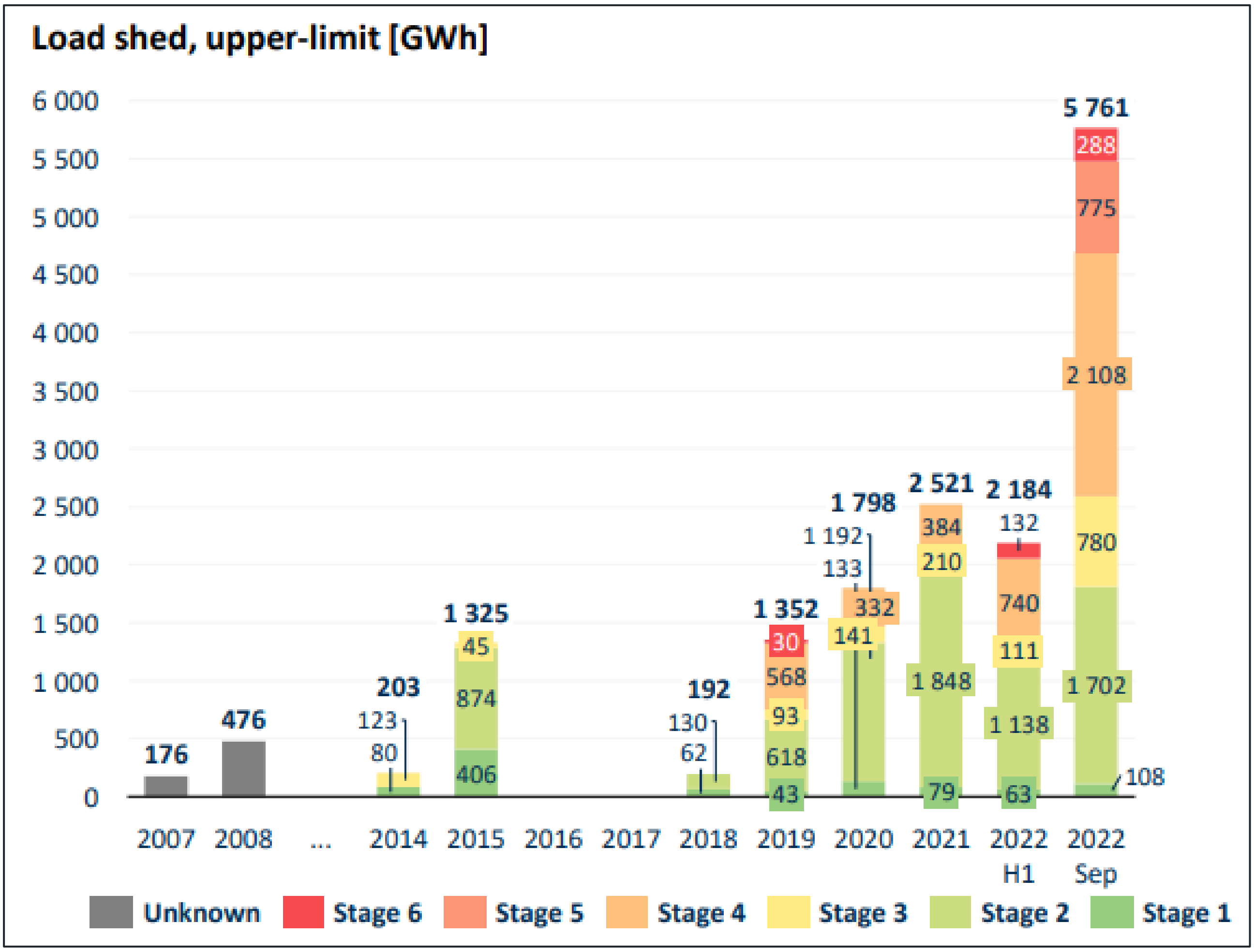

Figure 4-11 - Load shedding hours over the years in South Africa

Source: CSIR (2022)

In addition to this, recent updates from Eskom's Generation Connection Capacity Assessment (GCCA) 2025, published under the National Transmission Company of South Africa (NTCSA), highlight that the traditional renewable energy development areas including the Northern Cape, Western Cape, Hydra Cluster, and Eastern Cape currently have zero grid connection capacity available. This means that new wind and solar projects are effectively restricted from connecting to the grid in these regions, requiring a strategic shift in project development towards other provinces. Consequently, areas like the Free State are becoming increasingly important to achieve national renewable energy targets. However, these areas may include more environmentally sensitive landscapes, which underscores the importance of careful site selection and responsible development to balance energy needs with environmental protection (GCCA, 2025).

4.5.3 REGIONAL AND LOCAL PERSPECTIVE

4.5.3.1 Just Energy Transition

Coal power stations and the coal mining industry play a vital component in the economic and social components of the 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 JET 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 TMDM. The TMDM recorded an unemployment rate of 32.9%, with the majority of its employed in the trade and community services sectors. The Project will aid in solving two of the leading challenges faced by the TMDM, namely the cost of electricity and lack of adequate employment opportunities

The renewable industry will create job opportunities throughout the supply chain. The renewable industry will contribute to the Just 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 the Free State Province to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

Furthermore, Eskom's latest GCCA 2025, as published by the NTCSA confirms that the country's traditional renewable energy development zones notably the Northern Cape, Western Cape, Hydra Cluster, and Eastern Cape currently have no available grid capacity for new generation projects. This limitation has created an urgent need to identify and develop renewable energy projects in other regions, including the Free State. While these areas may present increased environmental sensitivity, they also represent a critical opportunity to contribute towards national renewable energy targets, regional energy security, and local socio-economic development. The Project's location within the Free State aligns with this broader strategic shift, offering both national benefits and meaningful local economic upliftment, provided that development proceeds in an environmentally responsible manner (GCCA, 2025).

5 PROJECT ALTERNATIVES

The EIA Regulations of 2014 (as amended) require that the S&EIR 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&EIR 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&EIR will holistically assess the impacts and risks of each alternative comparatively, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

All alternatives outlined below are considered both feasible and reasonable with no apparent advantages or disadvantages at this stage of the project. All alternatives will be described and assessed in more detail during the EIA Phase.

Extensive consideration of alternatives and avoidance of impacts took place in the screening/design phase. This is discussed in detail in the section below.

5.1 TECHNOLOGY ALTERNATIVES

5.1.1 WIND TECHNOLOGY

The Project will utilise wind technology to generate power. Therefore, no technology alternatives are being considered for this project. The motivation for the use of wind technology for this project is provided below:

5.1.1.1 Wind Resource

The Project site was primarily selected on the availability of very good wind resource in the Free State region. The availability of the wind resource is the main drivers of project viability. The Project site was identified by the proponent through a desktop pre-feasibility analysis based on the estimation of the wind energy resource. The average annual wind speed for the site was considered sufficient to ensure the economic viability of a wind energy facility. This viable wind resource ensures the best value for money is gained from the project, allowing for competitive pricing and maximum generation potential, with the resulting indirect benefits for the South African economy.

5.1.1.2 Topography

The surrounding landscape has a rolling hill topography which is suitable for the development of a wind project (and unsuitable for other technologies, e.g. Solar PV). The Project site itself is located on the highest lying ground in the area thus has the greatest wind resource within the immediate area.

5.1.1.3 Competition

There is minimal competition in the area with regards to authorised or operational WEFs.

5.1.2 BESS TECHNOLOGY

The BESS will be made up of Lithium-Ion batteries or similar solid-state technology due to them being a mature and safe technology with regard to potential impacts on the environment in a wind facility farm, modular and easy to install and due to their technical characteristics, will work well as energy storage systems for wind facilities, as well as supporting grid stability. No other BESS technology is being considered for this project.

5.2 LOCATION ALTERNATIVES

The selection of the Kromhof 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 Kromhof 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 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 (to form part of a separate EIA) and will have a loop in loop out into an existing 400kV line. The availability of grid capacity in this area is considered a strategic advantage, particularly given that many of the country's traditional renewable energy areas currently face severe grid constraints. Eskom's GCCA 2025 identifies this region as one of the limited areas where new renewable energy projects can feasibly connect to the grid without significant delays or additional infrastructure bottlenecks.
- **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 Kromhof WEF extends over approximately 6 067 ha, providing a substantial amount of land for the development of an up to 300MW 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 R722 which runs in a north-south trajectory to the west of the site.
- **Topography** - The surrounding landscape has a mountainous topography which is suitable for the development of a wind project. The Project site itself is located on a 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 act as one of the pioneering developments in the Verkykerskop area and will 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 the Free State Province.

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

5.3 LAYOUT ALTERNATIVES

5.3.1 PRELIMINARY LAYOUT ALTERNATIVE

The preliminary layout identified up to 40 turbine positions and associated main WEF components and was proposed during the Scoping phase. The preliminary layout and buildable are illustrated in **Figure 5-1.** The buildable area is indicated by the blue shaded area on the figure below.

Due to the nature of the project area, the specialists were requested to identify the sensitive areas within the study area. These sensitive areas will be overlaid and utilised to revise the layout accordingly.

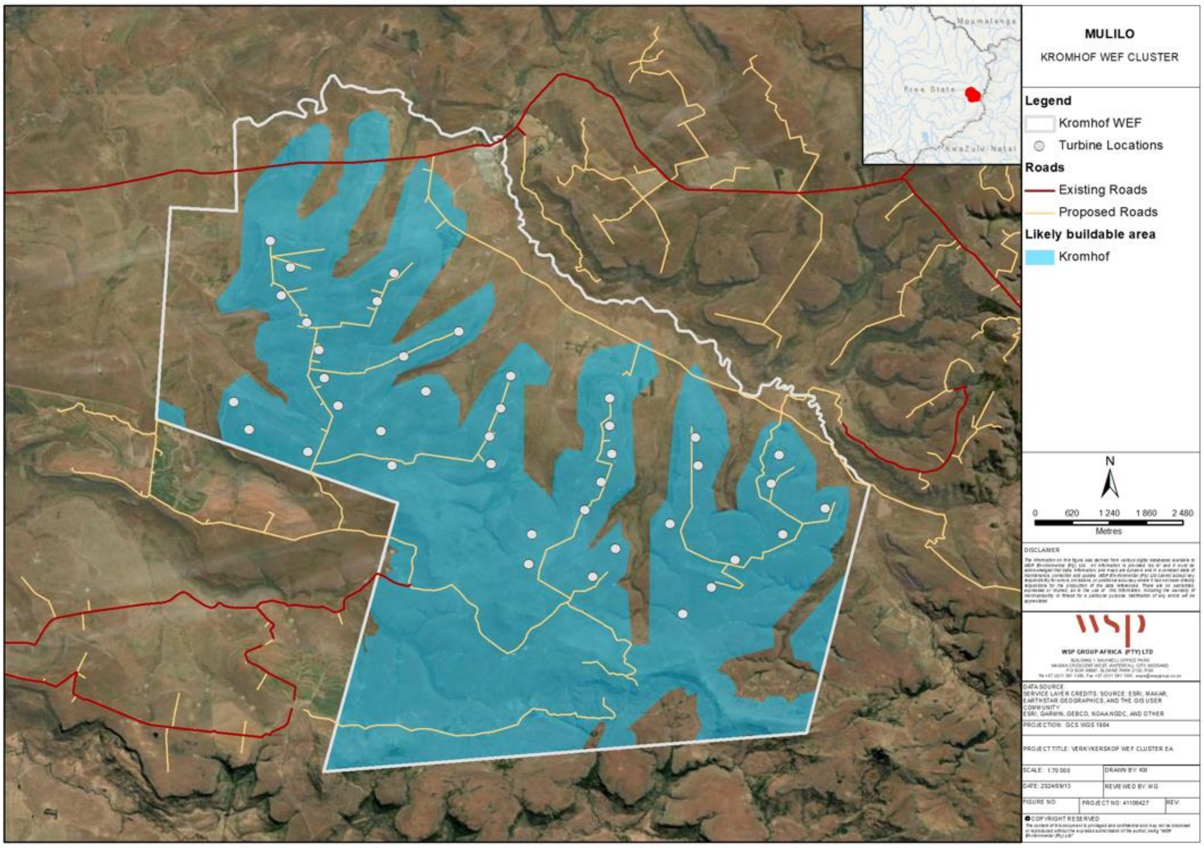

Figure 5-1 - Preliminary Layout for Kromhof WEF

5.3.2 OPTIMISED LAYOUT

Based on the input received from the specialists during the Scoping Phase, the layout was optimised. This “optimised” layout is illustrated in **Figure 5-2**. The Buildable area is indicated by the blue shaded area on the figure below. It should be noted that the buildable area remained the same, however the due to an assumption on the use of 8MW turbines, the number of turbines reduced from 40 to 21.

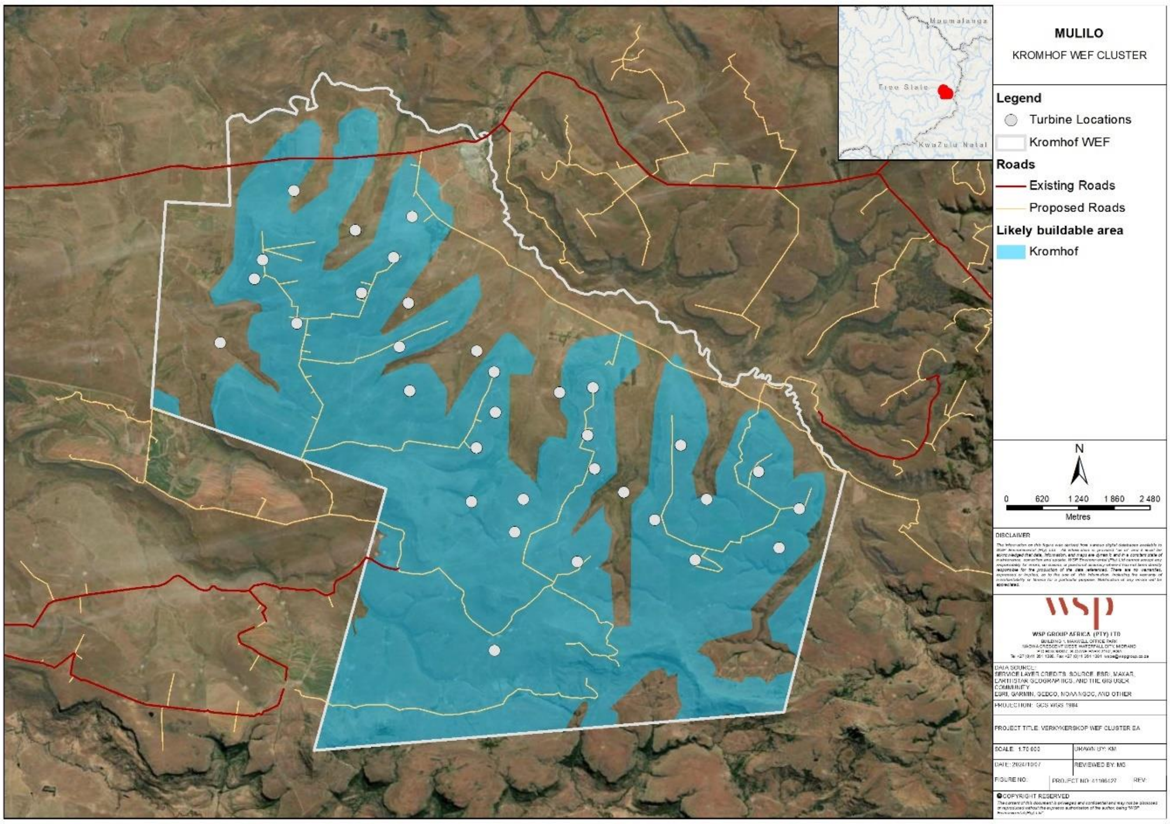

Figure 5-2 – Optimised Layout for Groothoek WEF

5.3.3 DEIR ASSESSED LAYOUT

The optimised layout and buildable area were further refined based on specialist recommendations and turbine technology options. The DEIR Assessed layout is illustrated in **Figure 5-2.** The Buildable area is indicated by the green shaded area on the figure below. It should be noted that the buildable area has been significantly reduced, however the number of turbines increased from 21 to 36.

This layout formed the basis of the EIA Phase specialist assessments

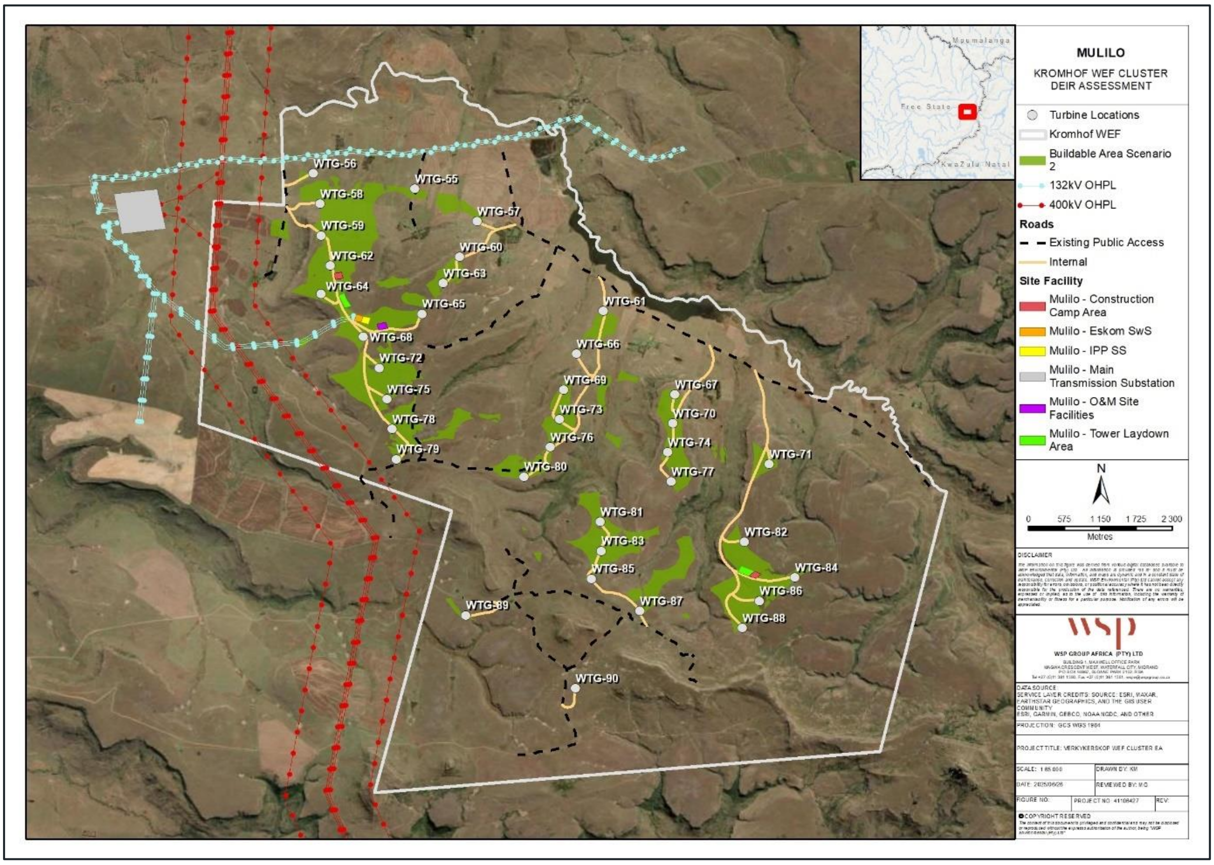

Figure 5-3 – DEIR Assessed Layout for Kromhof WEF

5.4 NO-GO ALTERNATIVE

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

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 a just transition within the Province and Nationally. This project will also support the need to increase 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.

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

5.4.1 AGRICULTURAL AGRO-ECOSYSTEM ASSESSMENT

Specialist assessments for environmental authorisation are required to include a comparative assessment of alternatives, including the no-go alternative. 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 option. 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.

5.4.2 TERRESTRIAL BIODIVERSITY ASSESSMENT:

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, along with current flora SCC, will likely remain unchanged.

5.4.3 PLANT SPECIES ASSESSMENT:

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, along with current flora SCC, will likely remain unchanged.

5.4.4 ANIMAL SPECIES ASSESSMENT:

Should the proposed Project not proceed, the existing agricultural practices (i.e., crop cultivation, cattle, and sheep farming) will persist across the LSA. Consequently, the condition and character of on-site natural habitat, along with current fauna populations, including SCC, will remain unchanged.

5.4.5 AVIFAUNAL ASSESSMENT:

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, will likely remain unchanged or potential deteriorate in some instances due to ongoing poor land practises e.g. overgrazing of important wetlands etc.

5.4.6 BAT ASSESSMENT:

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 2 m 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.

5.4.7 HERITAGE IMPACT ASSESSMENT:

No alternatives were provided, but the area assessed allows for siting of the development to avoid impacts to heritage resources.

5.4.8 PALAEONTOLOGICAL IMPACT ASSESSMENT

There are no ‘no-go’ areas because the fossils, if present, can be removed and curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.

5.4.9 TRAFFIC IMPACT ASSESSMENT:

This alternative considers the option of ‘do nothing’ and maintaining the status quo. Should the proposed activity not proceed, the site will remain unchanged. 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.

5.4.10 VISUAL IMPACT ASSESSMENT:

From a visual perspective, the “no-go” alternative, i.e. whereby the Kromhof Project will not be developed, would mean that none of the project elements that may be deemed visually detrimental would be introduced into the landscape and thereby retaining the existing visual character and associated resource value of the project site. It is noted that the project area has very low existing levels of development, a distinct and definable rural character, and high visual resource value of the ridges and low cliffs that characterise the site. It is also unlikely that significant visual mitigation could be implemented should the project proceed, given the great height of the turbines and the nature of the project technology.

5.4.11 NOISE IMPACT ASSESSMENT:

From a noise perspective, should the proposed Project not go ahead, the status quo will remain the same.

5.4.12 HEALTH, SAFETY AND ENVIRONMENT RISK ASSESSMENT:

For most projects, from an acute health and safety point of view, the No-Go option will usually be a preferred option since there are no immediate health and safety risks associated with not doing a project, i.e. no one can get hurt if something does not exist. However, some projects aim to reduce adverse effects elsewhere and can be viewed at offsetting either current or future risks. In this case, renewable energy projects should help to mitigate possible adverse impacts of climate change, create jobs and contribute to sustainable energy, i.e. the project risks are offset against future social risk reduction.

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 underpins the international principle that everyone has the right to an environment that is not harmful to their health or well-being. This fundamental human right is effected in Section 24 of the Constitution. The Constitution cannot manage regulate 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. NEMA is the principal environmental statute which regulates environmental management and seeks to give effect to the environmental right enshrined in section 24 of the Constitution.
National Environmental Management Act (No. 107 of 1998)	NEMA provides that an Environmental Authorisation (EA) is required by any person that intends to undertake certain listed activities that are considered likely to have a detrimental impact on the environment and have been identified in Listing Notice 1 (GN R983, GG 38282 of 4 December 2014), Listing Notice 2 (GN R984, GG 38282 of 4 December 2014), or Listing Notice 3 (GN R985, GG 38282 of 4 December 2014) published under the Environmental Impact Regulations (EIA Regulations). No construction/development (broadly defined in the EIA Regulations) activities may commence without an EA being granted by the relevant competent authority (and/or where such EA has been suspended by virtue of, for example, an appeal having been lodged)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 high biodiversity 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.

Legislation	Description of Legislation and applicability
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:** The proposed Kromhof WEF will include a 33kV/132kV onsite collector substation (inclusive of the IPP Portion). In addition, 33kV cabling is proposed to connect the wind turbines to the onsite collector substations, to be laid underground where practical.
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.* *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more* *(a) within a watercourse* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area; [or]* *(ee) where such development occurs within existing roads, [or] road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.* **Description:** The proposed Kromhof WEF will require the development of internal roads and/or access roads around the site. The physical footprint of the infrastructure

Legislation	Description of Legislation and applicability
	will be located within 32m of the outer extent of the delineated watercourses on site. The footprint of the infrastructure that will be within 32m of a watercourse will be confirmed in the EIA Phase. The development of the Kromhof will not trigger any of the listed exclusions.
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 Kromhof will require storage and handling of dangerous goods, including fuel, cement, and chemical storage onsite, that will be greater than 80m^3 but not exceeding 500m^3.
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.* *but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.* **Description:** Internal access roads and stormwater control infrastructure, as well as electrical cabling required to connect the various components of the Kromhof WEF will collectively require the excavation, infilling or removal of soil exceeding 10m^3 from delineated watercourses on site. The exact values will be confirmed once final designs have been provided. The development of the Kromhof WEF will not trigger any of the listed exclusions.
Listing Notice 1: GNR 983	*Activity 24(ii)* *The development of a road:* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) A road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres*

Legislation	Description of Legislation and applicability
	but excluding a road— *a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter* **Description:** The proposed Kromhof WEF will require the development of internal roads and/or access roads around the site. The roads will be up to 8m in width (operational width once constructed) with a road reserve wider than 13.5m. The development of the Kromhof WEF will not trigger any of the listed exclusions.
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 proposed Kromhof WEF is considered a commercial and/or 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 each of the facilities (buildable area) will exceed 1ha and is estimated to be 150 ha. The development of the Kromhof WEF will not trigger any of the listed exclusions.
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* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more* *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding—* *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;*

Legislation	Description of Legislation and applicability
	(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves* **Description:** Transport of large infrastructure components related to both facilities will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 100 m^2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32 m of the outer extent of the delineated watercourses on site. The development of the Kromhof WEF will not trigger any of the listed exclusions.
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—* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas* **Description:** Transport of large infrastructure components related to the facilities will require the widening of existing access and/or internal roads where no reserve exists and where such road is wider than 8 metres. The development of the Kromhof WEF will not trigger any of the listed exclusions.
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 to be 300MW). This activity is therefore considered applicable to the wind facilities.
Listing Notice 2: GNR 984	*Activity 15(i)* *The clearance of an area of 20 hectares or more of indigenous vegetation*. **Description:** Based on the information provided with regards to total project area, it is assumed that the facilities will result in the clearance of at least 20 hectares or more of indigenous vegetation. The buildable area is currently estimated to be 150ha.

Legislation	Description of Legislation and applicability
Listing Notice 3: GNR 985	***It has been confirmed that the 2015 Free State Biodiversity Sector Plan (FSBSP) was adopted by the Competent Authority on 14 October 2024.***
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.* *b. Free State* *(i) Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Description:** Internal access roads require 8m wide roads. The exact values will be confirmed once final designs have been provided. In addition, The Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020).
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.* *b. Free State* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(hh) Areas within a watercourse or wetland, or within 100 metres of a watercourse or wetland*; **Description:** The Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020). The Kromhof WEF will require storage and handling of dangerous goods, including fuel (e.g. diesel), cement and chemical storage onsite, that will be greater than 30m3 but not exceeding 80m^3. It is anticipated that these facilities will be developed within CBAs or ESAs or within 100m of a watercourse.
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.*

Legislation	Description of Legislation and applicability
	b. Free State *(ii) Within critical biodiversity areas identified in bioregional plans; or* **Description:** The Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020). It is anticipated that the construction of the Kromhof WEF will require clearance of 300m^2 or more within the mapped CBAs and ESAs.
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;* *b. Free State* *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 Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020). The cabling, access and/or internal roads are anticipated to traverse the CBAs and ESAs identified within the project area and will require the development of infrastructure or structures with a physical footprint of 10m^2 or more.
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.* *b. Free State* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Description**

Legislation	Description of Legislation and applicability
	The Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020). Transport of large infrastructure components related to the facilities will require the widening of existing access and/or internal roads by more than 4 metres or the lengthening of existing access and/or internal roads by more than 1km within the Free State Province and outside urban areas. The existing access and/or internal roads are anticipated to traverse watercourses, CBAs and ESAs.
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 be^{e}n adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *b. Free State* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Description:** The Project area is noted to traverse CBAs and ESAs which are largely aligned with grassland, cultivated stands and several wetlands, as presented in the 2015 Free State Biodiversity Plan and the national landcover dataset (GTI, 2020). The cabling, access and/or internal roads are anticipated to traverse the ESAs associated with the wetland areas, and will required the expansion of infrastructure or structures with a physical footprint of 10m^{2} or more.
Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GNR 320, 20 March 2020 and GNR 1150, 30 October 2020)	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 based environmental screening tool (screening tool). The Screening Report was generated for the project on 30 September 2024 (**Appendix E**). The following environmental themes were applicable to the Kromhof WEF: ■ Agricultural Theme; ■ Animal Species Theme; ■ Aquatic Biodiversity Theme; ■ Archaeological and Cultural Heritage Theme; ■ Avian (Wind) Theme;

Legislation	Description of Legislation and applicability
	- Bats (Wind) Theme; - Civil Aviation Theme; - Defence Theme; - Flicker Theme; - Palaeontology Theme; - Plant Species Theme; - Noise Theme; - Landscape (Wind theme); - Terrestrial Biodiversity Theme; and - Vulture Theme.
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	This Act provides for regulating waste management in ord^{er} 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) (**Appendix I**) 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 terrestrial biodiversity report (**Appendix G.3**), a significant part of the Project Area falls within CBA (Irreplaceable and Optimal). According to the description for the FSBSP 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).

Legislation	Description of Legislation and applicability
	Supplementary baseline terrestrial ecology studies will be undertaken during the EIA phase to inform the assessment of impacts and will include flora and fauna surveys of the project footprint to determine the presence of flora and fauna 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. Furthermore, the Multi-species Biodiversity Management Plan for Vultures in South Africa has been developed in terms of section 43(1)(b) and (c) and 43(3)(a) and (b) of the NEMBA.
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: ▪ Identifying the need for a biodiversity offset. ▪ Determining the requirements of a biodiversity offset and compilation of a Biodiversity Offset Report.

Legislation	Description of Legislation and applicability
	▪ 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 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. A significant portion of the development footprint coincides with areas that have been identified as Priority Focus Areas as part of the National Protected Area Expansion Strategy (2018) (NPAES), which is aligned with the FSBSP CBAs and ESAs. It must be noted that the NPAES are focus areas for the future expansion of protected are and are not gazetted protected areas in terms of Section 50 of the NEMPAA.
National Forest Act (No. 84 of 1998)	The National Forests Act (No 84 of 1998) (NFA) was promulgated to reform the law on forests, The NFA regulates the protection of certain forests and trees. The NFA provides that a licence or exemption must be obtained in order to: ▪ cut, disturb, damage or destroy (i) any indigenous tree in a natural forest; or (ii) any protected tree; or ▪ possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree, or any forest product derived from (i) an indigenous tree in a natural forest; or (ii) a protected tree.
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

Legislation	Description of Legislation and applicability
	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 (WULA) 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.
Water Services Act (No. 108 of 1997)	The Water Services Act (No. 108 of 1997) (WSA) regulates the supply of water services by water services authorities and water services providers. According to section 6 of the WSA, no person may use water supply and sanitation services from a source other than a water services provider nominated by the water services authority (such as a municipality) having jurisdiction in the area in question, without the approval of that water services authority. The definition of “water services” in the WSA includes “water supply services” and “sanitation services” If it is indented that the Project will receive water from a municipal system then the Water Services Act may be triggered, i.e. if the project will require water for construction and or later operational purposes other than from a bore hole, say from the municipality, then the Municipality will have to provide a confirmation letter to this effect. Please include reference to the WSA..

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 m2 in extent, must at the very earliest stages

Legislation	Description of Legislation and applicability
	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 Kromhof 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 desktop Heritage Scoping Report (**Appendix G.9**) has been carried out by a suitably qualified specialist, revealing: ▪ Heritage resources in the study area consist of structures and ruins older than 60 years, burial sites; ▪ The larger region around Verkykerskop is characterised by Later Iron Age stone walled sites likely an indicator of Batlokwa and Basia occupation; ▪ The study area is indicated to be of low, moderate, and very high paleontological sensitivity according to SAHRIS, and additional studies are required for the EIA phase; ▪ To comply with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and with cognisance of known heritage resources in the area, the development footprint should be subjected to a field-based Heritage Impact Assessment (HIA) of the final impact areas. The proposed project has been loaded onto the SAHRIS portal for comment and was allocated the Case ID: 24314. A draft comment was received which is responded to in the PPR (**Appendix C**). The DEIAr will also be uploaded to SAHRA for a final comment and will be responded to in the Final EIAr.
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.

Legislation	Description of Legislation and applicability
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. 2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards. 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.

Legislation	Description of Legislation and applicability
	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. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983 - CARA). A consent in terms of CARA is required for the cultivation of virgin land. Cultivation is defined in CARA as “any act by means of which the topsoil is disturbed mechanically”. The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of cultivation, disturbance to the topsoil that results from construction of infrastructure does not constitute cultivation as it is understood in CARA. This has been corroborated by Anneliza Collett (Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of the Department of Agriculture, Land Reform and Rural Development (DALRRD)). The construction and operation of the facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural Development in terms of this provision of CARA.
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 (**Appendix E**) identified Civil Aviation as having Low- sensitivity for the proposed WEF. 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.
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.

Legislation	Description of Legislation and applicability
	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 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 - 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,

Legislation	Description of Legislation and applicability
	transmission, distribution, trading and the import and export of electricity are regulated.
Environment Conservation Act No 73 of 1989	The Environment Conservation Act (No 73 of 1989) (ECA) requires that any person who constructs works for the supply of light, heat or power by means of electricity, must notify electronic communications network service licensees of the proposed works; provide such licensees with a plan of the proposed works and any further information that may be required; and comply with any requirements imposed by such licensees. Section 29(1)(b) of the ECA provides that electronic communications network service licensees (e.g.; Vodacom, MTN, ICASA) must be notified at least 30 days prior to commencement of construction.

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:

Applicable Policy	Description of Policy
	- 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. - 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.

Applicable Policy	Description of Policy
	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	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 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:

Applicable Policy	Description of Policy
	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 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.

Applicable Policy	Description of Policy
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.
Multi-species Biodiversity Management Plan for Vultures in South Africa	The Multi-species Biodiversity Management Plan for Vultures in South Africa aims to implement comprehensive strategic conservation actions that cover the geographic ranges of all nine vulture species found in South Africa, with a particular focus on the seven resident breeding species. The plan also aims to strengthen concerted, collaborative, and coordinated international efforts to recover these populations to acceptable levels by 2033. The BMP is published at an opportune time after the publication of the White Paper on Conservation and Sustainable Use of South Africa's Biodiversity. The BMP is aligned with the goals and enablers of the White Paper. As explicitly recognised that the responsibility rests with a range of stakeholders, including, but not limited to, the State, traditional leaders, traditional health practitioners, communities, private landowners, industry, academia, non-government organisations and civil society, this BMP provides the platform to showcase and uphold what is contained in the White Paper. It is a clear demonstration of how stakeholders involved with vulture conservation are working together to ensure that all South Africans will continue to benefit from the ecosystem services provided by vultures. In terms of section 43(2) and 43(3)(c) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), the Minister has assigned the responsibility for implementation of the Multi-species Biodiversity Management Plan for Vultures in South Africa to the National Vulture Task Force.

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
Phumelela Local Municipality Integrated Development Plan 2022-27 (MIDP).	The plan serves as a strategic plan document for the municipality. It details the municipality's short-term and long-term objectives and strategies aligned with the Provincial and National Development Plan.
Phumelela Local Municipality Spatial Development Framework.	The PSDF is a required tool to address historically distorted, unviable, and unsustainable spatial patterns and challenges caused by apartheid planning.
Provincial Biodiversity Permits	The project will be required to obtain Provincial Biodiversity Permits relating to activities relating to: ■ carry out a restricted activity involving a specimen of a listed threatened or protected species; and ■ carry out a restricted activity in relation to a specimen or an alien species or listed invasive species. A "restricted activity" is defined very broadly in NEMBA and almost any action in respect of a listed threatened or protected species or in respect of an alien species or listed invasive species would require a permit prior to undertaking that activity. Permits may be required in terms of the Nature Conservation Amendment Ordinance, No. 5 of 1986.
Free State Biodiversity Plan 2024	The FSBP was approved and adopted by the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs on 14 October 2024. The biodiversity plan was developed with cognisance of the requirements for the determination of bioregions and the preparation and publication of bioregional plans (DEAT, 2009). To this extent the two main products of the biodiversity planning process are: ■ A map indicating the different terrestrial categories (Protected, Critical Biodiversity Areas, Ecological Support Areas, Other and Degraded) ■ Land-use guidelines for the above-mentioned categories This plan represents the first attempt at collating all terrestrial biodiversity and ecological data into a single system from which it can be interrogated and assessed. Biodiversity and ecological data consulted and included are: • Land cover data • Inselbergs • Species distribution data (from records and expert mapping) • Modelled species distribution • A range of national data sets (Vegetation types, NFEPA sub- • catchments, species distribution data, etc.) • The existing Ekangala spatial biodiversity plan • Biodiversity plans of neighbouring provinces • Existing provincial plans that guide development within the Free • State Province, most notably the Provincial Spatial Development Framework (PSDF)

Applicable Plan	Description of Plan
	- Administrative data

6.4 INTERNATIONAL ENVIRONMENTAL AND SOCIAL STANDARDS

6.4.1 IFC PERFORMANCE STANDARDS

The IFC Performance Standards (PS) are internationally recognized guidelines for managing environmental and social risks. While this EIA focuses on meeting South African regulatory requirements under NEMA, the IFC PS are acknowledged as part of the project's future commitments to international standards, particularly for financial close.

At this stage, the EIA process is not designed to fully comply with IFC Performance Standards (PS), as these standards extend beyond what is required under South African regulations. However, the process includes specialist studies, such as social impact assessments, biodiversity assessments, and stakeholder consultations, which provide a foundation for future alignment with international standards.

Compliance with IFC PS will be addressed during later stages of the project lifecycle, should the project proceed, through the development of detailed action plans and a comprehensive Environmental and Social Management System (ESMS).

6.4.2 WORLD BANK GROUP ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

The World Bank Group (WBG) Environmental Health and Safety (EHS) Guidelines are technical reference documents that provide guidance on managing environmental, health, and safety risks. These guidelines are relevant for international financing requirements but are not mandatory for compliance with South African EIA regulations under NEMA.

While the EHS Guidelines have not been applied during the EIA process, they provide a valuable framework for identifying and mitigating risks. Should the project progress to the financing stage, the guidelines will be reviewed and applied, along with the IFC Performance Standards, to ensure alignment with international standards.

Future alignment with the Wind Energy Guidelines (2015) and General EHS Guidelines will address key issues such as:

- Biodiversity impacts (e.g., effects on birds and bats).
- Noise, shadow flicker, and visual impacts during construction and operation.
- Community health and safety, including transportation risks.

These guidelines will be incorporated into detailed planning and mitigation measures at a later stage, as part of the project's commitment to international best practices.

6.4.3 EQUATOR PRINCIPLES

The Equator Principles (EPs) provide a globally recognized framework for assessing and managing environmental and social risks in projects. They establish a minimum standard for due diligence and promote alignment with responsible environmental and social practices. While typically adopted by financial institutions for projects seeking international funding, the

EPs are also used to guide internal standards for companies aiming to align with global best practices.

For the Kromhof WEF project, compliance with the EPs is not a requirement during the Environmental Impact Assessment (EIA) process under South African regulations. However, alignment with the EPs will be required before financial close to meet the internal standards set by Copenhagen Infrastructure Partners (CIP), as the majority shareholder in Mulilo.

Instead of conducting a full Environmental and Social Impact Assessment (ESIA), any gaps identified during the EIA process will be addressed through additional specialist studies. These studies will focus on enhancing compliance with EP standards and ensuring the project meets the requirements for financial institutions that adopt the EP framework. This approach ensures a balance between meeting South African EIA regulatory requirements and the more extensive international standards required by the EPs.

The principles emphasize areas such as stakeholder engagement, grievance mechanisms, independent monitoring, and adherence to host country laws while addressing any additional requirements under the IFC Performance Standards or World Bank Group Environmental, Health, and Safety Guidelines for non-designated countries like South Africa.

By addressing the identified gaps and incorporating EP-aligned processes before financial close, the project will ensure robust environmental and social governance throughout its lifecycle.

The requirements and applicability of the EPs are outlined in **Table 6-4**.

Table 6-4: 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	This document is the third deliverable (i.e.,DEIAr) from the S&EIR process undertaken for the proposed Project. The impact assessment will be undertaken during the next phase of the S&EIR 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 will also be compiled.

Requirement		Project Specific Applicability
	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 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&EIR 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	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and

Requirement		Project Specific Applicability
	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 requirements in line with the applicable standards.	monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
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	The S&EIR 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 3.4** and in the PPR included in **Appendix C**. 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.

Requirement		Project Specific Applicability
	country obligations under international law.	
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 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.	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.
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	This principle will only become applicable in the event that the project is developed in the future.

Requirement		Project Specific Applicability
	EPFI in accordance with the frequency required.	

6.5 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 EMPrs for Substations will be included in the Site-Specific EMPr (**Appendix I**).

6.6 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, and which have been considered in this EIA process, are discussed below:

6.6.1 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.

6.6.2 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.

6.6.3 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' behaviours 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.

6.6.4 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).

6.6.5 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.

6.6.6 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.

6.7 ADDITIONAL PERMITS AND AUTHORISATIONS

Table 6-5 outlines the additional permits and authorisations required for the proposed development, as well as the relevant Competent Authorities responsible.

Table 6-5 – 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	In Progress
Notification Of Intent To Develop (NID) Section 38 (1) and Section 38 (8)	National Heritage Resource Act (Act No. 25 of 1999)	South African Heritage Resources Authority (SAHRA)	In Progress: The case I.D for the project has been received from SAHRA: 24314
Obstacle Permit	Civil Aviation Act (Act 13 of 2009)	Air Traffic and Navigation Services / Civil Aviation Authority	Conditional Approval will be required for the facility prior to construction.

7 DESCRIPTION OF BASELINE ENVIRONMENT

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed Project is located. It is important to gain an understanding of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project (i.e. the current, or status quo, environment) against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The area has previously been studied to some extent and is recorded in various sources. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed Project.

7.1 PHYSICAL ENVIRONMENT

7.1.1 SOIL, LANDUSE AND LAND CAPABILITY

The following is extracted from the Agricultural Agro-Ecosystem Specialist Assessment by Johann Lanz and included as Appendix G.1.

All the important parameters that control the agricultural production potential of the site are given in **Table 7-1**. The land type soil data are given in Appendix 5 of the specialist report. A satellite image map of the development site is given in **Figure 7-1**.

The site is not within a Protected Agricultural Area (PAA) (DALRRD, 2020). A PAA 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 PAAs, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa.

Table 7-1 - Parameters that control and/or describe the agricultural production potential of the site

	Parameter	Value
Climate	Köppen-Geiger climate description (Beck et al, 2018)	Temperate, dry winter, warm summer
	Mean Annual Rainfall (mm) (Schulze, 2009)	618 to 936
	Reference Crop Evaporation Annual Total (mm) (Schulze, 2009)	1250 to 1320
	Climate capability classification (out of 9) (DAFF, 2017)	Predominantly 6 (moderate-high)

	Parameter	Value
Terrain	Terrain type	Hilly with Rocky plateaus and high variation in elevation
	Terrain morphological unit	Varied
	Slope gradients (%)	0 to 47
	Altitude (m)	1950
	Terrain capability classification (out of 9) (DAFF, 2017)	3 (low) to 7 (high)
Soil	Geology (DAFF, 2002)	Beaufort mudstone, shale, and sandstone with occasional dolerite sills and narrow dolerite dykes.
	Land type (DAFF, 2002)	Ca18, Bd29, Fa26
	Description of the soils	Very shallow to deep, medium textured soils on underlying rock or clay.
	Dominant soil forms	Mispah, Glenrosa, Avalon, Pinedene, Clovelly, Rock outcrops.
	Soil capability classification (out of 9) (DAFF, 2017)	3 (low) to 5 (moderate)
	Soil limitations	Predominantly soil depth and rockiness
Land use	Agricultural land use in the surrounding area	Croplands and grazing
	Agricultural land use on the site	Croplands and grazing
General	Long-term grazing capacity (ha/LSU) (DAFF, 2018)	5
	Land capability classification (out of 15) (DAFF, 2017)	3 (low-very low) to 9 (moderate-high)
	Within Protected Agricultural Area (DALRRD, 2020)	No
	Within Renewable Energy Development Zone (REDZ)	No

The agricultural protocol requires the current productivity of the land based on detailed production figures and it requires the current employment figures. This detail is entirely irrelevant to the assessment of the agricultural impact, given that the expected losses in production and employment will be zero (see Section 9.1 of the specialist report). It is therefore unnecessary to include this detail. There are no existing impacts on the site that are relevant to agricultural impact.

7.1.1.1 Assessment of the agricultural production potential

The site is fairly mountainous and much of the land across the site has insufficient capability for viable crop production due to terrain and soil limitations (predominantly limited depth and rockiness). There are patches of land that are suitable for viable cropping. As discussed in Section 7 of the specialist study report, the crop-suitable versus unsuitable soils have been identified over time through trial and error. All the sufficiently deep, suitable soils are generally cropped, and uncropped soils that are used for grazing have various limitations, mostly depth limitations, that make them unsuitable for crop production.

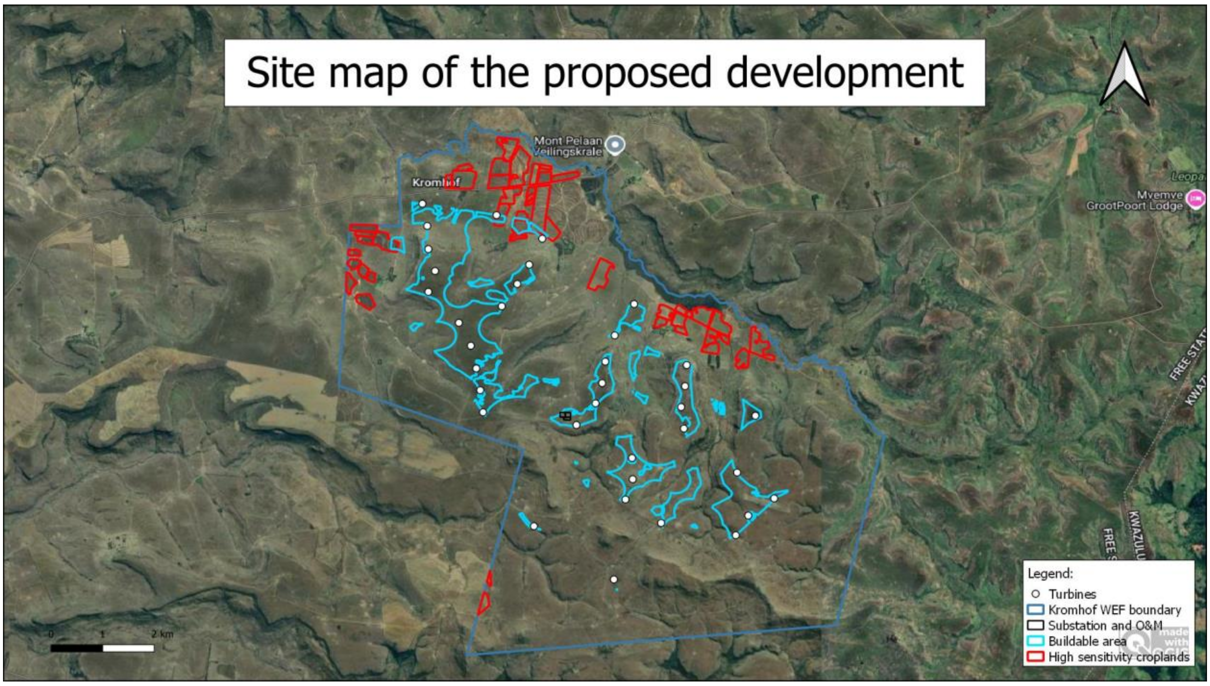

Figure 7-1 - Satellite image map of the assessed development

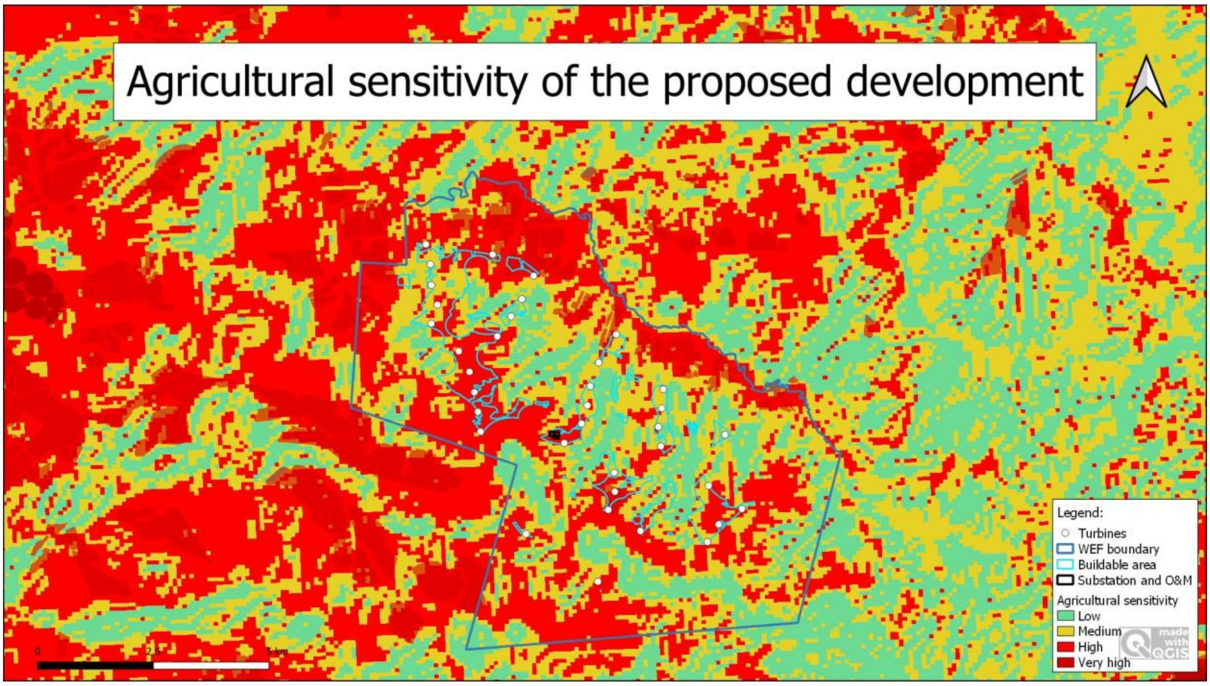

Figure 7-2 – The preliminary development footprint overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high; dark red = very high).

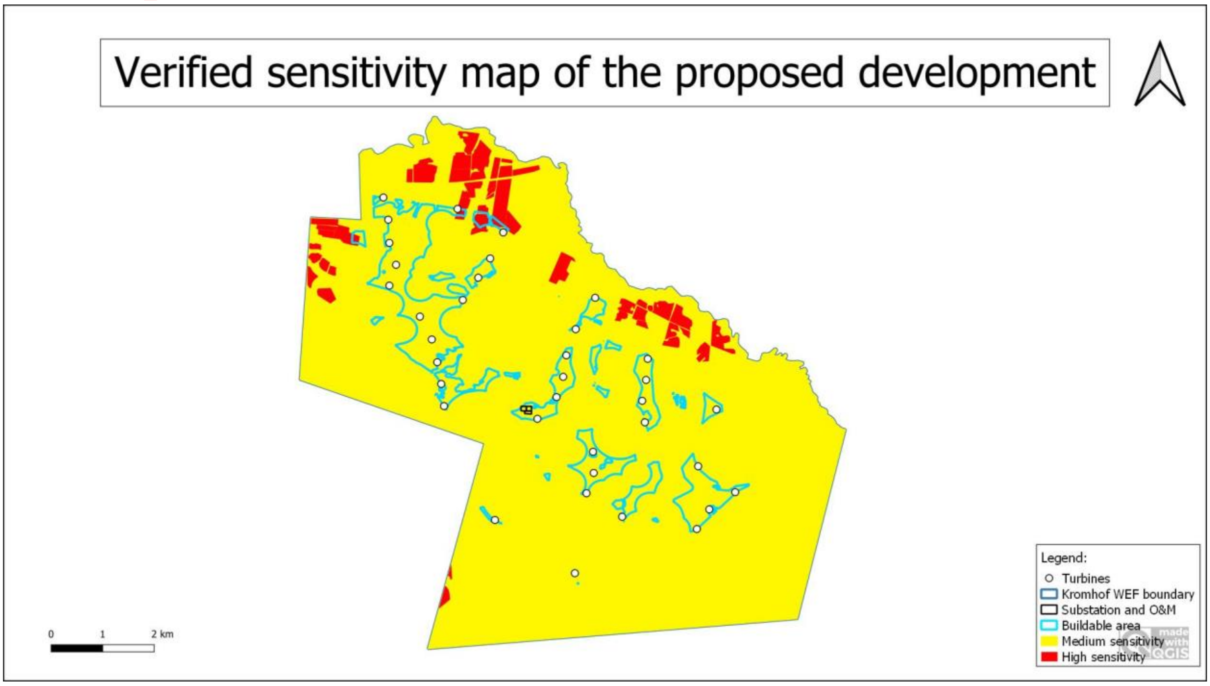

Figure 7-3 - Verified sensitivity map

The screening tool classifies the assessed site as ranging from low to high agricultural sensitivity and therefore classifies the overall site sensitivity, which is the highest sensitivity encountered across the site, as high. The high sensitivity classification by the screening tool is due to a combination of some land being classified as cropland (high sensitivity) and some land being classified as high sensitivity because of its land capability rating of 8 to 9. However, as shown in Section 7 of the study, only parts of the site have suitability for cropping and therefore deserve to be classified as high sensitivity. Those parts of the site that have been verified in this assessment as being of high sensitivity are shown in Figure 7 and differ from those shown by the screening tool. This assessment therefore disputes some of the detail of the sensitivity classification by the screening tool, in terms of which lands are viable for cropland, and therefore have high sensitivity, and which are not and therefore have medium sensitivity, but it confirms the overall site sensitivity - that is the highest sensitivity encountered across the site as high.

7.1.2 GEOLOGICAL CONTEXT

The following is extracted from the Geotechnical Report by WSP (April 2025) and included as Appendix G.2.

According to the published 1: 250 000 geological maps (Sheet 2728 Frankfort and 2828 Harrismith), the study area is underlain by rocks of the Adelaide and Tarkastad Subgroup, Beaufort Group of the Karoo Supergroup.

The Adelaide and Tarkastad Subgroups have been extensively intruded by Jurassic age dolerite (Jd).

Minor areas of recent surficial deposits, alluvium, blanket areas along the Meul River along the northern border of the site.

An excerpt of the published geological map showing the project area is presented as **Figure 7-4** and the lithostratigraphy is presented as **Table 7-2**.

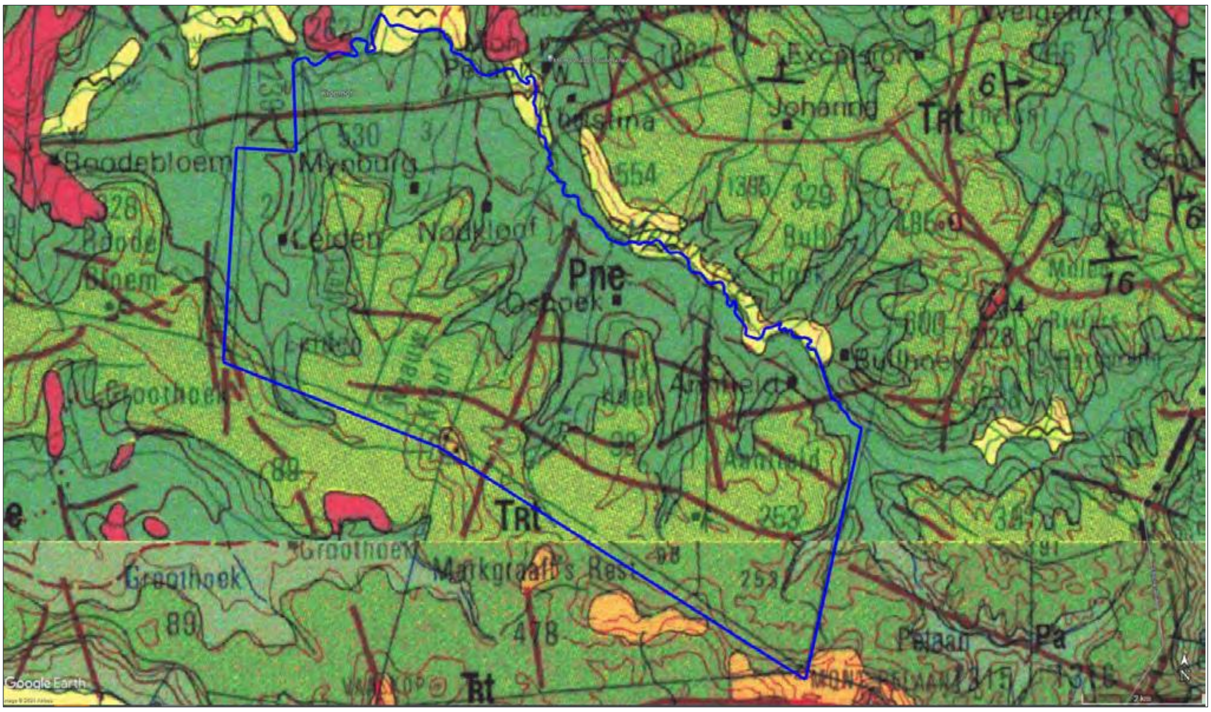

Figure 7-4 – Geological Map of the Project Area

Table 7-2 – Lithostratigraphy of the Study Area

Supergroup	Group	Subgroup	Formation	Lithology	Map Symbol
				Alluvium	~ ~ ~
				Dolerite, Dolerite dyke	Jd /
Karoo	Beaufort	-	Molteno	Medium to coarse grained glittering sandstone, gritstone, subordinate green and red mudstone, carbonaceous shale.	Trm
		Tarkastad	Driekoppen Formation Verkyksdorp Formation -	Brownish-red mudstone, interbedded fine grained reddish sandstone. Fine to coarse grained feldspathic sandstone, subordinate sandstone and brown-re mudstone. Fine to medium grained sandstone, red, green and blue mudstone.	Trt
		Adelaide	Normandien Formation Estcourt Formation	Olive green and grey mudstone, subordinate sandstone. Fine to coarse grained sandstone, grey shale	Pne

Supergroup	Group	Subgroup	Formation	Lithology	Map Symbol
				Alluvium	🟨
				Dolerite, Dolerite dyke	Jd ⟋
			-	Grey mudstone, dark grey shale (carbonaceous in places), siltstone and sandstone	Pa

7.1.3 SITE RECONNAISSANCE

A site reconnaissance was carried out on the 9th of July 2024 during the winter season. The season over which the site visit was conducted does not affect the outcome of the assessment as the geotechnical impacts are more of a technical nature rather than environmental.

The reconnaissance comprised a drive over the site within areas that were accessible by a 4x4 vehicle, profiling of geological exposures and documenting by taking photographs.

A total of three geological exposures, K2 to K4, were observed in the northern part of the site and were profiled according to the current South African standards and guidelines (SANS 633). This was done to confirm or dispute the baseline geological information.

The positions of the exposures across the site are indicated on **Figure 7-5**. The exposure profiles are presented in Appendix B and photographs, thereof, are presented in Appendix C of the study.

A summary of the description of the exposures is presented in **Table 4-1**. **Figure 4-2** shows the positions of the turbines.

Table 7-3 – Summary of the profiled cuts and exposures

Exposure No.	Talus	Colluvium	Alluvium	Residual shale
	Silty sand with gravel, cobbles and boulders	Sandy clay with cobbles and boulders	Sandy clay with gravel and cobbles	Silty clay
K2		0.00 – 0.40		0.40 – 0.80
K3	0.00 – 5.00			
K4			0.00 – 1.00	

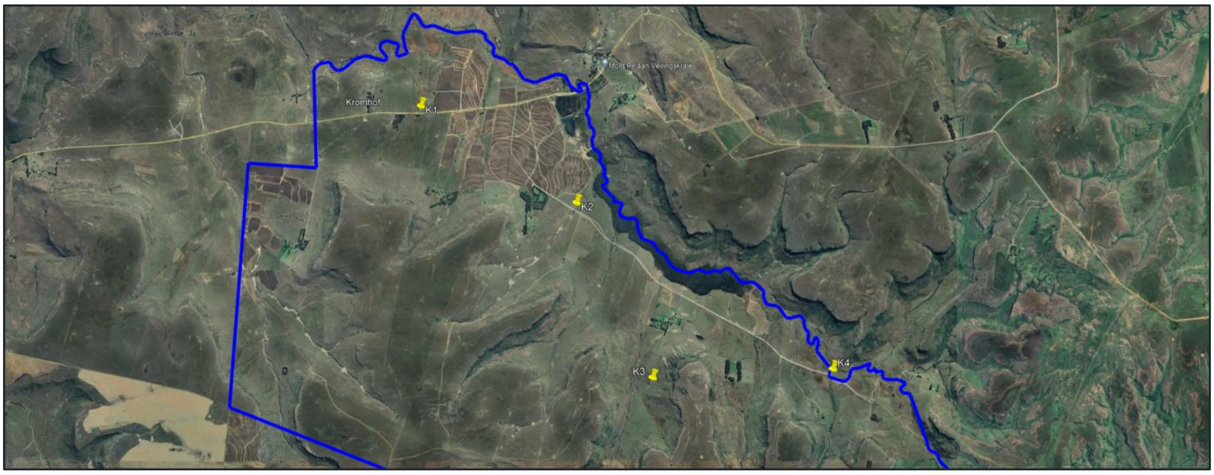

Figure 7-5 – Location of geological exposures across the Kromhof WEF site

7.2 BIOLOGICAL ENVIRONMENT

7.2.1 TERRESTRIAL BIODIVERSITY

The following is extracted from the Terrestrial Biodiversity Specialist Assessment compiled by Hawkhead Consulting and included as Appendix G.3.

The 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 LSA 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).

Eastern Free State Sandy Grassland

Eastern Free State Sandy Grassland is mainly confined to the Free State, with marginal extension into KwaZulu-Natal and Lesotho (Mucina & Rutherford, 2011). The prevailing terrain is flat- to slightly undulating, with certain areas drained by streams and rivers characterised by undulating terrain. Vegetation is characterised by closed grassland, dominated by *Eragrostis curvula, Tristachya leucothrix* and *Themeda triandra*, amongst other grasses and forbs (Mucina & Rutherford, 2011).

In Mucina and Rutherford’s (2011) regional vegetation type descriptions, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant), or are prominent in the landscape within a particular vegetation type. They recognise the following species as important taxa in Eastern Free State Sandy Grassland vegetation type, amongst others:

Graminoids: *Themeda triandra, Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Digitaria monodactyla, Digitaria tricholaenoides, Cynodon dactylon, Elionurus muticus, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Heteropogon contortus, Hyparrhenia hirta, Aristida junciformis, Tristachya leucothrix* and *Aristida congesta*.

Herbs: *Berkheya onopordifolia, Berkheya speciosa, Dicoma anomala, Acalypha angustata, Ajuga ophrydis, Anthospermum herbaceum, Berkheya pinnatifida, Crabbea acaulis, pelargonium luridum, Pentanisia prunelloides, Senecio coronatus, Senecio erubescens, Tolpis capensis, Haplocarpha scaposa, Helichrysum aureonitens, Helichrysum nudifolium* and *Hilliardiella oligocephala*.

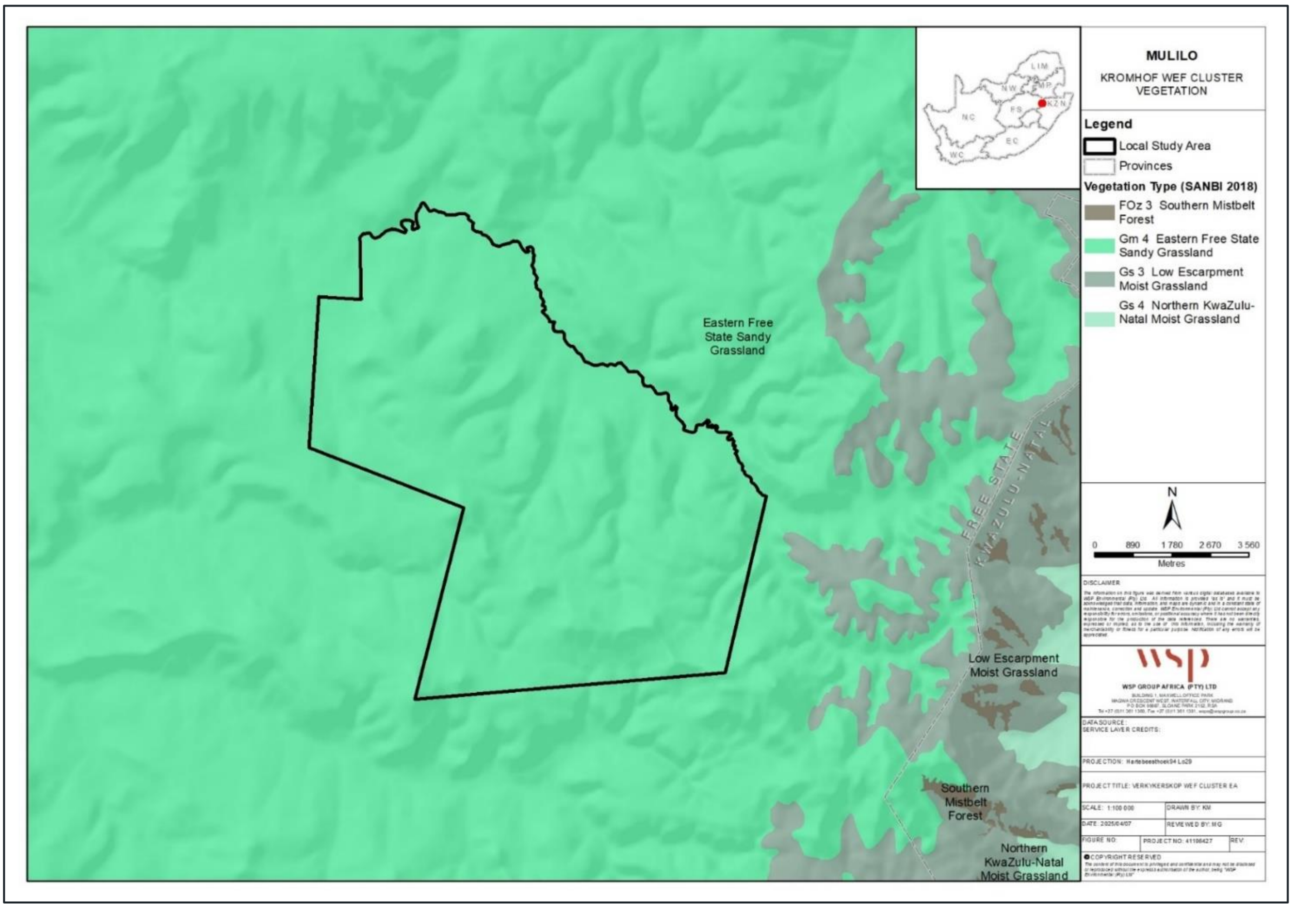

Figure 7-6 - Local study area in relation to the SANBI (2018) vegetation types

7.2.1.1 Nationally and Provincially Threatened Ecosystems

According to the NEMBA Threatened Ecosystems (2021), Eastern Free State Sandy Grassland are not listed as threatened vegetation types at a national level.

It is noted however, that according to the Free State Biodiversity Sector Plan technical report, the adjusted/provincial status of Eastern Free State Sandy Grassland is Vulnerable, with approximately 40% of the vegetation remaining in a natural condition and the remaining extent (approx. 60%) considered modified (Collins, 2024).

7.2.1.2 Terrestrial Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The Free State Biodiversity Sector Plan (FSBSP) technical report (Collins, 2024) recognises five categories of conservation focus; Protected, Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA), Other Natural Areas and Degraded. Definitions for each are presented below:

- Protected: Formal 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;
- **Critical Biodiversity Area**: An area that must be maintained in a natural or near-natural state in order to meet biodiversity targets. CBAs should collectively meet biodiversity targets for all ecosystem types, as well as for species and ecological processes that depend on natural or near-natural habitat, that have not already been met in the protected area network. Two CBA categories are recognised:
- **CBA Irreplaceable (CBA1)**: An area that is irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no, or very few other options, for meeting biodiversity targets for the features associated with the site;
- **CBA Optimal/Important (CBA2)**: An area that has been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency and/or avoidance of conflict with other land or resource uses;
- **Ecological Support Area**: An area that must be maintained in at least fair ecological condition (seminatural/moderately modified state) in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or not necessary to meet them in natural or near-natural areas;
- **Other Natural Areas**: An area in a good or fair ecological condition (natural, near-natural or semi-natural) that is not required to meet biodiversity targets for ecosystem types, species or ecological processes. One of five broad categories on a CBA map; and
- **Degraded**: Refers to land with no natural habitat remaining (NNR)

The spatial delineations of the Free State Biodiversity Sector Plan in relation to the LSA are shown in **Figure 7-7**.

The entire LSA is mapped as either CBA or ESA. Most of the southern and north-central portion of the LSA are mapped as CBA 1, with remaining areas mapped as either CBA 2, Esa 1 or ESA 2.

It is noted that the FSBSP mapping is done at a fairly course-scale, and as a result there may be spatial inaccuracies, particularly when the scale of analysis is fine, such as when dealing with the boundaries of individual cultivated fields. Excluding these small, modified patches, the remaining extensive tracts of CBA land in the LSA are important and functional natural habitat.

The continued integrity and protection of these CBA's is crucial to meet conservation targets. The presence of CBA 1 and CBA 2 land in the LSA is therefore a concern with respects to terrestrial biodiversity management and it is recommended that, as far as possible, proposed Project infrastructure should be sited to avoid impacting CBAs.

There is a greater range of land uses permissible in ESAs. 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.

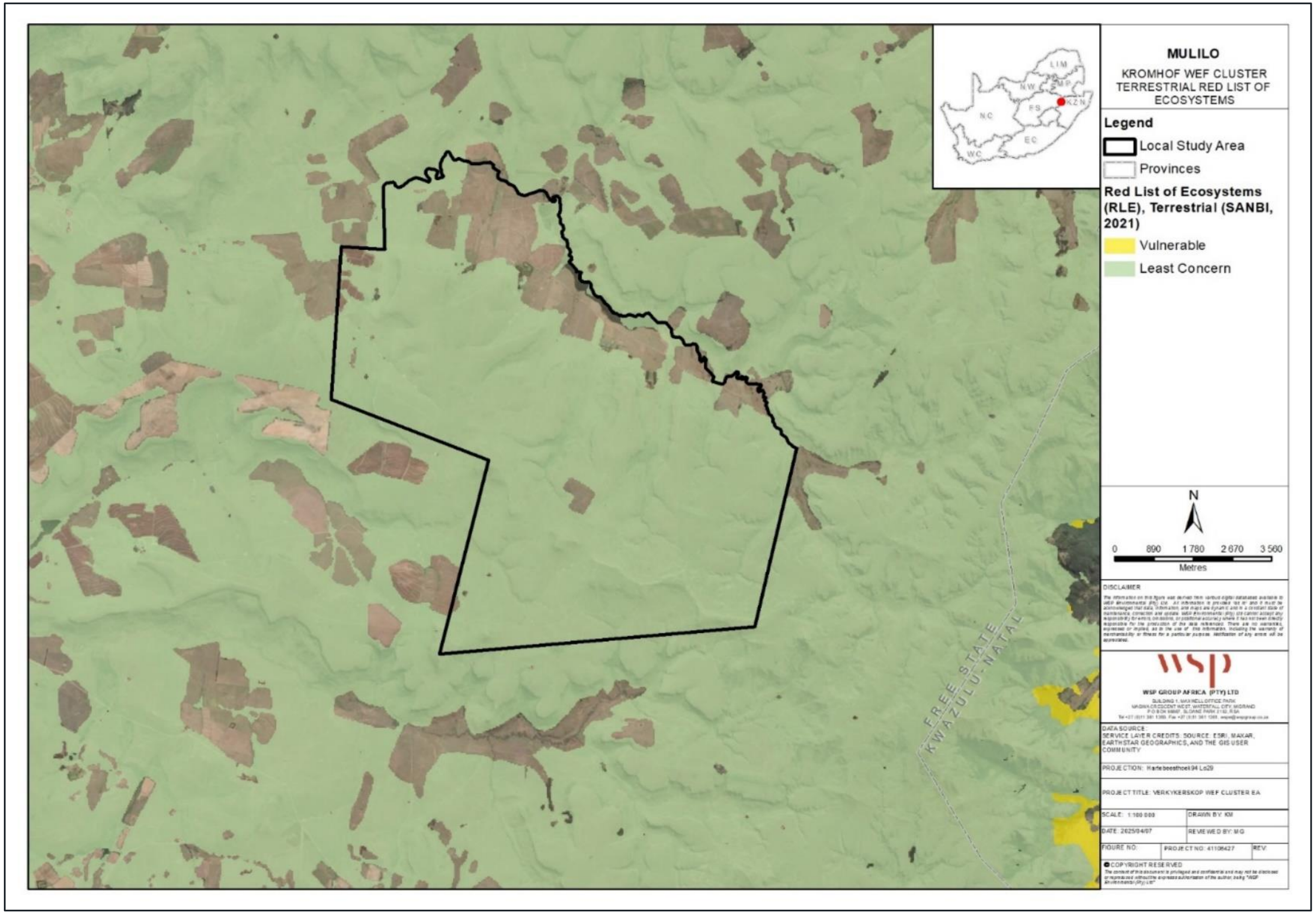

Figure 7-7 - Local study area in relation to delineations of the National Red List of Terrestrial Ecosystems

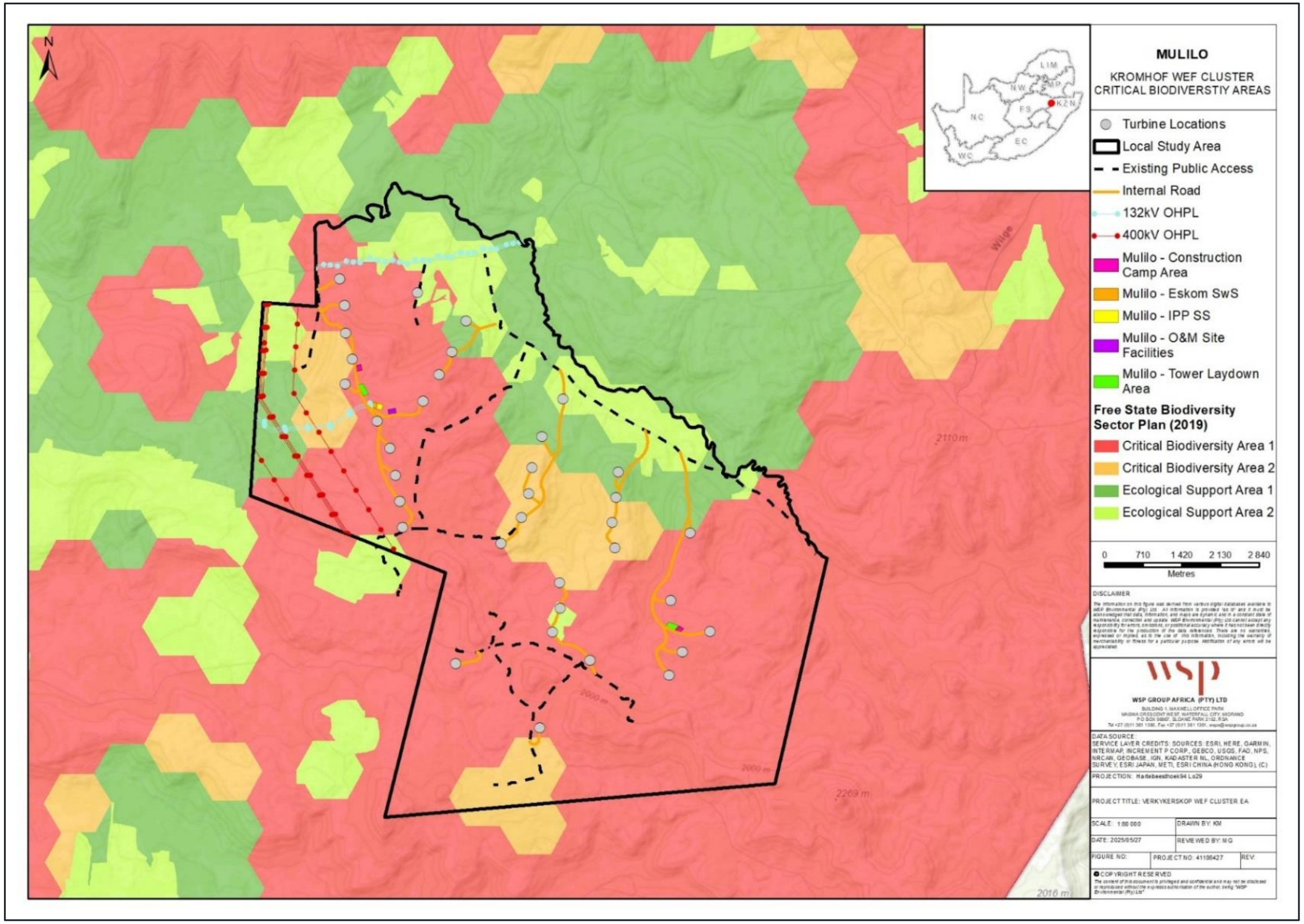

Figure 7-8 - Local study area and proposed infrastructure layout in relation to mapped Critical Biodiversity Areas and Ecological Support Areas, as per the FSBSP (2019)

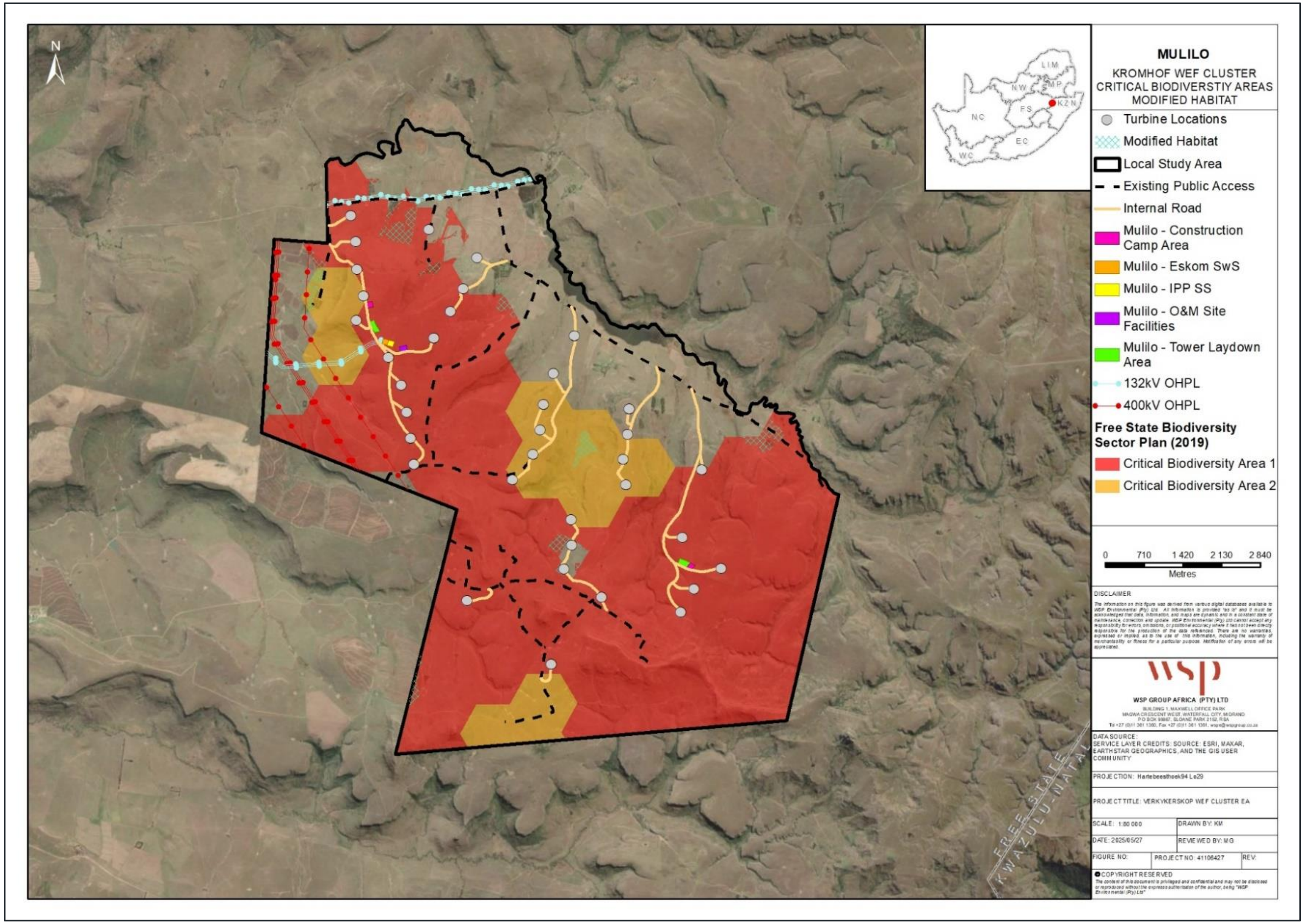

Figure 7-9 - Patches of CBA land that are actually modified (hatched) and characterised by cultivation or old lands

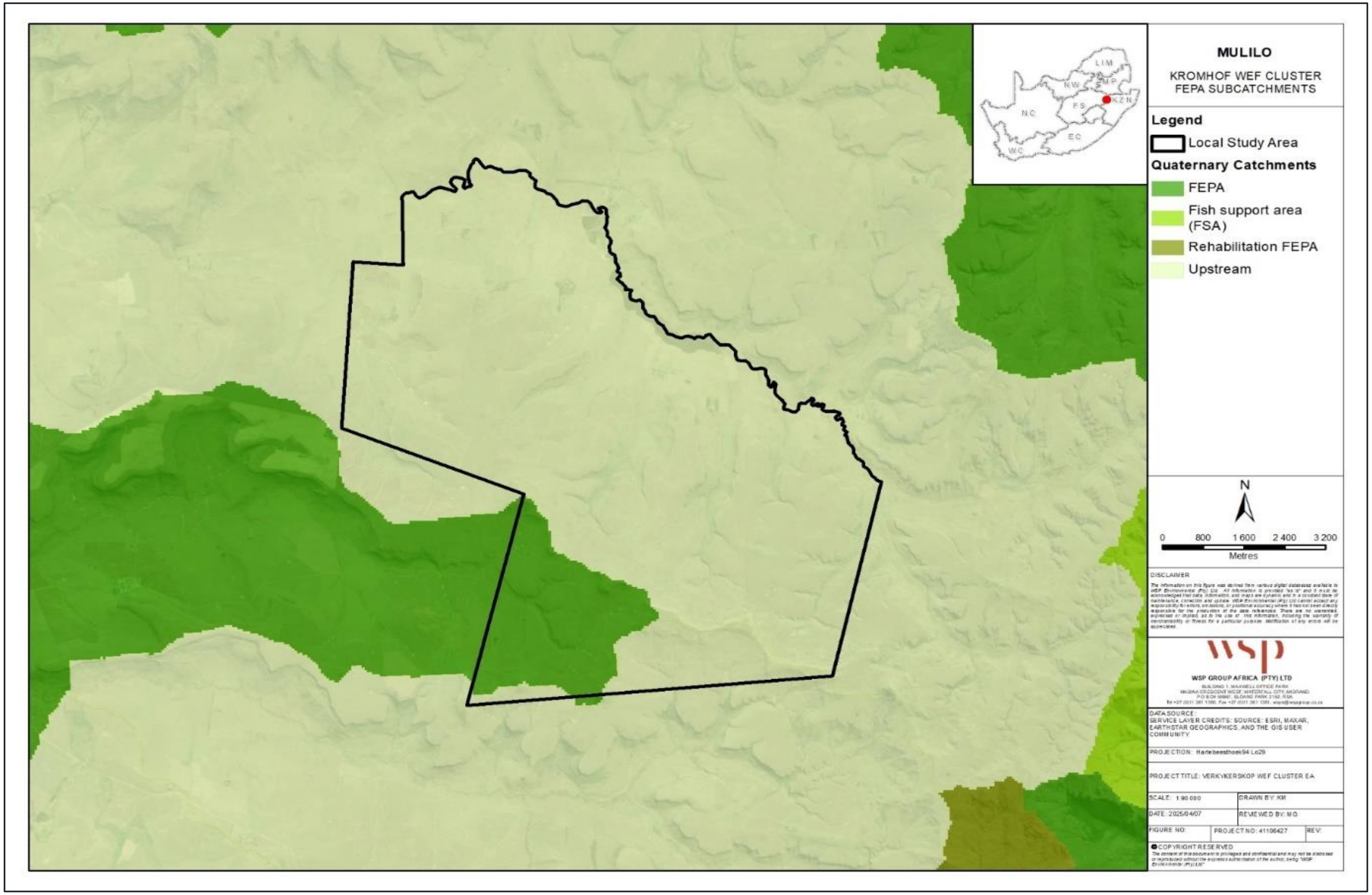

Figure 7-10 - LSA in relation to recognised Freshwater Ecosystem Priority Area.

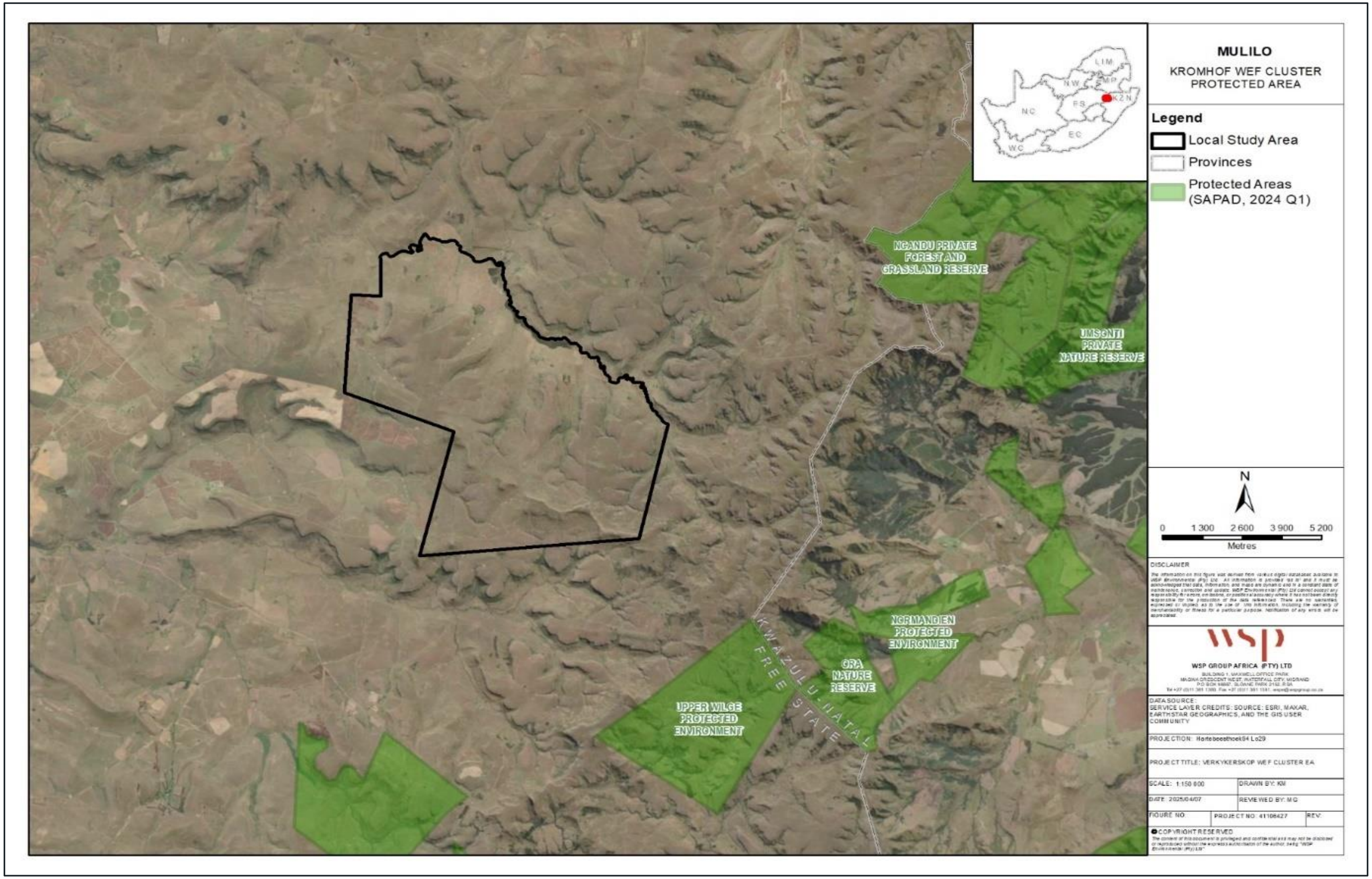

Figure 7-11 - LSA and Protected Areas in the region

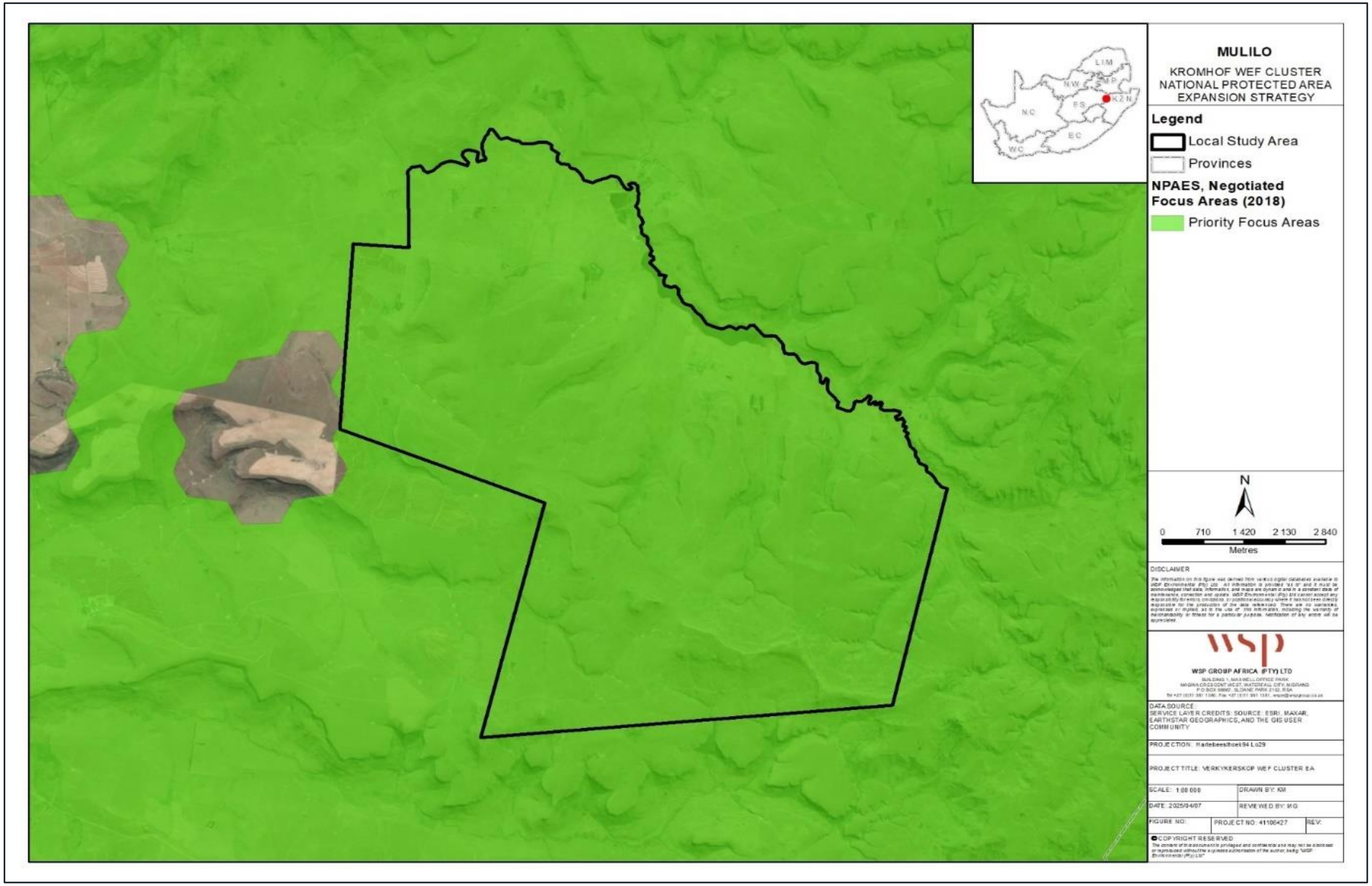

Figure 7-12 - LSA in relation to national Priority Focus Area, as per the National Protected Areas Expansion Strategy (2018).

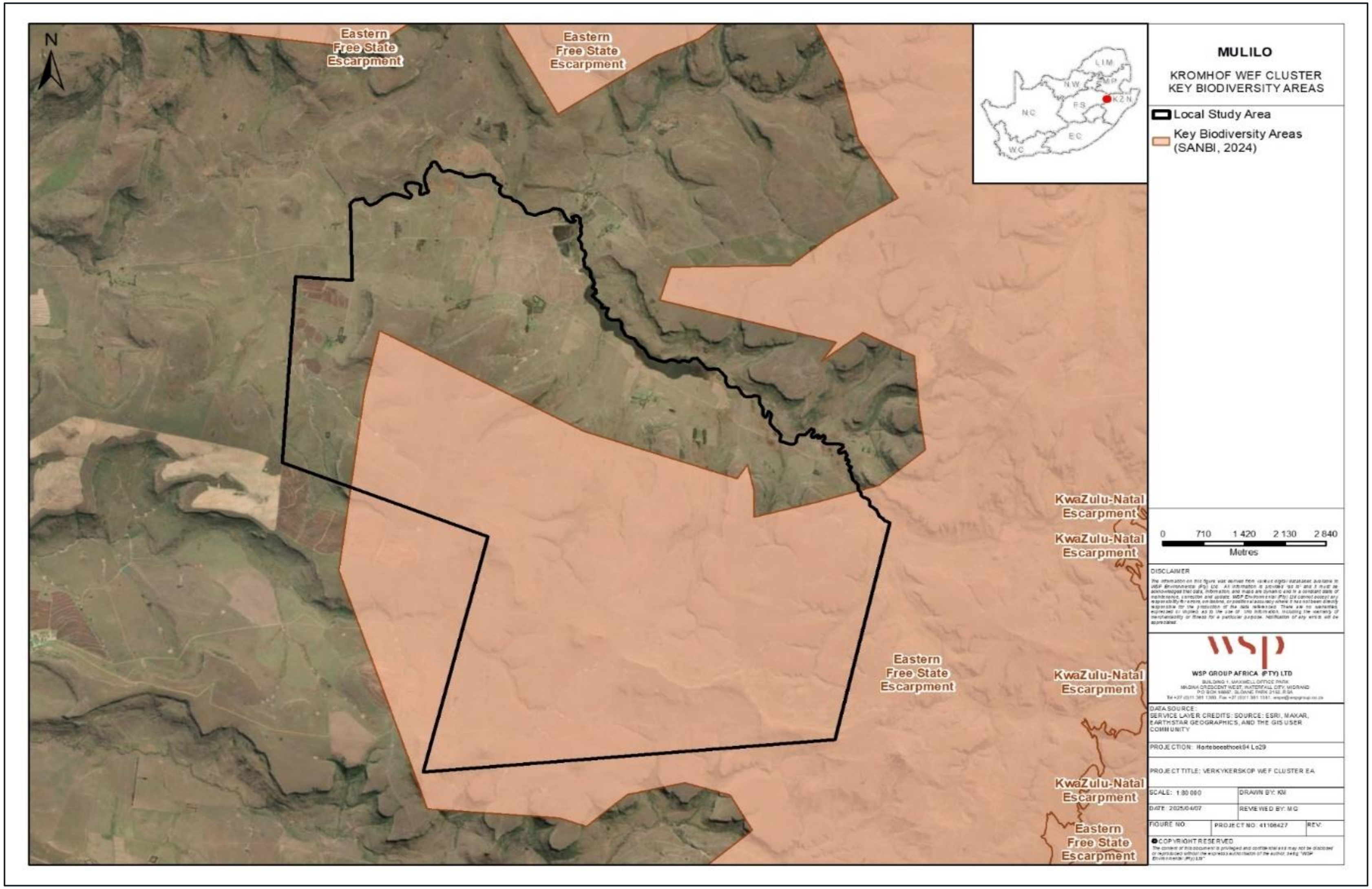

Figure 7-13 - LSA in relation to the Eastern Free State Escarpment Key Biodiversity Area

7.2.1.3 Landscape Context and Existing Impacts on Terrestrial Biodiversity

The following notes describe the general landscape context and major existing impacts (anthropogenic activities and infrastructure) that were observed during the 2025 field programme:

- The RSA is a rural agricultural landscape, characterised by extensive tracts of natural habitat, with localised patches of modified habitat (cultivated fields);
- Outside of crop growing, the primary agricultural land use is livestock farming with cattle and sheep;
- Linear infrastructure in the RSA includes gravel district roads, farms roads, powerlines and farm fences;
- Alien invasive species (AIS) were noted in the RSA; however, they are not abundant and typically colonise disturbed locations, such as the road verges, edges of cultivated field and other degraded locations; and
- Other anthropogenic activities and infrastructure that have resulted in small-scale and localised habitat modification include farm residences and various agriculture structures (barns).

7.2.1.4 Habitat Units in the Study Area

Based on data collected during the field programme, six primary habitat units comprising three natural habitat units and three modified habitat units, were identified across the RSA, and are relevant to the LSA:

- Natural Habitats
    - Natural Dry Grassland;
    - Rocky Shrubland; and
    - Moist Grassland (incl. rivers and streams).
- Modified Habitats
    - Secondary Grassland;
    - Cultivated Fields and Grass Pastures; and
    - Alien Tree Stands.

Habitat units are described in the Terrestrial Biodiversity Impact Assessment Report included in **Appendix G.3**. A habitat unit map for the LSA is shown in **Figure 7-14**.

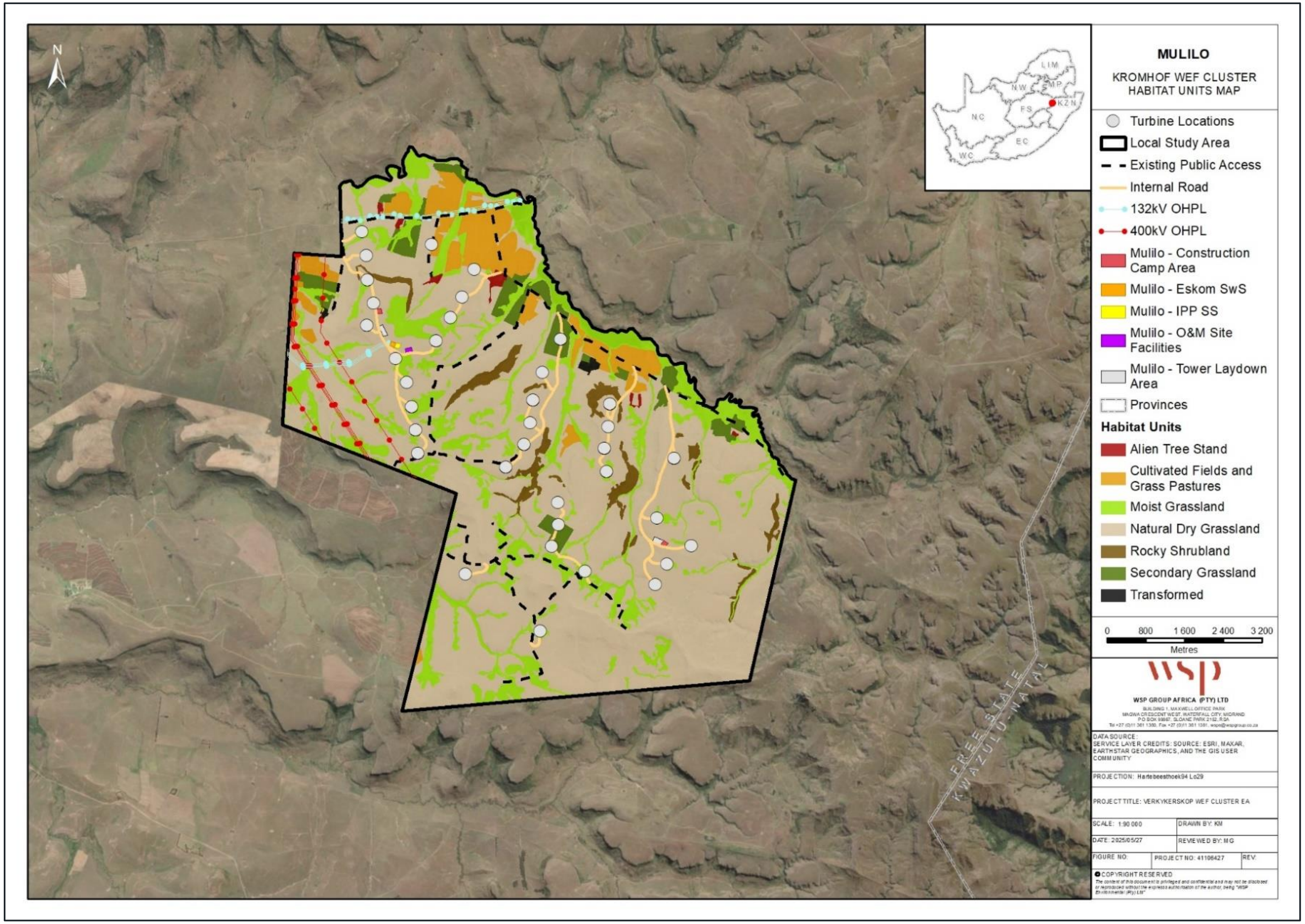

Figure 7-14 - Habitat unit map of the local study area (DEIR assessed layout)

7.2.1.5 Key Ecological Attributes and Processes

Habitat Corridors, Resources and Refugia

The LSA and broader RSA comprise extensive tracts of natural habitat, occurring on a highly varied topography that is characterised by low hills and mountains that are bisected by various drainage features. Areas of modified habitat (mostly Cultivated Fields) are present, but these are mostly confined to low-lying areas, where deeper soils facilitate crop production.

Prominent linear infrastructure noted during the field programme include gravel district roads, farms roads and tracks, as well as numerous farm fences. Although these linear features have caused some degree of habitat fragmentation, overall habitat connectivity remains very high due to the extensive areas of undisturbed natural habitat.

The Rocky Shrubland habitat unit is characterized by acute altitudinal changes, exposed rocks, and indigenous woody vegetation, which in the general grassland-dominated habitat matrix, significantly increases habitat heterogeneity and provides diverse micro-habitats for flora and fauna.

Amongst other impacts, the proposed Project will impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as inter alia, wildfire patterns, fauna movement and foraging, and flora propagule dispersal.

Dynamic Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on the character of terrestrial vegetation and flora.

- Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfires have several key ecological effects with respects to terrestrial biodiversity, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores;
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for flora and fauna populations. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences), and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources.

Fire is considered an important driver of change. It is anticipated that the proposed Project may result in altered wildfire patterns due to increased habitat fragmentation. It is also possible however, that the number of accidental fires initiated from proposed on-site Project infrastructure may increase. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

- Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity (Scholes, 2009). Excessive cattle grazing and trampling can also cause soil erosion and gulley formation and modify and homogenise vegetation structure.

Livestock grazing and trampling are considered important drivers of change. However, it is unlikely to that proposed Project activities will alter livestock grazing patterns.

Alien Invasive Species Colonisation

Several alien invasive plant species were recorded on-site during the field programme. These have the potential to spread into areas of natural habitat, where they may competitively exclude many indigenous species. This will have several deleterious impacts on the integrity and function of these habitats, such as inter alia:

- A loss of natural habitat and floristic diversity, with the resulting habitat patches unable to support diverse flora and fauna communities;
- A reduction in grass productivity for grazing herbivores, and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change, and one capable of negatively impacting terrestrial biodiversity

7.2.1.6 General Sensitivity and Site Ecological Importance

The ecological importance (SEI) of identified habitat units in the LSA were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology). The results of the assessment are presented in Table 6 and shown in Figure 25.

To assess the overall ecological sensitivity of the LSA, additional regional factors were also considered, as discussed below:

- Biodiversity Significance: Significant portions of the LSA are delineated as CBA 1 and CBA 2, with remaining areas mapped as either ESA 1 or ESA 2. These areas are crucial to meeting provincial targets for biodiversity patterns and ecological processes, and their continued conservation is therefore important;
- Threatened Vegetation Types: Eastern Free State Grassland, which dominates the LSA, is not considered a threatened vegetation type at a national level, according to NEMBA Threatened Ecosystems (2021). It is however, considered to be Vulnerable at a provincial level, according to the Free State Biodiversity Sector (Collins, 2024). Natural habitat should therefore, in general, be managed as sensitive and any potential negative impacts should be minimised; and
- Watercourse/Wetland Importance: Water courses and wetlands (discussed under the Moist Grassland habitat unit in this report) are functionally important from both a hydrological and biodiversity perspective, and delineated wetlands (refer to the wetland specialist study report) are subject to restrictions with respects to infrastructure development.

Based on these considerations, the findings of this specialist assessment confirm the 'Very High' sensitivity rating of the DFFE screening tool for the LSA.

Table 7-4 – Site Ecological Importance of habitat unit

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Natural Dry Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species (=Khadia carolinensis, VU A3c) >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Limited road network between intact habitat patches. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Rocky Shrubland on Hillsides and Ridges	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
		Only minor current negative ecological impacts (livestock grazing).			
Secondary Grassland	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past and current impacts (=ploughing).	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	LOW
Cultivated Fields	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Stands	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

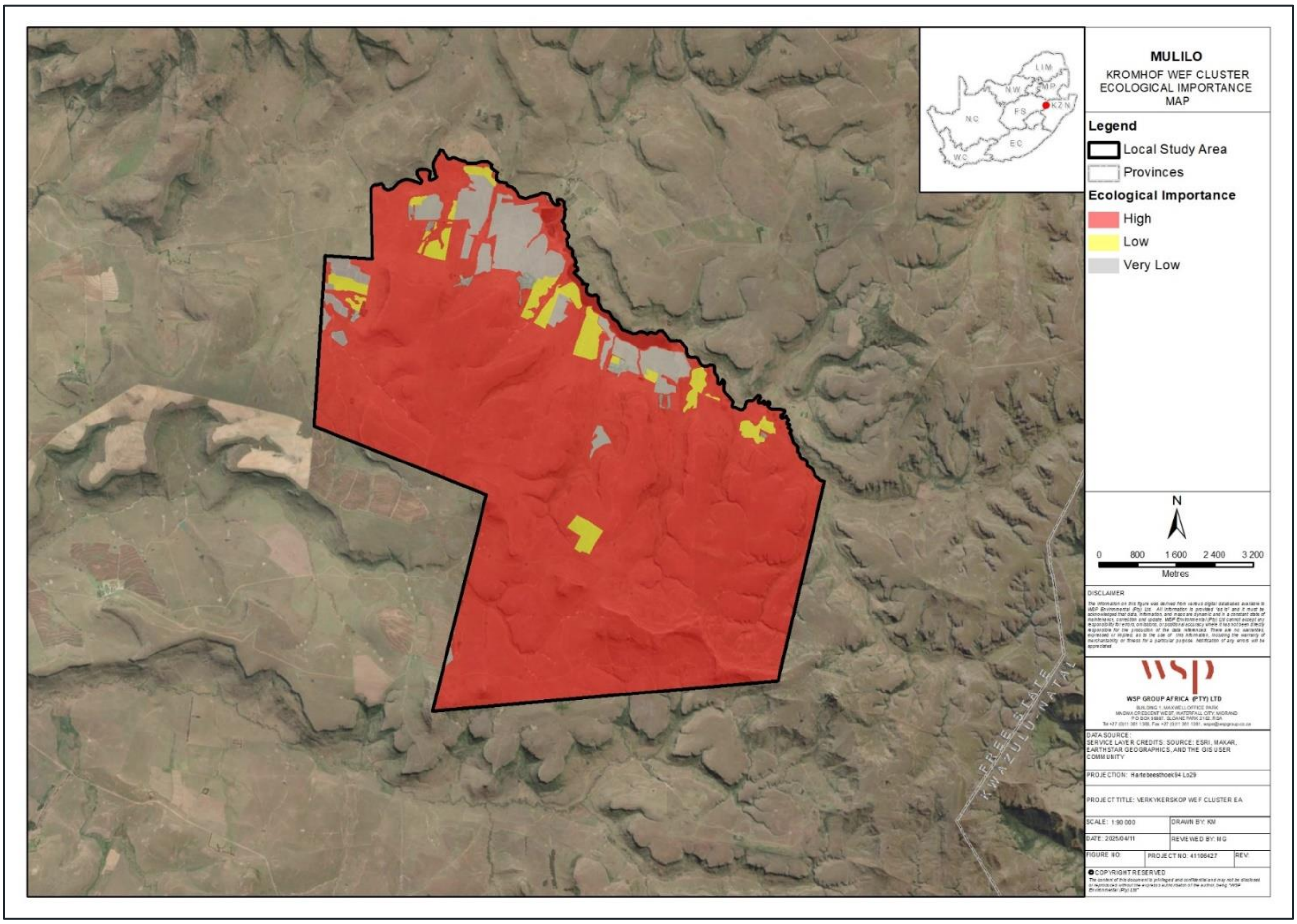

Figure 7-15 - Habitat unit map of the local study area

7.2.2 AQUATIC BIODIVERSITY

The following is extracted from the Aquatic Biodiversity Assessment compiled by WSP and included as Appendix G.4.

The proposed Project falls within the quaternary catchment C81L of the Vaal Water Management Area (WMA). The two main rivers draining this quaternary catchment are Meul River and Dwaalspruit. These rivers drain the northern and southern portions of the project area respectively.

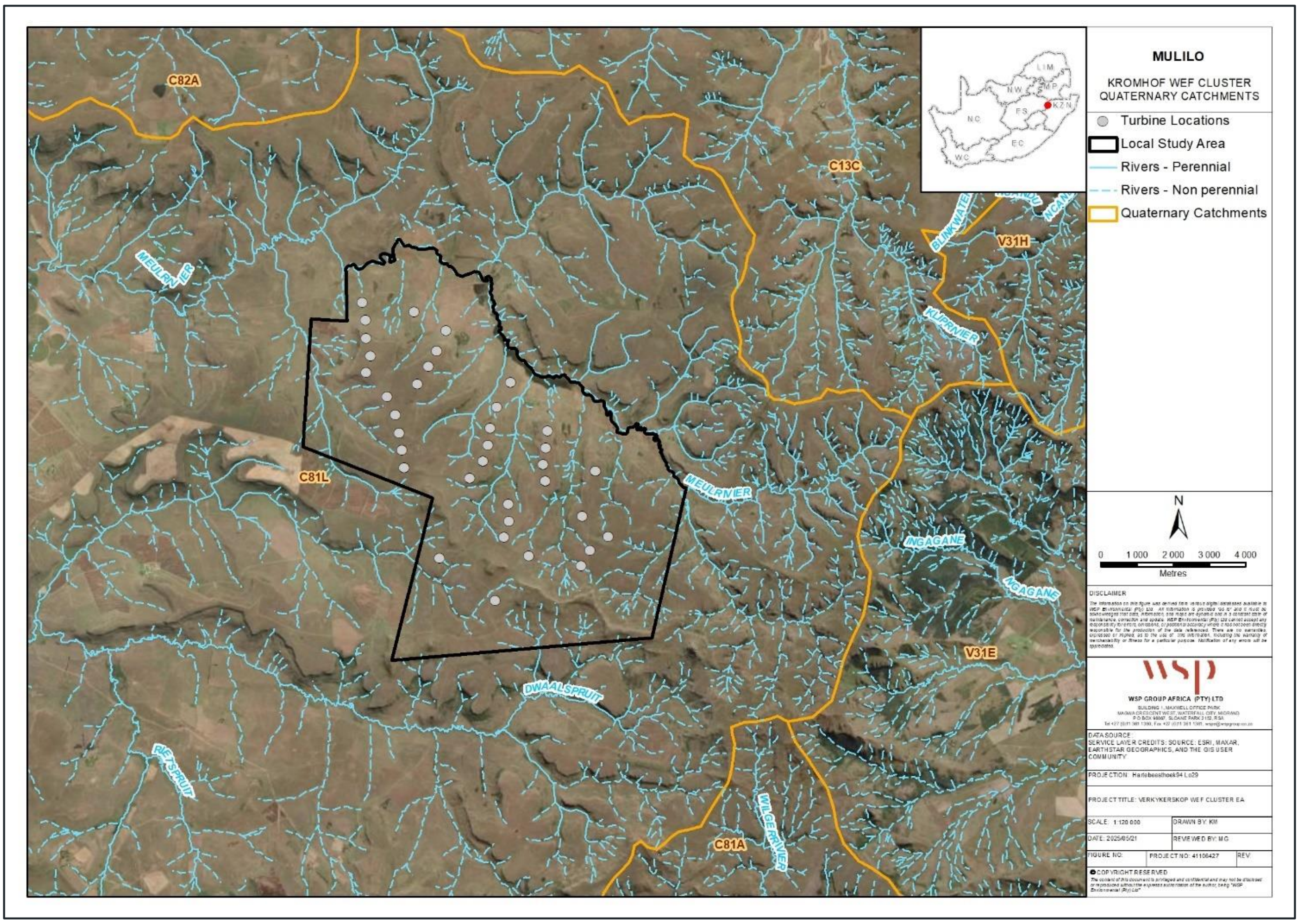

Figure 7-16 - Quaternary catchments and drainage lines associated with the proposed Project

7.2.2.1 National Freshwater Ecosystem Priority Areas (NFEPA)

The Atlas of Freshwater Ecosystem Priority Areas in South Africa (Nel et al, 2011a) (The Atlas) which represents the culmination of the National Freshwater Ecosystem Priority Areas project (NFEPA), a partnership between SANBI, CSIR, WRC, DEA, DWA, WWF, SAIAB and SANParks, provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources.

Freshwater Ecosystem Priority Areas (FEPA's) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. The Atlas incorporates the National Wetland Inventory (NWI Wetlands) (SANBI, 2011) to provide information on the distribution and extent of wetland areas. River, wetland and estuarine FEPAs should be regarded as significant water resources, and should be regarded as ecologically important and as generally sensitive to changes in water quality and quantity, owing to their role in protecting freshwater ecosystems and supporting sustainable use of water resources.

7.2.2.2 Wetland FEPAs

Both wetland FEPA's and FEPA wetland clusters overlap with the project area. The aim of identifying wetland clusters is to determine wetlands that exist within a relatively natural landscape in which dispersal between wetlands can occur (e.g. frogs and invertebrates) due to close proximity between systems.

As such, only non-riverine wetlands were used to identify wetland clusters (channelled valley-bottom wetlands, floodplain wetlands and valley head seeps were excluded in the cluster identification process). Unchanneled valley bottom wetlands were treated as non-riverine wetlands. In many areas of the country, wetland clusters no longer exist because the surrounding land has become too fragmented by human impacts. However, the northern boundary of the project area is located within an identified wetland cluster (**Figure 7-17**). This indicates that the wetland clusters in the project area are considered to exist within a relatively natural landscape, allowing for connectivity between the systems (ecological corridors). The wetland clusters coincide with the Meul River floodplain, which is therefore considered as an important system

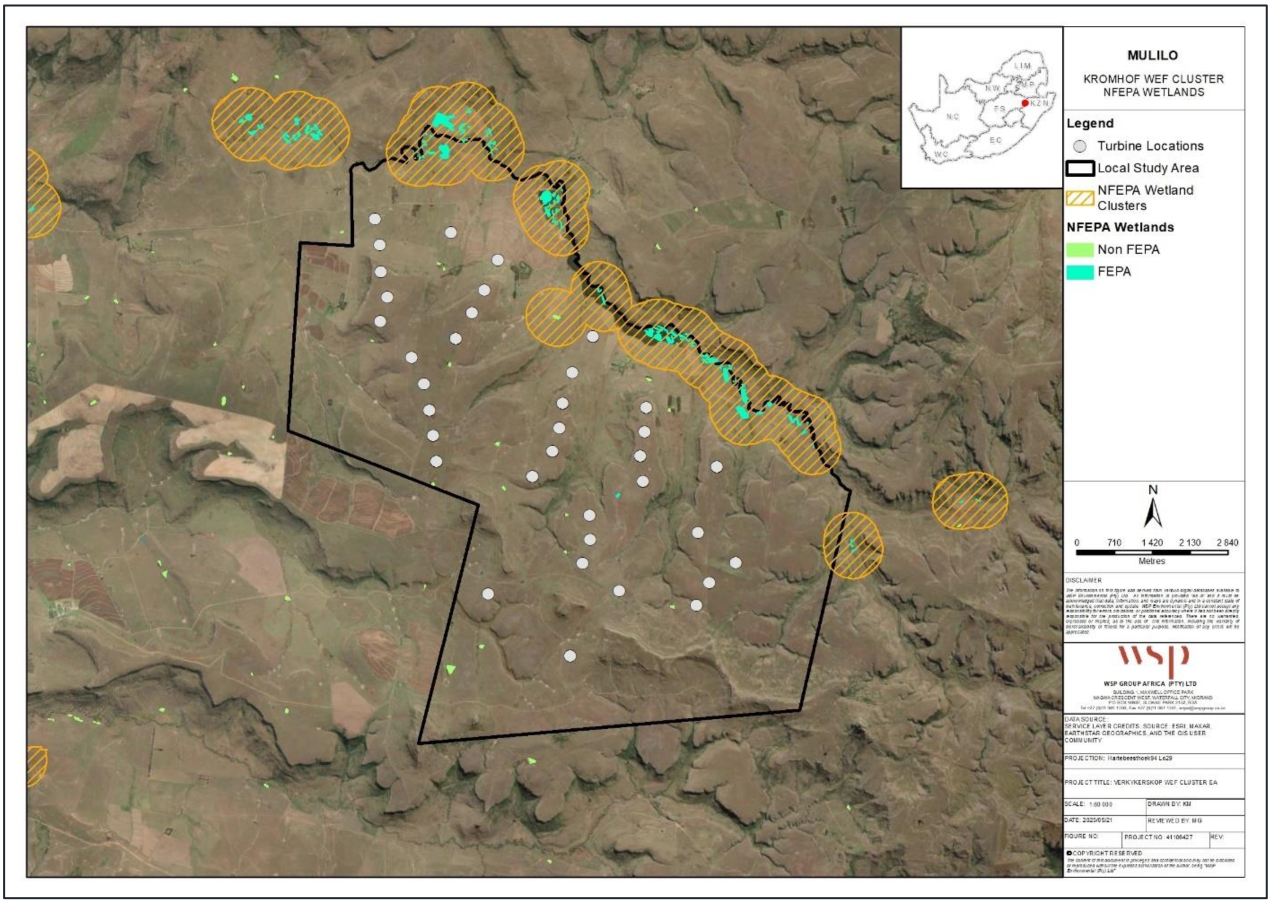

Figure 7-17 - FEPA wetland systems intersecting the Project study area

7.2.2.3 River FEPAs

Riverine Freshwater Ecosystem Priority Area (FEPA) features associated with the proposed Project include river FEPA's and upstream management areas (**Figure 7-18**). Descriptions of these FEPA categories are provided in **Table 7-5**.

Table 7-5 – Descriptions of the different river FEPA features present within the project area

FEPA Category	Description
River FEPA and associated sub-quaternary catchment	River FEPAs achieve biodiversity targets for river ecosystems and threatened/near threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicates that the surrounding land and smaller stream network should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources.
Upstream Management areas	These are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas

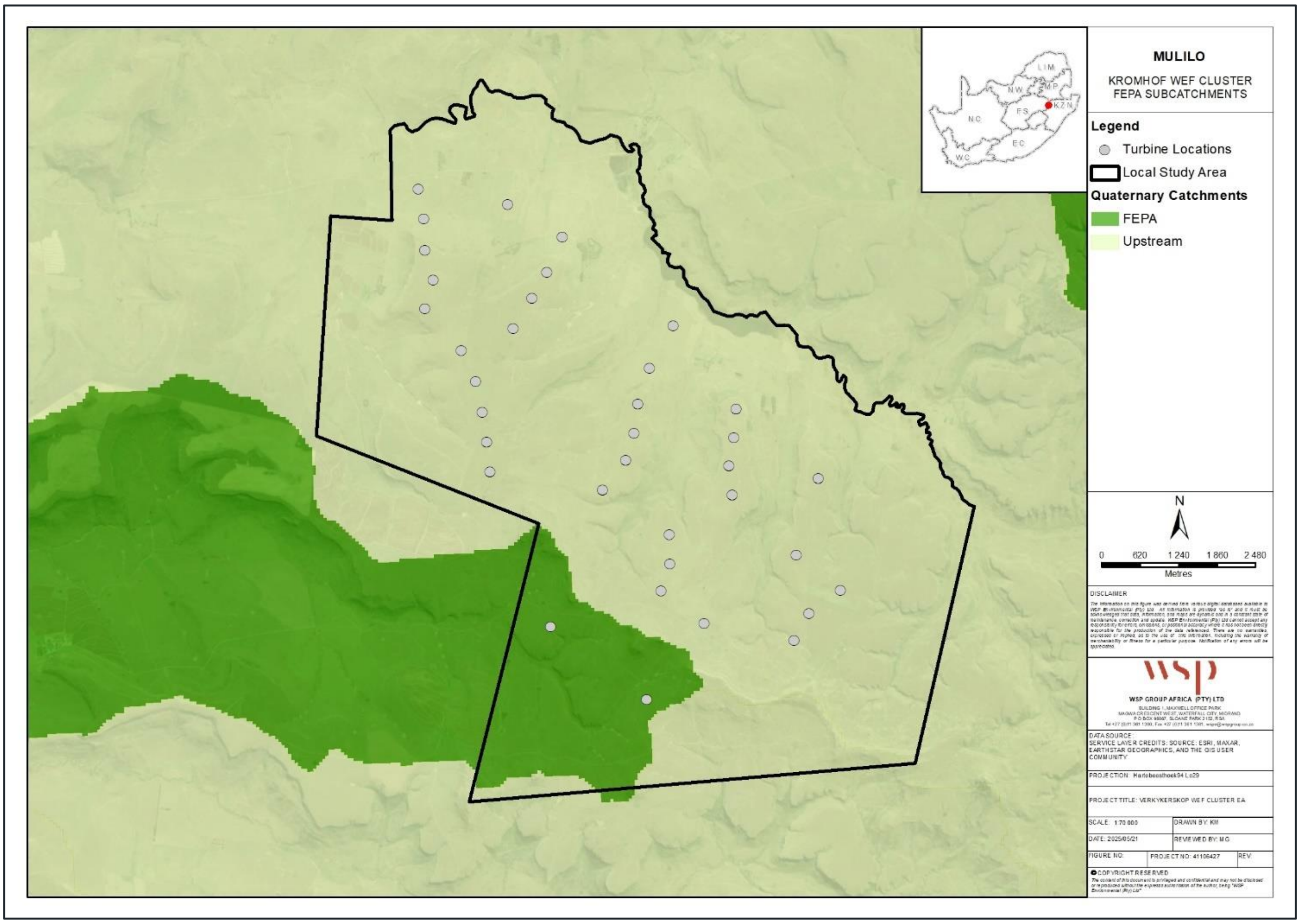

Figure 7-18 – Riverine Freshwater Ecosystem Priority Area map

7.2.2.4 Strategic Water Source Areas (SWSA)

Strategic Water Source Areas (SWSAs) have historically been defined based on the production of relatively large volumes of runoff which sustain lowland areas downstream. SWSAs are areas such as water catchments, which produce disproportionately greater volumes of water per unit area than other areas. These areas either: (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b) (Le Maitre et al., 2018).

The proposed Project Area is situated within the Northern Drakensberg Surface Water SWSA (**Figure 7-19**). The primary objective of SWSAs is to maintain ecosystem functionality across the whole catchment, particularly mindful of activities which impact water quality and quantity (Le Maitre & Lötter, 2021).

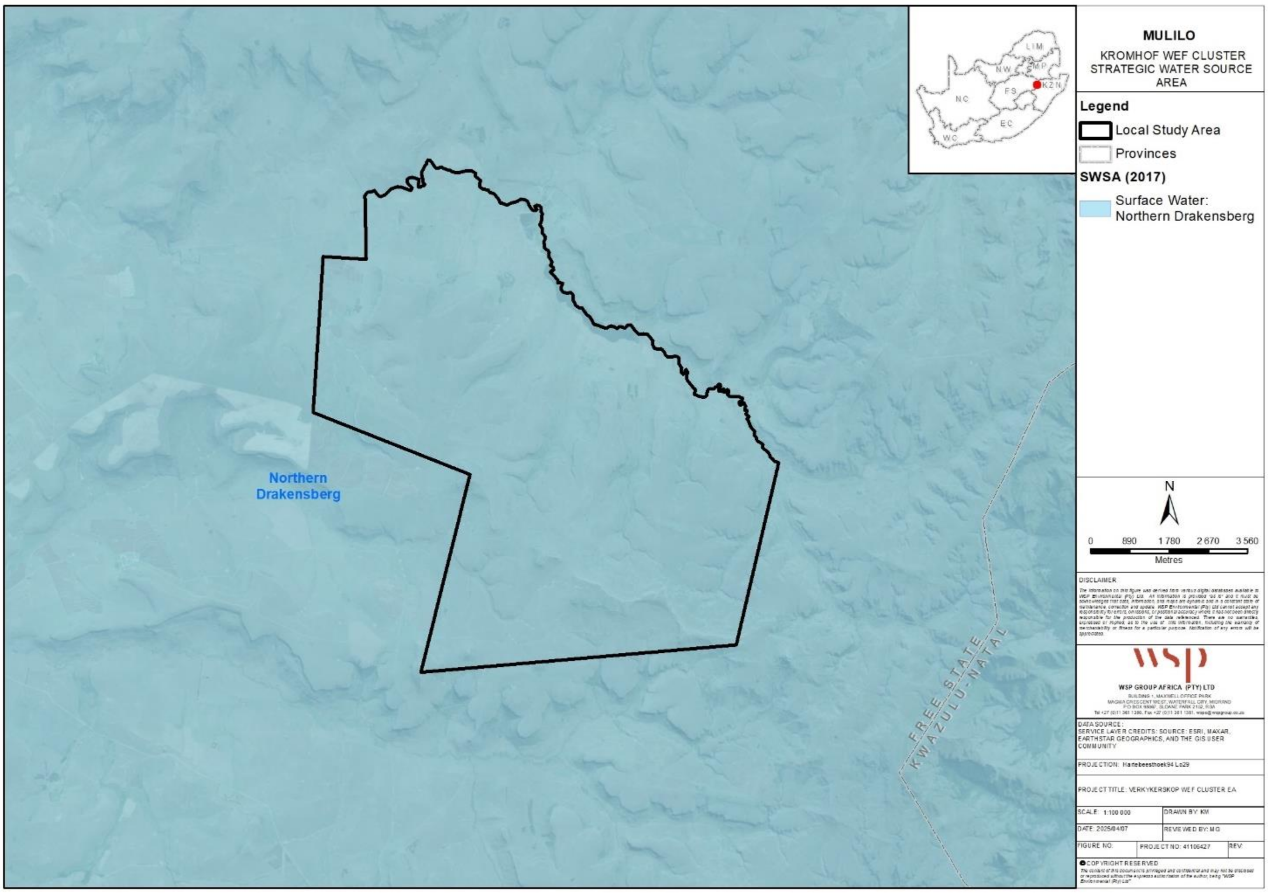

Figure 7-19 - SWSA associated with the proposed Project

7.2.2.5 NATIONAL WETLAND MAP 5 (NWM5)

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa (Van Deventer et al., 2019). The project strives to conserve a sample of freshwater ecosystems and diversity of species as well as the ecosystem processes which generate and maintain diversity (Nel et al., 2011).

The proposed project area in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated in **Figure 7-20**. The NWM5 recognises wetland systems that intersect with the proposed development footprint, particularly along the northern boundary which displays the massive extent of the Meul River floodplain system. It must be acknowledged that the data included in the NWM5 is informed by various spatial datasets that have been compiled at a national and regional scale to inform biodiversity planning at these levels. At a project level, the NWM5 data may be too coarse and requires verification to determine wetland extent and classification accurate at a local scale. The revised wetland extent and classification for the project area based on the site-specific assessment is presented in Section 6.

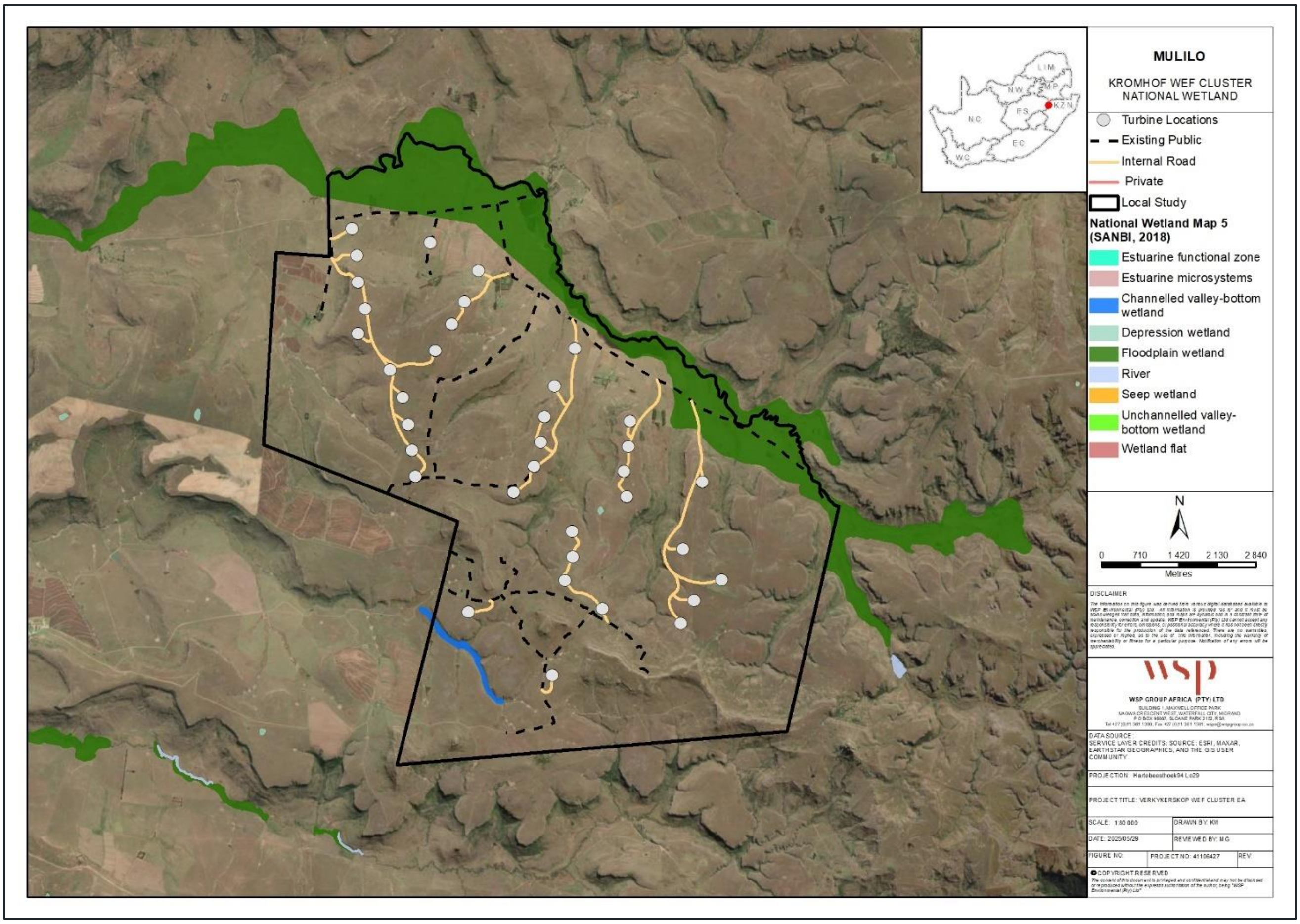

Figure 7-20 - National Wetland Map 5 for the proposed Kromhof project area (DEIR assessed layout)

7.2.2.6 Desktop Present Ecological State, Importance and Sensitivity

The Present Ecological Status (PES) for the Dwaalspruit (SQR C81L-02695) is Largely Natural (Ecological Category B) with an Ecological Importance (EI) and Ecological Sensitivity (ES) class of High respectively. This SQR is expected to host a total of 63 aquatic macroinvertebrates taxa (**Table 7-6**) and only two fish species (**Table 7-8**).

The PES for the Meul River (SQR C81L-02594) is Largely Natural with an EI class of High and an ES class of Very High. This SQR is expected to host a total of 63 aquatic macroinvertebrates taxa (**Table 7-7**) and eight fish species (**Table 7-8**).

The expected macroinvertebrate community assemblage is comprised of taxa with a wide variety of tolerance/sensitivity to water quality and flow conditions, whilst the sensitivities of the expected fish species range from tolerant to moderately intolerant.

It should be noted that the DWS (2016) PESEIS database lists expected biota at catchment level and with the species richness in headwater streams known to be lower compared to downstream reaches (Richardson, 2019), not all the biota was expected at the sampled sites. This was taken into consideration in the determination of biotic integrity in the latter sections of the report.

Table 7-6 –Expected aquatic biota for the Dwaalspruit (SQR C81L-02695 (DWS, 2016)

Family Names		
Turbellaria1,c	Corixidae1,b	Hydraenidae2,b
Oligochaeta1,a	Gerridae1,b	Hydrophilidae1,a
Hirudinea1,a	Blephariceridae5,4	Empididae2,c
Potamonautidae1,c	Hydrometridae2,b	Psephenidae3,d
Atyidae2,a	Naucoridae2,c	Athericidae3,a
Hydracarina2,a	Nepidae1,b	Ceratopogonidae1,b
Perlidae4,d	Pleidae1,b	Chironomidae1,a
Baetidae > 2 sp4,a	Notonectidae1,b	Culicidae1,b
Caenidae2,b	Veliidae/mesoveliidae1,b	Dixidae3,b
Heptageniidae4,d	Ecnomidae2,c	Muscidae1,a
Prosopistomatidae5,d	Planorbinae1,b	Ephydridae
Leptophlebiidae3,b	Hydropsychidae 2 sp2,d	Simuliidae1,c
Tricorythidae3,e	Philopotamidae3,d	Tabanidae1,b
Chlorocyphidae3,b	Thiaridae1,2	Lymnaeidae1,b
Synlestidae/Chlorolestidae2,b	Tipulidae1,b	Ancylidae2,a
Coenagrionidae1,c	Hydroptilidae3,c	Physidae1,b
Lestidae2,b	Ancylidae2,a	Belostomatidae1,b
Aeshnidae2,a	Leptoceridae2,c	Corbiculidae1,b
Corduliidae2,b	Dytiscidae1,b	Sphaeriidae1,b
Gomphidae2,c	Elmidae/dryopidae2,d	Helodidae4,a
Libellulidae1,c	Gyrinidae1,c	

Family Names		
Crambidae4,c	Haliplidae1,b	
Superscript definitions:		
Sensitivity toward water quality modifications: 1=Tolerant; 2=Moderately Tolerant; 3=Moderately Intolerant; 4=Intolerant		
Sensitivity toward no-flow conditions: A=Tolerant; B=Moderately Tolerant; C=Moderately Intolerant; D=Intolerant		

Table 7-7 – Expected aquatic biota for the Meul River SQR C81L-02594 (DWS, 2016)

Family Names		
Turbellaria1,c	Crambidae4,c	Hydrophilidae1,a
Oligochaeta1,a	Belostomatidae1,b	Psephenidae3,d
Hirudinea1,a	Corixidae1,b	Athericidae3,a
Potamonautidae1,c	Gerridae1,b	Blephariceridae5,4
Atyidae2,a	Hydrometridae2,b	Ceratopogonidae1,b
Hydracarina2,a	Naucoridae2,c	Chironomidae1,a
Perlidae4,d	Nepidae1,b	Culicidae1,b
Baetidae > 2 sp4,a	Pleidae1,b	Dixidae3,b
Caenidae2,b	Notonectidae1,b	Empididae2,c
Heptageniidae4,d	Veliidae/mesoveliidae1,b	Ephydridae
Leptophlebiidae3,b	Ecnomidae2,c	Muscidae1,a
Prosopistomatidae5,d	Hydropsychidae 2 sp2,d	Simuliidae1,c
Tricorythidae3,e	Philopotamidae3,d	Tabanidae1,b
Chlorocyphidae3,b	Hydroptilidae3,c	Tipulidae1,b
Synlestidae/Chlorolestidae2,b	Leptoceridae2,c	Ancylidae2,a
Coenagrionidae1,c	Dytiscidae1,b	Lymnaeidae1,b
Lestidae2,b	Elmidae/dryopidae2,d	Physidae1,b
Aeshnidae2,a	Gyrinidae1,c	Thiaridae1,2
Corduliidae2,b	Haliplidae1,b	Planorbinae1,b

Family Names		
Gomphidae2,c	Helodidae4,a	Corbiculidae1,b
Libellulidae1,c	Hydraenidae2,b	Sphaeriidae1,b
Superscript definitions:		
Sensitivity toward water quality modifications: 1=Tolerant; 2=Moderately Tolerant; 3=Moderately Intolerant; 4=Intolerant		
Sensitivity toward no-flow conditions: A=Tolerant; B=Moderately Tolerant; C=Moderately Intolerant; D=Intolerant		

Table 7-8 – Expected fish species per river reach of focus and their conservation status

Fish Species	Common Name	IUCN Status	Dwaalspruit	Meul River
Austroglanis sclateri	Rock Catfish	Least Concern		●
Clarias gariepinus	Sharptooth catfish	Least Concern		●
Enteromius anoplus	Chubbyhead Barb	Least Concern	●	●
Enteromius pallidus	Goldie Barb	Least Concern	●	●
Enteromius paludinosus	Straightfin barb	Least Concern		●
Labeo capensis	Orange River Mudfish	Least Concern		•
Labeo umbratus	Moggel	Least Concern		●
Labeobarbus aebeus	Smallmouth yellowfish	Least Concern		●

7.2.2.7 Wetland importance and sensitivity (IS) assessment

The ecological importance of a wetland is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has been impacted (Kleynhans et al., 1998). The IS assessment considers biodiversity, rarity, uniqueness and fragility of the resource. The intrinsic ecological value of the resource and its importance to the functioning of neighbouring ecosystems are the main concerns. Further considerations that informed the IS assessment include:

The location of the study area within a vegetation type - Eastern Free State Sandy Grassland - listed as Vulnerable in the Free State Biodiversity Sector Plan (2024).

- The Critical Biodiversity Area for the Greater Free State
- The loss of natural vegetation and habitats due to current and past cultivation within the wetlands.
- The types of wetland present, and the condition and potential functionality of the systems.

The IS assessment for the study area wetlands was conducted for all HGM units potentially affected by the proposed infrastructure (those falling within 500m of the proposed infrastructure footprints) with the results illustrated in **Figure 7-21**.

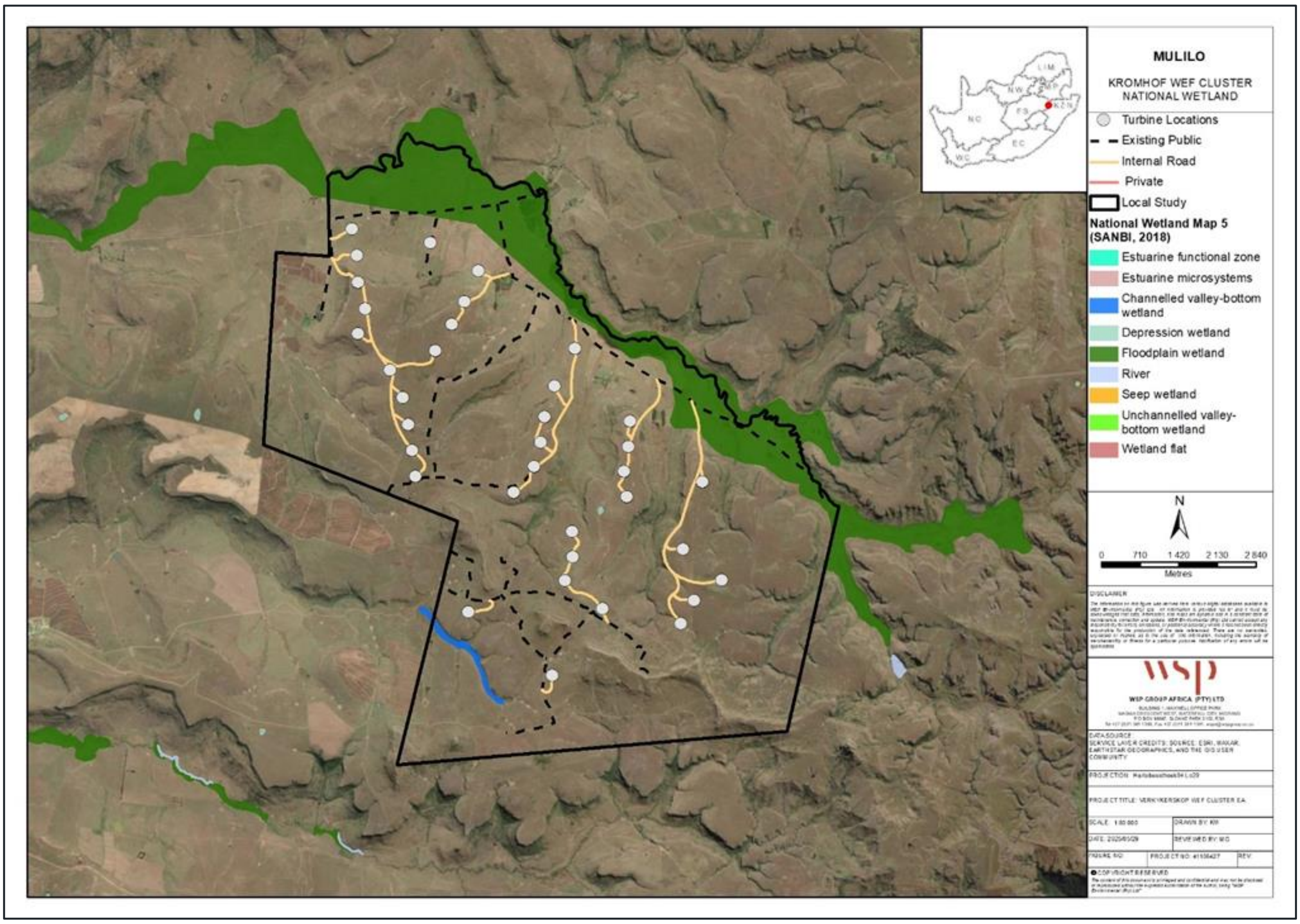

Figure 7-21 - IS of the wetlands within the Kromhof project area (DEIR assessed layout)

7.2.2.8 Wetland Present Ecological State

The outcomes of the PES assessment found the wetlands to currently lie along a spectrum of modification, ranging from pristine/natural (Category A) to largely modified (Category D). The majority of wetlands were found to range from natural to largely natural systems (PES categories A to B). Given the position of these wetlands towards the upper ends of the catchments, with limited significant landuse change, this outcome is anticipated.

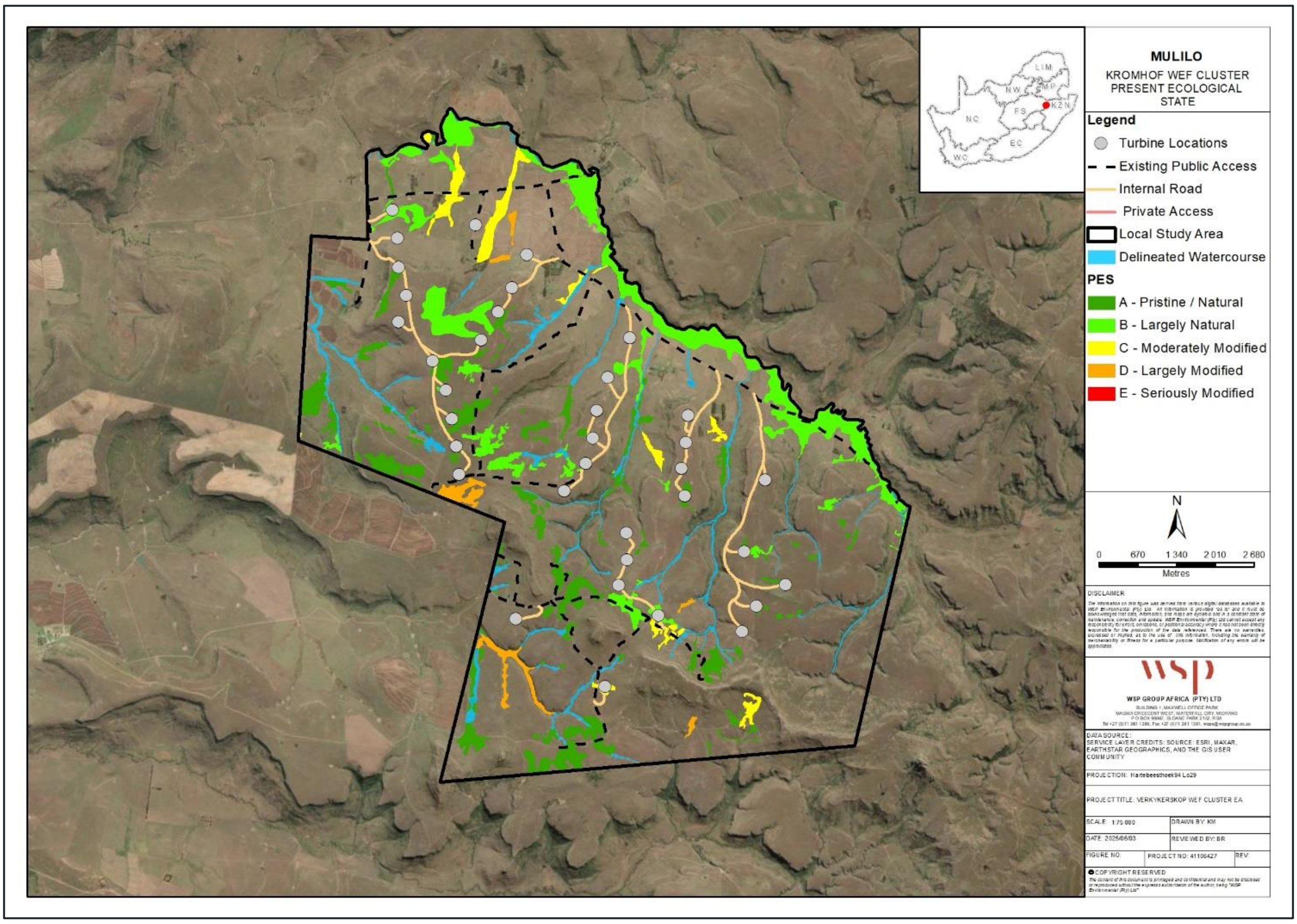

Figure 7-22 - PES of the wetlands within the Kromhof project area (DEIR assessed layout)

7.2.2.9 Wetland Importance and Sensitivity (IS) Assessment

The IS assessment for the study area wetlands was conducted for all HGM units potentially affected by the proposed infrastructure (those falling within 500m of the proposed infrastructure footprints) with the results illustrated in Figure 6-8.

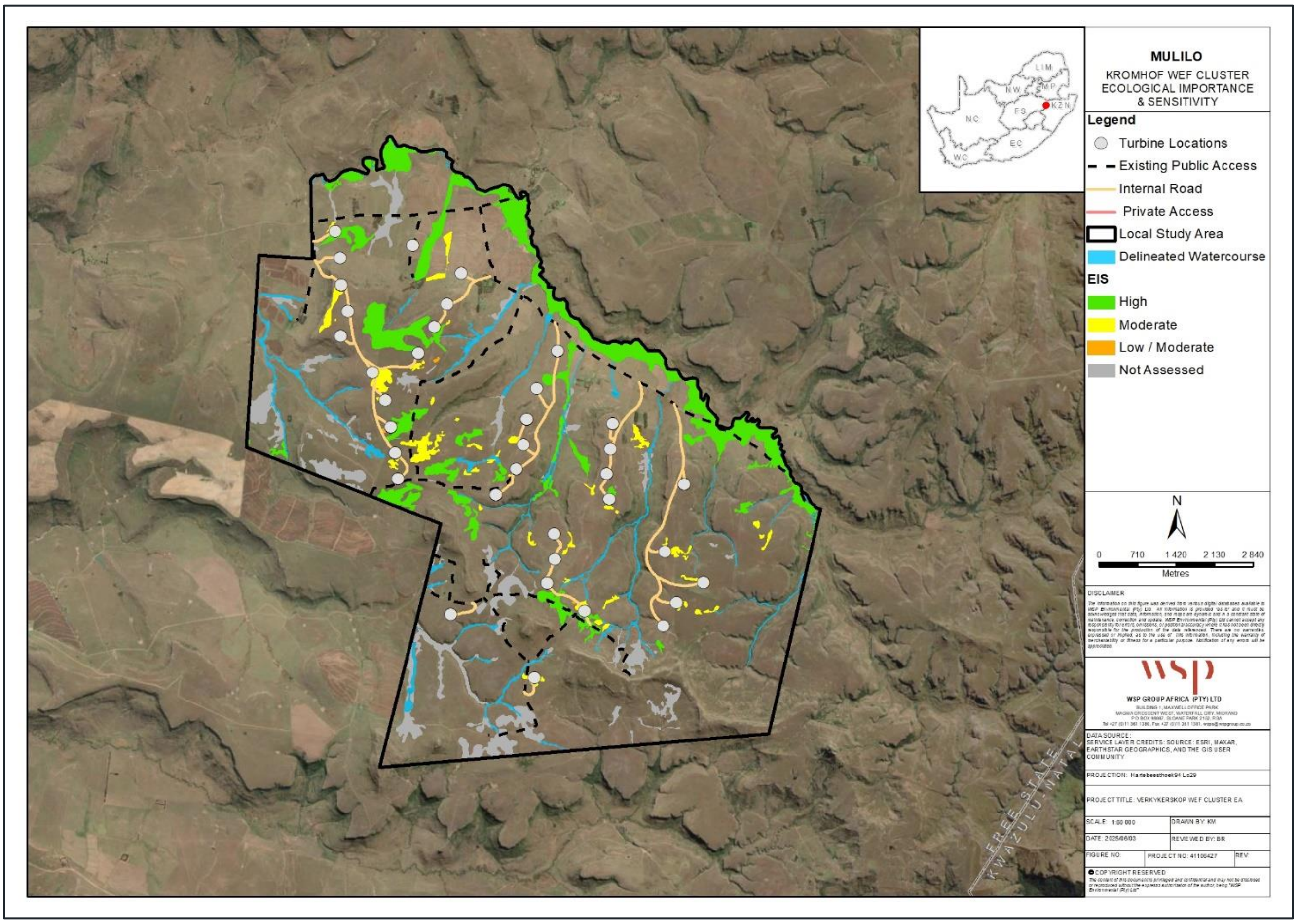

Figure 7-23 - PES of the wetlands within the Kromhof project area (DEIR assessed layout)

7.2.3 PLANT SPECIES

The following is extracted from the Terrestrial Biodiversity Specialist Assessment compiled by Hawkhead Consulting and included as Appendix G.5.

7.2.3.1 Habitat Units

Based on data collected during the field programme, six primary habitat units comprising three natural habitat units and three modified habitat units, were identified across the Regional Study Area (RSA), and are relevant to the Local Study Area (LSA):

Natural Habitats

- Natural Dry Grassland;
- Rocky Shrubland;
- Moist Grassland (incl. rivers and streams);

Modified Habitats

- Secondary Grassland;
- Cultivated Fields and Grass Pastures; and
- Alien Tree Stands.

Habitat units are described, with accompanying photographs, in the sections below. A habitat unit map for the LSA is shown in **Figure 7-23**.

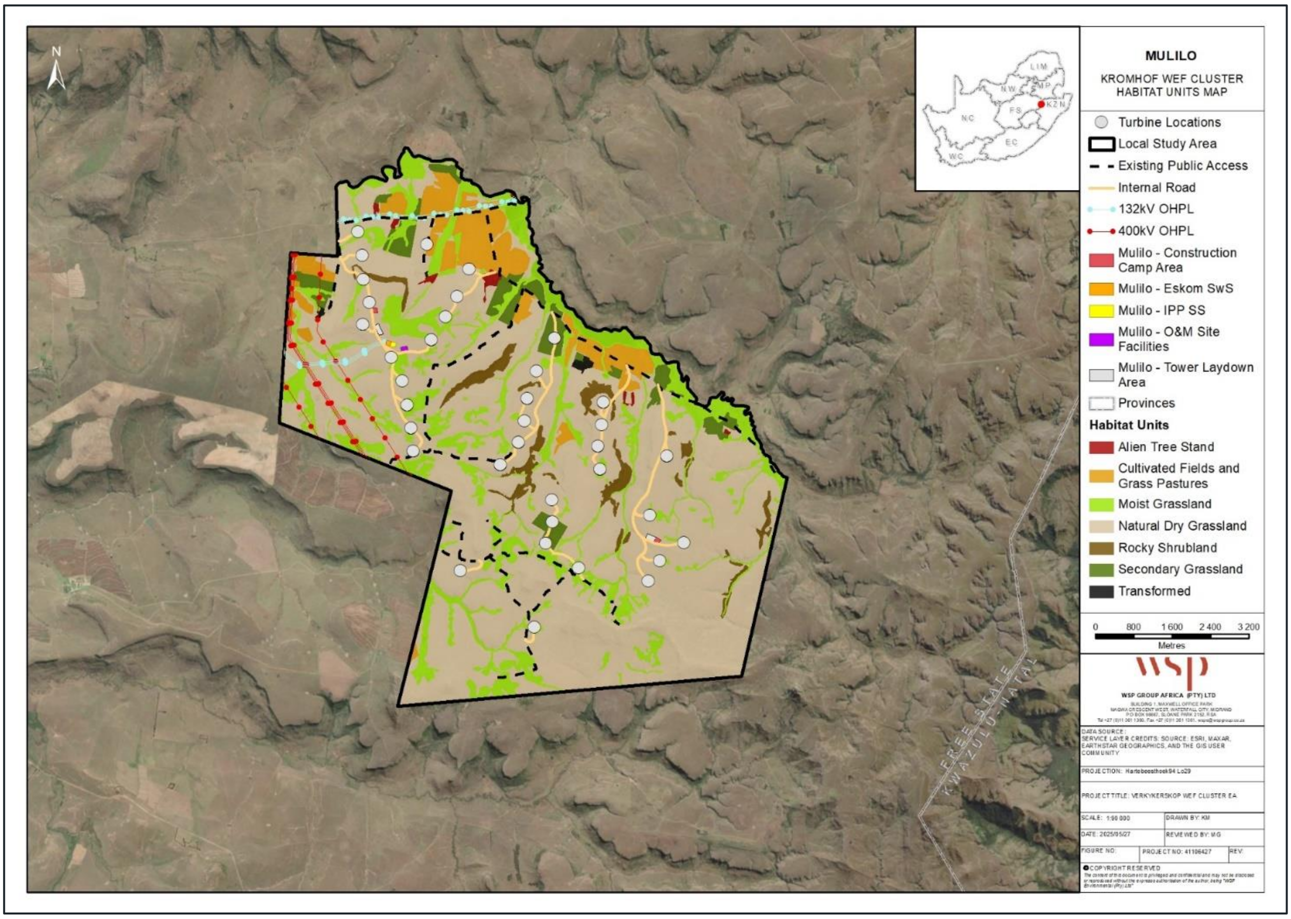

Figure 7-24 - PES of the wetlands within the Kromhof project area (DEIR assessed layout)

Natural Dry Grassland

This is a large and variable habitat unit that covers the extensive rolling hills of the RSA. Structurally, vegetation is characterised by low closed grassland, as per Edwards (1983) structural classification.

Natural Dry Grasslands are characterised by a diverse flora assemblage, comprising a mixture of grasses and forb/herb species. Common grasses recorded include *inter alia*; various *Eragrostis* species such as *Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana* and *Eragrostis racemosa,* as well as *Aristida junciformis, Cymbopogon pospischilii, Sporobolus africanus, Themeda triandra* and *Tristachya leucothrix.*

Common herbs/forbs recorded include *inter alia*; *Berkheya onopordifolia, Berkheya setifera, Commelina africana, Helichrysum nudifolium* var*. nudifolium, Helichrysum rugulosum, Hilliardiella elaeagnoides and Richardia brasiliensis*.* Woody species generally occur at low abundances and as scattered individual small trees and shrubs, with denser woody aggregations present in transition areas between Natural Dry Grassland and areas of Rocky Shrubland. Common woody species recorded include *Diospyros lycioides* subsp. *lycioides, Leucosidea sericea, Searsia dentata, Searsia discolor* and *Seriphium plumosum* (*denotes an alien species).

Common declared alien invasive species recorded in this unit include *Verbena bonariensis* and *Verbena rigida.* Both taxa are listed as NEMBA Category 1b alien invasive species. For a list of all flora species recorded in this habitat unit during the field programme refer to Appendix C.

Sensitivity Aspects

- Natural Dry Grassland is a natural habitat unit, with generally low levels of disturbance;
- Extensive intact tracts of grassland are present and provide important habitat for a variety of flora and fauna. These areas also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, inter alia, flora and fauna movement and dispersal;
- Although not recorded in the LSA, one Red List flora species, namely Khadia carolinensis (Vulnerable) was recorded in this habitat unit in the broader RSA (recorded in the Normandien WEF Project site). Habitat suitability assessments also suggest that several additional Red List flora species may also be present in this habitat unit;
- Several provincially Protected flora taxa were recorded in areas of Natural Dry Grassland; and
- Natural Dry Grasslands are therefore considered to have floristic importance and sensitivity.

Figure 7-25 - Typical Natural Dry Grassland.

Figure 7-26 -: Extensive tracts of intact Natural Dry Grassland are present on-site.

Rocky Shrubland

Rocky Shrubland characterises many of the rocky hillsides, slopes and valleys in the RSA. Vegetation structure is variable and strongly dependent on aspect. As per Edwards (1983) structural classification, tall- to high closed shrubland characterises the cooler and moister south-facing hillsides and ridges, as well as the deeper valley areas. A more open vegetation structure, approximating tall open shrubland, typically occurs on the drier north-facing hillsides and ridges.

Compositionally, *Leucosidea sericea* is the dominant woody species in this unit and is particularly prevalent on moist south-facing hillsides and in certain valleys, where it often forms dense, almost mono-specific stands. *Leucosidea sericea* is a common bush encroacher that typically increases in abundance in response to high levels of livestock grazing. This species is generally less abundant on north-facing slopes, with other woody taxa more evident, including *Diospyros lycioides* subsp. *lycioides, Euclea crispa, Searsia dentata, Searsia pallens* and *Searsia pyroides.*

Other less abundant woody species recorded in this unit include *inter alia*; *Buddleja salviifolia, Calpurnia aurea, Cussonia paniculata, Halleria lucida, Gymnosporia buxifolia, Kiggelaria africana, Myrsine africana, Protea roupelliae* and *Rhamnus prinoides.*

Common species recorded in the herbaceous layer include various grasses, such as *Digitaria eriantha Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Eragrostis racemosa* and *Sporobolus africanus,* as well as forbs, such as *inter alia*; *Acalypha angustata, Berkheya setifera, Hermannia transvaalensis* and *Hermannia depressa.*

Declared alien invasive species recorded in this unit include *Cotoneaster franchetii* and *Opuntia ficus-indica.* Both taxa are listed as NEMBA Category 1b alien invasive species. For a list of all flora species recorded in this habitat unit during the field programme refer to Appendix C of the study.

Sensitivity Aspects

- Rocky Shrubland is a natural habitat unit, with generally low levels of disturbance;

- In the grassland dominated habitat matrix, this well-wooded and rocky habitat unit significantly increases landscape-scale habitat heterogeneity, and provides important corridor and refugia habitat for a variety of flora and fauna;
- No national Red List flora species were recorded in this habitat unit. However, habitat suitability assessments suggest that several flora SCC may be present; and
- This habitat unit therefore is considered to have floristic importance and sensitivity

Figure 7-27 - South-facing hillside, dominated by *Leucosidea sericea*

Figure 7-28 - Rocky Shrubland below a rocky ridge/cliff face.

Moist Grassland

This is a broad habitat unit that encompasses the range of drainage features across the RSA, including rivers and stream channels, as well as other wetland type habitats.

In typical moist grassland habitat, vegetation structure typically comprises low- to tall closed grassland. Along certain river/stream sections that are characterised by an increase in woody taxa, vegetation structure ranges from tall-open shrubland to short-closed woodland (*sensu*. Edwards, 1983).

Common graminoid species along recorded include various reed, grass and sedge species, such as *Agrostis eriantha, Andropogon appendiculatus, Aristida junciformis, Cyperus congesta, Eragrostis curvula, Eragrostis gummiflua, Eragrostis plana, Leersia hexandra, Miscanthus junceus, Panicum schinzii, Paspalum distichum, Paspalum dilatatum**, *Phragmites australis, Scirpoides burkei, Setaria sphacelata, Themeda triandra* and *Typha capensis.* Common forbs recorded in this habitat unit include *inter alia*; *Centella asiatica, Commelina africana, Chironia palustris, Gunnera perpensa, Helichrysum aureonitens, Helichrysum mundtii, Oenothera roseus**, *Rumex crispus** and *Trifolium repens**.

Common woody species occurring along rivers and streams include *Leucosidea sericea* (which can be dominant), as well as *Salix mucronata, Searsia pyroides* and the alien's *Salix babylonica, Populus* x *canescens* and *Populus nigra* trees. For a list of flora species recorded in this habitat unit during the field programme refer to Appendix C.

Declared alien invasive species recorded in this unit include *inter alia*; *Cirsium vulgare*, *Populus* x *canescens, Solanum sisymbriifolium* and *Verbena bonariensis.* Apart from *Populus* x *canescens*, which is listed as NEMBA Category 2, these taxa are all listed as Category 1b alien invasive species.

Sensitivity Aspects

- Moist Grassland is a natural habitat unit, with varying levels of anthropogenic disturbance mostly associated with historic cultivation and alien species establishment;
- Moist Grassland and associated watercourses habitats (rivers and streams) play a crucial role in maintaining terrestrial biodiversity, ecological processes and the hydrological functioning (e.g., filtration and flood attenuation) of the landscape;
- These habitats significantly increase landscape-scale habitat connectivity and thus provide important ecological corridors;
- No national Red List species were recorded in this habitat unit; however, several provincially Protected flora species were recorded, and habitat suitability assessments also suggest that several flora SCC are likely to be present; and
- Moist Grassland and the associated watercourse habitats are therefore considered to have floristic importance and sensitivity.

Figure 7-29 - Typical moist grassland habitat.

Figure 7-30 - Broad open water body.

Figure 7-31 - Rocky mountain stream, flanked by *Leucosidea sericea* trees.

Figure 7-32 - Stream flanked by Salix mucronata trees and moist grassland.

Secondary Grassland

Secondary Grassland habitat characterises former cultivated fields that have been abandoned and left fallow, and over several years have regenerated to form a secondary, but indigenous grassland vegetation community (commonly termed ‘old lands’).

Like undisturbed Natural Dry Grasslands, vegetation structure is low closed grassland (Edwards, 1983). Common grasses include *Aristida congesta* var*. congesta, Cynodon dactylon*, *Eragrostis plana, Eragrostis chloromelas, Eragrostis curvula* and *Sporobolus africanus.*

Common forbs are present in areas of this habitat unit, and include, *inter alia*; *Acalypha angustata Selago densiflora, Helichrysum callicomum, Helichrysum rugulosum, Helichrysum nudifolium* var. *nudifolium, Hermannia transvaalensis, Hypochaeris radicata, Richardia brasiliensis* and *Solanum elaeagnifolium.* For a list of flora species recorded in this habitat unit during the field programme refer to Appendix C of the study.

Sensitivity Aspects

- Secondary Grassland is a modified habitat unit. Many of these areas have however, been stable for a long period, and as a result, retain some of the functional attributes of adjacent natural grasslands. They therefore provide supporting/buffering habitat for adjacent areas of natural habitat;
- No national Red List flora species were recorded in this habitat unit. Considering their disturbed nature, it is considered unlikely that any flora SCC are present; and
- Secondary Grasslands in the study area have low floristic importance or sensitivity.

Figure 7-33 - Secondary Grassland habitat associated with a former cultivated field.

Cultivated Fields and Grass Pastures

Cultivated Fields and Grass Pastures are typically present in low-lying bottomland areas that are characterised by deep, moist soils in RSA. Some however, were noted in flat, high-lying areas.

Both Cultivated Fields and Grass Pastures are subject to regular anthropogenic disturbance. Cultivated agricultural fields are regularly ploughed, planted with crop plants (e.g. maize) and harvested.

Grass pastures have been planted with palatable indigenous grasses species, such as *Chloris gayana, Digitaria eriantha* and *Eragrostis curvula*, and are regularly mown and baled to provide forage for livestock.

Sensitivity Aspects

- Cultivated Fields and Pastures are a modified habitat unit;
- These areas have been, or are currently, subject to regular and intense anthropogenic disturbances;
- No flora SCC were recorded in this habitat unit and none are considered likely to be present; and
- Cultivated Fields and Grass Pastures have no floristic importance or sensitivity.

Figure 7-34 - Cultivated field under maize production.

Figure 7-35 - Recently mown and baled grass pasture.

Alien Tree Stands

Stands of alien trees are not abundant or extensive in the RSA. Structurally, this habitat unit comprises closed woodland, as per Edwards (1983). Common alien tree species noted include *Eucalyptus* species and *Populus x canescens*. Little indigenous vegetation is present in well-established alien tree stands.

Sensitivity Aspects

- Alien tree stands are a modified habitat;
- No flora SCC were recorded in this habitat unit, and none are likely to be present; and
- Alien Tree Stands have no floristic importance or sensitivity.

Figure 7-36 - Stand of Eucalyptus trees.

Figure 7-37 - Populus x canescens trees.

Floristics Analysis

Flora Species of Conservation Concern

In line with the internationally endorsed IUCN Red List Categories and Criteria, the Red List of South African Plants recognises three categories of threatened species, namely Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), and five 'other categories of conservation concern' that are recognised as having high conservation importance, namely Near Threatened (NT), Critically Rare, Rare, Declining, and Data Deficient – Insufficient Information (DDD).

As they are subject to national and/or provincial environmental legislation and require specific conservation management, flora species listed on the NEMBA ToPS List (2007) or under Schedule 6 of the Free State Free State Nature Conservation Ordinance 8 of 1969, are also included as flora species of conservation concern and discussed in this section.

Red List Flora Species

During the wet season field survey, one flora species listed as threatened on the Red List of South African Plants was recorded in the RSA, namely *Khadia carolinensis* (Vulnerable).

Khadia carolinensis was recorded at two locations in Natural Dry Grassland in the Normandien WEF project site. *Khadia carolinensis* was not recorded in the LSA for this study (i.e. in the Groothoek WEF Project site); however, suitable habitat is present on-site, and it is therefore possible that *Khadia carolinensis* is present in the LSA.

Several *Khadia carolinensis* plants were recorded at both locations in the RSA. There was also no evidence of any current or direct anthropogenic threats to these locations. The local population of *Khadia carolinensis* therefore appears to be both large and stable. *Khadia carolinensis* was found at two locations in the Normandien WEF project site in the RSA, with a 200 m exclusion buffer area around each, as prescribed by SANBI (Driver, *et al*., 2009) (**Figure 7-39**).

Khadia carolinensis is range-restricted and occurs in Highveld grasslands at around 1700 m (Lötter *et al*., 2007a). It occurs on well-drained sandy loam soils, amongst rock outcrops, or along the edges of sandstone sheets (Lötter *et al*., 2007a). The AOO is estimated at 28.34 km^2 (SANBI, 2020). Any impacts on *Khadia carolinensis* associated with the proposed Project should be avoided.

Based on reviewed literature and data sources, an additional 13 nationally threatened or Near Threatened flora species occur or potentially occur in the RSA/LSA. These are listed Table 7-9, along with their conservation statuses, habitat preferences and a probability of occurrence, based on habitat suitability.

Flora Species List on the NEMBA ToPS List (2007)

No flora species listed on the NEMBA ToPS List (2007) were recorded in the RSA during the field programme. However, reviewed literature indicates that one species, *Merwilla plumbea* may be present. *Merwilla plumbea* is listed as Vulnerable on the NEMBA ToPS List (2007) and is also listed as Near Threatened on the national Red List.

Protected Flora Species

Several flora species listed as provincially Protected on the Schedule 6 of the Free State Free State Nature Conservation Ordinance 8 of 1969 were recorded during the field survey, including *inter alia Boophone disticha* and *Eucomis humilis*. These are listed in **Table 7-9**, along with other provincially Protected flora species that potentially occur in the RSA/LSA, based on reviewed literature and datasets.

Figure 7-38 - *Khadia carolinensis* (Vulnerable)

Figure 7-39 - Habitat where *Khadia carolinensis* was recorded.

Figure 7-40 - ***Boophone disticha*** **(Protected, FS)**

Figure 7-41 - ***Eucomis humilis*** **(Protected, FS)**

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Table 7-9 - Site Ecological Importance of habitat units

Family	Scientific Name#	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
Aizoaceae	*Khadia carolinensis*	Vulnerable	-	-	Range-restricted species, occurring in Highveld grasslands between 1700m. AOO is estimated at 28.34 km2 (SANBI, 2020). Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter et al., 2007)	Probable - suitable habitat present. (Recorded – in RSA in the Normandien WEF Project site)
Aizoaceae	*Khadia alticola*	Rare	-	-	A high-altitude species (above 2000 m), that occurs in montane grassland in shallow, sandy humus -rich soil, as well as crevice's between rock plates (Victor, 2005)	Probable - suitable habitat in LSA.
Lauraceae	*Ocotea bullata*	Endangered	-	-	Species has a wide but disjunct distribution, with >53% reduction in range due to exploitation. Favours high evergreen Afromontane forest (Williams, et al., 2008a).	Unlikely – no suitable habitat present.
Fabaceae	*Lotononis amajubica*	Rare	-	-	Habitat specialist, favouring well-drained, high-altitude grassland between 1600-1800 m. Species can be locally very common (Lötter et al., 2013).	Probable – suitable habitat present.

Family	Scientific Name#	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
Scrophulariaceae	*Zaluzianskya distans*	Rare	-	-	Widespread, but rare species. EOO is estimated at 25 286 km2. Occurs in damp, partially shaded locations in rocks or montane scrub. Also found along wooded watercourses (van Staden, 2018).	Probable – suitable habitat present.
Rosaceae	*Prunus africana*	Vulnerable	-	-	Forest species, favouring inter alia, inland mistbelt and Afromontane forests up to 2100 m. Population estimated at 10 000 mature trees (Williams et al., 2022).	Unlikely – no suitable habitat present
Ranunculaceae	*Anemone fanninii*	Near Threatened	-	-	Heavily exploited, with an estimated population decline of 20%. Species occurs in high altitude grassland habitats (Williams et al., 2024).	Possible – suitable habitat present.
Hyacinthaceae	*Eucomus bicolor*	Near Threatened	-	Protected	Heavily exploited species. Favours well-drained grassed mountain slopes, watercourses and rocky cliffs. Occurs at altitudes up to 2800 m (Williams, et al., 2008b).	Probable – suitable habitat present.
Polygalaceae	*Polygala praticola*	Vulnerable	-	-	Species is known from five to ten locations, with an EOO of 19 466 km2. Occurs in highly variable grasslands (Mtshali, et al., 2016).	Probable – suitable habitat present.
Hyacinthaceae	*Merwilla plumbea*	Near Threatened	Vulnerable	Protected	Favours rocky grassland areas on steep well drained slopes between 300 – 2500 m (Williams, et al., 2008c).	Probable – suitable habitat present.

Family	Scientific Name#	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
-	Sensitive species 851	Vulnerable	-	-	EOO is between 455 and 11 158 km2, and thought to occur at less than 10 locations, with an AOO estimated at 3.06 km2 (SANBI, 2020). Prefers moist areas in undulating grassland.	Probable – suitable habitat present.
-	Sensitive species 1248	Vulnerable	-	-	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes. No EOO for this species is listed, but its AOO is estimated at 30.70 km2 (SANBI, 2020).	Probable – suitable habitat present.
-	Sensitive species 998	Endangered	-	-	Favours forest margins, drainage lines and islands within wetlands. Also occurs on west and south facing mountain slopes.	Probable – suitable habitat present.
-	Sensitive species 1252	Vulnerable	-	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km2 (SANBI, 2020).	Probable – suitable habitat present.

#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).

Source: List based on data from BODATSA and Environmental Screening Report Output.

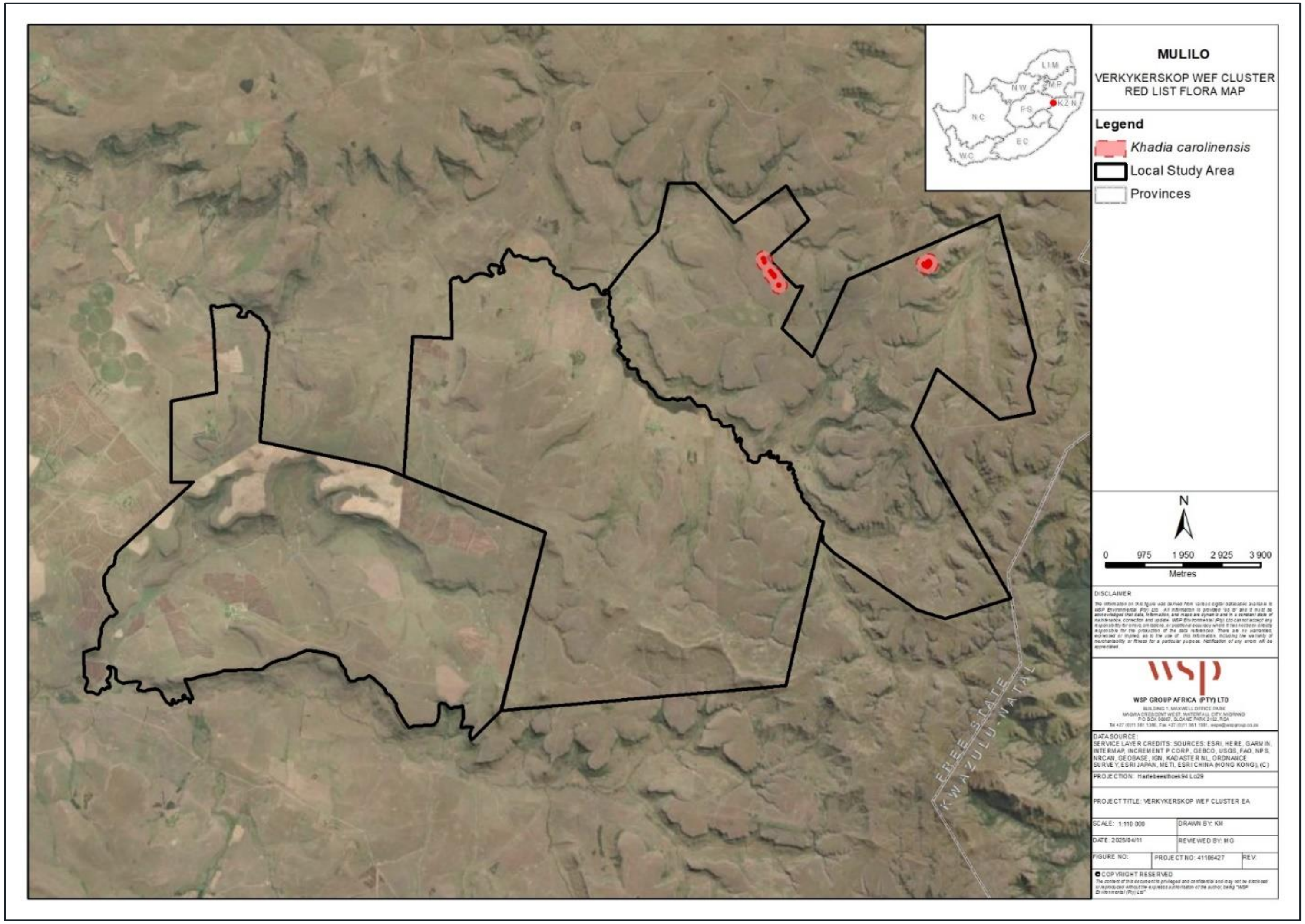

Figure 7-42 - Location of the observed *Khadia carolinensis* populations in the Normandien WEF project site in the regional study area

Table 7-10 - Site Ecological Importance of habitat units

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Agapanthaceae	*Agapanthus cf. campanulatus*	Least Concern	Protected	Recorded
Amaryllidaceae	*Apodolirion buchananii*	Least Concern	Protected	
Amaryllidaceae	*Boophone disticha*	Least Concern	Protected	Recorded
Amaryllidaceae	*Brunsvigia radulosa*	Least Concern	Protected	Recorded
Amaryllidaceae	*Cyrtanthus breviflorus*	Least Concern	Protected	
Amaryllidaceae	*Crinum bulbispermum*	Least Concern	Protected	Recorded
Amaryllidaceae	*Haemanthus humilis subsp. hirsutus*	Least Concern	Protected	
Amaryllidaceae	*Nerine angustifolia*	Least Concern	Protected	Recorded
Apocynaceae	*Asclepias cucullata*	Least Concern	Protected	
Apocynaceae	*Asclepias macropus*	Least Concern	Protected	
Aquifoliaceae	*Ilex mitis var. mitis*	Least Concern	Protected	
Araceae	*Zantedeschia albomaculata*	Least Concern	Protected	Recorded
Araliaceae	*Cussonia paniculata*	Least Concern	Protected	Recorded
Asphodelaceae	*Kniphofia porphyrantha*	Least Concern	Protected	
Asphodelaceae	*Kniphofia cf. baurii*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum acutatum*	Least Concern	Protected	
Asteraceae	*Helichrysum adenocarpum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum albo-brunneum*	Least Concern	Protected	
Asteraceae	*Helichrysum appendiculatum*	Least Concern	Protected	
Asteraceae	*Helichrysum aureum var. monocephalum*	Least Concern	Protected	
Asteraceae	*Helichrysum argentissumum*	Least Concern	Protected	Recorded

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Asteraceae	*Helichrysum aureonitens*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum cephaloideum*	Least Concern	Protected	
Asteraceae	*Helichrysum callicomum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum chionosphaerum*	Least Concern	Protected	
Asteraceae	*Helichrysum confertifolium*	Least Concern	Protected	
Asteraceae	*Helichrysum cooperi*	Least Concern	Protected	
Asteraceae	*Helichrysum hypoleucum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum melanacme*	Least Concern	Protected	
Asteraceae	*Helichrysum miconiifolium*	Least Concern	Protected	
Asteraceae	*Helichrysum monticola*	Least Concern	Protected	
Asteraceae	*Helichrysum mundtii*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum nudifolium var. nudifolium*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum opacum*	Least Concern	Protected	
Asteraceae	*Helichrysum oreophilum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum pallidum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum psilolepis*	Least Concern	Protected	
Asteraceae	*Helichrysum rugulosum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum spiralepis*	Least Concern	Protected	
Asteraceae	*Helichrysum splendidum*	Least Concern	Protected	
Asteraceae	*Helichrysum subglomeratum*	Least Concern	Protected	
Asteraceae	*Helichrysum sutherlandii*	Least Concern	Protected	
Ericaceae	*Erica caffrorum*	Least Concern	Protected	
Ericaceae	*Erica caffrorum var. caffrorum*	Least Concern	Protected	

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Ericaceae	*Erica cerinthoides var. cerinthoides*	Least Concern	Protected	
Ericaceae	*Erica oatesii var. oatesii*	Least Concern	Protected	
Ericaceae	*Erica paniculata*	Least Concern	Protected	
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Protected	Recorded
Hyacinthaceae	*Eucomis humilis*	Least Concern	Protected	Recorded
Iridaceae	*Dierama pictum*	Least Concern	Protected	
Iridaceae	*Gladiolus crassifolius*	Least Concern	Protected	
Iridaceae	*Gladiolus ecklonii*	Least Concern	Protected	
Iridaceae	*Gladiolus woodii*	Least Concern	Protected	
Iridaceae	*Gladiolus species (no flowers)*	Least Concern	Protected	Recorded
Iridaceae	*Hesperantha baurii subsp. baurii*	Least Concern	Protected	
Iridaceae	*Hesperantha coccinea*	Least Concern	Protected	
Iridaceae	*Watsonia confusa*	Least Concern	Protected	
Iridaceae	*Watsonia species (no flowers)*	Least Concern	Protected	Recorded
Orchidaceae	*Disa baurii*	Least Concern	Protected	
Orchidaceae	*Disa brevicornis*	Least Concern	Protected	
Orchidaceae	*Disa cooperi*	Least Concern	Protected	
Orchidaceae	*Disa versicolor*	Least Concern	Protected	Recorded
Orchidaceae	*Disperis fanniniae*	Least Concern	Protected	
Orchidaceae	*Eulophia hians var. hians*	Least Concern	Protected	
Orchidaceae	*Eulophia ovalis var. ovalis*	Least Concern	Protected	
Orchidaceae	*Habenaria dives*	Least Concern	Protected	
Orchidaceae	*Habenaria epipactidea*	Least Concern	Protected	
Orchidaceae	*Habenaria laevigata*	Least Concern	Protected	

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Orchidaceae	*Holothrix incurva*	Least Concern	Protected	
Orchidaceae	*Pterygodium dracomontanum*	Least Concern	Protected	
Orchidaceae	*Pterygodium nigrescens*	Least Concern	Protected	
Orchidaceae	*Satyrium cristatum var. longilabiatum*	Least Concern	Protected	
Orchidaceae	*Satyrium longicauda var. longicauda*	Least Concern	Protected	
Proteaceae	*Protea roupelliae*	Least Concern	Protected	Recorded

7.2.3.2 Declared Alien Invasive Species

Seventeen NEMBA declared alien invasive plant species were recorded in the RSA during the field programme. These are listed in **Table 7-11,** along with their growth form and NEMBA Category.

Table 7-11 - Site Ecological Importance of habitat units

Scientific Name	Common Name	Growth Form	NEMBA Category
Acacia mearnsii	Black Wattle	Tree	2
Acacia dealbata	Silber Wattle	Tree	2
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b
Datura stramonium	Common Thorn Apple	Herbaceous forb	1b
Eucalyptus camaldulensis	Gum	Tree	1b or 2
Morus alba	White Mulberry	Tree	3
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b
Pennisetum clandestinum	Kikuyu	Graminoid	1b
Pinus patula	Patula pine	Tree	2
Populus x canescens	Grey Poplar	Tree	2
Pyracantha angustifolia	Yellow Fire-thorn	Tree	1b
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b
Solanum sisymbriifolium	Wild Tomato	Herbaceous forb	1b

Verbena brasiliensis	Brazilian Verbena	Herbaceous forb	1b
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b
Verbena rigida	Veined Verbena	Herbaceous forb	1b
Xanthium spinosum	Spiny Cocklebur	Herbaceous forb	1b

7.2.3.3 Flora of Medicinal Value

Twenty-five flora species recorded in the RSA have recognised medicinal value. These are listed in **Table 7-12**, accompanied by a description of their purported use, as per Van Wyk et al., (2009).

Table 7-12 - Flora species recorded in the RSA that have recognised medicinal value

Scientific Name	Medicinal Use*
Asparagus laricinus	Used in the treatment of tuberculosis, kidney ailments and rheumatism.
Agapanthus cf. campanulatus	Oral decoction that is used as a post-natal medicine.
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Centella asiatica	Used to treat a variety of infirmities including leprosy, wounds, cancer, fever and syphilis.
Crinum bulbispermum	Used to treat colds and flu.
Datura stramonium	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
Dicoma anomala	Treats a variety of aliments including fever, stomach issues, high blood pressure and cancer.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Hilliardiella aristata	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Eucomis species	Used to treat lower back pain, fractures, urinary diseases, stomach aches, colic, syphilis, and to facilitate childbirth.
Gunnera perpensa	Used to induce labour and as an antenatal medication to tone the uterus.
Heteromorpha arborescens	Used as a remedy for tuberculosis, abdominal pains, colic and to treat mental disorders.

Scientific Name	Medicinal Use*
Mentha longifolia	Treats various respiratory ailments including coughs, colds and asthma.
Melianthus comosus	Leaf decoctions are used to treat septic wounds, sores, bruises, back ache and rheumatic joints.
Leonotis ocymifolia	Smoked for the relief of epilepsy, while leaves and roots are used to treat snake bites and other stings.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos var. calomelanos	Used to treat boils and abscesses and for internal parasites
Pentanisia prunelloides	Decoctions are used to treat burns, swellings, sore joints and rheumatism.
Rhoicissus tridentata	Root or tuber infusions are used as enemas.
Rumex crispus	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
Salix mucronata	Used as a remedy for rheumatism and fever.
Scabiosa columbaria	Used to treat colic and heartburn.
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
Xysmalobium undulatum	Remedy for diarrhoea and colic.

*Medicinal use, as per Van Wyk, et al. (2009).

7.2.3.4 Key Ecological Attributes and Processes

Habitat Corridors, Resources and Refugia

The LSA and broader RSA comprise extensive tracts of intact natural habitat, occurring on a highly varied topography that is characterised by low hills and mountains, are bisected by numerous drainage features. Areas of modified habitat (mostly Cultivated Fields) are present, but these are mostly confined to low-lying areas and some small upland sites.

Prominent linear infrastructure noted during the field programme included gravel district roads, farms roads and tracks, powerlines, as well as numerous farm fences. Although these linear features have caused some degree of habitat fragmentation, overall habitat connectivity remains very high across the landscape due to the extensive areas of undisturbed natural habitat.

The Rocky Shrubland habitat unit is characterized by acute altitudinal changes, exposed rocks, and indigenous woody vegetation, which in the general grassland-dominated habitat matrix, significantly increases habitat heterogeneity and provides diverse micro-habitats and refugia for flora and fauna.

Amongst other impacts, the proposed Project will impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as *inter alia*, wildfire patterns, fauna movement and foraging, and flora propagule dispersal.

Dynamic Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on the character of terrestrial vegetation and flora.

Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfires have several key ecological effects with respects to terrestrial biodiversity, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination / flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland and closed- and open wooded areas.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for flora and fauna populations. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences), and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources.

Fire is considered an important driver of change. It is anticipated that the proposed Project may result in altered wildfire patterns due to increased habitat fragmentation. It is also possible that the number of accidental fires initiated from shorting/faulty electrical infrastructure associated with the proposed Project may increase. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity (Scholes, 2009). Excessive cattle grazing and trampling can also cause soil erosion and gulley formation and modify and homogenise vegetation structure.

Livestock grazing and trampling are considered important drivers of change. However, it is unlikely to that proposed Project activities will alter livestock grazing patterns.

Alien Invasive Species Colonisation

Several alien invasive plant species were recorded on-site during the field programme. These have the potential to spread into areas of natural habitat, where they may competitively exclude many indigenous species. This will have several deleterious impacts on the integrity and function of these habitats, such as *inter alia*:

- A loss of natural habitat and floristic diversity, with the resulting habitat patches unable to support diverse flora and fauna communities;
- A reduction in grass productivity for grazing herbivores, and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change, and one capable of negatively impacting terrestrial biodiversity. The proposed Project will create disturbed sites where alien invasive species could establish and this will need to be managed.

General Sensitivity and Analysis of Site Ecological Importance

The DFFE National Web Based Screening Tool rated the Plant Species Theme for the LSA as ‘Medium’ sensitivity, based on the potential presence of several flora SCC.

One Red List flora species was observed in Natural Dry Grassland in the RSA during the field programme, *viz. Khadia carolinensis* (Vulnerable), and habitat suitability assessments indicate that other flora SCC, including some of the taxa highlighted by the screening tool, may occur on-site. The findings of this study therefore indicate that the sensitivity for the Plant Species Theme is ‘High’.

The ecological importance (SEI) of identified habitat units were assessed using the SANBI (2020) protocol. The results of the assessment are presented in **Table 7-13**.

Table 7-13 - Flora species recorded in the RSA that have recognised medicinal value

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Natural Dry Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species (=Khadia carolinensis, VU A3c) >50% of receptor contains natural	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
	habitat to support SCC.	ecological corridor. Limited road network between intact habitat patches. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.			
Rocky Shrubland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing).	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH

Habitat Unit	**Conservation Importance**	**Functional Integrity**	**Biodiversity Importance**	**Receptor Resilience**	**Site Ecological Importance**
Secondary Grassland	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past impacts (=ploughing).	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	LOW
Cultivated Fields	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Stands	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

7.2.4 ANIMAL SPECIES

The following is extracted from the Animal Species Assessment compiled by Hawkhead Consulting (April 2025) and included as Appendix G.6.

Twenty-one mammal species were recorded in the RSA during the field programme. These are listed in **Table 7-14**, with Figure 14 to Figure 19 in **Appendix G.6** showing select photographs of mammals taken during the field programme.

Recorded mammals range from small species (e.g., Woodland Dormouse *Graphiurus murinus*), through to medium-sized species, such as Southern Reedbuck (*Redunca arundinum*) and Black-backed Jackal (*Canis mesomelas*). All recorded mammals are free-roaming[7] species, except the Blesbok (*Damaliscus pygargus phillipsi*), which is likely part of a managed/farmed population.

The LSA and broader RSA are characterised by extensive tracts of suitable, remote and heterogenous natural habitat. Despite the presence of numerous farm fences, habitat connectivity within LSA, as well as across the broader RSA, remains high. These factors, coupled with the low human population density, will promote a rich mammal assemblage, that is anticipated to approximate a contemporary reference community for the region.

The distribution range maps presented in Stuart & Stuart (2007) and Child et al., (2016) indicate that up to 73 mammal species are known from the region encompassing the RSA, and of these, MammalMAP records indicate that 24 mammal species have previously been documented in the relevant QDS. These are listed in Appendix C of **Appendix G.6**.

Table 7-14 - Mammal species recorded in the regional study area during the field programme.

Family	Scientific Name	Common Name	Field Programme
Bathyergidae	*Cryptomys species*	Mole-rat	Earth mound
Bovidae	*Redunca arundinum*	Southern Reedbuck	Visual observation
Bovidae	*Pelea capreolus*	Grey Rhebok	Visual observation
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Visual observation
Bovidae	*Raphicerus campestris*	Steenbok	Visual observation
Bovidae	*Sylvicapra grimmia*	Common Duiker	Visual observation
Canidae	*Canis mesomelas*	Black-backed Jackal	Visual observation
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Visual observation
Felidae	*Caracal caracal*	Caracal	Camera trap
Felidae	*Leptailurus serval*	Serval	Camera trap
Gliridae	*Graphiurus murinus*	Woodland Dormouse	Camera trap
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Visual observation
Herpestidae	*Atilax paludinosus*	Water Mongoose	Tracks
Herpestidae	*Suricata suricatta*	Suricate	Visual observation

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[7] Part of self-sustaining, natural populations that can move freely across the landscape. I.e., not part of managed/farmed populations.

Family	Scientific Name	Common Name	Field Programme
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Scat
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	Anecdotal
Leporidae	*Pronolagus cf. rupestris*	Red Rock Rabbit	Scat
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Tracks & Scat
Oryceropodidae	*Orycteropus afer*	Aardvark	Burrows
Sciuridae	*Xerus inauris*	Ground Squirrel	Visual observation
Suidae	*Potamochoerus larvatus*	Bushpig	Anecdotal

**Anecdotal evidence is based on an interview with local farmer I. van de Merwe & K. Eloff*

7.2.4.1 Mammal Species of Conservation Concern

Four mammal species recorded in the RSA during the field programme are listed on the regional mammal Red List as threatened or Near Threatened, namely Grey Rhebok (*Pelea capreolus*), Brown Hyaena (*Parahyaena brunnea*), Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*). These are discussed in more detail in Section 6.1.2.1 to Section 6.1.2.4 in the specialist report (**Appendix G.6**).

The DFFE web-based screening tool listed three mammal species as potentially sensitive features, namely the Maquassie Musk Shrew (*Crocidura maquassiensis*), Spotted-necked Otter (*Hydrictis maculicollis*) and Oribi (*Ourebia ourebi ourebi*). These are also discussed in more detail in Section 6.1.2.5 to Section 6.1.2.7 in the specialist report (**Appendix G.6**).

Reviewed literature and datasets further indicates that an additional 12 mammal species that occur or potentially occur in the RSA, are listed as threatened (VU, EN or CR) or Near Threatened on the regional Red List, or as a SCC on the NEMBA ToPS List (2007) and/or provincial conservation legislation. These are listed in **Table 7-15**, along with their conservation statuses, habitat preferences and a 'probability of occurrence' determined through field observations and/or habitat suitability assessments.

Table 7-15 - Mammal species of conservation concern occurring or potentially occurring on-site

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Free State Provincial Status	Habitat Preferences*	Probability of Occurrence
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern	Protected		Open grassland plains and arid shrubland.	Possible - Suitable habitat present, although typically a farmed species
Bovidae	*Ourebia ourebi ourebi*	Oribi	Endangered	Endangered	Protected	Short open grassland, with patches of taller grass.	Unlikely – Suitable habitat present, but no observations of species by farmers.
Bovidae	*Pelea capreolus*	Grey Rhebok	Near Threatened	-	-	Sourveld grassland and scrubland in hills and mountainous areas.	Recorded
Bovidae	*Redunca arundinum*	Southern Reedbuck	Least Concern	Protected	-	Savanna and grassland habitats in mountainous areas.	Recorded
Bovidae	*Redunca fulvorufula fulvorufula*	Mountain Reedbuck	Endangered	-	-	Rolling grassy hillsides and mountain slopes.	Probable - Suitable habitat present.
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Protected	-	Range of habitats, including	Probable - Suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Free State Provincial Status	Habitat Preferences*	Probability of Occurrence
						grassland and arid savanna.	
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	Near Threatened	-	-	Sandy soils in grassland areas.	Possible - Suitable habitat present.
Chrysochloridae	*Chrysospalax villosus*	Rough-haired Golden Mole	Vulnerable	Critically Endangered	-	Sandy soils in grassland areas.	Possible - Suitable habitat present.
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	Near Threatened	Protected	-	Range of habitats, including grassland and savanna.	Probable - Suitable habitat present.
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable	Protected	-	Open short grass areas in savanna and grassland habitats.	Possible - Suitable habitat present.
Felidae	*Leptailurus serval*	Serval	Near Threatened	Protected	-	Wetland, tall grassland and well-watered savanna habitats.	Recorded
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	Near Threatened	Protected	-	Savanna and grassland habitats.	Recorded (anecdotal)
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern	-	Protected	Savanna and grassland habitats.	Probable - Suitable habitat present.

Family	**Scientific Name**	**Common Name**	**Regional Red List Status (2016)**	**NEMBA ToPS List (2007)**	**Free State Provincial Status**	**Habitat Preferences***	**Probability of Occurrence**
Muridae	*Mystromys albicaudatus*	White-tailed Rat	Vulnerable	-	-	Grassland habitats.	Possible - Suitable habitat present.
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Protected	-	Riparian habitats, with permanent water.	Recorded
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable	Protected	-	Riparian habitats, favouring large, open water bodies.	Probable - Suitable habitat present.
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Least Concern	-	-	Grassland habitats.	Probable - Suitable habitat present.
Soricidae	*Crocidura maquassiensis*	Maquassie Musk Shrew	Vulnerable	-	-	Little is known of habitat preferences. Thought to favour rocky or montane grasslands.	Unlikely - Suitable habitat present, but no records of this species in Free State Province.
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened	-	-	Reedbeds, wetlands and thick moist grassland in riverine habitats.	Probable - Suitable habitat present.

**Habitat preferences as per Skinner and Smithers (1990), Stuart and Stuart (2007) and Child et al., (2016).*

7.2.4.2 Herpetofauna

Herpetofauna Richness and Habitat Availability

Two reptile and two amphibian species were documented in the RSA during the field programme - listed in **Table 7-16**. However, considering the availability and diversity of suitable herpetofauna habitat, ranging from rocky and well-wooded hillsides and valleys, large open watercourses, and areas of open grassland and wetlands, it is likely that the RSA, supports a diverse herpetofauna assemblage.

Indeed, ReptileMAP rand FrogMAP records indicate that 27 reptile and 20 amphibian species have previously been recorded in the QDS that encompass the RSA (Fitzpatrick Institute of African Ornithology, 2024). These data indicate the most frequently reported reptile taxa include the Common Crag Lizard (*Pseudocordylus melanotus melanotus*), Speckled Rock Skink (*Trachylepis punctatissima*) and the Burchell's Sand Lizard (*Pedioplanis burchelli*), while the most frequently reported amphibian species are the Common River Frog (*Amietia delalandii*) and the Cape River Frog (*Amietia fuscigula*).

The distribution maps presented in Bates et al., (2014) and Du Preez and Carruthers (2009), indicate that up to 56 reptile and 21 amphibian species are known from the region in which the RSA is located. These are listed in Appendix E of **Appendix G.6**.

Table 7-16 - Reptile and amphibian species recorded during the field programme

Family	Scientific Name	Common Name	Field Programme
Reptile			
Elapidae	*Hemachatus heamachatus*	Rinkhals	Anecdotal
Scincidae	*Trachylepis species*	Rock Skink	Visual observation
Amphibians			
Pipidae	*Xenopus laevis*	Common Platanna	Visual observation
Ranidae	*Amietia delalandii*	Common River Frog	Visual observation
*Anecdotal evidence is based on an interview with farmer K. Eloff			

7.2.4.3 Herpetofauna Species of Conservation Concern

Four herpetofauna SCC, comprising three reptile and one amphibian species, potentially occur on-site. These are listed in **Table 7-17**, along with their conservation status, habitat preferences and a probability of occurrence. Also discussed in more detail in this section is Sensitive species 15, which was highlighted as a potential sensitive receptor for the broader RSA.

Sensitive species 15

Sensitive species 15 is listed as Vulnerable on both the regional and provincial Red Lists. It is further listed as Endangered on the NEMBA ToPS List (2007). This species is range-restricted and has a EOO estimated at 34 500 km2 and an AOO of 1 149 km^2. It is restricted to northern Free State and south-western Mpumalanga. The population size is estimated at 677 000 mature individuals. Sensitive species 15 is a habitat specialist, occurring in Highveld grasslands where it favours gently sloping *Themeda triandra* dominated primary grasslands. Several factors shape the niche requirements of this species including soil type, prey species, temperature and humidity. It is an obligate burrower, living in self-excavated burrows. Sensitive species 15 was not observed in the RSA and LSA during the field programme, and none of the farmers interviewed during the field programme were aware of the presence of this species on their farms. This notwithstanding, considering the availability and remoteness of potentially suitable habitat, it is considered possible that Sensitive species 15 is present in the LSA.

Table 7-17 - Reptile and amphibian species of conservation concern potentially occurring on-site

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	Free State Provincial Status	Habitat Preferences*	Probability of Occurrence
Reptiles							
Chamaeleonidae	*Bradypodion dracomontanum*	Drakensberg Dwarf Chameleon	Near Threatened	-	Protected	Favours small forest patches but can occur in grassland.	Unlikely/Possible – Suitable habitat present.
Chamaeleonidae	*Chamaeleo dilepis*	Flap-neck Chameleon	Least Concern	-	Protected	Occurs in a range of habitats, but typically found in well-wooded areas.	Probable – Suitable habitat present
Pythonidae	*Python natalensis*	South African Python	Least Concern	Protected	Protected	Occurs in a range of habitats, but typically favours riverine and rocky habitats.	Probable – Suitable habitat present
-	Sensitive species 15	-	Vulnerable	Endangered	Protected	Highveld grasslands, often dominated by *Themeda triandra.*	Possible – Suitable habitat present.
Amphibians							
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bullfrog	Least Concern	Protected	-	Shallow pans, wetlands and seasonally rained-filled depressions in savanna and grasslands.	Possible – Suitable habitat present

**Habitat preferences as per Branch (1998) and Bates et al., (2014) for reptiles, and Du Preez and Carruthers (2007) for amphibians.*

7.2.4.4 Invertebrates of Conservation Concern

Data retrieved from the Virtual Museum database lists 13 dragonfly, 63 butterfly, two lacewing, two scorpion and two spider species for the QDS that encompass the RSA. Of the listed taxa, one butterfly (*Orachrysops mijburghi*) and one spider (*Harpactira hamiltoni*) are SCC. The DFFE screening reports also identifies two other threatened invertebrate species as potentially sensitive features, namely *Chrysoritis phosphor borealis* and *Colonia lalandei*. These four species are discussed in more detail in **Appendix G.6**.

7.2.4.5 General Sensitivity and Analysis of Site Ecological Importance

The DFFE National Web Based Screening Tool rated the Animal Species Theme as 'High' sensitivity, based on the potential presence of several fauna SCC (listed in Section 1.4).

- During the field programme, four free-roaming Red List mammal species were recorded, namely Grey Rhebok (Pelea capreolus), Brown Hyaena (Parahyaena brunnea), Serval (Leptailurus serval) and Cape Clawless Otter (Aonyx capensis) – all listed as Near Threatened;
- Habitat suitability assessments also indicate that several other fauna SCC, including Spotted-necked Otter (Vulnerable), which was highlighted by the DFFE screening environmental tool, may be present.

The findings of this study therefore confirm the 'High' sensitivity rating.

The site-specific ecological importance (SEI) of identified habitat units in the LSA were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology). The results of the assessment are presented in **Table 7-18**, and shown in **Figure 7-81**.

Table 7-18 - Site Ecological Importance of habitat units

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Natural Dry Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Limited road network between intact habitat patches. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Rocky Shrubland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing).	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Secondary Grassland	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past impacts (=ploughing).	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	LOW

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Cultivated Fields	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Stands	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

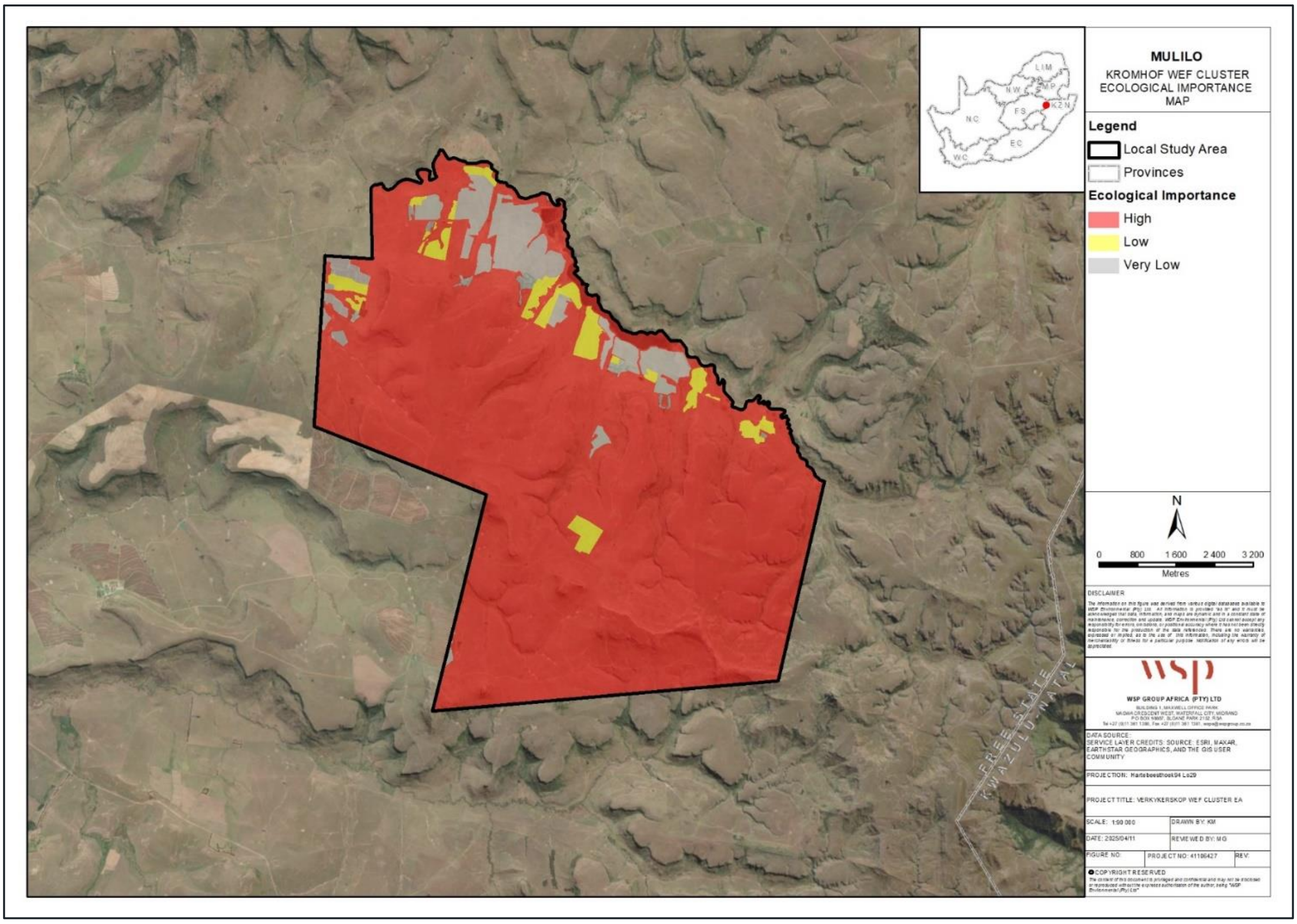

Figure 7-43 - Site Ecological Importance of the local study area.

7.2.5 AVIFAUNA

The following is extracted from the Avifauna Assessment compiled by the Biodiversity Company and included as Appendix G.7.

7.2.5.1 Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are sites which contribute most significantly to the global persistence of biodiversity in terrestrial, freshwater and marine ecosystems (IUCN, 2016). Both SANBI and BirdLife South Africa have recognise the importance of mapping, monitoring conserving these areas of global biodiversity importance through the implementation of the Key Biodiversity Areas Program. To date a network of 263 terrestrial KBAs have been identified and assessed against the global standard set by the IUCN. The areas will ultimately supersede IBAs as the main currency for identifying areas of high avian importance in the country. A large proportion (63%) of the Kromhof WEF in the south overlaps the Eastern Free State Escarpment KBA which is covers most of the WEF's plateau grasslands. This KBA is recognised primarily for its importance in supporting a high diversity of threatened and range-restricted avifauna. The KBA is classified as 100% irreplaceable. This KBA envelops the Grasslands and Alexpan IBAs (KBA Partnership, 2024).

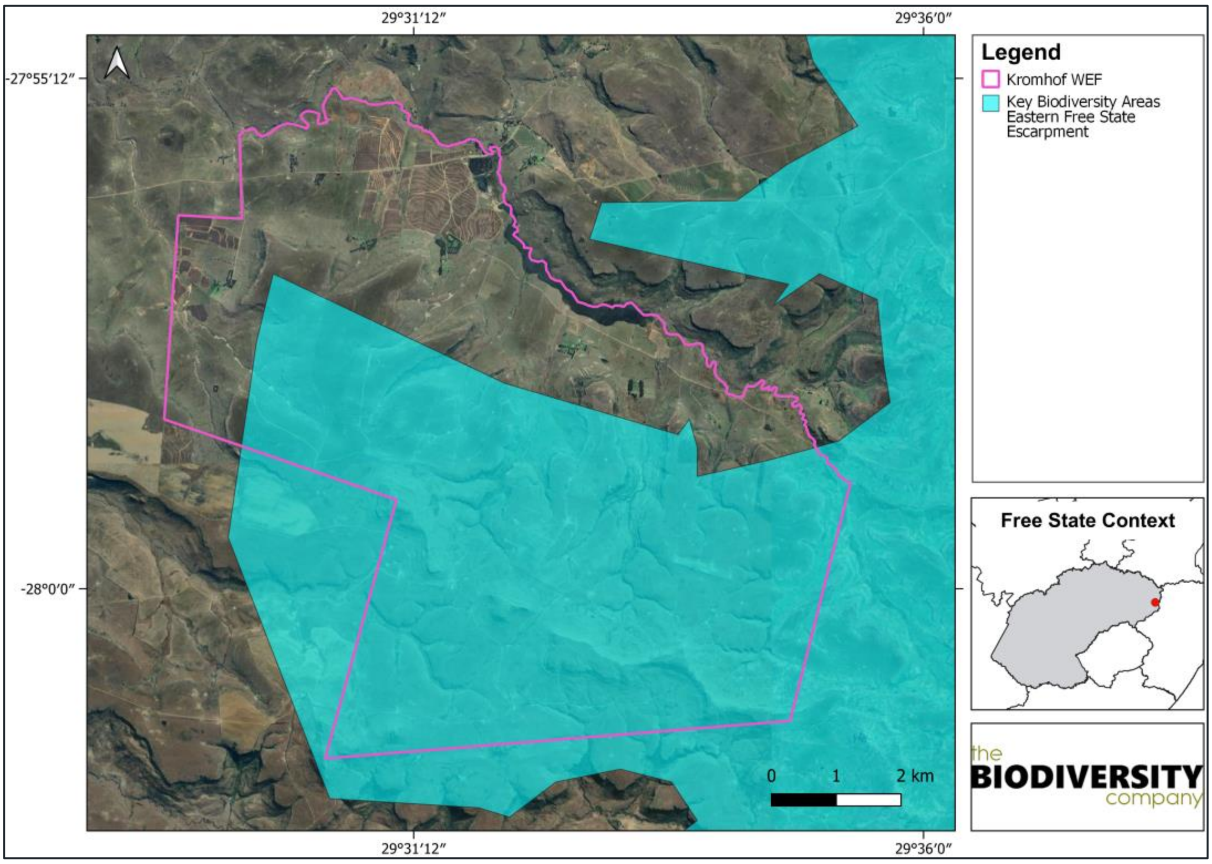

Figure 7-44 - Project area in relation to Key Biodiversity Areas

7.2.5.2 Statutorily Protected Areas

The proposed development site does not intersect any protected areas. However, the AOI intersects with seven statutorily protected areas. The most significant of which being the Upper Wilge Protected Environment championed by BirdLifeSA. The entire Kromhof WEF falls within an area identified by the National Protected Areas Expansion Strategy. These are not statutorily protected areas but rather areas earmarked for potential expansion of the protected areas network. It is important to note that, based on communications with Birdlife SA, a request has recently been submitted to declare additional properties as part of the Sneeuberg Protected Environment in the area between the existing PE and the proposed Verkykerskop WEF Cluster.

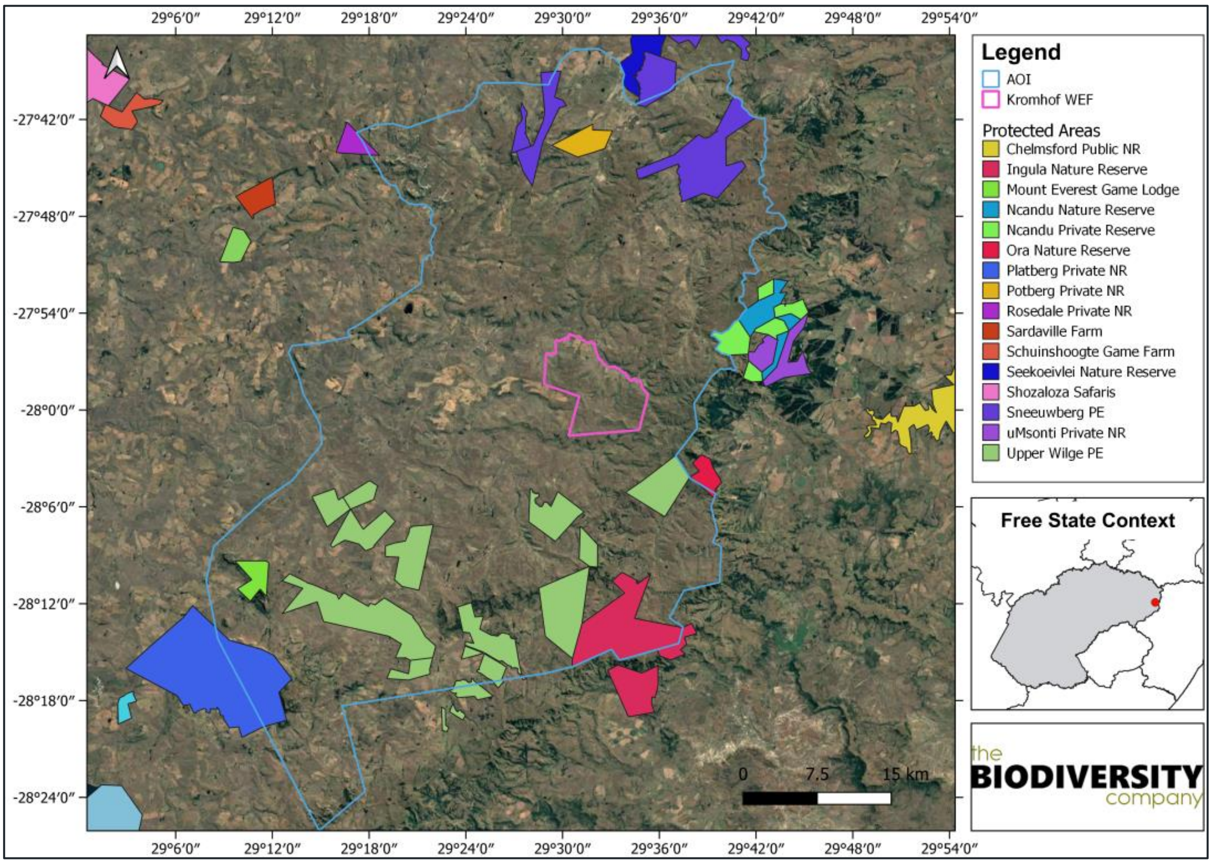

Figure 7-45 - Nationally protected areas in relation to the project area

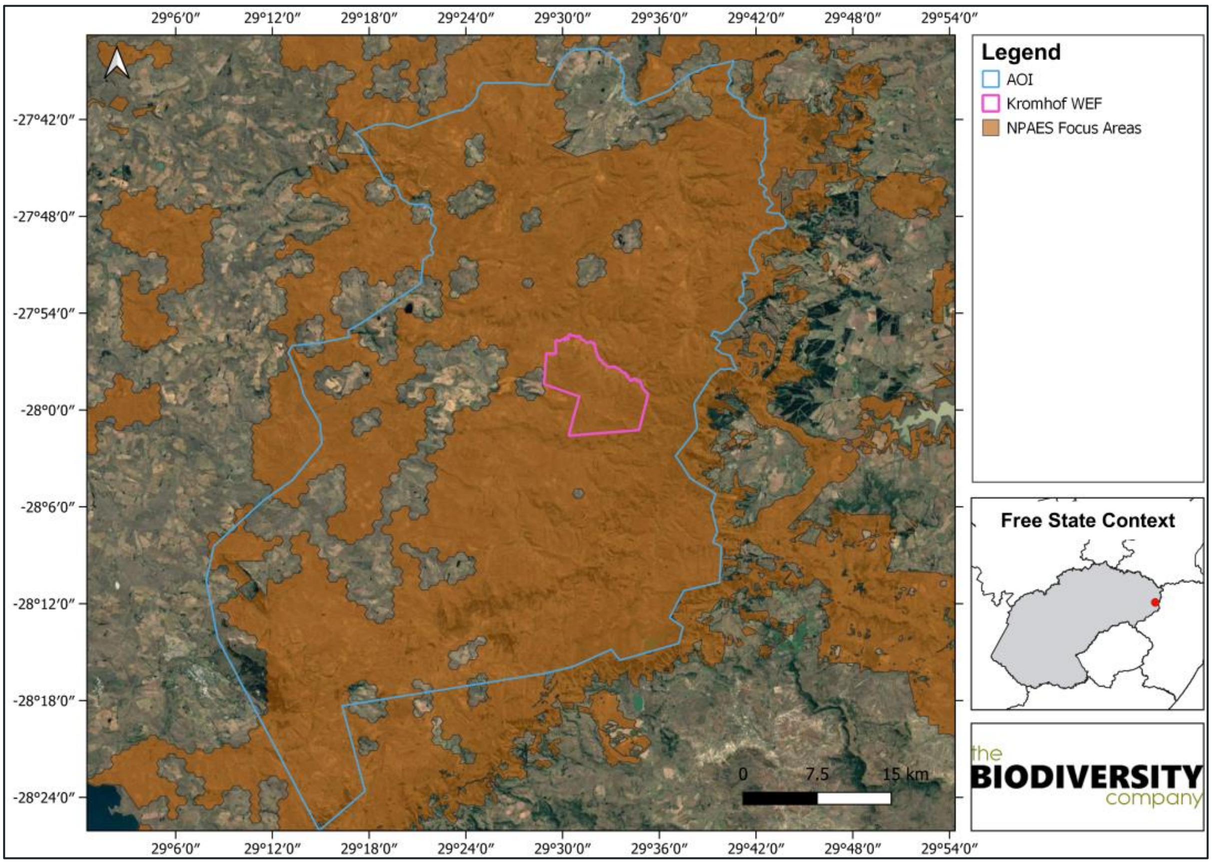

Figure 7-46 - National protected areas expansion strategy in relation to the project area

7.2.5.3 Local Avian Diversity

Habitats

Kromhof WEF spans an altitudinal gradient from the broad low lying Muel River floodplain in the north to the high-altitude plateau grasslands in the south, some of the most intact and conservation important to be found in the VWC. The southern plateaus are subject to harsh conditions and often receive snowfall. As such these areas support short (relatively treeless) high-altitude grasslands. The land use is predominantly natural grasslands (under grazing), interspersed with commercial croplands and pasture lands with livestock (cattle grazing). The prevailing biome is grassland. More specifically, Eastern Free State Sandy Grassland predominates (Mucina and Rutherford, 2006). At this stage at least four broad habitats as relevant to avifauna were identified. These included Open Grassland, Rocky Grassland, Wetlands and Croplands.

Figure 7-47 - Examples of the four main avifaunal habitats identified in the project area; A) Open Grassland, B) Rocky Grassland, C) Wetlands and D) Croplands

Open Grassland

At least two sub-classifications of grassland could be distinguished at the proposed Kromhof WEF as relevant for avifauna which include the higher altitude, short plateau grassland (to the south) and the lower altitude moist grasslands along the Muel River valley (in the north). The Plateau grasslands are likely to support most of the regionally occurring high altitude endemics and red-listed species. A prominent ridge runs along the southern border (the foot slope of Mont Pelaan). This area is the highest-lying area in the entire VWC and provides optimal; habitat for all of the regions threatened, high-altitude grassland species. It is characterised by a dense, short and relatively homogenous plateau grass sward dominated by Eragrostis spp. and Themeda triadra. Red-listed species regularly seen in this habitat include Rudd’s Lark, Yellow-breasted Pipit, Denham’s Bustard, Blue Korhaan, Blue Crane and Southern Bald Ibis (. Of greatest significance in this regard is the grassland’s importance in terms of supporting breeding pairs of Rudd’s Lark and Yellow-breasted Pipit. Blue Crane also nest in two locations near VP 11 (Nests 1 and 3). The area between the Met mast and VP 11 is particularly productive and has been designated as a Core Habitat for Threatened High Altitude species.

Rocky Grassland

The Rocky Grassland habitat typically occurs in areas with a slope gradient of more than 20 %. This habitat includes boulder strewn mid to upper slopes as well as crests which support sandstone cliff and scarp-like Leucosidea-dominated forest-scrub. At Kromhof WEF, the scrub is slightly more species rich than the western regions of the VWC, increasing in density and species composition towards the base of the crest especially in more fire-protected areas. Structural complexity, vegetation diversity, food, cover and microclimatic niche differentiation is highest in this habitat type. This habitat type is likely to be most important in terms of supporting rupicolous high-altitude endemics, raptors and cliff-nesting species. These scrub-forests seasonally support Bush Blackcap in summer. However, these scrub-forests appear to lack the structural complexity frequented by most of the true forest specialists such as Cape Parrot and White-starred Robin. In addition to the scrub-forest, the rocky grasslands at Kromhof WEF are important in terms of supporting rupicolous high-altitude endemics such as African Rock Pipit, as well as smaller cliff-nesting raptors such as Jackal Buzzard (Nest 3), and one Southern Bald Ibis breeding roost (Roosts 5). Flight paths of most of the regionally occurring red-listed raptor species are strongly associated with the deeply incised Rocky Grassland and associated cliffs habitat, especially in areas with a slope gradient of >20%. These include Cape Vulture, Martial Eagle, Verreaux’s Eagle, Lanner Falcon, White-necked Raven and especially around VP 9 Rock Kestrel.

Wetlands

The northern boundary is marked by the perennial Muel River floodplain which flows west to east. This habitat is likely to be most significant in terms of supporting Threatened wetland species including cranes, harriers and flufftails. The Muel floodplain is very broad wetland with a shallow longitudinal gradient and as such, has an extremely high channel sinuosity. However, this wetland habitat has been threatened by the construction of a large dam wall near the western boundary of the WEF. Other wetlands include channelled and unchanneled valley-bottoms but also hillslope seeps, bench (or plateau) seeps and depressions and mountain streams cutting through gorges. The mountain streams and gorges are lined by scarp-like forest with a moderately diverse floral assemblage.

Croplands

Croplands occur in the lower lying north-western portions of the WEF. These croplands mostly produce fodder crops for livestock (mainly cattle), typically maize and oats. Many of these fields are irrigated from the dam along the Muel River. This habitat also includes patches of seeded pasture lands. Overall, it supports a high abundance but low diversity of birds comprising mainly seed-eaters. This habitat supports a high abundance but low diversity of birds comprising mainly seed-eaters but occasionally supports large flocks of Blue Crane.

Expected Diversity

At the start of the pre-construction monitoring (July 2022) a total of 218 bird species had been recorded during South African Bird Atlas (SABAP2, 2022) surveys within the nine pentads that overlap the VWC. This inventory was considered (at the time) to be a relatively accurate, if not slightly under-representative, portrayal of regional diversity. As such this expected species list was supplemented with additional species known to occur based on Chittenden et al. (2016) and expert knowledge of avifauna from the region. As monitoring progressed, 48 species not previously documented by SABAP2 surveys were added. This integrated inventory (including data from

SABAP2, Chittenden et al. (2016) and in-field observation), totalling 321 species, was used as the project's species probability list, as presented in Appendix 1. Of these regionally occurring species, around 249 are considered highly likely to occur on a regular basis in the proposed Kromhof WEF.

Observed Diversity

Over the course of the pre-construction monitoring (S1-14), a total 244 species were recorded within the VWC during the pre-construction surveys. The presence of one additional species namely White-backed Vulture (an infrequent visitor) was added based on Vulpro (2025) tracking data. Of these, 190 species were recorded in the Kromhof WEF, which represents a large proportion (72%) of the 260 species recorded during monitoring projects in the AOI. It also represents a significant proportion (60%) of the expected regional diversity (318 spp.). This inventory is comprehensive and should be considered a good representation of the typical bird assemblage in the proposed WEF. It represents a moderate to high diversity in South Africa. Importantly, a very high proportion of these are red-listed and/or endemic species.

7.2.5.4 Diversity

Red-listed Species

Of the 88 regionally (Phumelela District) occurring priority species, 51 are red-listed. Of these, 37 were recorded in the VWC. Based on habitat suitability, 39 regionally red-listed species are considered highly likely to occur within the proposed Kromhof WEF. Surveys to date in the proposed Kromhof WEF have recorded 31 red-listed species of which 19 are threatened. This represents a high number in the South African context. Species which remain un-detected include Wattled Crane, Bearded Vulture, White-backed Vulture, Yellow-billed Stork and Botha's Lark.

Natural plateau grasslands south of the Muel floodplain support populations of threatened high altitude species. Of particular significance is the occurrence of a small breeding population of the Endangered Rudd's Lark. Over two surveys (S2 and 3) in the summer of 2022-2023, at least three individuals were detected in a high-altitude grassland between VP10 and 12 on a north-facing aspect at the foot of a mountain slope. On two occasions males were observed displaying at a height of 20-50 m for 5-10 min over the course of a few hours before sunset, (calm, warm evenings). The species appears to frequent lush, high-lying, plateau grasslands. Their presence in the VWC remains enigmatic with birds appearing sporadically in certain locations and seemingly not in others, a testament to the thinly distributed nature of this imperilled bird. Other threatened upland grassland species that occur at Kromhof include Denham's Bustard, White-bellied Korhaan and Yellow-breasted Pipit, all of which are currently listed as Vulnerable and, apart from Denham's Bustard (often observed in grasslands near the met mast in summer), are breeding residents. In the proposed Kromhof WEF, White-bellied Korhaan are concentrated in plateau grasslands between VP5 and 12 (ca. 1200 ha). Yellow-breasted Pipit occurs in most of the natural plateau grasslands having been observed at 47 locations spanning approximately 2000 ha, each time in short, lush high-altitude grassland. The regular observation of non-breeding males in winter reveals year-round residency. Blue Korhaan are also frequently observed in these highland grasslands. During summer visiting Red-footed Falcon forage for insects amidst large flocks of migrating Amur Falcons.

Rocky grassland within the proposed Kromhof WEF support several red-list species. Pockets of scarp thicket see occasional visitation by Bush Blackcap. A variety of raptors use the various hills and slopes to hunt and / or gain lift. Threatened raptor species closely associated with this habitat include Cape Vulture (seen regularly in the WEF, most frequently from VP 5, 10 and 9) and

Verreaux's Eagle (a pair frequently patrols the gorges around VP 9 and the Muel River valley, have been observed predating on Jackal Buzzard chicks).

Other threatened species which are less tied to the highlands include Black Harrier (rare non-breeding winter visitor, observed once at VP12), Blue Crane (Confirmed multiple successful breeding attempts with chicks successfully reared), Secretarybird (observed regularly especially at VP 9 and VP11, no nests in proposed WEF), Southern Bald Ibis (multiple roosts in WEF, some breeding) and Martial Eagle (no nest in WEF).

In terms of wetlands, some of the higher-lying seeps are likely to support Striped Flufftail while the larger lower-lying wetlands associated with the Muel floodplain see visitation by Grey Crowned Crane (no nests recorded in the WEF. No suitable wetland habitat exists for Sensitive Species 23 in the Kromhof WEF.A resident pair of Half-collared Kingfisher are regularly observed at low-level crossing downstream of the newly constructed large dam on the Muel River. In 2025 a pair of Maccoa Duck were recorded for the first time in the newly created dam along the Muel floodplain.

Migratory and Congregatory Species

Large flocks of migratory birds move across the project area in early summer, the most notable of which being Amur Falcons. The species arrives en-masse to forage over the grasslands on site. During S3, a very large migratory flock (numbering over a thousand birds) was observed moving across the VWC in a dense swarm. The flocks tend to aggregate and roost on powerlines along the Muel floodplain. This floodplain appears to facilitate passage over the escarpment. Migratory flocks of this size are of global significance. The potential for a significant collision event is a distinct possibility and represents a considerable risk in terms of wind farm development. Accompanying these flocks are small groups of Near-threatened Red-footed Falcon. Another seasonal visitor is Black Harrier which hunts over the grasslands in winter.

In late 2023 a large dam was created along the Muel floodplain (along the north-eastern boundary of the Kromhof WEF). In spite of a loss of sedge-dominated oxbow habitat for several threatened wetland species such as cranes and flufftails, the dam now attracts large congregations of waterfowl. Over the course of the monitoring period a gradual colonisation of the dam by various species was witnessed. After a year, counts began to yield in excess of 200 Yellow-billed Duck (NT) and over 900 Red-knobbed Coots. Additionally, flooded willow trees in the middle of the dam have created roosting habitat for large numbers of African Darter and Reed Cormorant, and now constitutes a heronry. In early 2025, 10 Cape Shoveler (NT) and at least three pairs of Maccoa Duck (VU) were observed at this dam. At present, the waterbird congregation is significant and, with time, may reach nationally or potentially globally significant thresholds for certain species as aquatic and wetland vegetation re-establishes.

Endemic Species

A total of 15 South African endemics occur in the region. Non-red listed species include Grey-winged Francolin (Scleroptila afra), Forest Buzzard (Buteo trizonatus) Cape Rock Thrush (Monticola rupestris), Buff-streaked Chat (Campicoloides bifasciata) and Pied Starling (Lamprotornis bicolor). All except, Forest Buzzard were recorded during the monitoring. Except for Pied Starling (which is ubiquitous) all of these species tend to frequent the higher altitude plateau grassland and rocky grassland habitat.

Other Priority Species

Other than Red-listed species, a further 32 regionally occurring species (Table 4 1) are also considered priority species. These include mainly raptors, red-listed species, large-bodied birds and other species that may be either rare, range restricted or habitat specialists. Of these, 24 species were recorded in the proposed Kromhof WEF.

7.2.5.5 Occurrence Hotspots

The precise location of every observed priority species was documented in a comprehensive database for the entire VWC, consisting of 4088 locality points representing a total count of 19145 birds. The proposed Kromhof WEF accounts for 24.2% of these records with a count of 7186 birds. This point locality data is shown in Figure 4 5 and represents the basis of the kernel density model which was used to map hotspots for priority species throughout the VWC. It was then subsequently used to inform the detailed habitat modelling exercise which was used to refine these core areas for the final sensitivity assessment. This data reveals that priority species are concentrated in at least six main hotspot areas in the VWC which tend to coincide with core habitat for threatened high altitude passerines, especially in areas close to cliffs or broken rocky terrain which provides nesting and foraging habitat for many priority species. One of two main hotspot areas for priority species occurs within the Kromhof WEF, the higher lying plateau grasslands in the southern half of the WEF (Figure 4 6). These largely pristine grasslands (associated with the prominent Mont Pelaan ridgeline) support an exceptionally high concentration of threatened grassland species including a breeding population of Rudd’s Lark.

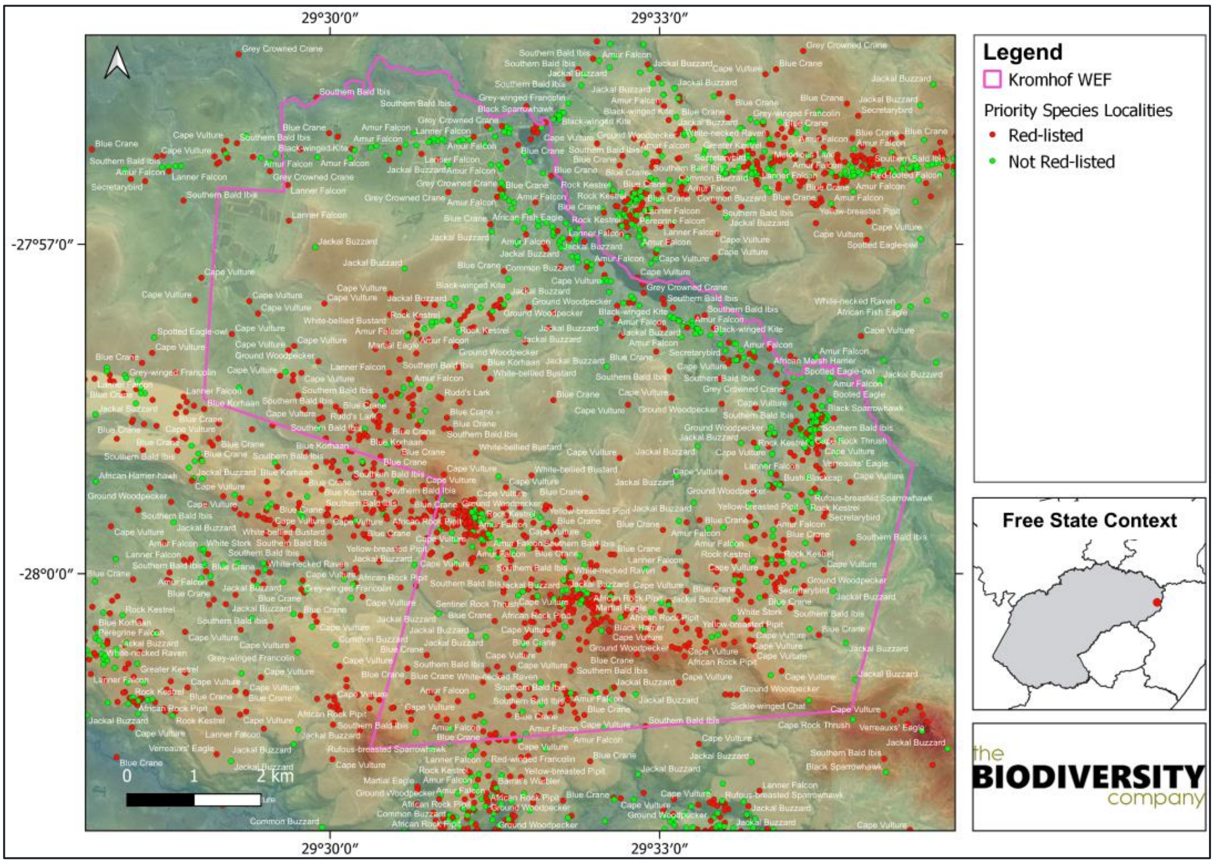

Figure 7-48 - Point localities of priority species observations

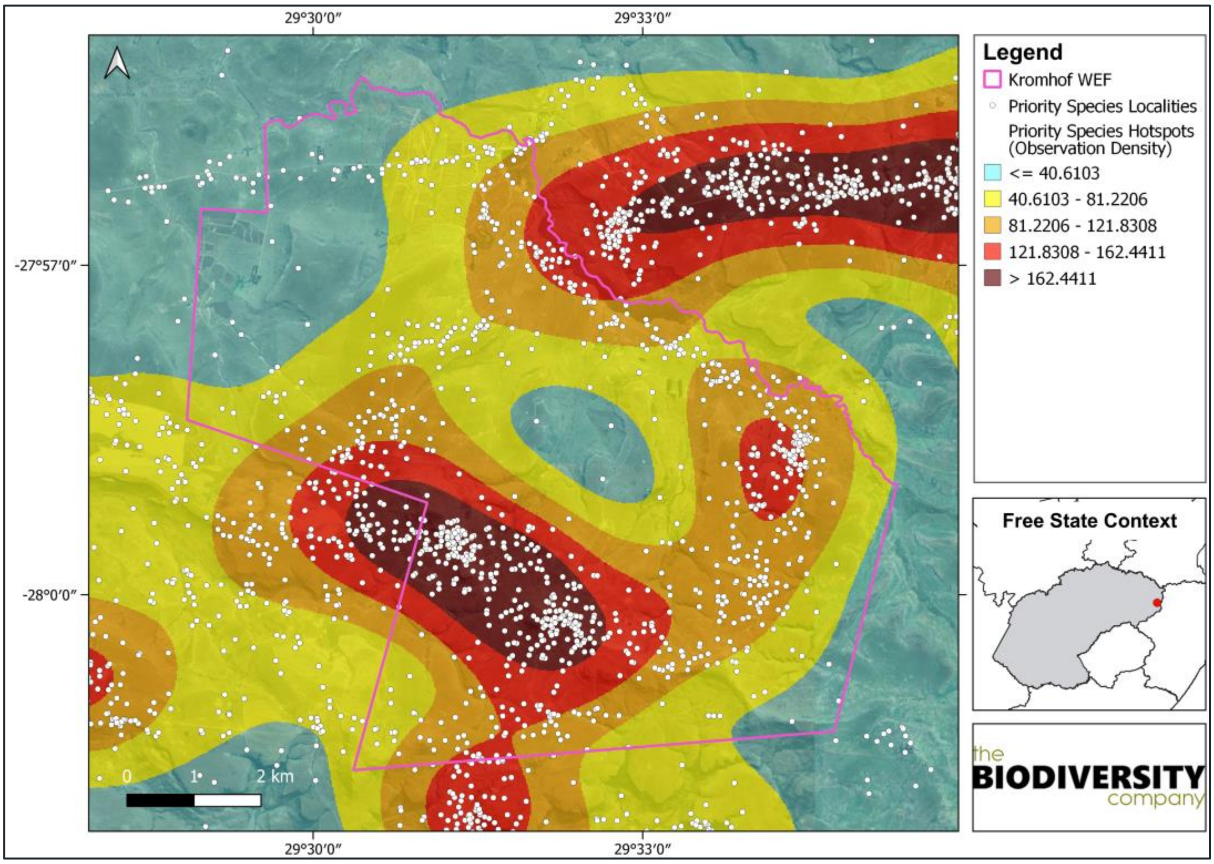

Figure 7-49 - Kernel density model portraying hotspots of priority species occurrence

7.2.5.6 Key Habitats

Cliffs and Ridges

Cliffs and ridges provide important nesting and / or soaring habitat for several priority species. The Mont Pelaan ridge in the south is the highest lying and most prominent ridgeline in the VWC. This ridgeline (identified as Flight Corridor 5) is a prominent regional land mark and skyline feature whose orographic winds are frequently utilised by numerous large-bodied soaring birds, (especially Cape Vulture and Jackal Buzzard) to gain lift. Additionally, a prominent cliff line occurs along the northern edge of the Kromhof plateau. This extensive series of cliffs hosts four Southern Bald Ibis Roosts (14, 16, 17 and 18), one Rock Kestrel Nest (1), one Jackal Buzzard Nest (3) and one Verreaux's Eagle Nest (4).

High Altitude Plateau Grasslands

The Kromhof WEF supports some of the best examples of intact high-altitude grasslands to be found in the VWC. Extensive areas of near pristine high-altitude plateau grassland occur in the west-central, southern and eastern highlands which represent highly suitable habitat for threatened grassland endemics. Most notable in this regard being Botha's Lark (Critically Endangered), Rudd's Lark (Endangered) and Yellow-breasted Pipit (Vulnerable). In recognition of the VWC's position with the core area of occupancy and global hotspot for all three of these species, AfriAvian was commissioned to identify and delineate key high altitude plateau grassland habitat for these three species based on a robust 5-year modelling study. These areas consist of (i) very high-risk core areas and (ii) surrounding high risk connective areas. It is important to note these areas do not represent all potential habitat for these species, only the higher risk areas. These higher risk areas occupy a large proportion of the VWC due to it being; *"…in the core area of occupancy and global hotspot for all three of these endemic, threatened and habitat specialist species. This area hosts some of the highest densities and most intact habitats for these species globally" (Dr. R. Colyn pers. comm, 2025).* These areas are also associated with a considerably higher abundance of other priority species (as evidenced through kernel density estimation and flight paths), particularly red-listed grassland species such as Denham's Bustard, White-bellied Bustard, Blue Korhaan, Southern Bald Ibis African Rock Pipit, Ground Woodpecker and Sentinel Rock Thrush. Even relatively small habitat losses or alterations in these areas could have a significant impact on these highly range-restricted and rare habitat specialists. As such, both core (very high risk) and connective habitat (high risk) as identified for Threatened high altitude passerines are considered to be all infrastructure exclusion areas (Zone 1 sensitivity) and collectively occupy a large proportion (47%, 3416 ha) of the proposed Kromhof WEF area.

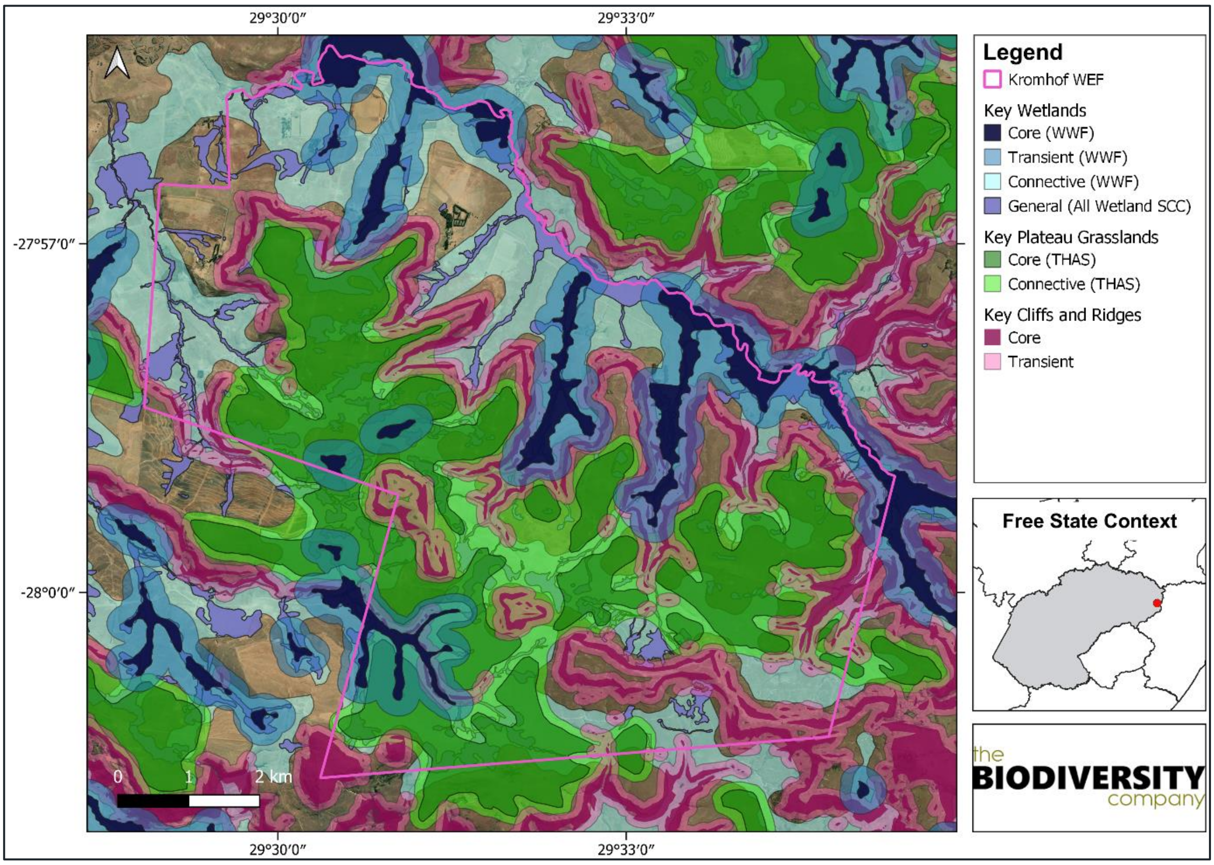

Figure 7-50 - Key habitats for avifauna at the proposed Kromhof WEF (SPECIES 23, Species 23, THAS, Threatened High Altitude Species)

Wetlands

Wetlands within the proposed Kromhof WEF are considered important for supporting a wide diversity of wetland associated priority species including several Threatened Species. Two main subdivisions of wetland habitat are recognised namely (i) general wetlands (for all wetland associated priority species) and (ii) wetlands (and associated transient buffers and connectivity corridors) considered important for the regional persistence of Species 23 (Endangered) as modelled by AfriAvian (2025), see full report for details (Appendix 3 of the study).

General Wetlands

Wetlands in the proposed WEF area provide suitable habitats for all three of South Africa's crane species (all Threatened). Of these, only Blue and Grey-crowned Crane have been recorded breeding in wetlands within the VWC. Marginally suitable habitat exists along the main Dwaalspruit floodplain for African Marsh Harrier. The species was observed once on Groothoek but regularly forage over some of the floodplains and larger valley-bottom wetlands in the far north-eastern regions of the AOI. No immediately obvious, suitable breeding habitat (dense *Phragmites* reedbeds) for this species has been found in Groothoek (although a large dam along the entrance road to the house could be utilised), but very likely occurs in some larger wetlands within the AOI, particularly along the Klip floodplain in the north-east of the VWC. Intensive efforts have been made to search for signs of African Grass Owl, but no signs have been encountered in the Kromhof WEF, and it would seem there is a scarcity of suitably dense and tall, *Imperata cylindrica* dominated grassland along wetlands that could facilitate breeding. Indeed, no signs of their presence have been found to date in the greater VWC. Similarly, the floodplains and perennial streams at Kromhof WEF appear too sparsely wooded to sustain breeding populations of the Half-collared Kingfisher.

Wetlands of Importance for Species 23

With regards to Species 23 (globally Critically Endangered, regionally Endangered), AfriAvian was tasked with conducting a robust assessment of the suitability of wetland habitat in the VWC and surrounding AOI for the species using a combination of passive surveillance (trail cameras and acoustic recorders), habitat modelling (using remote sensing) and in-filed site assessment.

The study revealed a large contiguous network of high to very high suitability wetland patches for the species within the AOI. Habitat suitability was highest in the central to north-eastern portions of the AOI decreasing in suitability towards the south-west. "*The central and north-eastern wetlands, forming a contiguous cluster of suitable habitat, are strongly aligned with field-verified habitat characteristics, including shallowly flooded palustrine systems with a mosaic of varied (including some low) intensity land use*" (AfriAvian, 2025). The authors cite overgrazing (trampling and defoliation), damming, artificial drainage, hayfield conversion, and recurrent mowing or burning as the main land use currently impacting habitat suitability in the AOI (particularly in the south-west).

Overall, the AfriAvian (2025) study highlights the importance of the strategical positioning of the VWC between two confirmed localities of ongoing occupancy for the species namely Seekoeivlei Nature Reserve to the north and Ingula Nature Reserve to the south (both within 30 km of the VWC). "*This central location suggests that the Verkykerskop landscape may function as a critical stepping-stone or movement corridor within the species' fragmented range, further emphasizing the need for precautionary land-use planning and the protection of identified connectivity zones*". More specifically the study singles out the north-eastern and central sections of the wetland complex as being particularly important areas of habitat suitability, *"… warranting high conservation priority and protection from further disturbance or development*". Although much of this habitat occurs outside of the VWC (towards Memel and around Ingula), several core habitat suitability areas were identified within the VWC itself. These core areas exceeded the suitability threshold and were assigned a 250 m transient buffer to account for potential edge disturbance and indirect development impacts. Additionally, areas considered important for maintaining habitat connectivity, facilitating dispersal and promoting persistence in the broader landscape were delineated around the core areas using resistance surface modelling.

Of the various core wetland habitat areas delineated for Species 23 within the AOI, six distinct patches occur within the proposed Groothoek WEF area. One of which represents a wetland system prioritised for detailed sampling and assessment namely VKK 6. The wetland is recognised as being of Moderate habitat suitability. Below is an excerpt from the AfriAvian (2025) study for this site:

- Verkykerskop Site 5 (VKK5)

This site encompasses a relatively large (~156 ha) channeled valley bottom wetland system, hydrologically connected to adjacent riparian and seep habitats. However, over 85% of the palustrine wetland has been inundated following the recent construction of a dam (circa 2023–2024). Remaining marginal habitats in the southern portion of the site continue to support notable species of conservation concern, including the Endangered Grey Crowned Crane and Endangered African Marsh Harrier. Based on the site's former mosaic of wetland vegetation types (i.e. defined by remaining patches), structural heterogeneity, and floristic composition, it is likely that this wetland previously offered suitable habitat for additional threatened species, including the Critically Endangered Species23, Vulnerable African Grass Owl and Critically Endangered Wattled Crane. Multiyear (2020–2025) Habitat Suitability Index (HSI) analysis (see methodology) indicates that VKK5 offers high seasonal suitability for the target species within the remaining patches that have not been flooded. Peak HSI values exceeded the suitability threshold (0.8) between mid-December and Mid-January. Suitability increases steadily from late spring (October–November), reaching a maximum in January before declining again in early autumn. The modelled HSI trend suggests that VKK5 provides favourable habitat conditions during the core summer period, likely driven by vegetation productivity, shallow inundation, and optimal cover. However, a substantial portion of the overall wetland has been inundated, and the reported suitability scores only reflect the ~15% of remaining unflooded habitat. Given the recent construction of the dam, water levels may continue to rise—particularly during periods of high rainfall—posing a risk of further inundation to the remaining suitable habitat.

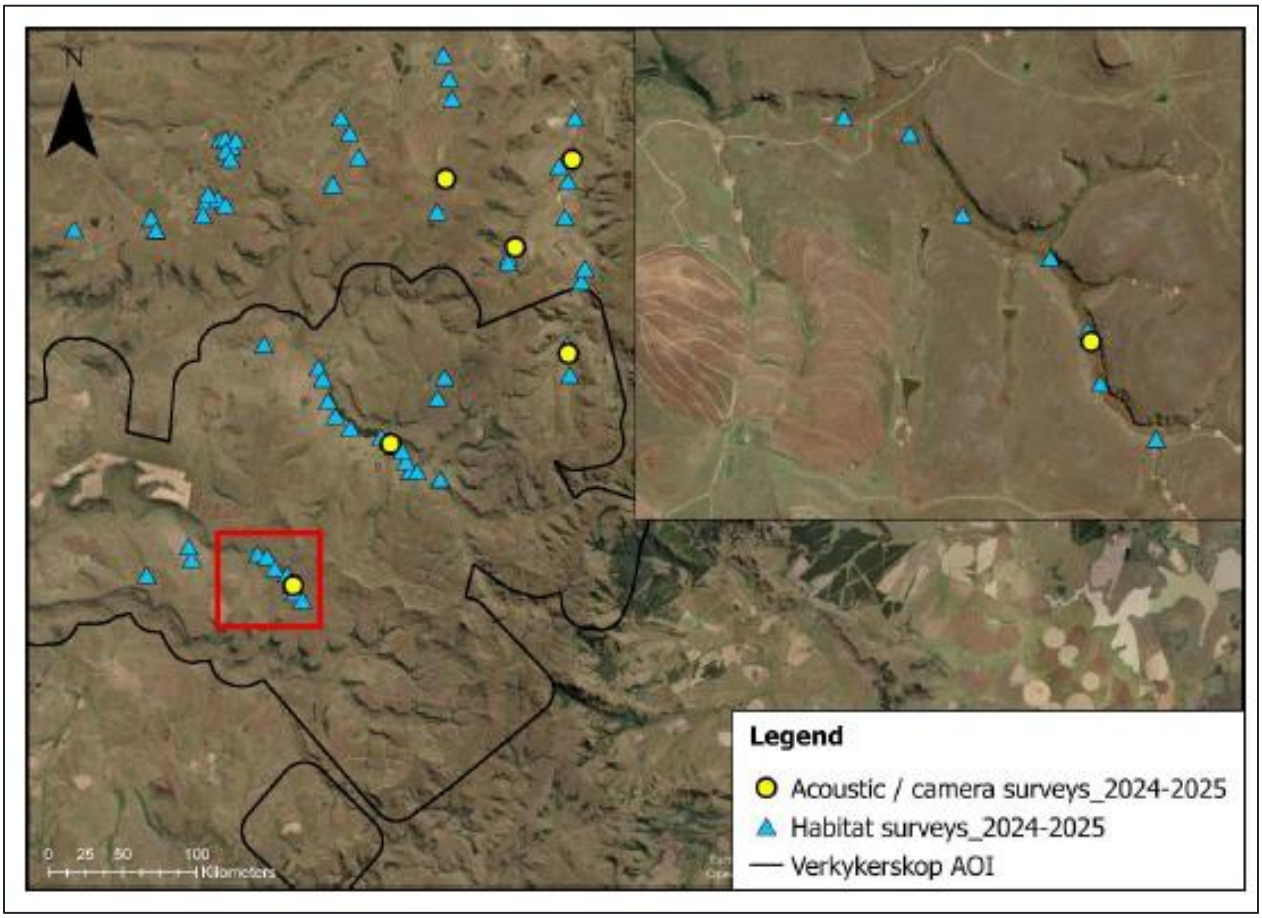

Figure 7-51 - Verkykerskop (VKK5) wetland site surveyed from November 2024 to March 2025.

7.2.5.7 Flight Activity

All Priority Species

Year 1-2 flight activity data for the Kromhof WEF (five, 12-hour VPs run over 12 surveys totalling 720 hours) and the controls (four VPs totalling 576 hours) is summarised in **Table 7-19**. Overall, vantage point observations in the WEF yielded a total of 1338 flights of priority species, totalling 251.33 hours with a passage rate of 1.86 birds-hour. The passage rate was higher than the control (1.23 birds-hour). Cape Vulture and Yellow-breasted Pipit are singled out for further analysis on flight activity as they represent two contrasting yet collision-prone flight patterns namely soaring and displaying. Aside from Cape Vulture, Southern Bald Ibis contributes most significantly to overall passage rates in the WEF. Only one Rudd's Lark flight passage was documented, highlighting the rarity of the species.

Table 7-19 - Summarised flight activity data

Species	VP Hours		No. Fly. Ind.		Passage Rate		Flight Hours	
	WEF	Control	WEF	Control	WEF	Control	WEF	Control
Cape Vulture	720	576	618	141	0.858	0.245	198.785	53.120

Yellow-breasted Pipit	720	576	41	5	0.026	0.057	0.912	0.280
Southern Bald Ibis	720	576	191	137	0.265	0.238	4.908	6.770
All Priority Species	720	576	1338	706	1.860	1.230	251.334	112.500

When comparing passage rates of priority species among vantage points (**Table 7-20**), VP5 and VP10 stand out with a passage rate of 2.11 birds-hour and 2.52 birds-hour respectively. This contrasts starkly with the control (highest per VP control passage rate observed at VP6 of 1.71 birds-hour). When considering variation among seasons, a marked phenological response is revealed. It is clear that the by far the highest passage rates are encountered towards the end of the rainy season with a significant peak in summer (3.12 birds-hour) and autumn (2.04 birds-hour). This is expected given the higher activity associated with increased primary productivity (and consequently insect, seed and other food availability) during this time in this summer rainfall region, breeding and influx of migrants. This period was not only characterised by an influx of Palearctic and intra-African migrants but was found to also be also strongly influenced by altitudinal migration from several Southern African residents (species which move away from these colder highlands to warmer, moister regions below the escarpment and nearer the coast during winter). Additionally, a distinct difference in passage rate among years was observed with Year 2 yielding almost twice as many passages than Year 1, likely a consequence of the shift in southern hemisphere climate patterns from the dryer El Niño during 2023/2024 to the wetter La Niña period from late 2024 (CSIR, 2024).

Table 7-20 - Summarised flight activity data

Site	VP	Winter	Spring	Summer	Autumn	Y1	Y2	Total
Kromhof WEF	5	0.61	0.92	2.61	4.31	1.32	2.90	2.11
	9	1.42	1.97	1.22	0.61	1.54	1.07	1.31
	10	0.53	1.36	7.08	1.11	1.92	3.13	2.52
	11	0.53	0.31	3.36	1.50	1.08	1.76	1.42
	12	2.89	0.83	1.33	2.67	0.75	3.11	1.93
	Total	1.19	1.08	3.12	2.04	1.32	2.39	**1.86**
Control	6	0.61	0.86	1.14	4.22	1.07	2.35	1.71
	7	1.94	1.50	1.11	0.89	1.88	0.85	1.36
	8	1.39	0.78	1.69	0.22	1.11	0.93	1.02
	18	0.44	0.11	1.83	0.92	0.97	0.68	0.83
	Total	1.10	0.81	1.44	1.56	1.26	1.20	**1.23**

Interspecific comparisons on passage rates among the flying priority species (30 spp.) reveal that four have notably higher passage rates than any other, Cape Vulture (0.86 birds^{-hour}) and Southern Bald Ibis (0.27 birds^{-hour}), Jackal Buzzard (0.16 birds^{-hour}) and Amur Falcon (0.15 birds^{-hour}). In terms of seasonality, winter is characterised by a noticeable reduction in the diversity and abundance of large terrestrial birds such as cranes, ibises, korhaans and bustards. In contrast, Black Harrier (observed once during S13) and Greater Kestel were exclusively winter visitors to the WEF. Most notable during winter was the notable reduction in the prevalence of Blue and Crowned Cranes (to almost zero). It was subsequently established that most of the regional crane populations that occur in the project area during summer, leave the project area to aggregate and overwinter, in large non-breeding flocks (of several hundred birds), at one of the two known congregation sites situated on Farm Nugget near Verkykerskop and the dairy farm near Memel. In contrast, summer was characterised by marked increase in local and migratory bird activity which translated into large increases in passage rate during summer and autumn. Visitors during the warmer rainy months included African Fish Eagle, Amur Falcon, Black-chested Snake Eagle, Blue Crane, Blue Korhaan, Booted Eagle, Common Buzzard, Denham's Bustard, Wahlberg's Eagle and Yellow-billed Kite. Verreaux’s Eagle also visit the WEF to hunt (especially along the Mont Pelaan ridgeline and Muel valley) year-round suggesting a nearby nest nearby (likely Nest 4 situated 2.1 km east of the WEF based on proximity and flight paths). It is presumed that the juvenile frequently observed from VP 9 during 2023 came from this nest.

Table 7-21 - Passage rates among the 32 priority species observed during Y1-2

Common Name	Winter S1, 5, 10	Spring S2, 6, 11	Summer S3, 7, 12	Autumn S4, 8, 9	Y1	Y2	Site	Control
African Fish Eagle		0.006		0.011		0.008	0.004	0.003
African Harrier-Hawk		0.011	0.006	0.011		0.014	0.007	0.012
Amur Falcon			0.350	0.244	0.175	0.122	0.149	0.226
Black Harrier								
Black Sparrowhawk	0.006					0.003	0.001	0.005
Black Stork	0.006	0.011	0.017			0.017	0.008	
Black-chested Snake Eagle		0.006				0.003	0.001	
Black-winged Kite	0.011	0.006			0.008		0.004	
Blue Crane		0.128	0.222		0.094	0.081	0.088	0.042
Blue Korhaan								
Booted Eagle								
Cape Vulture	0.572	0.200	1.428	1.233	0.300	1.417	0.858	0.245
Common Buzzard		0.011		0.011	0.006	0.006	0.006	0.002

Common Name	Winter S1, 5, 10	Spring S2, 6, 11	Summer S3, 7, 12	Autumn S4, 8, 9	Y1	Y2	Site	Control
Denham’s Bustard			0.028		0.014		0.007	
Greater Kestrel	0.011				0.006		0.003	0.005
Grey Crowned Crane								
Grey-winged Francolin								
Ground Woodpecker								
Half-collared Kingfisher		0.011				0.006	0.003	
Jackal Buzzard	0.211	0.128	0.133	0.167	0.144	0.175	0.160	0.245
Lanner Falcon	0.056	0.072	0.044	0.017	0.042	0.053	0.047	0.026
Lesser Kestrel								
Little Sparrowhawk								
Martial Eagle	0.011	0.028	0.011	0.006	0.014	0.014	0.014	0.014
Melodious Lark								
Montagu's Harrier								
Pale Chanting Goshawk				0.011		0.006	0.003	
Peregrine Falcon	0.006		0.006			0.006	0.003	
Rock Kestrel	0.089	0.039	0.106	0.056	0.067	0.078	0.072	0.030
Rudd’s Lark		0.006			0.003		0.001	
Rufous-breasted Sparrowhawk	0.006		0.006			0.006	0.003	0.007
Secretarybird	0.006		0.006	0.011	0.006	0.006	0.006	0.014
Southern Bald Ibis	0.094	0.328	0.506	0.133	0.372	0.158	0.265	0.238
Verreaux's Eagle	0.028	0.039	0.033	0.017	0.036	0.022	0.029	0.024
Wahlberg's Eagle		0.006			0.003		0.001	
White Stork				0.039		0.019	0.010	0.002

Common Name	Winter S1, 5, 10	Spring S2, 6, 11	Summer S3, 7, 12	Autumn S4, 8, 9	Y1	Y2	Site	Control
White-bellied Korhaan	0.033					0.017	0.008	
White-necked Raven	0.050	0.022	0.011	0.067	0.031	0.044	0.038	0.076
Yellow-billed Kite		0.011				0.006	0.003	
Yellow-billed Stork								0.002
Yellow-breasted Pipit		0.011	0.211	0.006	0.003	0.111	0.057	0.009

Flight activity was also found to be influenced by time of day with trends in daily activity patterns having varied significantly among the four main time slots. Early mornings (06:30-09:30), as would be expected, are characterised by a peak in total species richness and abundance (particularly with regards to small-passerines). Late mornings (09:30-12:30) are associated with a timeous and drastic increase in the prevalence of soaring birds, which appears related to an increase in temperature and, subsequently, wind speed (particularly above 10 km/h). Early afternoons (12:30-15:30) are considerably quieter with bird activity decreasing drastically. Late afternoon (15-30-18:30) bird activity starts slow before a spike in activity at and just after sunset as many species (particularly Bald Ibis and large raptors) begin their commute back to their roosts/nests.

Flight paths of all priority species observed during vantage point surveys within the project area are mapped in **Figure 7-52**. From this figure, it is apparent that flights by red-listed species are more numerous and generally longer than those made by other priority species. This is because a large proportion of these flights are made by Cape Vulture and Southern Bald Ibis which are gregarious soaring birds. What is also apparent is that Cape Vulture made the furthest flights.

To better understand the spatial distribution of flights over the project area a flight path intersection density model was made (**Figure 7-54**). This model (essentially kernel density estimation applied to intersecting lines) subsequently formed the basis of the flight corridors sensitivity layer included in the sensitivity assessment. This figure shows that although priority species flights cross the entire VWC, they are concentrated in at least 10 “hotspot” areas for flight activity, hereafter referred to as flight corridors, of which five interconnecting routes occur in the proposed Kromhof WEF namely Flight Corridors 3, 4, 5, 7, 9. Flight Corridor 3 is a large kloof area with frequent flight passages due to proximity to a Southern Bald Ibis Roost and Kestrel nests along the cliff line. Flight Corridor 4 connects the Ingula-Majuba 14 transmission lines with the Dwaalspruit valley to the west which is frequently used by Blue Crane and Cape Vulture. Flight Corridor 5 occurs along the prominent ridgeline associated with Mont Pelaan, is frequently used by Cape Vulture and other large soaring birds to gain lift, undoubtedly the most important flight corridor in the VWC which also connects several priority species nests. Flight Corridor 7 is along the Muel River valley, a large dammed floodplain lined by low cliffs. The steeper north-eastern bank of this valley is frequented used by numerous priority species and waterfowl for commuting. During summer this prominent break in topography funnels large flocks of migratory amur falcon over the escarpment into KwaZulu-natal. Flight Corridor 9 is utilised primarily by a flock of Southern Bald Ibis to access their breeding colony (Roost6). It also connects to major flight corridors to north and south.

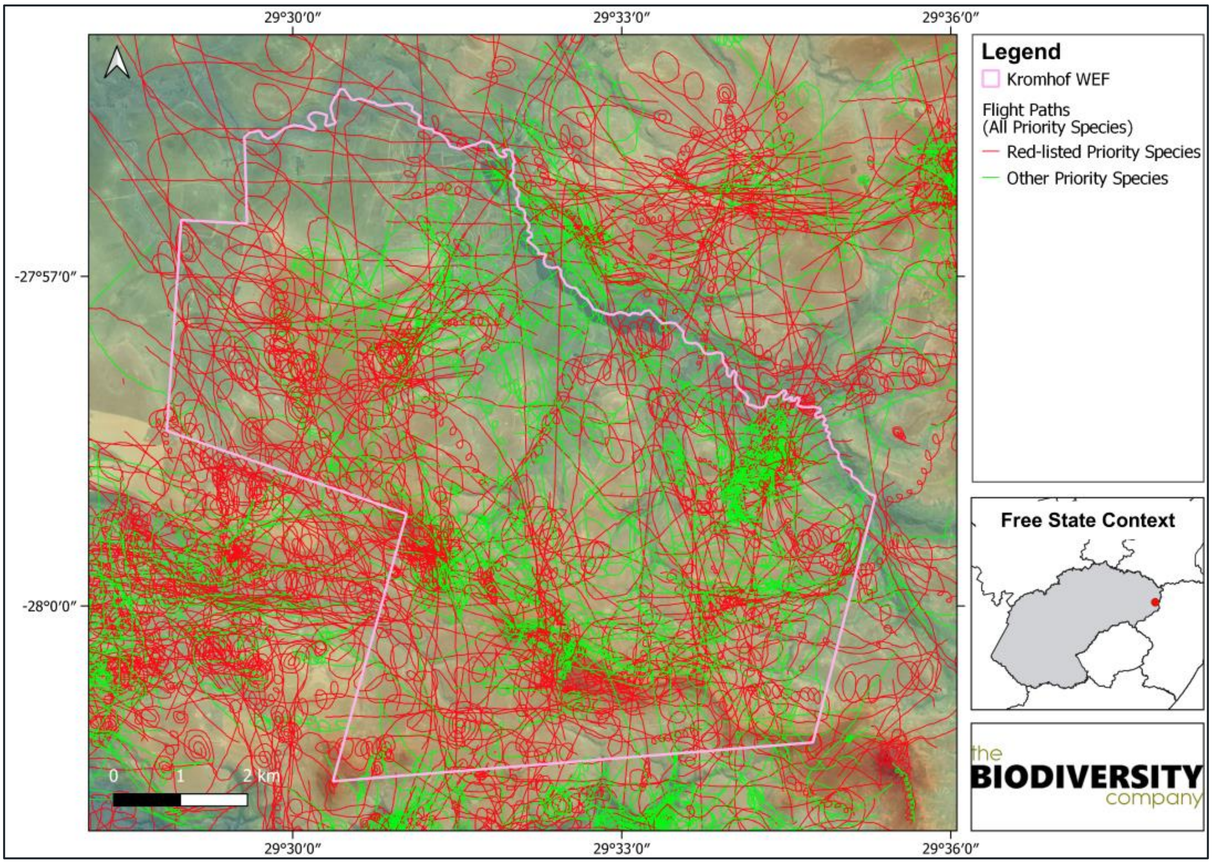

Figure 7-52 - Combined flight paths of red-listed and other priority species

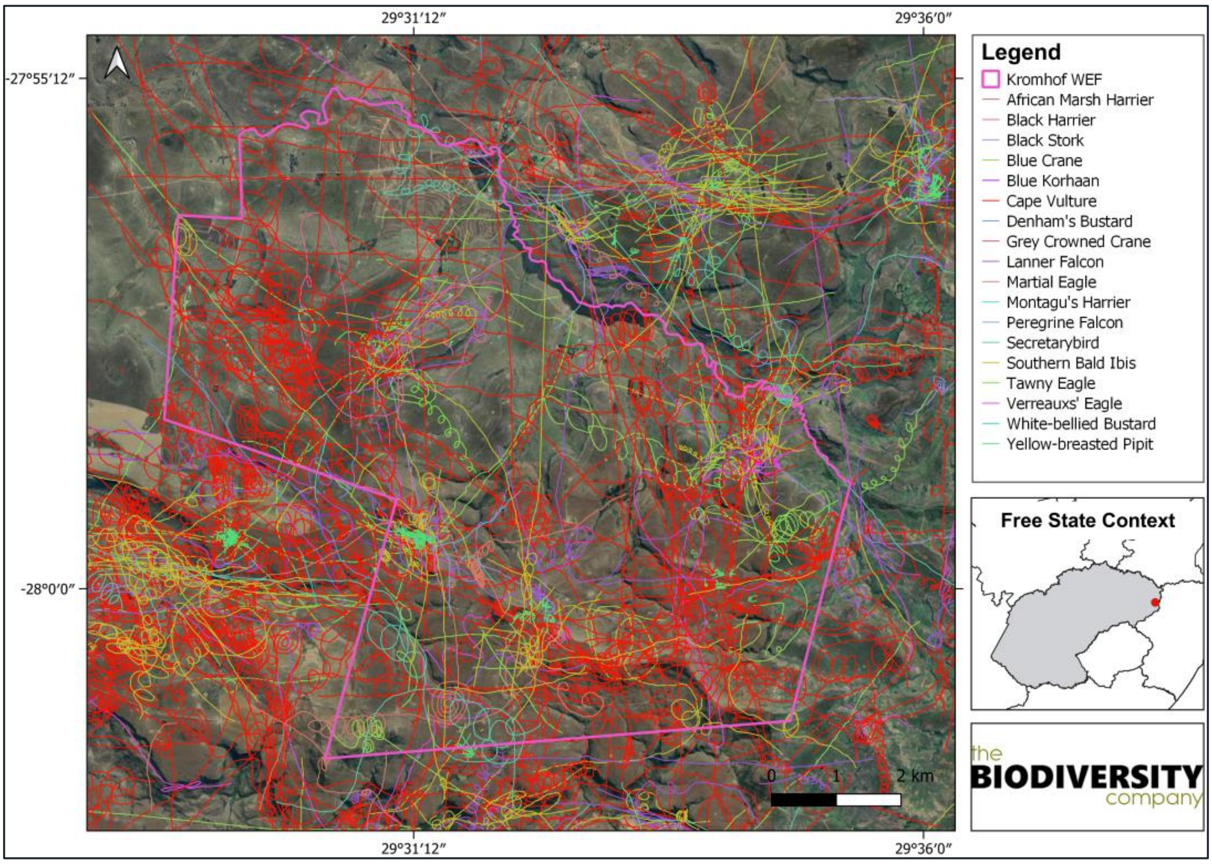

Figure 7-53 - Annotated fight paths of red-listed species

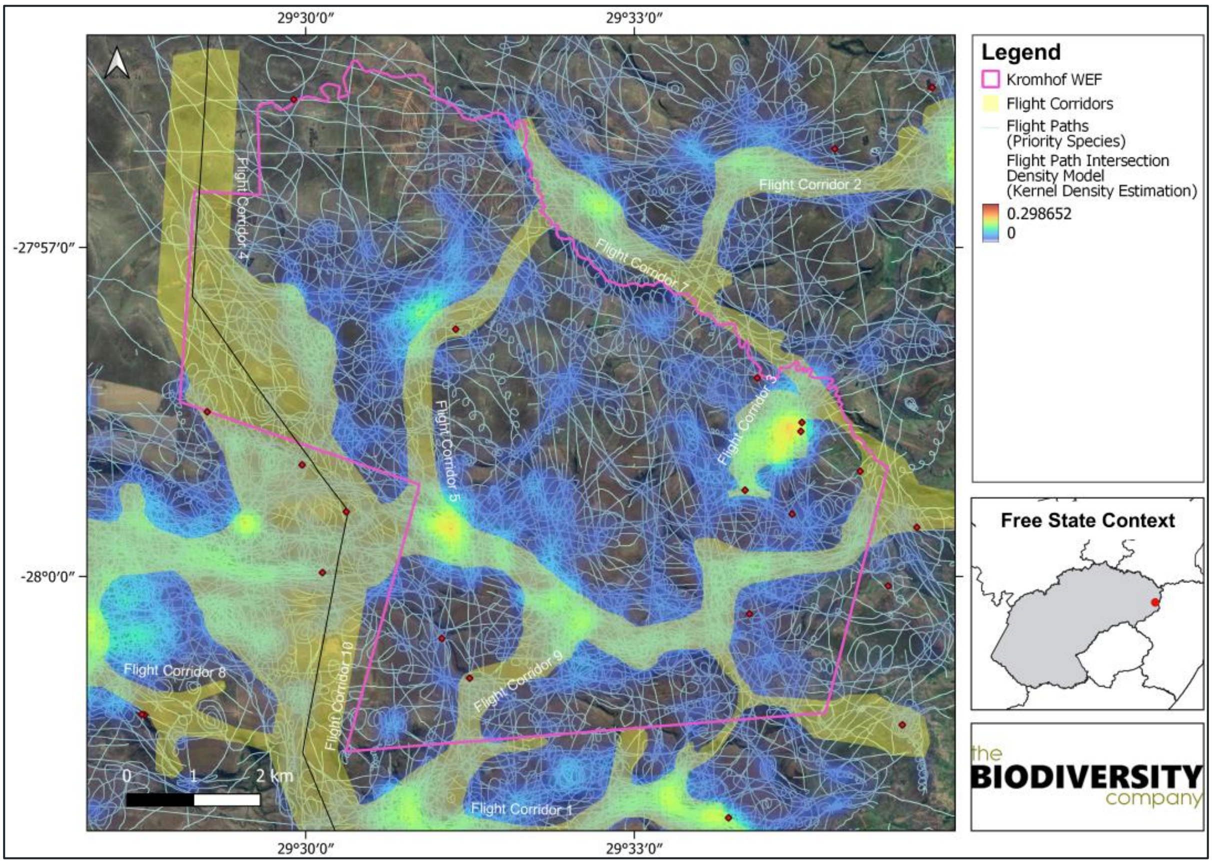

Figure 7-54 - Flight path density intersection model

7.2.5.8 Cape Vulture

Tracking Data

Tracking data on 16 Cape and four White-backed Vultures fitted with GPS loggers (clipped to the AOI) was supplied courtesy of Vulpro (2025) to inform planning and risk assessment with regards to the VWC. The data reveals that Cape Vultures regularly fly across the VWC. As much as 94% of the CV data supplied by Vulpro for the AOI was logged during the study period (data from June 2022 till March 2025). The tracking data also shows the erratic nature of the flights which are spread across most of the VWC, as was observed in-field. Overlaying digital elevation models on flight data helps to shed light on potential flight routes and triangulation between the various roosts that was inferred from in-field observations. Of greatest potential significance to the project are the generally north/south and north-west/south-east trending flights from the breeding roost at Nelsonskop to the non-breeding Witkoppe and Verkykerskop roosts respectively. The general pattern is for the vultures to fly northwards in the morning from Nelsonskop (often low over the VWC) towards the Witkoppe following a distinct series of inselbergs which includes Waterkop and Mont Pelaan Ridge. Another flight path follows the powerline servitude. They then either head south-westwards towards Arend's Kop via Verkykerskop before circling back to Nelsonskop or continuing northwards. Tracked vultures G26904 and G36625, demonstrate this trend particularly well. At the Kromhof WEF, Cape Vulture flights are associated with Flight Corridors 4 (powerlines), 5 (Mont Pelaan ridgeline), and 7 (Muel valley). Interestingly White-backed Vulture were also tracked over the WEF, an “out of range” species more typically associated with warmer bushveld regions.

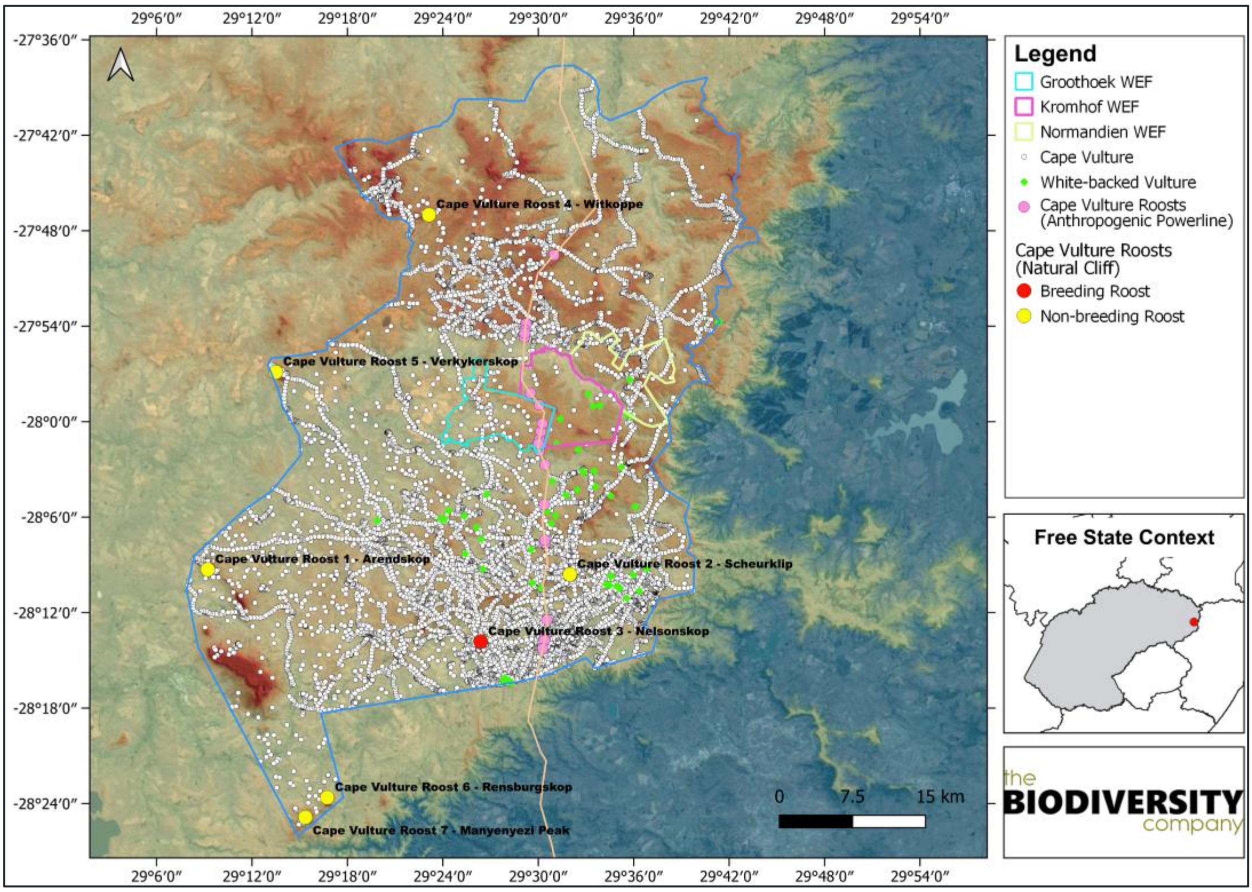

Figure 7-55 - Vulture tracking localities and roosts (within 50 km). Data courtesy of Vulpro (2025)

Monitoring Data

Cape Vulture flight path across the Kromhof WEF are represented spatially in **Figure 7-53**. During the standard two-year monitoring program, 618 individual Cape Vulture passages were recorded from the five on-site vantage points at the Kromhof WEF, representing an average passage rate of 0.858 birds^{-hour}. This is three times greater than the combined passage rate for the four control VPs. Although Cape Vulture are present year-round in the WEF, a distinct seasonal variation in passage rate was observed. Over the two-year monitoring period, Cape Vulture passages were consistently higher during summer and autumn surveys with passage rates of 1.4 birds^{-hour} and 1.2 birds^{-hour} respectively more than twice that of any other season. Although the passage rate data provides information on the regularity and frequency of vulture flights it does not account for the duration and time spent flying at rotor height nor the spatial variation thereof.

7.2.5.9 Key Flight Corridors

Hotspots of heightened flight activity, referred to as flight corridors are mapped in **Figure 7-54**. These flight corridors were delineated so as to best intersect with the available data in a way that is both intuitive and biologically meaningful. Input data included the flight path density intersection model (kernel density estimation based on visual observations from the two-year monitoring program), species occurrence density model (kernel density estimation), vulture tracking point clouds (Vulpro, 2025) and Martial Eagle core use areas based on kernel density estimation (EWT, 2025).

Of the 10 identified flight corridors, five interconnecting routes occur in the proposed Kromhof WEF namely Flight Corridors 3, 4, 5, 7, 9. Flight Corridor 3 is a large kloof area with frequent flight passages due to proximity to a Southern Bald Ibis Roost and Kestrel nests along the cliff line. Flight Corridor 4 connects the Ingula-Majuba 14 transmission lines with the Dwaalspruit valley to the west which is frequently used by Blue Crane and Cape Vulture. Flight Corridor 5 occurs along the prominent ridgeline associated with Mont Pelaan, is frequently used by Cape Vulture and other large soaring birds to gain lift, undoubtedly the most important flight corridor in the VWC which also connects several priority species nests. Flight Corridor 7 is along the Muel River valley, a large dammed floodplain lined by low cliffs. The steeper north-eastern bank of this valley is frequented used by numerous priority species and waterfowl for commuting. During summer this prominent break in topography funnels large flocks of migratory amur falcon over the escarpment into KwaZulu-Natal. Flight Corridor 9 is utilised primarily by a flock of Southern Bald Ibis to access their breeding colony (Roost6). It also connects to major flight corridors to north and south. Flight corridors are considered to be of very high sensitivity and represent exclusion zones for all infrastructure that poses a collision risk (e.g. turbines, power lines and fences). Additionally, it would be prudent to avoid placing collision risk infrastructure in all areas of high utilisation for the tracked Martial Eagle “Brad” that fall beyond the delineated flight corridors.

7.2.5.10 Key Breeding and Roosting Areas

The proposed Kromhof WEF occurs within 50 km of seven Cape Vulture roosts (closest being Scheurklip 14.8 km south and the closest breeding colony being Nelsonskop at 23.5 km south-west.

It also intersects 15 nest / roost buffers of other priority species of which Southern Bald Ibis Roosts 5, 11, 14, 16, 17, 18 and 19, Blue Crane Nests 1-3, Jackal Buzzard Nest 3, Lanner Falcon Nests 2 and 3, Rock Kestrel Nest 1, and Verreaux’s Eagle Nests 2 and 3 have buffer implications for the proposed Kromhof WEF.The various nests and roosts recorded within the AOI together with their prescribed buffers, justifications and Implications for the proposed WEF are shown in Table 7-22. These areas of avifaunal sensitivity within the project area spatially depicted in Figure 7-57. A very high sensitivity core buffer of 18 km is applied to known breeding colony on Nelsonskop as per Pfeiffer and Ralston-Paton (2018). This area represents an exclusion zone for all collision-risk infrastructure (e.g. turbines, powerlines and fences). The 50 km roost buffers applied to the various Cape Vulture roosts (which cover 100% of the WEF) represents a high sensitivity intensive mitigation zone. All core buffers on other priority species nests and roosts are afforded a very high sensitivity and represent all infrastructure exclusion zones while the transient buffers surrounding the core areas are afforded a high sensitivity and represent infrastructure minimisation and intensive mitigation zones.

Table 7-22 - List of nests and roosts within the AOI, their buffer sizes, justifications and implications for the proposed Kromhof WEF

Name	Breeding Activity	Buffer1[8] (m)	Buffer2[9] (m)	Buffer3[10] (m)	Justification	Buffer Implications for WEF
African Harrier-hawk Nest 1	Confirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed.	No
African Harrier-hawk Nest 2	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed.	No
Bearded Vulture Nest 1	Confirmed	5500	10000	0	Krueger, S & Amar, A. (2021). The Ecology and Management of a Critically Endangered Population of Bearded Vultures. Imperilled: The Encyclopaedia of Conservation 10.1016/B978-0-12-821139-7.00168-9.	No
Black Sparrowhawk Nest 1	Confirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 2	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 3	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 4	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 5	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 6	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No

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[8] Buffer 1: Very High sensitivity, Zone 1 all infrastructure exclusion area.
[9] Buffer 2: High sensitivity, Zone 3 infrastructure minimisation and intensive mitigation area.
[10] Buffer 3: High sensitivity, Zone 4 intensive mitigation area (within 50 km of CV roost).

Name	Breeding Activity	Buffer1[8] (m)	Buffer2[9] (m)	Buffer3[10] (m)	Justification	Buffer Implications for WEF
Black Sparrowhawk Nest 7	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 8	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Blue Crane Nest 1	Confirmed	150	300	0	DFFE stipulation.	Yes
Blue Crane Nest 2	Confirmed	150	300	0	DFFE stipulation.	Yes
Blue Crane Nest 3	Confirmed	150	300	0	DFFE stipulation.	Yes
Blue Crane Nest 4	Confirmed	150	300	0	DFFE stipulation.	No
Cape Vulture Roost 1	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 2	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 3	Confirmed	18000	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 4	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 5	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 6	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 7	Unconfirmed	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Grey Crowned Crane Nest 1	Confirmed	1000	0	0	Specialist recommendation. Endangered species.	No
Grey Crowned Crane Nest 2	Confirmed	1000	0	0	Specialist recommendation. Endangered species.	No

Name	Breeding Activity	Buffer1[8] (m)	Buffer2[9] (m)	Buffer3[10] (m)	Justification	Buffer Implications for WEF
Ground Woodpecker Nest 1	Confirmed	150	300	0	Specialist recommendation. Endangered species.	No
Ground Woodpecker Nest 2	Confirmed	150	300	0	Specialist recommendation. Endangered species.	No
Half-collared Kingfisher Nest 1	Confirmed	1000	0	0	Pairs typically defend a 1-3 km reach of river (Chittenden et al. 2016). Threatened Species.	No
Jackal Buzzard Nest 1	Confirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Jackal Buzzard Nest 2	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Jackal Buzzard Nest 3	Confirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	Yes
Jackal Buzzard Nest 4	Unconfirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	Yes
Lanner Falcon Nest 1	Confirmed	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	No
Lanner Falcon Nest 2	Confirmed	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	Yes
Lanner Falcon Nest 3	Confirmed	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	Yes
Lanner Falcon Nest 4	Confirmed	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and	No

Name	Breeding Activity	Buffer1[8] (m)	Buffer2[9] (m)	Buffer3[10] (m)	Justification	Buffer Implications for WEF
					industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	
Martial Eagle Nest 1	Confirmed	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Martial Eagle Nest 2	Confirmed	5000	0	0	DFFE stipulation and Brink, R. (2020).	Yes
Martial Eagle Nest 3	Unconfirmed	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Martial Eagle Nest 4	Confirmed	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Martial Eagle Nest 5	Confirmed	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Rock Kestrel Nest 1	Confirmed	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Secretarybird Nest 1	Unconfirmed	500	1000	0	Specialist recommendation. Some flexibility typically allowed	No
Southern Bald Ibis Roost 1	Unconfirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 2	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 3	Unconfirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 4	Unconfirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 5	Confirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 6	Confirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 7	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 8	Confirmed	1000	5000	0	Specialist recommendation.	No
Southern Bald Ibis Roost 9	Confirmed	1000	5000	0	Specialist recommendation.	No
Southern Bald Ibis Roost 10	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 11	Confirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 12	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 13	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 14	Unconfirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 15	Confirmed	1000	2500	0	Specialist recommendation.	No
Southern Bald Ibis Roost 16	Unconfirmed	1000	2500	0	Specialist recommendation.	Yes

Name	Breeding Activity	Buffer1[8] (m)	Buffer2[9] (m)	Buffer3[10] (m)	Justification	Buffer Implications for WEF
Southern Bald Ibis Roost 17	Unconfirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 18	Unconfirmed	1000	2500	0	Specialist recommendation.	Yes
Southern Bald Ibis Roost 19	Confirmed	1000	2500	0	Specialist recommendation.	Yes
Verreaux's Eagle Nest 1	Unconfirmed	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
Verreaux's Eagle Nest 2	Unconfirmed	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	Yes
Verreaux's Eagle Nest 3	Confirmed	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
Verreaux's Eagle Nest 4	Unconfirmed	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	Yes
White-necked Raven Nest 1	Confirmed	750	0	0	Specialist recommendation.	No

7.2.5.11 Combined Avifauna Sensitivity Mapping

Overall sensitivity rating per receptor is taken as a function of its Biodiversity Importance and Receptor Resilience as per the Species Environmental Assessment Guidelines (2022). To assist in the practical application of these sensitivity ratings these sensitivity ratings are further categorised into sensitivity zones based on their implications for wind energy-related infrastructure development in the proposed WEF. The various sensitivity zones as applicable to avifauna are defined in **Table 7-24** which also provides a summary on their extent within the proposed WEF and the number of proposed Wind Turbine Generators (WTGs) they overlap (based on the current layout).

Table 7-23 - Summary of the extent of the four sensitivity zones within the proposed WEF area (7269 ha)

Sensitivity Zone	Description	Area (ha)	Proportion of WEF (%)
Zone 1	All infrastructure exclusion	3063	50
Zone 2	Collision-risk infrastructure exclusion (e.g. turbines, powerlines and fences)	4109	67

Sensitivity Zone	Description	Area (ha)	Proportion of WEF (%)
Zone 3	Infrastructure minimisation and intensive mitigation	5451	88
Zone 4	Intensive mitigation	6170	100
Total: Combined WTG Exclusion Area		4776	77

Table 7-24 - Receptors underpinning the avifaunal sensitivity mapping and their implications for Kromhof WEF (BI, Biodiversity Importance; RR, Receptor Resilience; SEI, Site Ecological Importance and Sensitivity)

Receptor	Description	Avifauna Sensitivity			Mapped Sensitivity Zones	
		BI	RR	SEI	Implications	Zone
Regional Significance						
Key Biodiversity Areas (KBAs)	Eastern Free State Escarpment. Overlaps 63% of the eastern region of the proposed Kromhof WEF.	H	M	H	Infrastructure minimisation and intensive mitigation	3
Habitats						
Key Plateau Grasslands: Core	**Areas of plateau grassland identified as core habitat for threatened high altitude grassland species based on a five-year modelling study by Dr R. Colyn (AfriAvian). Refined and validated using on-site locality records from monitoring. Falls within global hotspot for Rudd's Lark, Botha's Lark and Yellow-breasted Pipit occurrence.**	**VH**	**VL**	**VH**	**All Infrastructure exclusion**	**1**
Key Plateau Grasslands: Connective	**Areas of plateau grassland identified using the same modelling exercise as being important for buffering and maintaining connectivity between core habitats for threatened high-altitude passerines.**	**H**	**M**	**H**	**All Infrastructure exclusion**	**1**
General Wetlands	All wetlands as delineated during the wetland assessment for the VWC. Considered highly important for a wide diversity of wetland dependant priority species of which several are Threatened. Both Grey-crowned and Blue Crane breed in wetlands in the VWC.	H	M	H	All Infrastructure exclusion	1
Key Wetlands (Core)	**Areas of suitable habitat for Species 23 based on a robust, site-specific and field validated multi-tiered modelling exercise.**	**VH**	**VL**	**VH**	**All Infrastructure exclusion**	**1**
Key Wetlands (Transient)	**A 250 m transient buffer assigned to core areas account for potential edge disturbance and indirect development impacts.**	**H**	**M**	**H**	**All Infrastructure exclusion**	**1**

Receptor	Description	Avifauna Sensitivity			Mapped Sensitivity Zones	
		BI	RR	SEI	Implications	Zone
Wetlands (Connective)	**Medium risk areas identified using resistance modelling considered important for maintaining habitat connectivity and facilitate movement of the species through the broader landscape (e.g. between known populations from Memel to the north and Ingula to the south). Forms a contiguous network effectively connecting these two known populations.**	**M**	**M**	**M**	**Collision-risk infrastructure exclusion (e.g. turbines, powerlines and fences)**	**2**
Cliffs and Ridges Core	Slopes >20% modelled using analysis of 30 m resolution Jaxa Digital Elevation Model	VH	VL	VH	Collision-risk infrastructure exclusion (e.g. turbines, powerlines and fences)	2
Cliffs and Ridges Transient	100 m buffer on core cliffs and ridges habitat. Important for buffering against collision events.	H	M	H	Infrastructure minimisation and intensive mitigation	3
Other Natural Habitat	All other areas of remaining natural habitat.	M	M	M	NA: Covered by Zone 4 - Intensive Mitigation (within 50 km of CV roost)	4
Active Croplands	Areas of active crop cultivation. Frequently utilised by flocks of Blue and Grey Crowned Crane for foraging while fallow.	M	H	L	NA: Covered by Zone 4 - Intensive Mitigation (within 50 km of CV roost)	4
Transformed Areas	All areas which have been completely transformed by infrastructure such as farm buildings and gravel roads.	VL	VH	VL	NA: Covered by Zone 4 - Intensive Mitigation (within 50 km of CV roost)	4
Flight Areas						
Flight Corridors	Areas of heightened flight activity identified through a combination of flight path intersection density modelling and tracking data on Cape and White-backed Vultures (Vulpro, 2025) as well as Martial Eagle (EWT, 2025).	VH	L	VH	Collision-risk infrastructure exclusion (e.g. turbines, powerlines and fences)	2
Tracked ME Utilisation Areas (beyond corridors)	Based on modelled high utilisation areas of one tracked Martial Eagle named Brad (EWT, 2025)	H	M	H	Infrastructure minimisation and intensive mitigation	3
Breeding and Roosting Areas						

Receptor	Description	Avifauna Sensitivity			Mapped Sensitivity Zones	
		BI	RR	SEI	Implications	Zone
Cape Vulture Roosts: Breeding (18 km)	Core buffer of 18 km applied to known breeding colony on Nelsonskop as per Pfeiffer and Ralston-Paton (2018).	VH	VL	VH	Collision-risk infrastructure exclusion (e.g. turbines, powerlines and fences)	2
Cape Vulture Roosts: Non-breeding (50 km)	The proposed Kromhof WEF falls within the 50 km buffer zone (as per Pfeiffer and Ralston-Paton, 2018) of seven Cape Vulture roosts. Buffer coverage of WEF 100%.	H	M	H	Intensive mitigation (within 50 km of CV roost)	4
Nests and Roost Buffers: Core (Buffer 1)	Core buffers on priority species nests and roosts. See Table 5-1 for details on those with buffer implications for the WEF and justifications for buffer size.	VH	L	VH	All Infrastructure exclusion	1
Nest and Roosts Buffers: Transient (Buffer 2)	Transient buffers on priority species nests and roosts. See Table5-1 for details.	H	M	H	Infrastructure minimisation and intensive mitigation	3

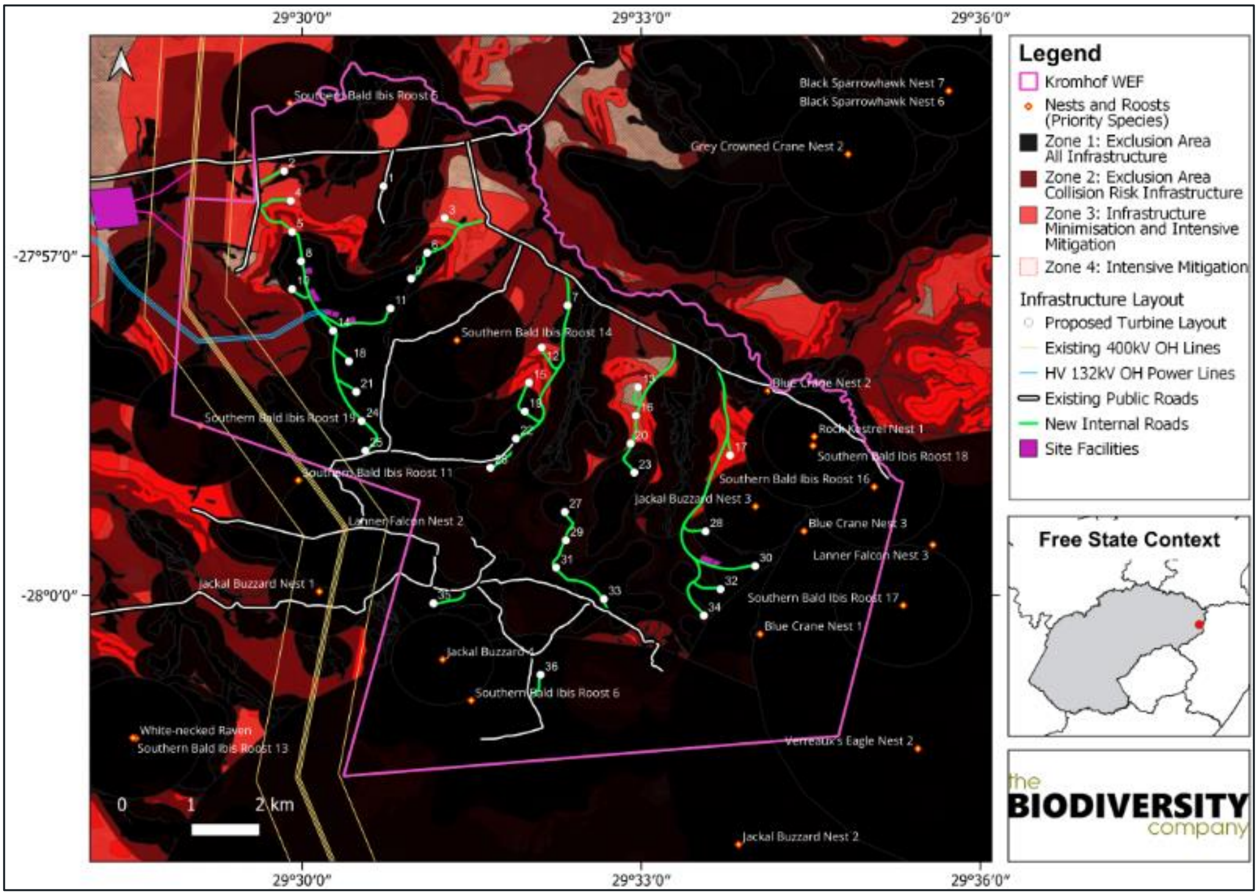


Figure 7-56 – Avifaunal sensitivity map for Kromhof WEF

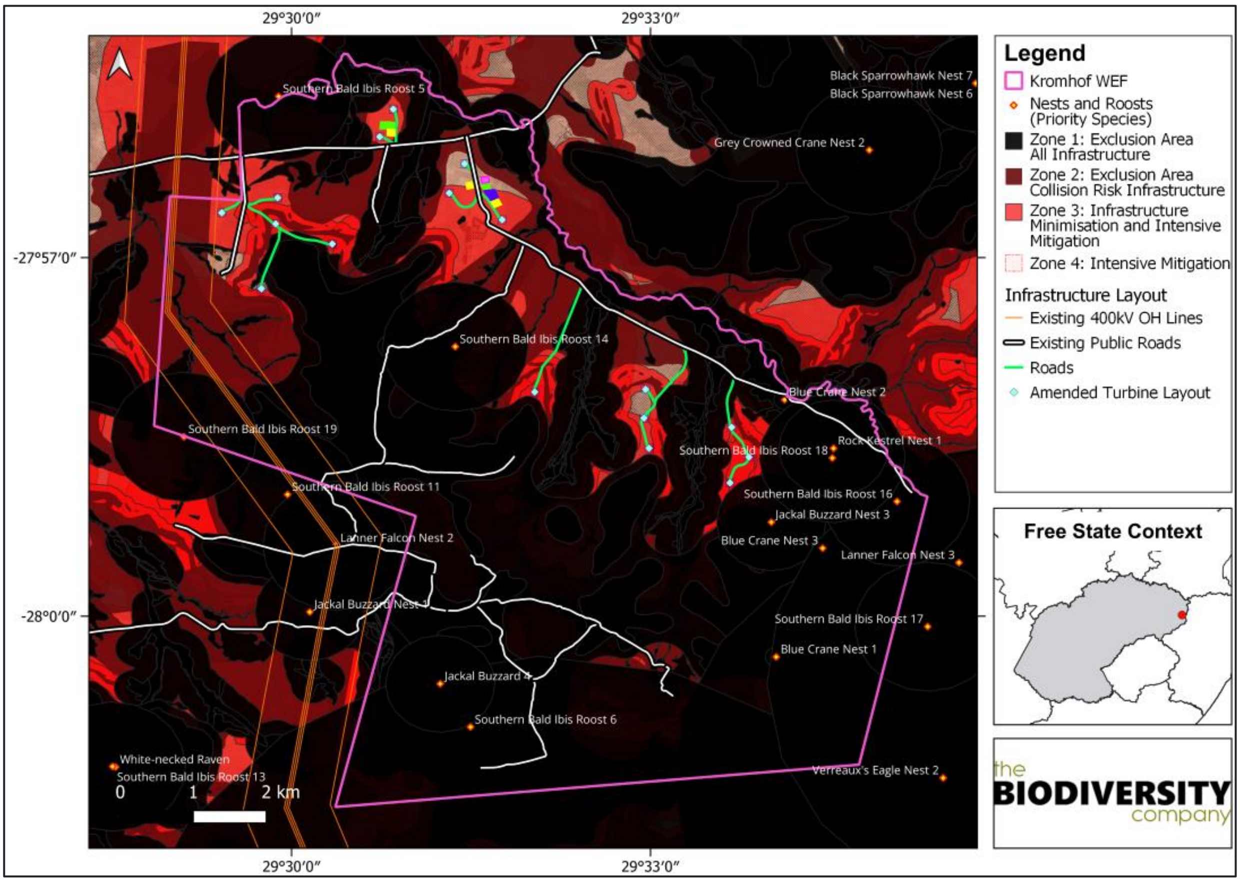


Figure 7-57 – Avifaunal sensitivity map for Kromhof WEF (Amended layout)

7.2.6 BATS

The following is extracted from the Bat Assessment Report compiled by Inkululeko Wildlife Services (Pty) Ltd and included as Appendix G.8.

According to the spatial data and other information sources that were consulted by IWS, seven protected areas are situated within only 10 km of the proposed Verkykerskop Cluster site and one within 10 km of the Groothoek WEF site. Bats which should be conserved within these protected areas could potentially be impacted in various ways by each WEF within the Cluster and, therefore, a 0-2.5 km High and 2.5-5 km Medium sensitivity buffer has been assigned around each of the seven closest protected areas

Bat species which have been detected or which potentially occur in the Verkykerskop WEF cluster study area are listed in **Figure 7-58,** together with their current Red List status, conservation significance, and turbine fatality risk (as given in MacEwan *et al*. 2020a). Of 18 bat species that are listed for the study area, 14 species were recorded within the Verkykerskop cluster site. Among these 14 recorded species, seven have a High fatality risk of collision with turbines, and two have a Medium–High fatality risk. Two fruit bat species were rated with a Low potential occurrence.

The 14 months of passive monitoring of bat call activity revealed the presence of at least 12 species in/near the Groothoek WEF site, including the Egyptian Free-tailed Bat (*Tadarida aegyptiaca*), Cape Serotine (*Laephotis capensis*), Natal Long-fingered Bat (*Miniopterus natalensis*), Lesser Long-fingered Bat (*Miniopterus fraterculus*), Mauritian Tomb Bat (*Taphozous mauritianus*), Little Free-tailed Bat (*Mops pumilus*), Midas Free- tailed Bat (*Mops midas*), Long-tailed Serotine (*Cnephaeus hottentotus*), Dusky Pipistrelle (*Pipistrellus hesperidus*), Lesueur's Wing-gland Bat (*Cistugo lesueuri*), Temminck's Myotis (*Myotis tricolor*) and *Rhinolophus cervenyi* (which has recently been classified, and does not yet have a common name). Geoffrey's Horseshoe Bat (*Rhinolophus acrotis*) and Swinny's Horseshoe Bat (*Rhinolophus swinnyi*) were not recorded (but could occur) at Groothoek.

The widespread aerial-feeding Egyptian Free-tailed Bat and Cape Serotine and migratory Natal Long-fingered Bat have been killed most often at wind farms in South Africa (Aronson 2022).

Of the 18 listed species; the following eight species are regarded by IWS as Species of Conservation Concern (SCC):

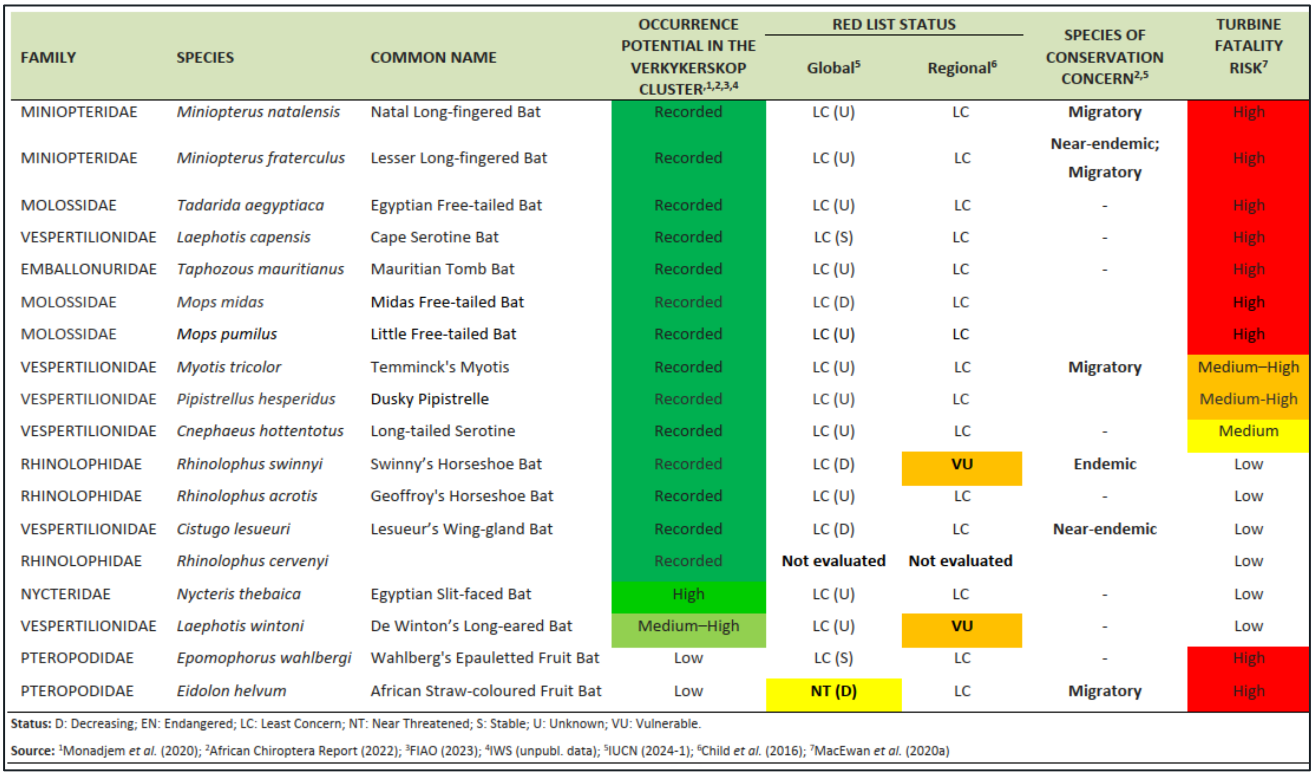
- Natal Long-fingered Bat: known to roost in large numbers (sometimes hundreds or thousands of individuals) and to migrate hundreds of kilometres (Miller-Butterworth et al. 2003; Kearney et al. 2017; MacEwan *et al.* 2016).
- Lesser Long-fingered Bat: endemic to South Africa and Eswatini where the core of its distribution is in the montane grasslands of the escarpment. Cave-dependent and migratory; this species congregates in far smaller numbers than the Natal Long-fingered Bat (Monadjem *et al.* 2020)
- Temminck's Myotis: Known to undertake seasonal migrations similar to the Natal Long-fingered Bat (Monadjem *et al*. 2020).
- Long-tailed Serotine: Near-endemic (Monadjem et al. 2020; IUCN 2024-1). This bat occurs widely but sparsely in southern Africa. The patchy distribution of this species is probably due to its specific roosting requirements. Individuals roost in small groups of two to four individuals in caves and rock crevices.
- Lesueur's Wing-gland Bat: Near-endemic to South Africa and Lesotho. Currently Red Listed as Least Concern, but experiencing a global population decline (IUCN 2024-1).

- Swinny’s Horseshoe Bat (Rhinolophus swinnyi): a rare cavity-roosting species listed as regionally Vulnerable (Child *et al*. 2016) and endemic to South Africa, where it appears to be associated with temperate Afromontane forests (Monadjem *et al.* 2020).
- De Winton’s Long-eared Bat (Laephotis wintoni): Regionally Vulnerable (Child *et al.* 2016). This species occurs at high altitude (>1 500 m above sea level) in the Free State and Lesotho, where it has been collected from montane grasslands. The echolocation call of this species has not yet been recorded, and little else is known about this species. It is presumed to use crevices in rock faces (Monadjem *et al.* 2020).
- African Straw-coloured Fruit Bat: Globally and nationally Near Threatened. Known to roost in large numbers and migrate hundreds of kilometres (Monadjem *et al*. 2020).

Of the eight SCC, the Natal and Lesser long-fingered bats have the Highest risk of fatality from turbines, followed by Temminck’s Myotis and the Long-tailed Serotine, which have a Medium-High and Medium fatality risk, respectively. The other SCC have a Low fatality risk. Records in the study region of the High-risk African Straw-coloured Fruit Bat are most likely representative of vagrant individuals.

The nearest known major bat roost is ~103 km north-east of the Verkykerskop WEF site, in old mine tunnels referred to as Yzermyn. Here, sizeable populations of the migratory Natal Long-fingered Bat, Geoffroy’s Horseshoe Bat, Temminck's Myotis, and the Vulnerable endemic Swinny's Horseshoe Bat have been recorded (NSS 2013). Given the distance from the Yzermyn tunnels, the proposed Verkykerskop WEF Cluster is not expected to have a major impact on bats from that roost site.

However, several active or potential bat roost sites were identified at various locations throughout the cluster. Primary roost locations included farmhouses, outbuildings, and crevices in rocky ridges (**Figure 7-58**) of **Appendix G.8**. The specific roosts in each WEF site are listed below, with accompanying photographs.



FAMILY	SPECIES	COMMON NAME	OCCURRENCE POTENTIAL IN THE VERKYKERSKOP CLUSTER[1,2,3,4]	RED LIST STATUS		SPECIES OF CONSERVATION CONCERN[2,5]	TURBINE FATALITY RISK[7]
				Global[5]	Regional[6]		
MINIOPTERIDAE	*Miniopterus natalensis*	Natal Long-fingered Bat	Recorded	LC (U)	LC	**Migratory**	High
MINIOPTERIDAE	*Miniopterus fraterculus*	Lesser Long-fingered Bat	Recorded	LC (U)	LC	**Near-endemic; Migratory**	High
MOLOSSIDAE	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Recorded	LC (U)	LC	-	High
VESPERTILIONIDAE	*Laephotis capensis*	Cape Serotine Bat	Recorded	LC (S)	LC	-	High
EMBALLONURIDAE	*Taphozous mauritianus*	Mauritian Tomb Bat	Recorded	LC (U)	LC	-	High
MOLOSSIDAE	*Mops midas*	Midas Free-tailed Bat	Recorded	LC (D)	LC		High
MOLOSSIDAE	*Mops pumilus*	Little Free-tailed Bat	Recorded	LC (U)	LC		High
VESPERTILIONIDAE	*Myotis tricolor*	Temminck's Myotis	Recorded	LC (U)	LC	**Migratory**	Medium–High
VESPERTILIONIDAE	*Pipistrellus hesperidus*	Dusky Pipistrelle	Recorded	LC (U)	LC		Medium-High
VESPERTILIONIDAE	*Cnephaeus hottentotus*	Long-tailed Serotine	Recorded	LC (U)	LC	-	Medium
RHINOLOPHIDAE	*Rhinolophus swinnyi*	Swinny’s Horseshoe Bat	Recorded	LC (D)	**VU**	**Endemic**	Low
RHINOLOPHIDAE	*Rhinolophus acrotis*	Geoffroy's Horseshoe Bat	Recorded	LC (U)	LC	-	Low
VESPERTILIONIDAE	*Cistugo lesueuri*	Lesueur’s Wing-gland Bat	Recorded	LC (D)	LC	**Near-endemic**	Low
RHINOLOPHIDAE	*Rhinolophus cervenyi*		Recorded	**Not evaluated**	**Not evaluated**		Low
NYCTERIDAE	*Nycteris thebaica*	Egyptian Slit-faced Bat	High	LC (U)	LC	-	Low
VESPERTILIONIDAE	*Laephotis wintoni*	De Winton’s Long-eared Bat	Medium–High	LC (U)	**VU**	-	Low
PTEROPODIDAE	*Epomophorus wahlbergi*	Wahlberg's Epauletted Fruit Bat	Low	LC (S)	LC	-	High
PTEROPODIDAE	*Eidolon helvum*	African Straw-coloured Fruit Bat	Low	**NT (D)**	LC	**Migratory**	High

Status: D: Decreasing; EN: Endangered; LC: Least Concern; NT: Near Threatened; S: Stable; U: Unknown; VU: Vulnerable.

Source: [1]Monadjem *et al.* (2020); [2]African Chiroptera Report (2022); [3]FIAO (2023); [4]IWS (unpubl. data); [5]IUCN (2024-1); [6]Child *et al.* (2016); [7]MacEwan *et al.* (2020a)

Figure 7-58 - Bat species detected and potentially occurring in the proposed Verkykerskop WEF Cluster site

7.2.6.1 Bat species composition at different heights

In the Verkykerskop WEF cluster, the Egyptian Free-tailed Bat, Little Free-tailed Bat, and Cape Serotine Bat were recorded at all stations and monitoring heights.

At turbine rotor sweep height, the Egyptian Free-tailed Bat was the dominant bat species recorded in the Verkykerskop WEF cluster. Calls made by this species contributed 94 – 96 % of all bat calls recorded at 88 m a.g.l in 2023/2024. The Little Free-tailed Bat contributed 3-4 % of all bat calls and the Cape Serotine contributed 1 % of all bat calls recorded at 88 m a.g.l. These findings suggest that during operation of the WEF cluster, most of the turbine-related fatalities will comprise Egyptian Free-tailed Bats. Little Free-tailed Bats and Cape Serotines and possibly other species will likely also be killed during operation, but in fewer numbers.

The Egyptian Free-tailed Bat, Cape Serotine Bat, Natal Long-fingered Bat, Long-tailed Serotine Bat, Little Freetailed Bat, and Lesueur's Wing-gland Bat were recorded at all near ground-level stations (VK1 – VK8, 9.5 – 10 m a.g.l.) in the Verkykerskop WEF cluster. The Egyptian Free-tailed Bat contributed between 18 – 63% of the recorded calls made near ground-level at all monitoring stations. The Egyptian Free-tailed Bat was the dominant species at five of the monitoring stations (VK2, VK3, VK4, VK7-2 and VK8-2), while the Cape Serotine was the dominant species at VK1, VK5 and VK6 (32-51 % of all bat calls recorded). Overall, Cape Serotines contributed 1 – 51 % of the total amount of bat calls recorded near ground level. The Natal Long-fingered Bat contributed 1 – 29 % of all bat calls, with the greatest contribution by this species at VK 5. The Long-tailed Serotine contributed 4 – 30 % of all recorded bat calls near ground level and was the second most dominant species recorded at VK6 and VK7-2. The Little Free-tailed Bat and Lesueur's Wing-gland Bat, respectively, contributed 3 – 11 % and 1 – 4 % of all bat calls recorded near ground level. These findings indicate that a greater diversity (species richness and abundance) of bats will be at risk of fatality the closer that turbine blades sweep down towards ground level.

Near the Groothoek WEF site (stations VK1, VK2 and VK8), the Egyptian Free-tailed Bat was the dominant species in rotor sweep height (88 m a.g.l), contributing 94 % of all bat calls at VK8-1. Near ground level, the Egyptian Free-tailed Bat was the dominant species at VK2 (63 % of all bat calls) and VK8-2 (48 % of all bat calls), followed by Cape Serotines contributing 7 – 32 % of all bat calls recorded at those stations. Cape Serotines dominated at VK1 contributing 51 % of all bat calls recorded. The amount of Cape Serotine bat calls was relatively low at VK2 (7 % of all bat calls) compared to VK1 and VK8-2. Little Free-tailed Bats were recorded at all monitoring heights, contributing 4 – 11 % of all bat calls. Specifically, at rotor sweep height, Little Freetailed Bats contributed 4 % of all bat calls. These findings suggest that during operation of the Groothoek WEF, most of the turbine-related fatalities will comprise Egyptian Free-tailed Bats. Little Free-tailed Bats and Cape Serotines and possibly other species will likely also be killed during operation but in fewer numbers.

The Natal Long-fingered Bat, Long-tailed Serotine Bat and Lesueur's Wing-gland Bat were only recorded near ground level. The Long-tailed Serotine Bat and Little Free-tailed Bat were the second most dominant species recorded at VK2, both contributing 11 % of all bat calls recorded. Lesueur's Wing-gland Bat only contributed 1-2 % of the bat calls recorded on site.

In/Near the Groothoek WEF site, at least 12 different species were recorded near ground level over the monitoring period. For example, at VK2, at least 10 species were recorded and at VK8-2, 12 species were recorded. Aside from the afore-mentioned species, these included Temminck's Myotis, Mauritian Tomb Bat, Dusky Pipistrelle, Midas Free-tailed Bat, Lesser Long-fingered Bat and Rhinolophus cervenyi, which were recorded only a handful of times each contributing less than 1 % of all bat calls. Certainly, a greater diversity (species richness and abundance) of bats will be at risk of fatality from turbines with blades that approach closer to ground level. Although these species were only recorded a handful of times, the risk of fatalities of SCC (e.g. Temminck's Myotis, Lesser Long-fingered Bat, Lesueur's Wing-gland Bat, and possibly others) will also increase with blades that approach closer to ground level. This is a very important consideration. Differences in species composition between seasons at all monitoring heights can be seen in Appendix 1.

7.2.6.2 General bat activity at different heights and locations and during different seasons

Overall, the Verkykerskop cluster site had a high level of bat activity per night, with an average of 15.39 bat passes (bp) recorded at rotor sweep height, and 88.59 bp recorded near ground level. Per hour, 1.26 bp were detected in rotor sweep height, and an average of 7.38 bp were detected near ground level. The overall levels of bat activity recorded in the Verkykerskop cluster site are appreciably higher than those recorded elsewhere in the Drakensberg Grasslands ecoregion (Dinerstein et al. 2017), where activity at height (60 m) averaged 0 bp/h (range: 0 – 2 bp/h), and near-ground activity averaged 2 bp/h (range: 0 – 6 bp/h) (MacEwan et al. 2020b). The recorded high bat activity levels are at least partly explained by the extensive availability of suitable bat habitat including rocky outcrops with crevices, farm buildings, woody vegetation, and water in the form of dams, streams, other wetlands, and reservoirs.

At the bat monitoring stations in/near the Groothoek WEF site, an average of 13.82 bp/night was recorded in rotor sweep height (at VK8) and an average of 48.04 bp/night was recorded near ground level. Hourly, an average of 1.14 bp were detected in rotor sweep height, and 3.99 bp were detected near ground level on average. The recorded bat activity in/near the Groothoek WEF site is within the range of bat activity reported for the Drakensberg Grasslands ecoregion (MacEwan *et al.* 2020b).

7.2.6.3 Activity of different bat families at different heights and locations and during different seasons

Overall bat activity levels were highest in summer, spring, and autumn, with the lowest activity levels present in winter. The different bat taxa exhibited distinct seasonal patterns of activity. Egyptian Free-tailed Bats (of the Molossidae family) were generally most active in spring and summer. Cape Serotines (of the Vesertilionidae family) were most active during summer, possibly because this is when females have pups to feed and wean (Monadjem *et al.* 2020). The Natal Long-fingered Bat (of the Miniopteridae family) exhibited the highest levels of activity mostly in summer, spring, and autumn possibly due to their breeding and migratory patterns (Pretorius *et al*. 2020). The other recorded families had distinctly lower activity levels but exhibited similar patterns across all seasons. These patterns in family activity levels over the seasons were mirrored by the recordings at the bat monitoring stations at the Groothoek WEF site. These taxon-specific differences should be taken into consideration if/when fatality mitigation measures are implemented.

7.2.6.4 Nights when bat activity peaked

Across the Verkykerskop cluster site, the highest total numbers of bat passes were recorded mainly during nights between mid-September to mid-March (early spring to late summer). The highest peaks in nightly bat activity were observed during summer, when as many as 1099 bp, 1505 bp, and 1521 bp per night were recorded at VK6. Higher peaks in bat activity were observed closer to the ground (10 m) then at rotor sweep height (88 m).

At the Groothoek WEF site, nights with the highest total number of bat passes were recorded generally from mid-September to mid-March (early spring to late summer), but most often during spring (September – November), specifically mid-September and early October.

Egyptian Free-tailed Bat activity at 9.5 m peaked on multiple nights particularly from September to November, with the highest number (778 bp) recorded at VK2 9.5 m on 23 September 2023. In rotor sweep height, the activity of this species reached 176 bp at VK8-1 88 m on 1 April 2024. During such nights, fatalities of Egyptian Free-tailed Bats will be inevitable without effective mitigation.

Cape Serotine activity reached up to 404 bp on 15 March 2024 at VK8-2 10 m, and 238 bp on 22 November 2023 at VK1, compared to a considerably lower peak of 39 bp on 18 October 2023 at VK2. These differences are likely a reflection, inter alia, of the proximity of these stations to the nearest Cape Serotine roost(s). Cape Serotine activity was much lower at height, with peaks reaching up to 31 bp at 88 m at VK8-1 on 5 March 2024.

Miniopteridae bats are often most active in autumn (and winter), which was the case at VK2. These taxon-specific differences should be taken into consideration if/when fatality mitigation measures are implemented. Should Natal Long-fingered Bat fatalities exceed the WEF's threshold for this species, mitigation may be required during autumn and winter.

7.2.6.5 Key bat activity times

At VK1, VK2, and VK8 (mainly VK8-2), a distinct pattern in nightly activity was evident, especially from Egyptian Free-tailed Bats and Cape Serotines. From sunset, there was a sudden increase in the activity of Egyptian Free-tailed Bats until circa (ca.) 19:30, whilst Cape Serotine activity gradually increased or was more delayed and only began to decline later into the evening at around 20:00/20:30 and Little Free-tailed Bat emerged roughly 30 minutes later. From then, appreciable activity was recorded until ca. 04:30, whereafter activity declined by sunrise. The activity of species such as the Natal Long-fingered Bat, Little Free-tailed Bat, and Lesueur's Wing-gland Bat, was recorded most often during the first 1-3 hours after sunset before declining. Due to their protracted night-time activity, Egyptian Free-tailed Bats and to a lesser degree Cape Serotines, will be at risk of fatality from turbines throughout the night whenever favourable weather, insects, and possibly other (e.g. lunar) conditions prevail. In contrast, species like Natal Long-fingered Bat will likely be at greatest risk of fatality for 1-3 hours after sunset, and in some areas (near roosts) for 1-3 hours before sunrise. Again, taxon-specific differences such as these should be taken into consideration if/when fatality mitigation measures are implemented. These trends were observed throughout the various seasons, only differing in relation to the time of sunset and sunrise (Appendix 3 of the study).

7.2.6.6 Bat activity in relation to weather

The cumulative and percentage bat passes recorded during different wind speeds in rotor sweep height were extrapolated from data measured at 80 m and 100 m and are shown in Figure 12. Similarly, cumulative and percentage bat passes recorded in rotor sweep height were compared to different atmospheric temperatures and are shown in Figure 13. Note, however, that temperature data were only available from 10 m above ground level. Based on the data from 10 m, most (>95%

of) bat activity in rotor sweep height was recorded during temperatures above 9 and below 22°C. Miniopteridae species seemed to be more active during cooler temperatures (most activity between 8 to 18°C), while Verspertilionidae species were more active in warmer temperatures (between 12 to 21°C).

In 2023/24 at 88 m a.g.l. approximately:

- 50% of bat activity was recorded during wind speeds below 5 m/s.
- 60% of bat activity was recorded during wind speeds below 5.5 m/s. • 70% of bat activity was recorded during wind speeds below 6.5 m/s. • 80% of bat activity was recorded during wind speeds below 7 m/s.
- 90% of bat activity was recorded during wind speeds below 8.5 m/s.
- 100% of bat activity was recorded during wind speeds below 12 m/s.

The results indicate that half of the time, bats were active onsite during wind speeds stronger than 5 m/s at 80-100 m a.g.l. If the bat fatality threshold is exceeded during operation, only 50% of activity of all bat species onsite would be protected below a cut-in wind speed of 5 m/s at 88 m a.g.l. should turbine curtailment be implemented. The calculation of bat fatality thresholds (as described by MacEwan *et al.* 2018) is dependent, inter alia, on the final (constructed) layout of the turbines.

7.2.6.7 Sensitive Bat Areas

- High Bat Sensitive Areas include:
  - Confirmed roosts with a 500 m buffer around these, based on evidence of bat roosting activity and suitable roosting habitat for certain cavity/roof-roosting bat species in identified buildings onsite, 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.
  - Potential roosts with a 200 m 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 200 m buffer recommendation in the MacEwan *et al*. (2020a) guidelines for any potentially important bat features.
  - Significant natural rocky terrain including cliff faces, overhangs, cavities, crevices, and/or exfoliating rock, and a 200 m buffer extending downslope from these, based on: i) 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; ii) the minimum 200 m buffer recommendation in the MacEwan *et al.* (2020a) guidelines for any potentially important bat features; and iii) the generally higher levels of bat activity recorded by IWS at monitoring stations at lower elevations, compared to those at higher elevations.
  - Natural and artificial hydrological features including rivers, dams, pans, and certain herbaceous wetlands, and a 500 m buffer around the large dam and river onsite, and 200 m buffer around all other hydrological features, based on: i) 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); ii) the minimum 200 m buffer recommendation in the best practice guidelines by MacEwan *et al.* (2020a) for known and potential bat important features; and iii) the recorded high activity of bats at monitoring stations VK5 and VK6 and the anticipated high activity of bats at the dam and along the river between these two locations.

Medium–High Bat Sensitive Areas include:

- 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 Bat Sensitive Areas include:

- A 2.5 km buffer around the VK5 and VK6 monitoring stations, where a cave and other significant roosts are suspected, and exceptionally high levels of bat activity were recorded.

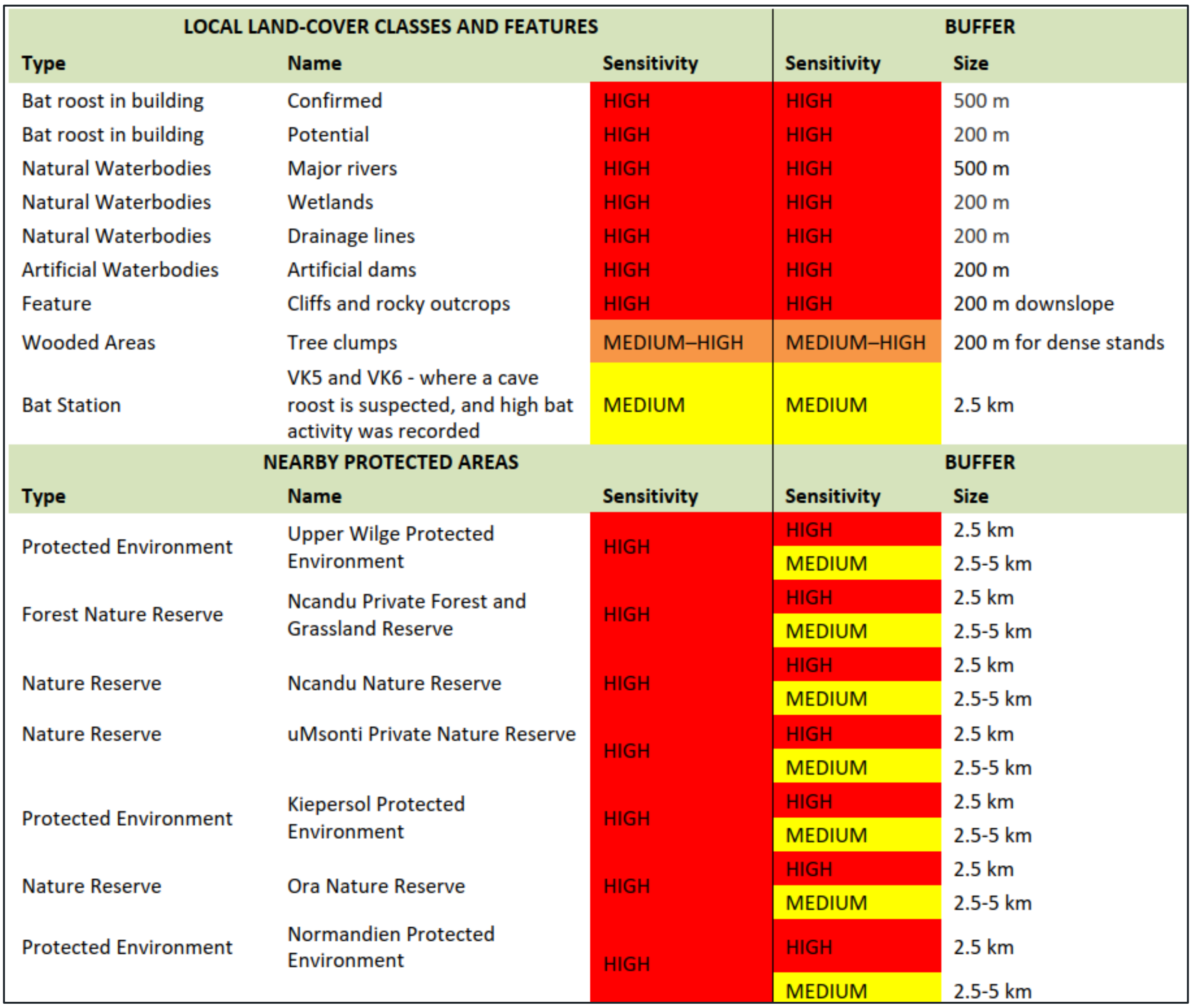
In addition to the identified local sensitivities, according to the spatial data and other information sources that were consulted by IWS, seven protected areas are situated within only 10 km of the proposed Verkykerskop WEF Cluster site.

Many other formal and informal protected and conservation areas occur within a 50 km radius of the Cluster site (Figure 3 in **Appendix G.8**). Bats which should be conserved within these protected areas could potentially be impacted in various ways by the proposed Verkykerskop WEF Cluster and, therefore, a 0-2.5 km High and 2.5-5 km Medium sensitivity buffer has been assigned around each of the seven closest protected areas (**Figure 7-60** and **Figure 7-61**).

The sensitivity mapping should be interpreted as follows:

- 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 2 m 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.
- Medium-High Bat Sensitive Areas represent areas where the construction of infrastructure and other disturbances should be avoided where possible (to avoid areas where bat activity is likely to be concentrated). No turbine towers should be positioned in Medium-High sensitive areas (to limit turbine encroachment into dense woody vegetation, which may be utilized by tree-roosting and/or clutter- and clutter-edge foraging bats).
- In the 2.5 km Medium Bat Sensitive buffers around VK5 and VK6, where a cave and other significant roosts are suspected, and exceptionally high levels of bat activity were recorded, all turbines will require bat fatality mitigation.
- Disturbances (e.g. light pollution) in Low Bat Sensitive Areas should be minimized.

IWS agrees with the “High” overall sensitivity rating of the three WEF sites comprising the Verkykerskop Cluster as per the national Screening Tool. This is not only due to the presence of various hydrological features and croplands onsite, but due to the collective presence of local rocky terrain, hydrological features, woody vegetation, confirmed and potential bat roosts in buildings and other locations, and nearby protected areas – as well as the onsite recorded above-average activity and diversity of bats including several Species of Conservation Concern.



LOCAL LAND-COVER CLASSES AND FEATURES			BUFFER	
Type	**Name**	**Sensitivity**	**Sensitivity**	**Size**
Bat roost in building	Confirmed	HIGH	HIGH	500 m
Bat roost in building	Potential	HIGH	HIGH	200 m
Natural Waterbodies	Major rivers	HIGH	HIGH	500 m
Natural Waterbodies	Wetlands	HIGH	HIGH	200 m
Natural Waterbodies	Drainage lines	HIGH	HIGH	200 m
Artificial Waterbodies	Artificial dams	HIGH	HIGH	200 m
Feature	Cliffs and rocky outcrops	HIGH	HIGH	200 m downslope
Wooded Areas	Tree clumps	MEDIUM–HIGH	MEDIUM–HIGH	200 m for dense stands
Bat Station	VK5 and VK6 - where a cave roost is suspected, and high bat activity was recorded	MEDIUM	MEDIUM	2.5 km
NEARBY PROTECTED AREAS			**BUFFER**	
Type	**Name**	**Sensitivity**	**Sensitivity**	**Size**
Protected Environment	Upper Wilge Protected Environment	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Forest Nature Reserve	Ncandu Private Forest and Grassland Reserve	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Nature Reserve	Ncandu Nature Reserve	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Nature Reserve	uMsonti Private Nature Reserve	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Protected Environment	Kiepersol Protected Environment	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Nature Reserve	Ora Nature Reserve	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km
Protected Environment	Normandien Protected Environment	HIGH	HIGH	2.5 km
			MEDIUM	2.5-5 km

Figure 7-59 - Sensitivity and buffering of local land-cover classes and features, and nearby protected areas

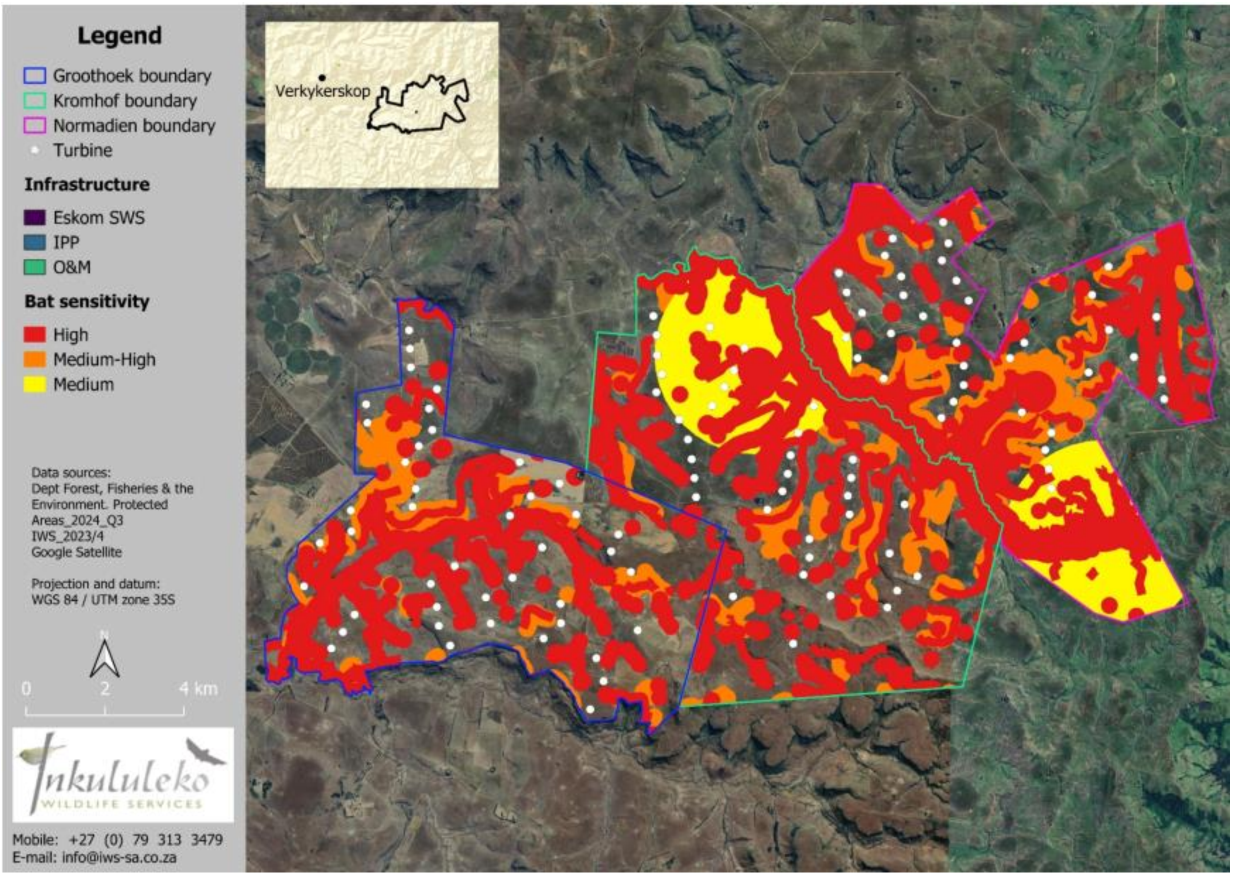


Figure 7-60 - Bat sensitivity map for the proposed Verkykerskop wind energy facility cluster site (DEIR assessed layout) – excluding the buffers around nearby protected areas

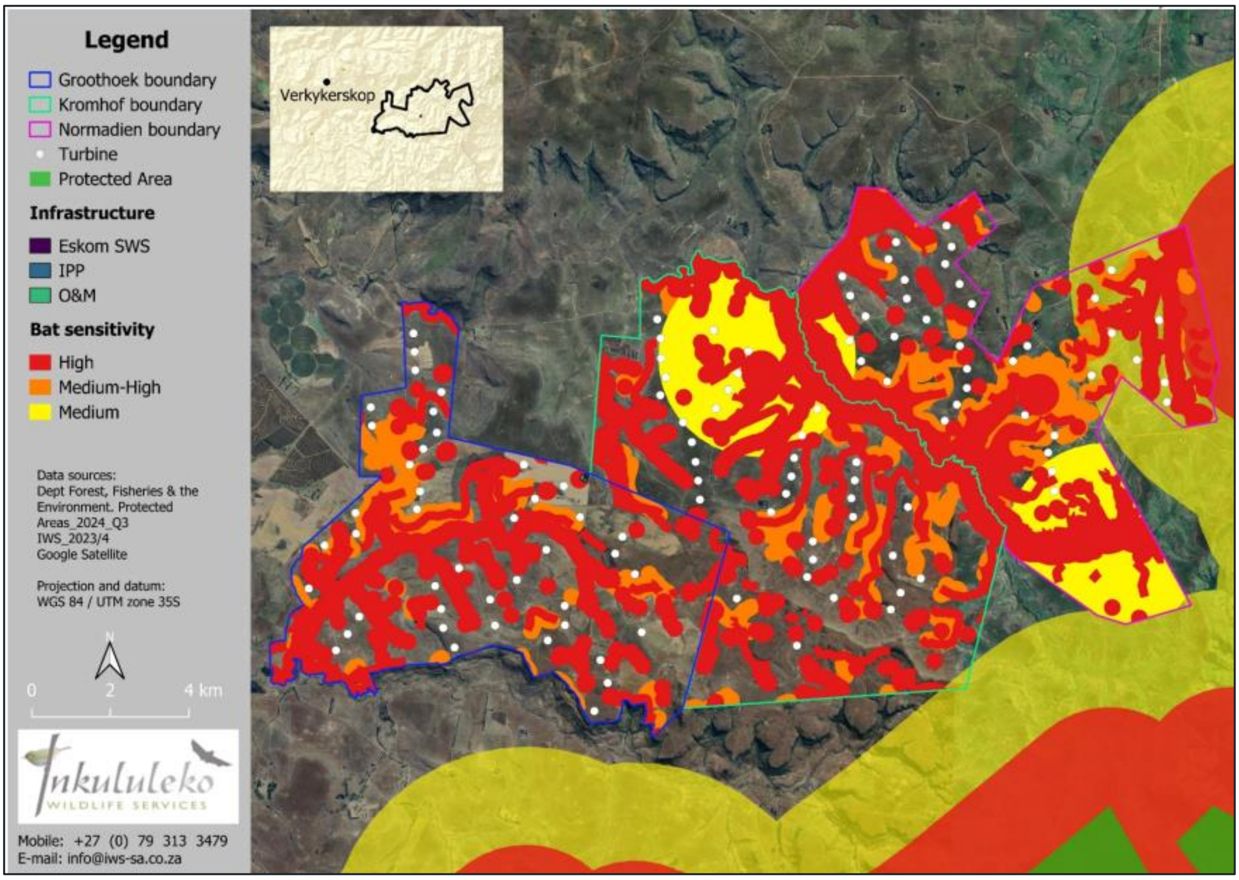


Figure 7-61 - Bat sensitivity map for the proposed Verkykerskop WEF cluster site(DEIR assessed layout) – including the buffers around nearby protected areas

7.3 SOCIAL AND ECONOMIC ENVIRONMENT

The social baseline describes the social profile of the project-affected area based on desktop research. The regional, district and local context describes the geographical setting of the project. The demography of the project-affected area is provided and its leadership structures.

7.3.1 ARCHAEOLOGICAL AND CULTURAL HERTAGE

The following is extracted from the Heritage Impact Assessment compiled by Beyond Heritage and included as Appendix G.9.

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

7.3.1.1 Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resource Management (CRM) purposes it is often only expected/ possible to identify the presence of the three main phases. Yet sometimes the recognition of cultural groups, affinities or trends in technology ^{a}nd/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable. The three main phases can be divided as follows:

- Later Stone Age (LSA); associated with Khoi and San societies and their immediate predecessors. - Recently to ~30 thousand years ago.
- Middle Stone Age (MSA); associated with Homo sapiens and archaic modern human - . 30-300 thousand years ago.
- Earlier Stone Age (ESA); associated with early Homo groups such as Homo habilis and Homo erectus. - 400 000-> 2 million years ago.
- The Stone Age within the southern Highveld is largely represented through sparce surface scatters of Middle and Later Stone Age lithics. These scatters are often found along the erosion gullies of rivers and streams. Early Stone Age Acheulian hand axes have been recorded further north of Verkykerskop (Rossouw 2013). Although no prominent Stone Age sites are present near the Project area, some surveys in the larger area have recorded rock art (Becker 2015, Dreyer 2007), indicating the movement of LSA people through this landscape.

7.3.1.2 Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

No Sites dating to the Early or Middle Iron Age have been recorded or is expected for the study area. The landscape only saw extensive Iron Age occupation from the Late Iron Age with extensive research conducted on LIA sites within the Free State (Maggs 1976).

The Project area falls geographically within the outer region of LIA occupation settlement sites referred to as Type V and Type N sites (Maggs 1976). Type V sites consist of a ring of enclosures which are then connected by stonewalling and creates a ring of connected enclosures within a larger enclosure (Maggs 1976). Settlement Type V consists of the standard core of cattle enclosures surrounded by beehive houses and grain bins, but outer walls are usually absent. Corbelled huts have been associated with this type. As the geographical layout of Type N and Type V overlap, it was seen that some Type N settlements were reoccupied and altered into the Type V sites. The main difference being that Type V does not have an outer wall enclosure as Type N does. Type V sites are dated to the 16th and 17th centuries.

The larger area is known to have been occupied by Batlokwa and Basia people, with a memorial stone which commemorates the burial sites of at least eight Batlokwa chiefs situated near Verkykerskop on the farm Morgenlicht 869 (Dreyer 1999). The Batlokwa and Basia occupied the area until the Mfecane when they were displaced from the landscape.

7.3.1.3 Historical context of Verkykerskop

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).

The Nkoe/Sefate/Poqong settlement is historically significant as the home of the Batlokoa tribe, led by Manthatise and Sekonyela. The Batlokoa settled in the Harrismith district around the 15th century, and a monument honors eight generations of their chiefs. Manthatise ruled in place of her young son Sekonyela after her husband, Mokotjo, died in 1813. In 1822, the Batlokoa faced attacks from the AmaNgwane and AmaHlubi, leading to their displacement from the site. Further conflicts, including an attack by Chief Mpangazitha, turned the area into a battlefield, destroying huts and kraals. After their defeat, the Batlokoa migrated through various regions, including Kuruman, Namibia, and Lesotho, in search of resources. Today, remnants of stone walls and middens serve as evidence of their presence, offering valuable insights into the history and way of life of the Sotho-speaking people (sahris.org.za). The site was declared a Provincial Heritage Site in 2016.

Verkykerskop is a village which was established on the farm Aansluit. The village was named after a large hill nearby from which one could see the landscape. The named means ‘spy hill’ (Raper 2004). It is however argued which hill is the exact Verkykerskop hill. Many of the original homesteads in Verkykerskop have been altered into tourist buildings.

7.3.1.4 Battlefields and war history

The Basotho Wars which took place between 1858 and 1868 greatly affected the town of Harrismith whereby there was conflict between the Basotho people and white settlers regarding the boundaries and ownership of lands. In 1869, the conflict concluded when the Convention of Aliwal-North was used to formally draw the boundaries of present-day Lesotho.

During the Anglo Boer War (1899-1902), Harrismith was the settling for much conflict. On the 4th August 1900, Harrismith was surrendered to the British forces and the British camped near Basuto Hill. The British proceeded to build lines of blockhouses which would link Harrismith to Olivierhoek Pass and Kroonstad. This was done to block Boer troops and make it possible to catch Boer soldiers. After the end of the war, the British remained in Harrismith until the outbreak of World War One (samilitaryhistoyr.org).

7.3.1.5 Heritage Resources

Heritage observations within the study area included a burial site and a circular enclosure and were recorded as waypoints numerically using the prefix VK for Verkykerskop. Numerous heritage features were recorded in the larger area but are not assessed in this report as they are located outside of the impact area. General site distribution of the recorded observations in relation to the Project layout is spatially illustrated in **Figure 7-62** and briefly described in **Table 7-25**.

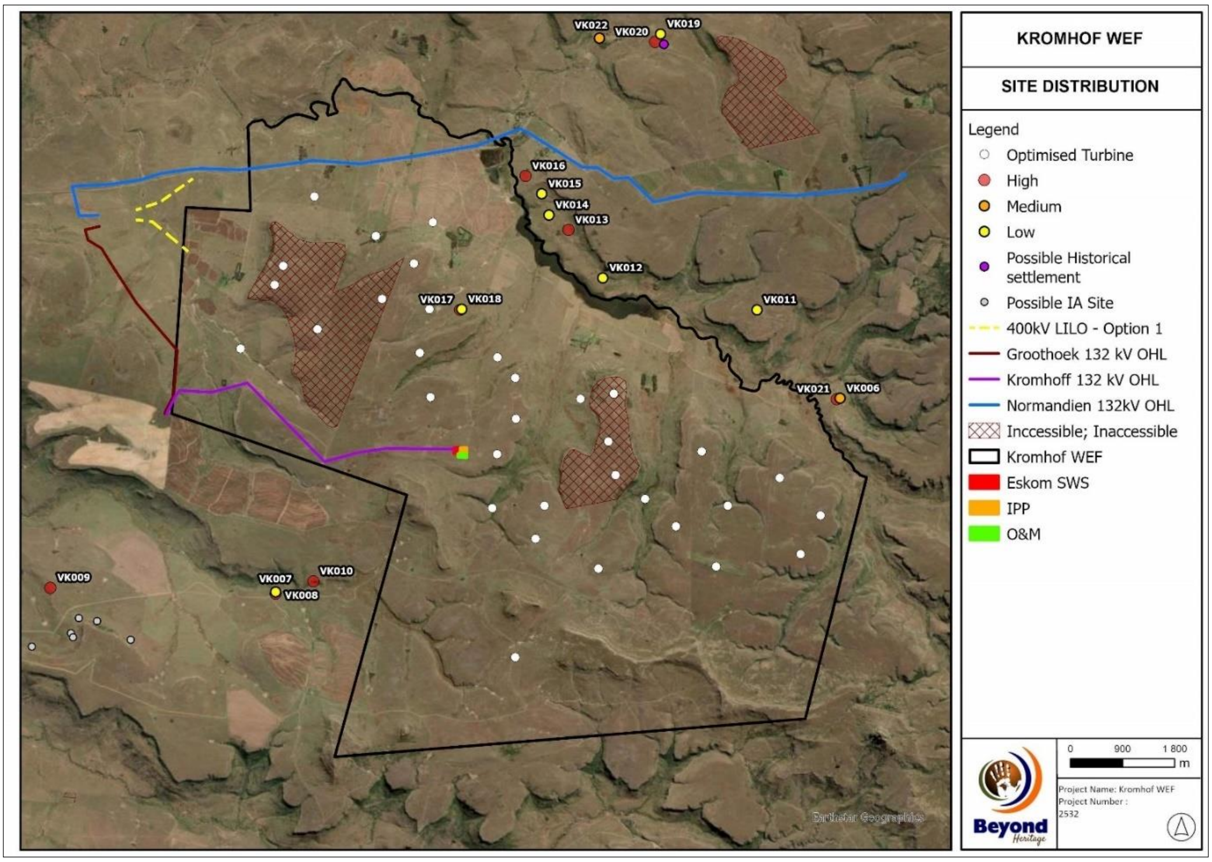


Figure 7-62 - Site distribution map (DEIR assessed layout)

Table 7-25 - Sites recorded in the study area

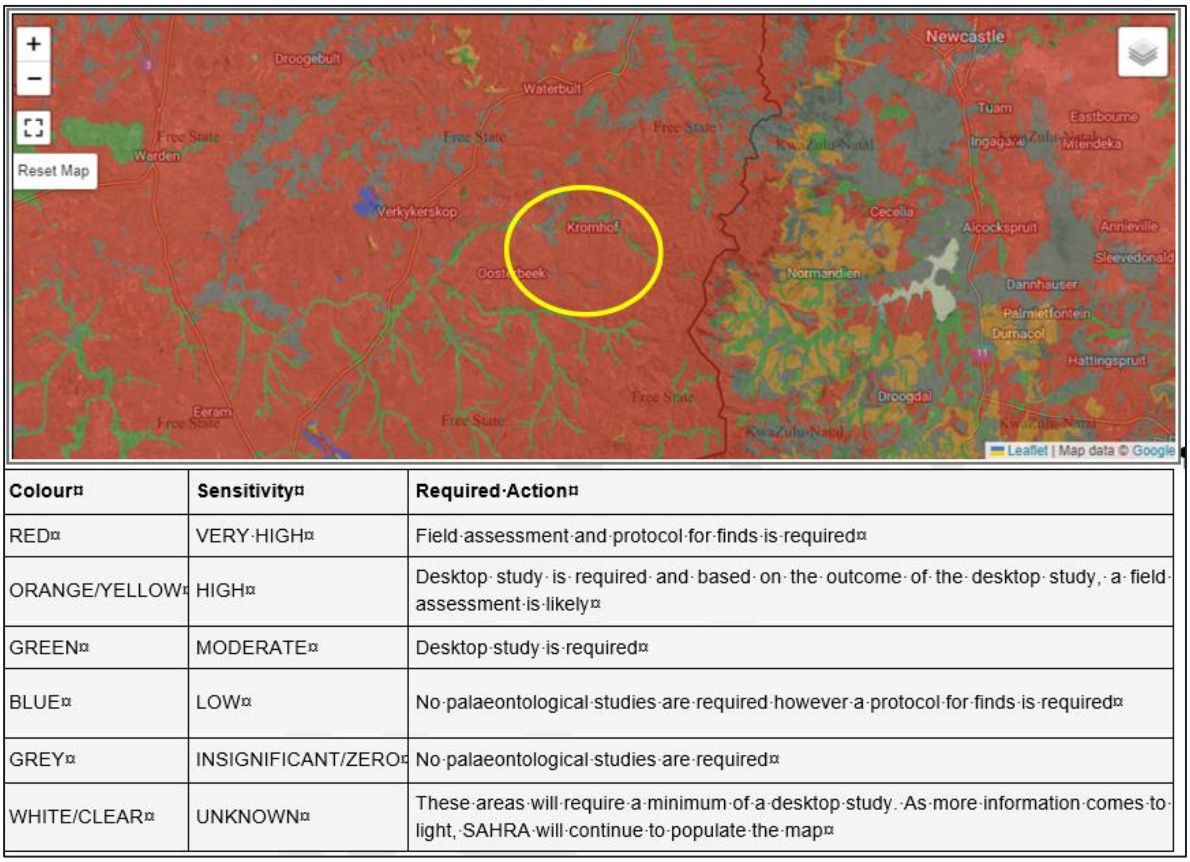
Label	Longitude	Latitude	Description	Significance
VK017	29°31'31.92"E	27°57'26.46"S	Small, packed stone burial site that is 12x10m in size situated near a gravel road. The burial site contains multiple packed stone graves that are surrounded by a packed stone enclosure. There are seven visible graves.	High Social Significance 3A
VK018	29°31'32.79"E	27°57'26.14"S	Partially buried and degraded packed stone circular foundation that is 5x5m in size. Circular packed stone feature built next to the road near VK017.	Low Significance GP C

7.3.2 PALAEONTOLOGY

The following is extracted from the Palaeontological Impact Assessment compiled by Beyond Heritage and included as Appendix G.10.

According to the SAHRA palaeontological sensitivity map, the study area is indicated as of insignificant, moderate, and very high palaeontological sensitivity (**Figure 7-63**) and an independent study was commissioned for this aspect (Bamford 2025).

A Fossil Chance Find Protocol should be added to the EMPr.



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 7-63 - Paleontological sensitivity of the approximate study area (yellow polygon) as indicated on the SAHRA Palaeontological sensitivity map

The **Adelaide Subgroup** is part of the eastern foredeep basin and was deposited in the overfilled or non-marine phase (Catuneanu et al., 2005) and so comprises terrestrial deposits. There are numerous fining-upward cycles, abundant red mudrocks and sedimentary structures that indicate deposition under fluvial conditions (Johnson et al., 2006). Some of the lower strata probably represent a subaerial upper delta-plain environment and the generally finer grained materials are typical of meandering rather than braided rivers. Channel deposits are indicated by sandstones while overbank deposits are indicated by the mudstones (Johnson et al., 2006).

The **Normandien Formation** is represented by the *Daptoccephalus* Assemblage Zone

The **Daptocephalus Assemblage Zone** is recognised by the co-occurrence of the dicynodontoid *Daptocephalus leoniceps*, the therocephalian *Theriognathus microps*, and the cynodont *Procynosuchus delaharpeae* (Viglietti, 2020). This has been further divided into two subzones, the lower *Dicynodon -Theriognathus* Subzone (in co-occurrence with *Daptocephalus*), and the upper *Lystrosaurus maccaigi – Moschorhinus kitchingi* Subzone (ibid). Other taxa include fish, amphibians, parareptiles, eureptiles, biarmosuchians, anomodontians, gorgonopsians, therocephaleans, cynodonts and molluscs. The flora is more diverse than the older Assemblage Zones and comprises glossopterids, mosses, ferns, sphenophytes, lycopods, cordaitaleans and gymnosperm woods (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

The early Triassic **Verkykerskop Formation** (lower Tarkastad Subgroup) represents shallow, braided environment with pulsatory discharges. It also has abandoned channel fills and braidplain environments, and the latter just representing a braidplain environment (Catuneanu et al., 1998). The ***Lystrosaurus declivis* Assemblage Zone** occurs in this formation and it is typified by a low diversity of herbivorous vertebrates, the abundance of the dicynodont therapsid *Lystrosaurus declivis* in association with the dicynodont therapsid *Lystrosaurus murrayi* (Botha and Smith, 2020). Other fauna include the non-mammaliaform epicynodont therapsid *Thrinaxodon liorhinus*, the procolophonoid parareptile *Procolophon trigoniceps*, and the absence of the dicynodont therapsid *Daptocephalus leoniceps* (ibid). Apart from the usual range of fish, amphibians and therapsid groups, the plants (rare) include glossopterids, lycopods, sphenophytes, ferns and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004; Barbolini et al., 2018).

The Early to middle Triassic **Driekoppen Formation** (Tarkastad Subgroup) is home to the ***Cynognathus* Assemblage Zone**. This post Permo-Triassic extinction event and recovery phase has a lower diversity of fauna and flora. It is typified by the presence of the cynodont genus *Cynognathus* (Kitching, 1995; Hancox et al., 2020), and has been divided into three subzones, namely the lower *Langbergia-Garjainia* Subzone, the *Trirachodon-Kannemeyeria* Subzone and the upper *Cricodon-Ufudocyclops* Subzone (Hancox et al., 2020). Other fauna include, fish, amphibians, parareptiles, eureptiles, therocephalians, cynodontians and trace fossils. Plants of the Burgersdorp Formation no longer include the glossopterids; there are lycopods (*Gregicaulis*), sphenophytes (*Calamites)*, ferns (*Asterotheca, Cladophlebis*), seed ferns (*Lepidopteris, Dicroidium*), cycads (*Pseudoctenis, Nilssonia*), ginkgos (*Ginkgoites, Sphenobaiera*) and conifers (*Sewardistrobis, Agathoxylon, Podocarpoxylon*) (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004; Barbolini et al., 2018).

Stormberg Group

The **Molteno Formation**, of upper Triassic age, represents braided streams on a vast braid plain, rare coal deposits with a few filled in abandoned channel tracts and some ponded bodies of water (Catuneanu et al., 1998). It was a part of the ever-shrinking Karoo Basin and only occurs around the margins of the Drakensberg Mountains. There are no vertebrate fossils in this formation but footprints of three-toed vertebrates are common in some parts (Anderson et al., 1998).

In contrast, the flora is extremely rich and diverse in pockets around Little Switzerland, Molteno, Birds River and others (Anderson and Anderson, 1985). The flora includes the lower plants such as bryophytes, ferns, lycopods and sphenophytes, the now extinct seed ferns such as *Dicroidium* (dominant), *Lepidopteris, Yabiella, Taeniopteris, Dejerseya*, cycads such as *Pseudoctenis, Nilssoniopteris*, gymnosperms such as *Ginkgoites, Sphenobaiera, Rissikia, Voltziopsis, Heidiphyllum, Pagiophyllum,* and incertae sedis (Plumstead, 1969; Anderson and Anderson, 1983, 1985, 2002. 2020; Bamford 2004; Anderson et al., 2019a, b, 2020). There is no vertebrate assemblage zone for the Molteno

From the SAHRIS map above the area is indicated as very highly sensitive (red) so a site visit and walkdown was done in late August 2024.

7.3.3 TRAFFIC

The following is extracted from the Traffic Impact Assessment Report compiled by iWink Consulting and included as Appendix G.11.

Route for Components manufactured within South Africa

In South Africa, the majority of the manufacturing industry's national workforce resides in four metros - Johannesburg, Cape Town, Gqeberha and eThekwini. It is therefore anticipated that elements that can be manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg, Gqeberha or Pinetown/Durban areas. Components will be transported to site using appropriate National and Provincial routes. It is expected that the components will generally be transported to site with normal heavy load vehicles

Route from Cape Town Area to Site – Locally sourced materials and equipment

Cape Town has a large manufacturing sector with industrial areas located throughout the metro.

The proposed industrial hubs being considered to source the required materials and components is currently unknown. With quite an extensive and widespread industrial market, a specific route to the site cannot be considered at this point in time, but it is expected that a majority of the route length will be similar to the routes considered for the haulage of imported materials and equipment. No road limitations envisaged along the route for normal load freight. Several routes are available and one possible route is shown in **Figure 7-64** via the N1 with a travel distance of approximately 1 390km.

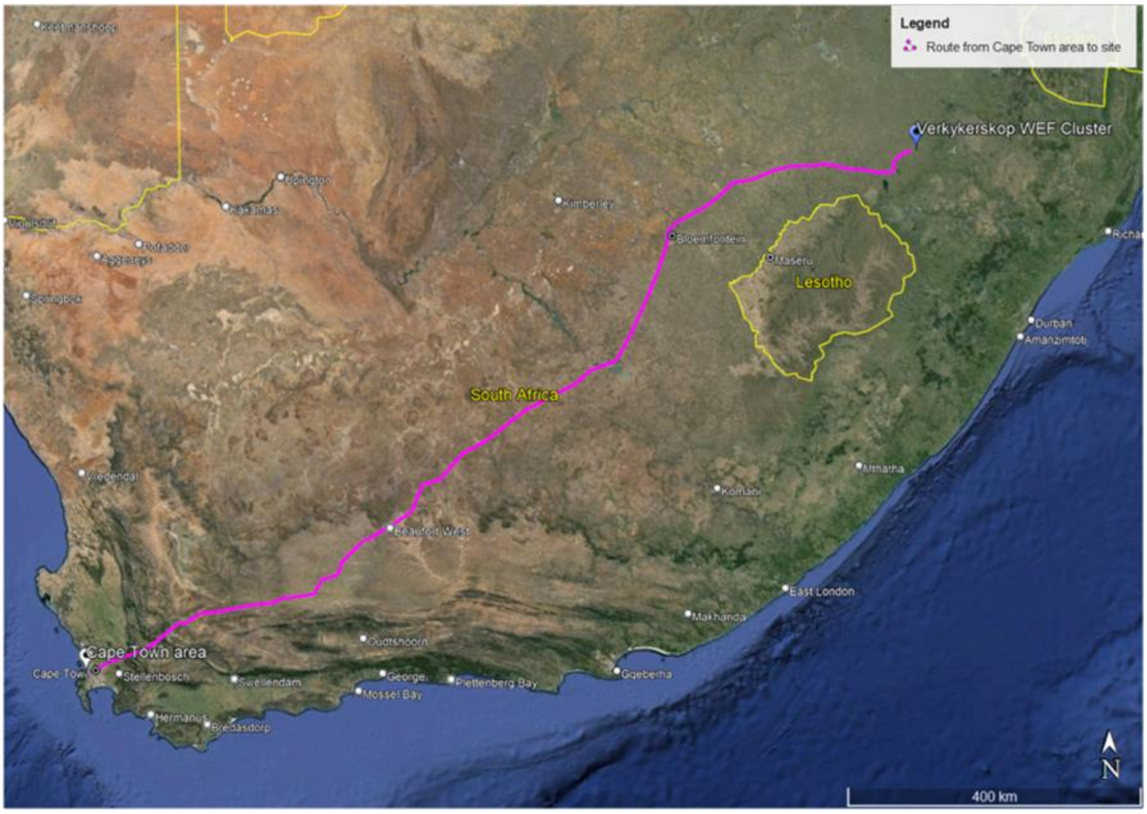


Figure 7-64 - Route from Cape Town area to the proposed Verkykerskop WEF Cluster

Route from Johannesburg Area to Site – Locally sourced materials and equipment

If components from Johannesburg are considered, normal loads from Johannesburg to the site can be transported via several routes of which one is shown in **Figure 7-65**. No road limitations are envisaged along the route for normal load freight. The travel distance from the Johannesburg area to the site is approximately 300 km via the N3.

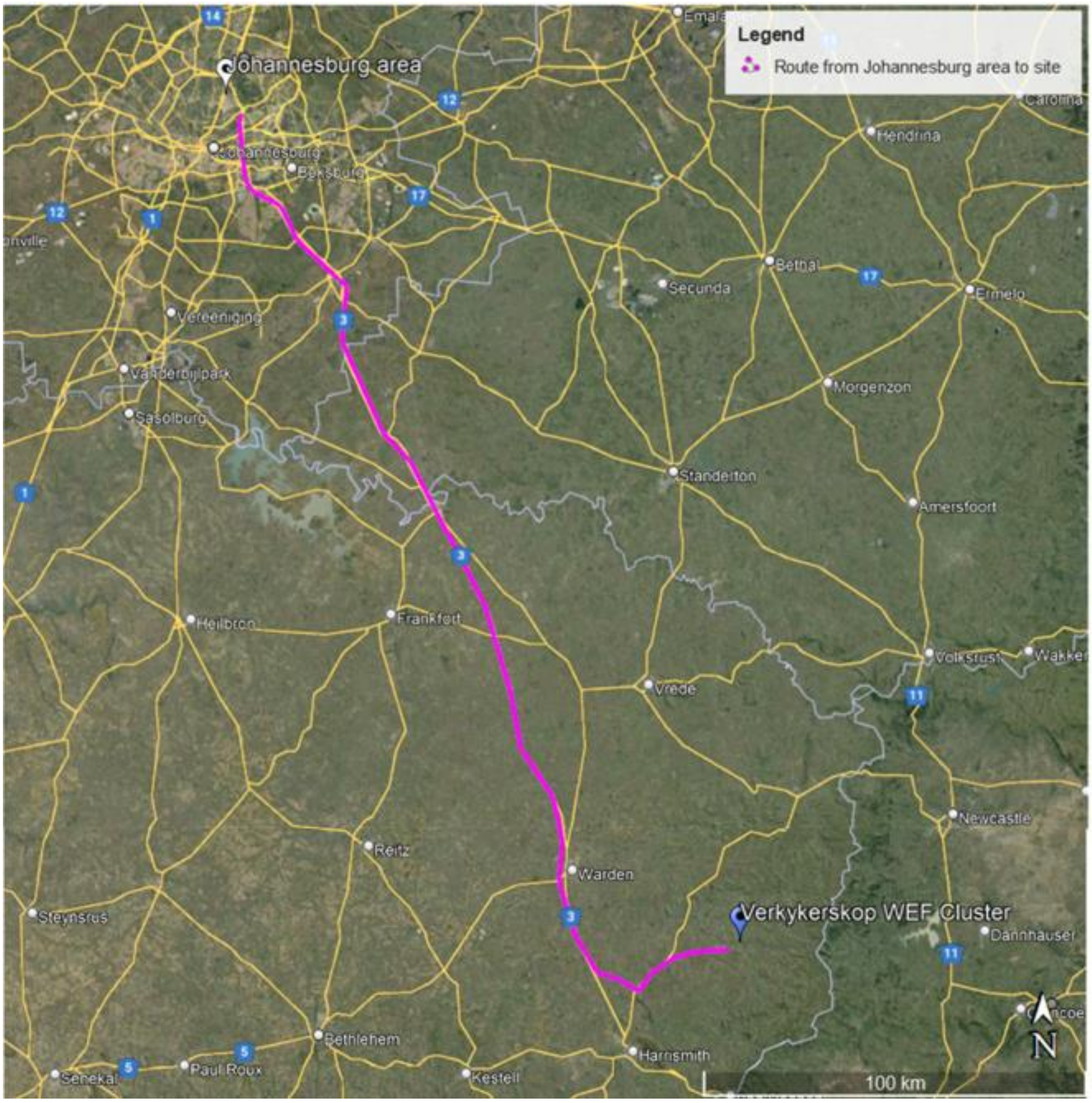


Figure 7-65 - Route from Johannesburg Area to the proposed Verkykerskop WEF Cluster

Route from Gqeberha area to Site - Locally sourced materials and equipment

If loads are transported from the Gqeberha area to site, several routes to site are available. One potential route is shown in **Figure 7-66** via the R75, N9, N1 and N5 with a travel distance of approximately 1 050km.

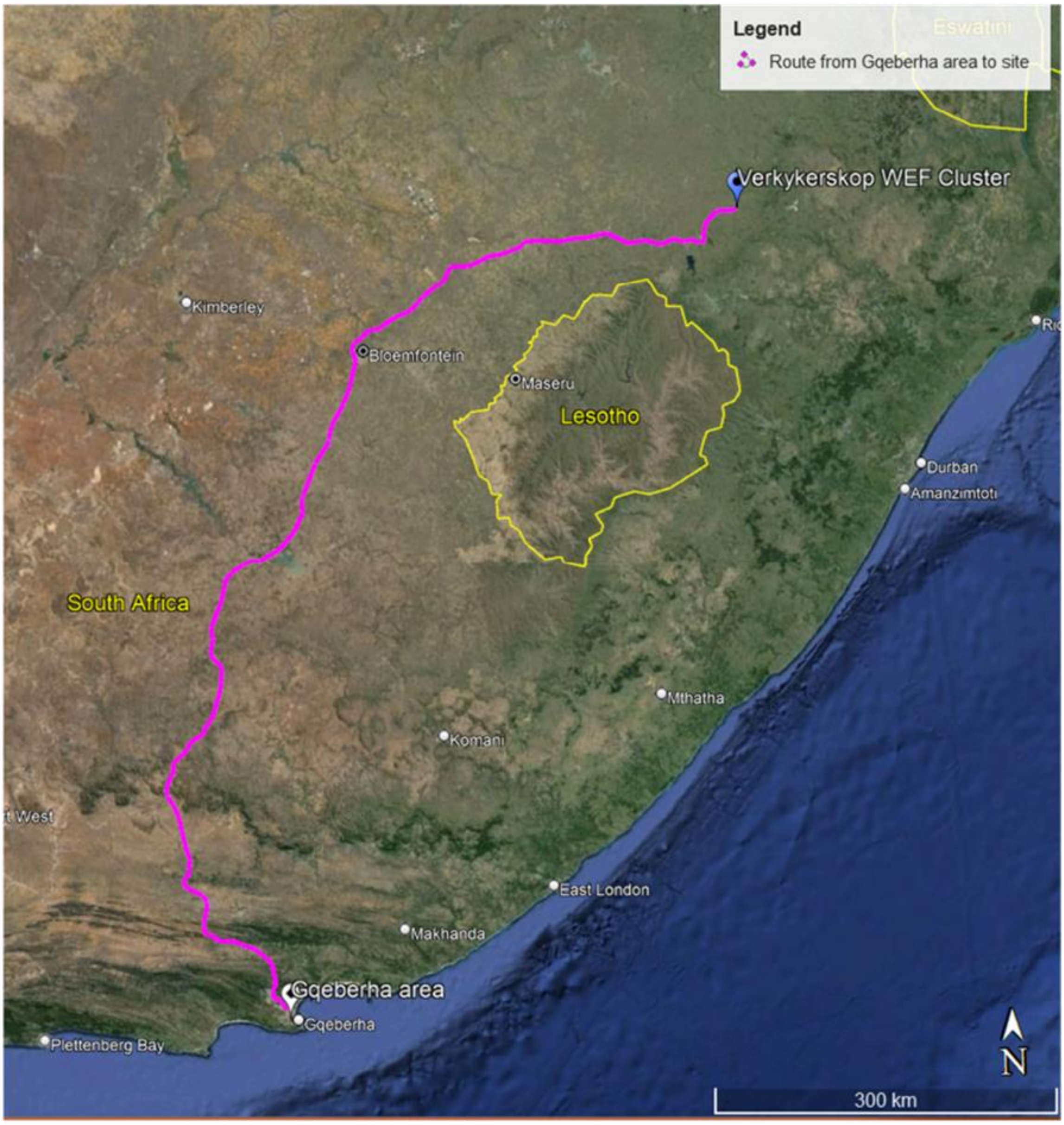


Figure 7-66 - Route from Gqeberha area to proposed Verkykerskop WEF Cluster

Route from Pinetown / Durban to Site - Locally sourced materials and equipment

Normal loads can transport elements via two potential routes from Durban and Pinetown to the site. No road limitations are envisaged along the route for normal load freight. The shortest distance from Pinetown to the site is approximately 300 km via the N3 (see Figure 7-67).

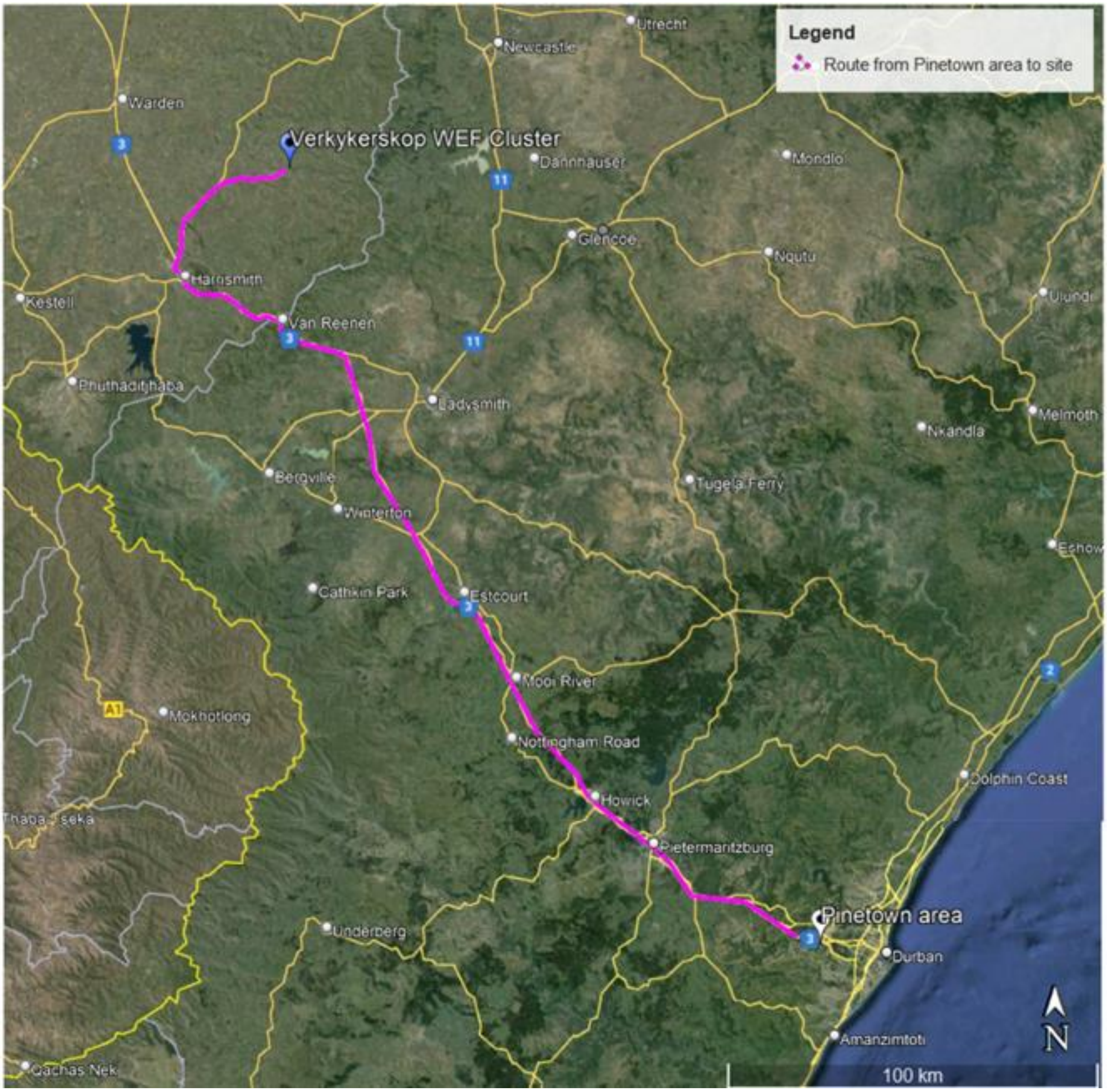


Figure 7-67 - Route from Pinetown to the proposed Verkykerskop WEF Cluster

Surrounding road network

The construction vehicles for the proposed Kromhof WEF project can take access via the R722, which runs past the project site in approximately 13 km distance to the west of the site (see **Figure 7-68**).

The R722 is a regional route that connects Memel with Harrismith with a total length of approximately 85km. According to the road classification of the surrounding road network as per COTO's TRH26 South African Road Classification and Access Management Manual, the R722 can be classified as Class 3 rural minor arterial, which typically carries inter-district traffic between:

- Small towns, villages and larger rural settlements (population typically less than about 25000);

- Smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight and other traffic in the district (public transport and freight terminals, railway sidings, small seaports and landing strips);
- Very small or minor border posts;
- Tourist destinations;
- Other Class 1, 2 and 3 routes; and
- Smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

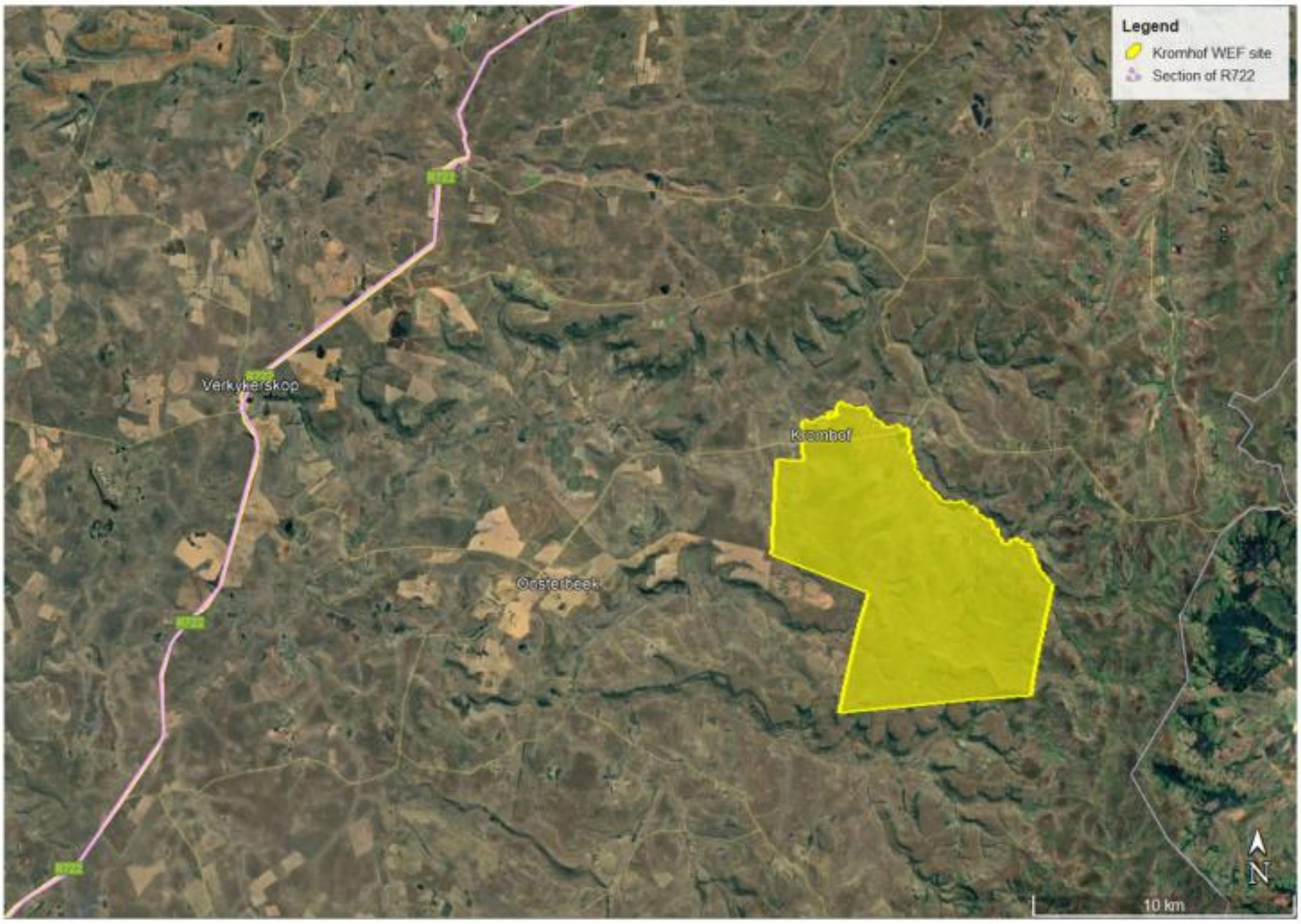


Figure 7-68 - Aerial view of R722 route

Proposed Accesses

Feasible accessibility was established in consideration with required sight distances, minimum access spacing requirements and road safety principles. It needs to be noted that the access points discussed in this report are recommended from a traffic engineering and transport planning point of view only and do not factor in landownership or other considerations.

Figure 7-69 shows an overview of the proposed turbine locations for the entire Verkykerskop WEF Cluster including existing farm roads that can be used and proposed new roads that need to be built.

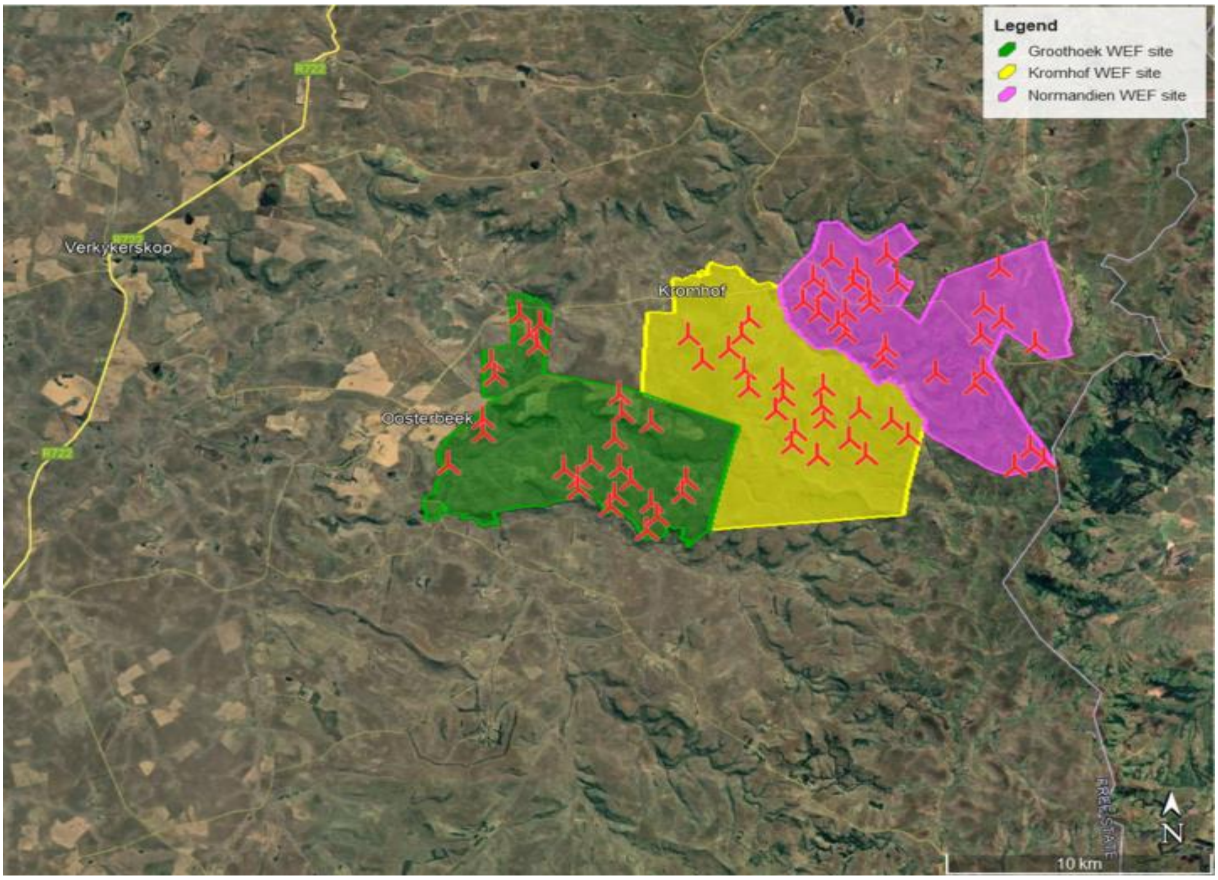


Figure 7-69 - Aerial Overview of Turbine locations and roads for the Verkykerskop WEF Cluster

There are a number of public roads towards the site available, of which the following two access routes are recommended for the Kromhof WEF (see **Figure 7-70**):

- Access route 1 (blue): from R722 onto S795 for approximately 13 km before turning left into the S18 towards the site (see **Figure 7-71**); and
- Access route 2 (orange): from R722 onto S470 and then S471 towards the site (see **Figure 7-72**).

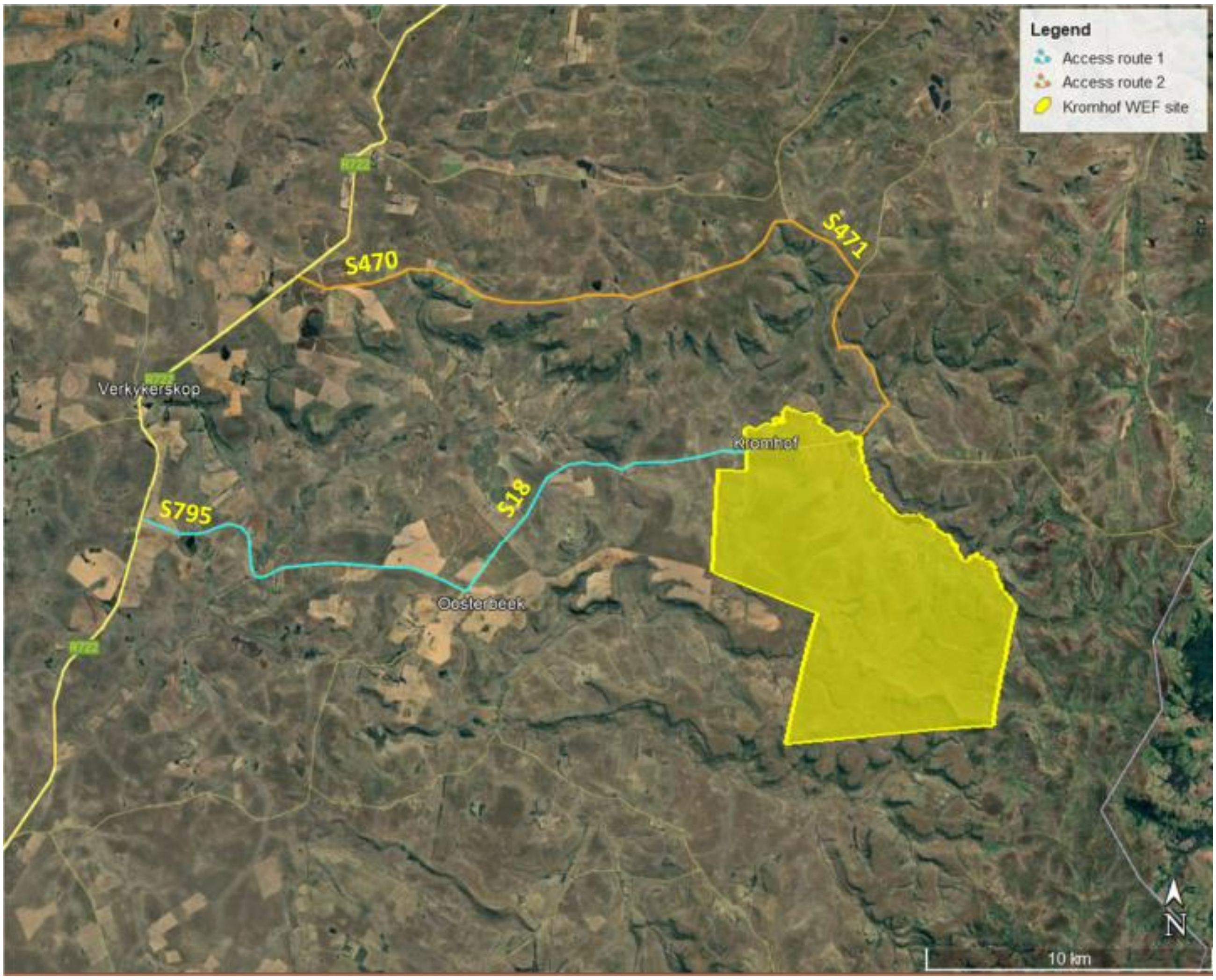


Figure 7-70 - Aerial View of recommended Access routes to Kromhof WEF site

Figure 7-71 - View of S795 from R722

Figure 7-72 - View of S470

In accordance with Figure 2.5.5(a) of the TRH17 Guidelines for the Geometric Design of Rural Roads (see **Figure 7-73**), the shoulder sight distance for a stop-controlled condition on a road with a speed limit of 100 km/h, needs to be a minimum of 420m for the largest vehicle (5m set back from the intersecting road).

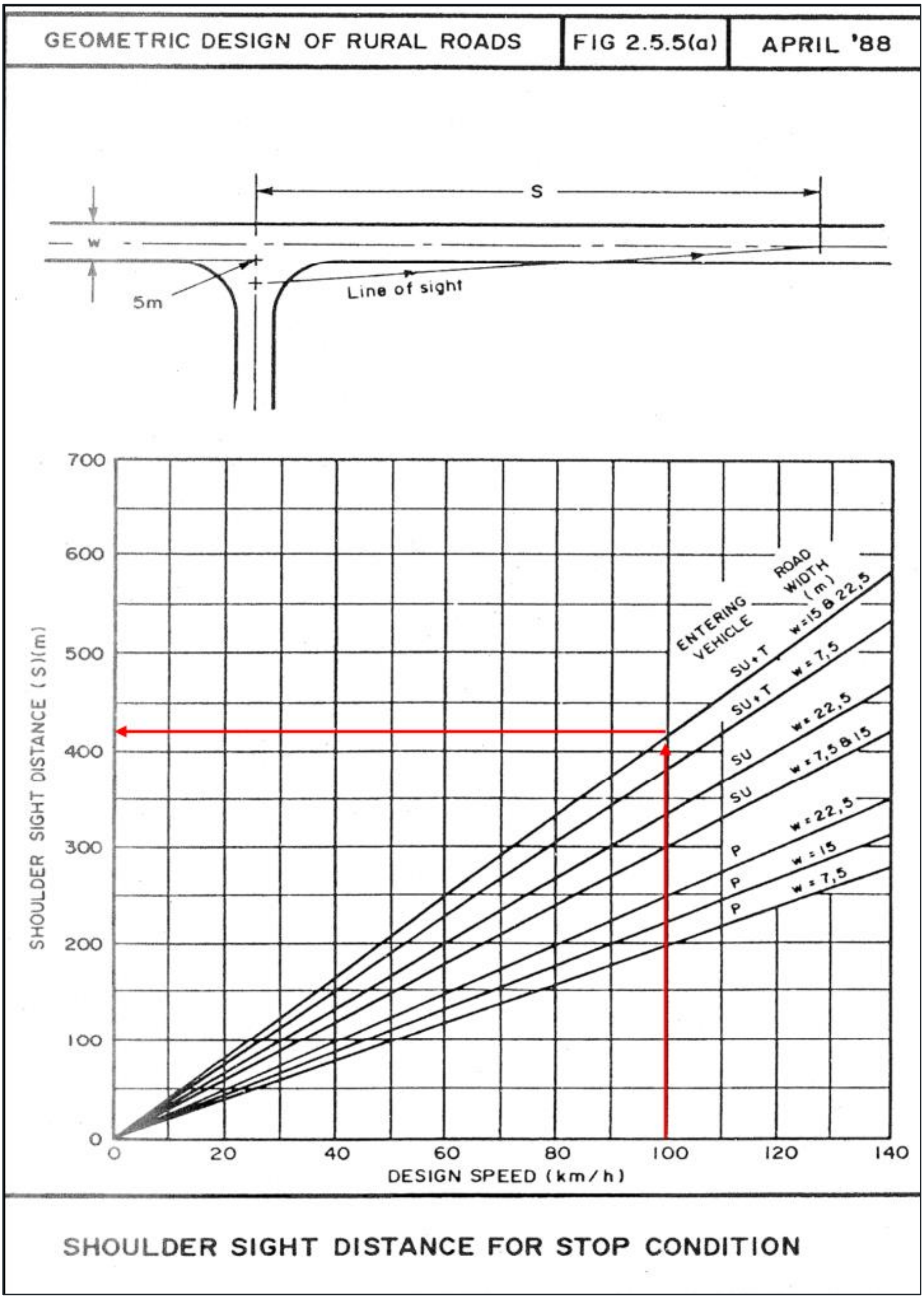


Figure 7-73 - Shoulder sight distance (TRH17)

The required minimum shoulder sight distances are met in both directions accessing the R722 from the S795 and S470, respectively (see **Figure 7-74** and **Figure 7-75**).

Figure 7-74 - Required Sight distances from S795 onto R722

Figure 7-75 - Required Sight distances from S470 onto S722

General

The geometric design and layout for the access roads need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

The access points to the site will need to be able to cater for construction and abnormal load vehicles. A minimum road width of 8 m is recommended for the access points and the internal roads can have a minimum width of 6 m. The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely (i.e., bellmouths of min. 15m). Sight lines at the intersections of the R722 with the S470 and S795, respectively, need to be kept clear of any trees and shrubbery.

It is recommended that the direct site accesses are security controlled during the construction phase.

All temporary road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM). It is advised to provide temporary road signage along the R722 passing the turn offs onto the S470 and S795 to alert drivers of large haulage vehicles entering and exiting the roads.

Transportation of Materials, Plant and People to the proposed site

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible, as for example from Harrismith.

Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act (NLTA) (Act No.5 of 2009), the assessment of available public transport services is included in this report. The following comments are relevant in respect to the public transport availability for the proposed development.

Non-motorised transportation (NMT) is a dominant mode of transportation, 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, but it is assumed that minibus taxis travel at irregular intervals along the R722. However, generally the appointed contractor of a large-scale project, such as many renewable energy projects, will provide shuttle buses or similar for workers during the construction phase.

7.3.4 VISUAL

The following is extracted from the Visual Impact Assessment Report compiled by WSP and included as Appendix G.12.

The project site in the Free State Province is roughly 30 km southwest of Newcastle and 50 km northeast of Harrismith, and partially abuts the border of KwaZulu-Natal, within the Grassland Biome. The region is largely rural and undeveloped in character, and land uses are primarily crop production, livestock farming and other agricultural uses, with vast areas still characterised by primary grassland and associated vegetation communities. Settlements most settlements in the region are small, with Newcastle, Harrismith and Ladysmith being the only notable exceptions.

The study area visual baseline is further described in the following subsections and illustrated by various maps and photos.

7.3.4.1 Topography

The natural topography of much of the vicinity is characterised by expansive rolling plateaus, contrasted by distinct escarpments and low cliff faces and ridges, various wide and narrower valleys that have been carved by a comprehensive network of watercourses, and several isolated and more prominent outcrops form distinct visual landmarks.

The topography of the Kromhof WEF Project site (**Figure 7-76**) is visually characterised by the higher-lying plateau and protruding spurs in the southern and central parts of the site, respectively, from which several roughly north-draining tributaries flow into a lower-lying valley that make up the northern part of the site.

Additionally, one of the highest koppies in the area (with an elevation of approximately 2 080 m) is located along the southern site boundary. This feature is around 180 m to 200 m higher than the surrounding plateaus and forms the most prominent landmark within the site boundary area.

By contrast, the Kromhof WEF site elevation is at its lowest along the northernmost site boundary, which is formed by a tributary of the Wilge River, at around 1 740 m. The valley floors are between 80 m and 150 m lower than the surrounding plateaus, which are edged by steep and rocky cliffs.

Figure 7-76 – The site topography is characterised by expansive rolling plateaus, low cliff faces, outcrops, and valleys

Hydrology (Drainage Features)

The Kromhof WEF is located within the Upper Wilge River Catchment Area, with the regional topography having been sculpted by a complex network of watercourses and generally draining towards the west and north.

One of the upper tributaries of the Wilge River forms the northern boundary of the Kromhof WEF Project site, while the associated broad and relatively wide valley makes up approximately a third of the norther part of the site. The stream itself is larger than those found in the surrounding areas, and the incised stream channel that meanders and curls through the deep valley also has several prominent horseshoe lakes associated with it.

Most hydrological features within the site boundaries tend to be partly obscured by rises in the elevation when viewed from some distance away, and over greater distances are often first identified by surrounding trees and denser vegetation, and the frequently eroded channel sides, rather than visible or standing water. During the rainy season, the larger watercourses and surrounding floodplains can become inundated which together with the few dams form larger visible bodies of open water (**Figure 7-78**). The smaller watercourses are less visible but provide visual variation and interest (**Figure 7-79**). By contrast, during the dry season some of the smaller watercourses are not particularly prominent, when open water is often limited to the broader, wider sections of the larger watercourses, and the few dams.

Figure 7-77 - During the rainy season, the larger floodplains and few dams form larger visible bodies of open water (Zinn, 2025)

Figure 7-78 - The smaller watercourses are less visible but provide visual variation and interest

Figure 7-79 - During the dry season open water is often limited to the broader, wider sections of the larger watercourses and dams

Vegetation Characteristics

Large parts of the greater region and Kromhof WEF Project site itself are still characterised by original primary grassland vegetation communities, which is visually punctuated by expansive stretches of often dense shrubland occurring along the steeper slopes and rocky areas, as well as bordering the smaller drainage channels in the narrower valleys. Isolated clumps of indigenous willow (*Salix mucronata*) and exotic willow (*Salix babylonica*) also form local focal points and add interest in short-range views. Markedly, there are almost no areas of typical alien tree species invasion (i.e. eucalyptus, wattle, or poplar) anywhere within the site boundary, with the only isolated exotic trees being those planted within the few farmsteads and other small building clusters scattered throughout the site.

There are limited areas of cropped farmland within the site, occurring mostly within the flatter valley area. The remainder of the site is covered by grassland, which from a distance blend into a mosaic patchwork of textures and different greens, browns, tans, and reds. The vegetation cover is also characterised by a marked change in appearance from summer to winter, as grasses change from green to brown and crop areas are planted and subsequently harvested (refer to Section 4.6 in the specialist report). The predominant vegetation communities are illustrated by **Figure 7-80**.

Figure 7-80 - The site is mainly characterised by A) Wetland, B) Rocky Grassland, and C) Open Grassland (The Biodiversity Company, 2025)

Land Cover and Land Uses

The visual context of the project site is distinctly rural and is primarily untransformed and natural in character, and areas of development and active human use are limited. Importantly, none of the few manmade structures protrude above the very characteristic horizon and are therefore not visually dominant and blend into the surrounding landscape.

Seasonal and Atmospheric Conditions

A further aspect of the visual baseline that needs to be considered is that of weather-related/atmospheric conditions and seasonal variations. Prevailing atmospheric conditions can greatly influence how a landscape is perceived by viewers, as well as the range over which views are possible.

The study area is located in a summer rainfall region, while winters are cold and mostly dry. Mist is common particularly during winter, greatly reducing visibility when it is present. Airborne pollution in the region is limited, but high humidity or smoke from fires often result in hazy atmospheric conditions. Fires can also significantly impact visual conditions, causing vast and highly visible smoke columns which greatly reduce visibility in short-range views.

In addition, seasonal changes greatly change the appearance of most landscapes, with the region typically alternating from vast expanses of various hues of green during the rainy season, to more subdued browns and tans during the winter (**Figure 7-81**). Croplands also change in appearance, from bare earth at the start of the spring planting season to visually uniform fields of corn during summer, which gradually brown and yellow during autumn before harvesting, following which the fields are again characterised by exposed earth and bare stalks.

Figure 7-81 – The predominant vegetation cover is characterised by a marked change in appearance from summer to winter, as grasses change from greens to browns and tans

7.3.4.1 Theoretical Visibility

The level of theoretical visibility (LTV) is defined as the sections of the study area from which the proposed project infrastructure may be visible and was determined by conducting a viewshed analysis and using Esri ArcGIS for Desktop software, with 3D Analysist Extension (Geographic Information System software with three-dimensional topographical modelling capabilities).

The basis of a viewshed analysis is a Digital Elevation Model (DEM). The DEM for this viewshed analysis was derived from contour sets for the site if available, as well as national 5 m contour lines. A 10 km study area surrounding the site was used for the analysis. The viewshed was developed for the proposed turbines assuming a “worst-case” scenario height of 240 m, which accounts for the

140 m tower height, and 100 m individual blade length. The viewshed analysis was collectively generated from each of the individual turbines, using the individual locations established in the most recent project layout.

Artificial landforms and structures, such as berms, stockpiles, buildings, and indeed tall vegetation (particularly alien tree windrows and plantations) are not reflected in the DEM. However, given largely uniform, low vegetation height and the limited development and within study area and the great height of the turbines, the influence of these factors on the results of the viewshed analysis are negligible.

The LTV of the Normandien WEF project is represented by **Figure 7-82**:

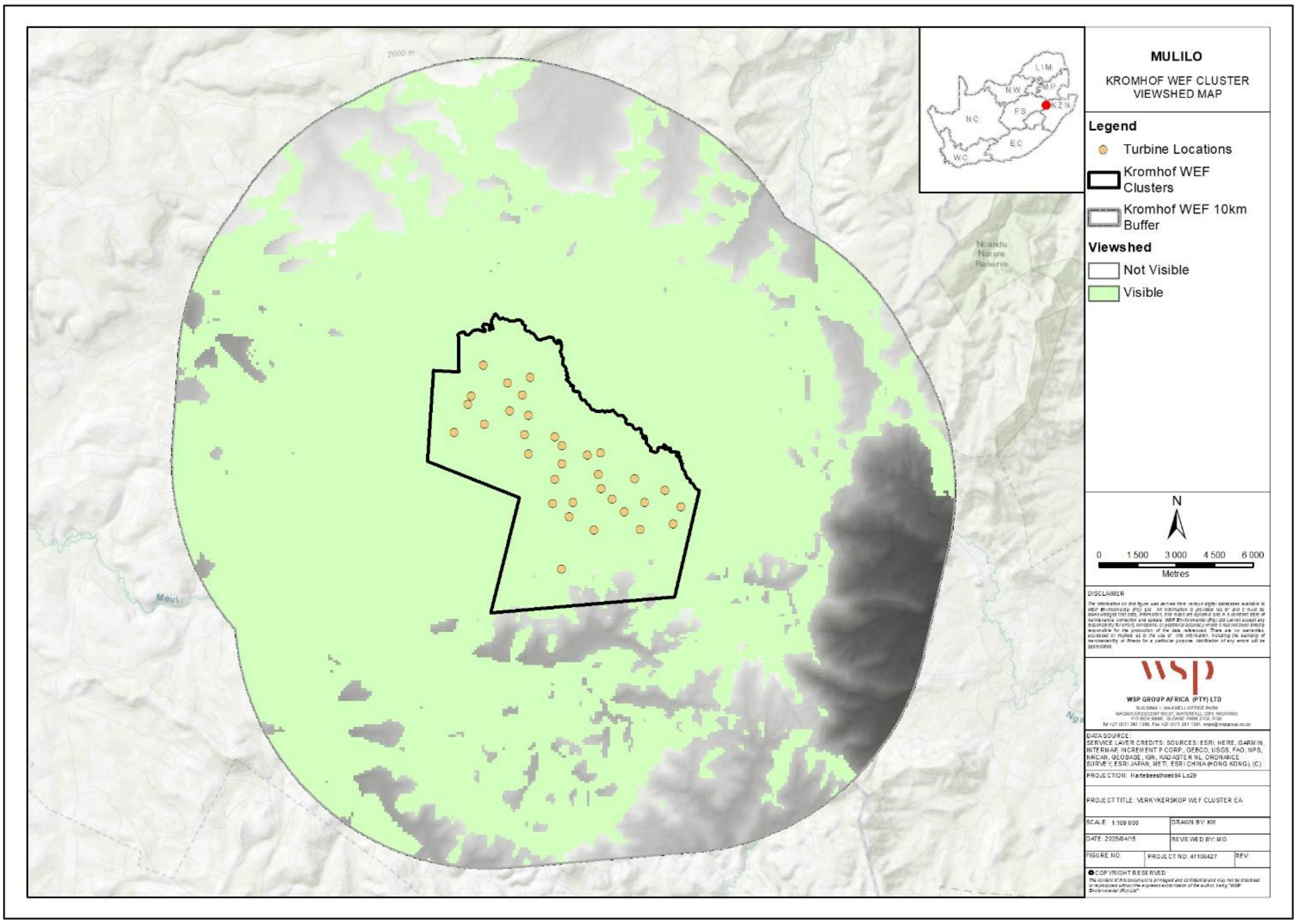


Figure 7-82 - Viewshed analysis of the Kromhof WEF Project (DEIR assessed layout)

7.3.5 SOCIAL

The following is extracted from the Social Impact Assessment Report compiled by WSP and included as Appendix G.13.

7.3.5.1 REGIONAL CONTEXT

The proposed project is in the Free State Province, located in the eastern part of the province at the boundary of Kwa-Zulu Natal Province. The whole project area (i.e. the farm portions assessed) covers an area of 23 814km².

The province is divided into five district municipalities: Fezile Dabi, Mangaung, Xhariep, Lejweleputswa, and Thabo Mofuntsanyane, where the proposed project is located. These five districts are further subdivided into 19 Local Municipalities. The proposed project is situated in the Phumelela Local Municipality (PLM).

7.3.5.2 DISTRICT CONTEXT

Thabo Mofutsanyane District Municipality is a Category C municipality located in the eastern part of the Free State Province. It is bordered by the Dannhauser local municipality in KwaZulu-Natal Province.

The district comprises six local municipalities: Dihlabeng, Mantsopa, Nketoana, Phumelela, Setsotso, and Maluti-A-Phofung (Coorperative Governance Traditional Affairs, 2022).

7.3.5.3 LOCAL CONTEXT

Phumelela Local Municipality covers an area of 8197 km². It is one of the six local Municipalities within the Thabo Mofutsanyane District Municipality. It has a population of 52,224 people (Statistics South Africa, 2022). PLM is the least populated municipality of the six local municipalities in Thabo Mofutsanyane District Municipality.

Phumelela Local Municipality is accessible through two National Roads and four Provincial main roads, which are R34, R714, R103, R722, N11, and N3. Figure 7-83 (Agriculture ,Land Reform and Rural Development, 2021)below depicts the local context. It comprises three towns, namely Vrede, warden and Memel, which is 5 km North of the Project area (Coorperative Governance Traditional Affairs, 2022) .

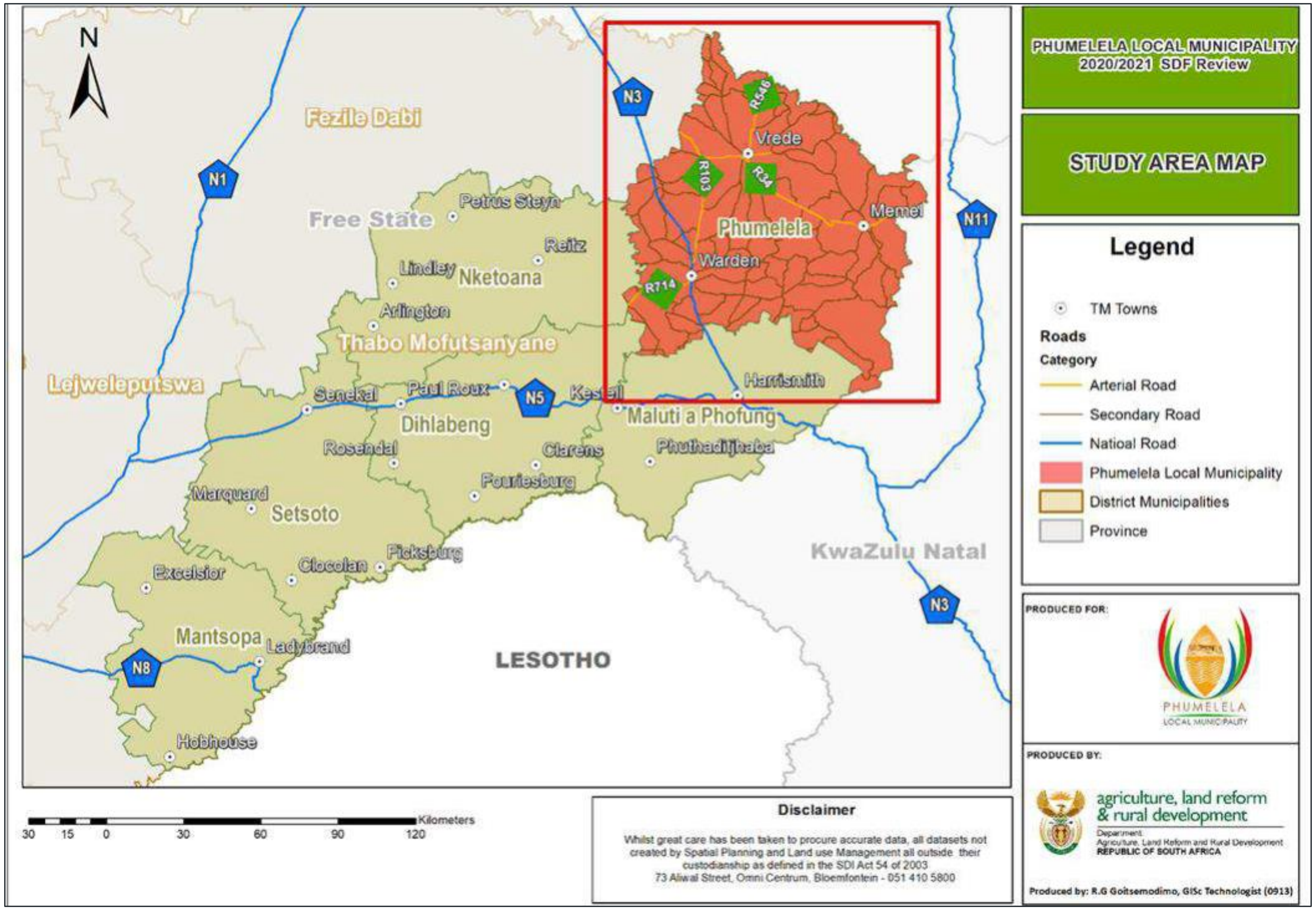


Figure 7-83 - Local Context

7.3.5.4 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. The demography informs the project of potential social context that may influence the project either negatively or positively. When the project is aware of the local social contexts, better informed decision making is enhanced. This will create a healthy social license to operate and create a conducive environment for both the local community and the project to co-exist.

POPULATION

According to the 2016 Community Survey by Statistics South Africa, the municipality had a population of 50054. However, according to the recent statistics released in 2022, the population has increased to 52,224. (Statistics South Africa, 2022). This indicates that the population is growing and may mean a higher energy demand in the area. Therefore, a WEF can be considered a viable solution to meet the energy demand.

GENDER AND AGE PROFILE

The population pyramid below is a graphic representation of the population categorised by gender and age for PLM. The horizontal axis depicts the share of people, with the male population charted on the right-hand side and the female population on the left-hand side of the vertical axis. The vertical axis is divided into 5-year age categories. The figures below show Phumelela's population pyramid/structure based on the Census Community Survey 2016. See **Figure 7-84** for the population pyramid.

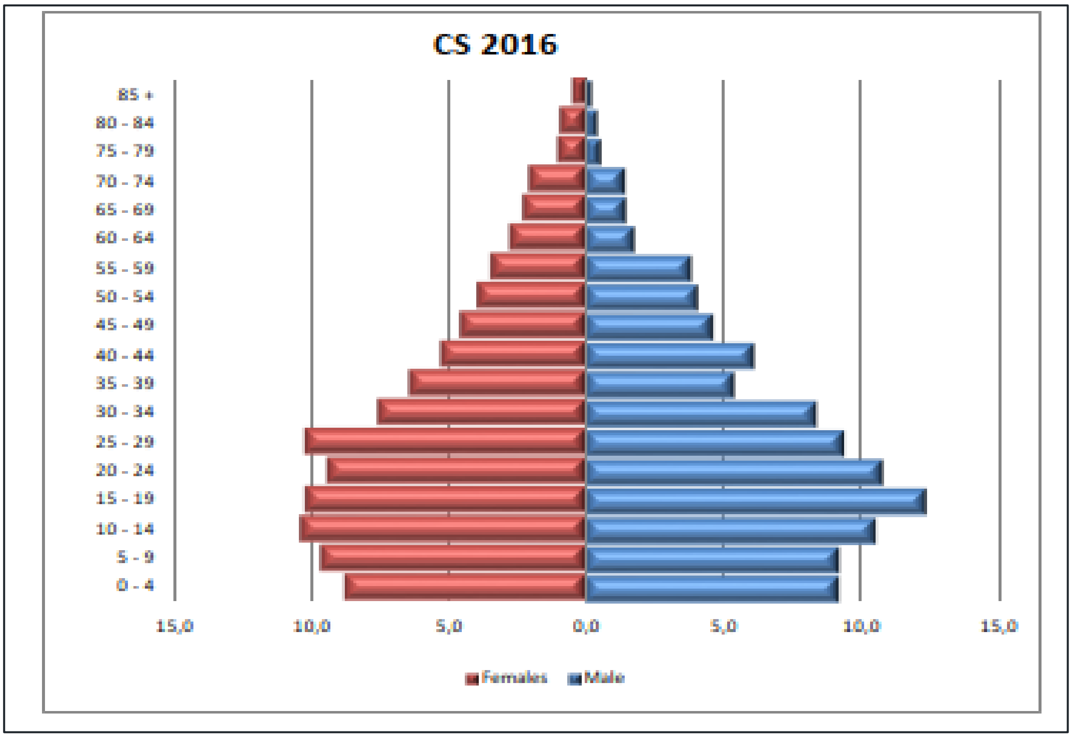


Figure 7-84 - Population Pyramid, 2016

The figure above shows that, in 2016, PLM males had the highest proportions for the age group 15-19 than females. As age increases, the population decreases. Female numbers started to decrease from age 30-34, whereas males decreased from age 20-24. In 2016, the municipality had the lowest population in the age group (0-4) for both males and females compared to the Census 2011, which had the highest population proportion for the age group 0-4 years. In 2016, the pyramid showed that fertility rates decreased as the 0-4 age group decreased, and more male children were born than female children. (Phumelela Local Municipality, 2022-2027, p. 57).

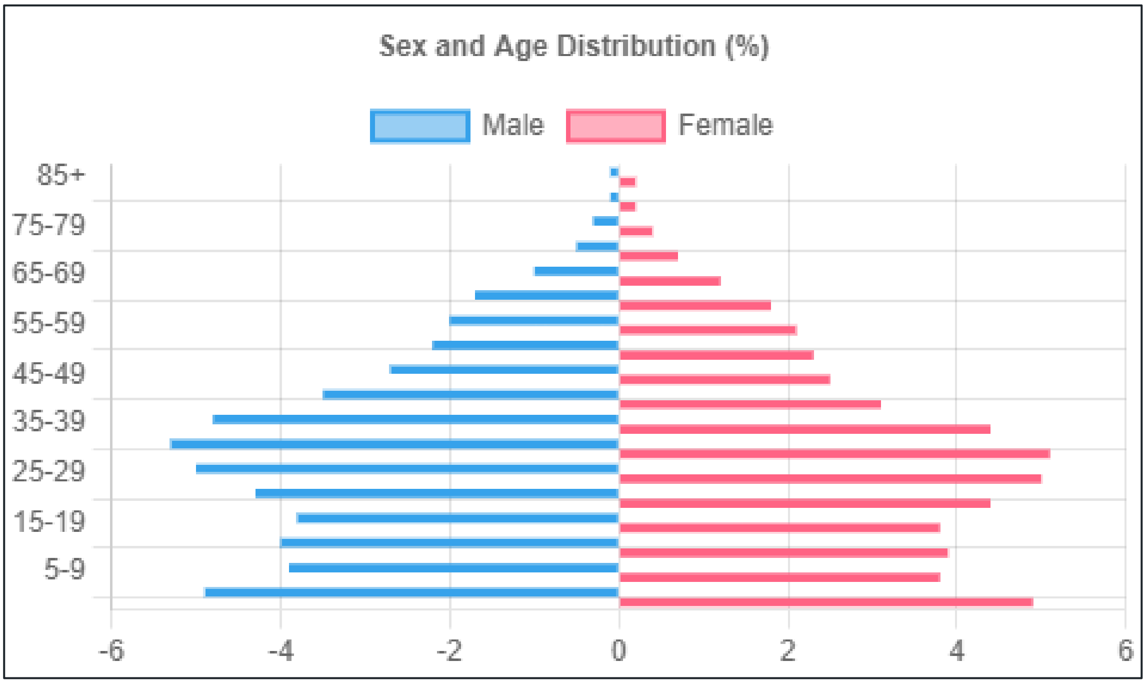


Figure 7-85 - Sex and Age Distribution, 2022

In 2022, the total male population was 47.8 % and females at 52.1 %. The working age (15-64) increased by approximately 4 % from 2011 to 2022. These figures may impact the project positively as the pyramid indicates available human resources that the project can employ. See Figure 7-85 above.

HOUSEHOLD LIVING CONDITIONS

The project is situated on a farmland. According to (Statistics South Africa, 2022) 60% of the population within the municipality uses electricity from the main grid as an energy source (see **Figure 7-86** below).

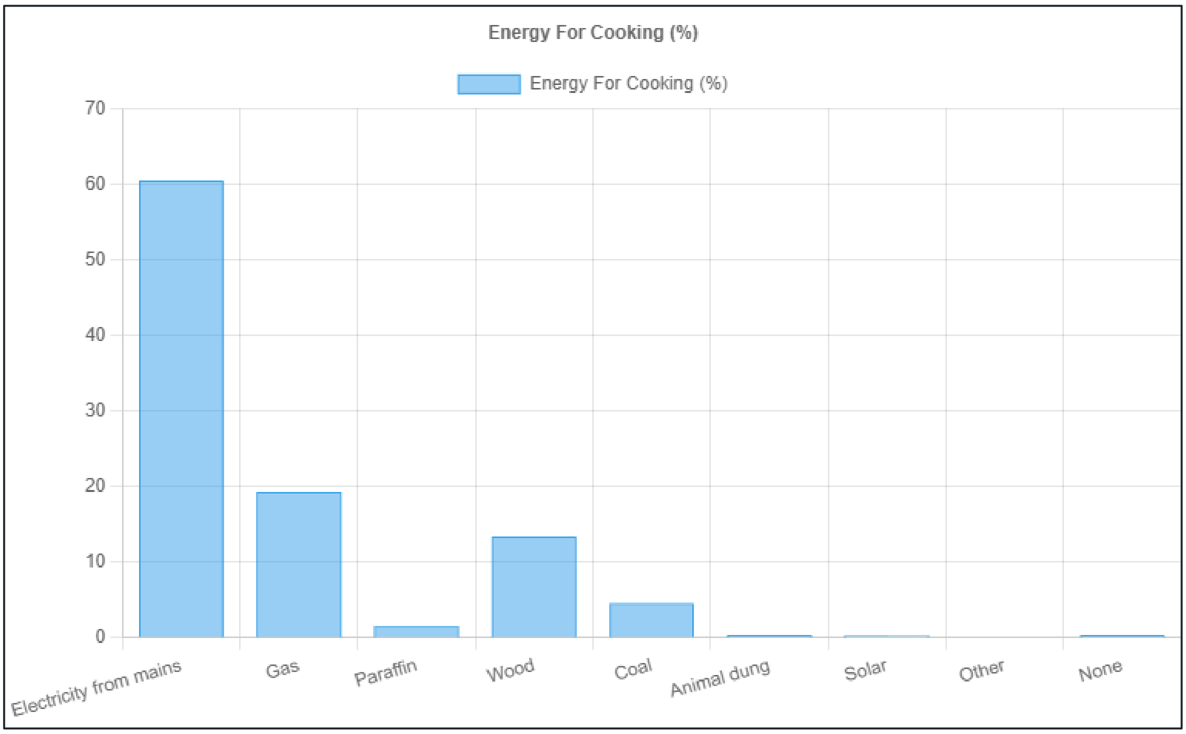


Figure 7-86 - Energy for Cooking

The graph above shows that out of the population, 20% rely on gas for cooking, 12% rely on wood, and less than 1% use renewable energy. By implementing the project, the pressure on non-renewable energy use will decrease, and the usage of green energy will be promoted. This is necessary as the graph indicates that there is more reliance on the grid for energy. The grid will be powered by wind renewable energy.

EDUCATIONAL PROFILE

Education is important to a country's economic growth and its industries' development, providing a trained workforce and skilled professionals. The education measure represents an individual's highest level of education, using those aged five years and older. See **Figure 7-87**

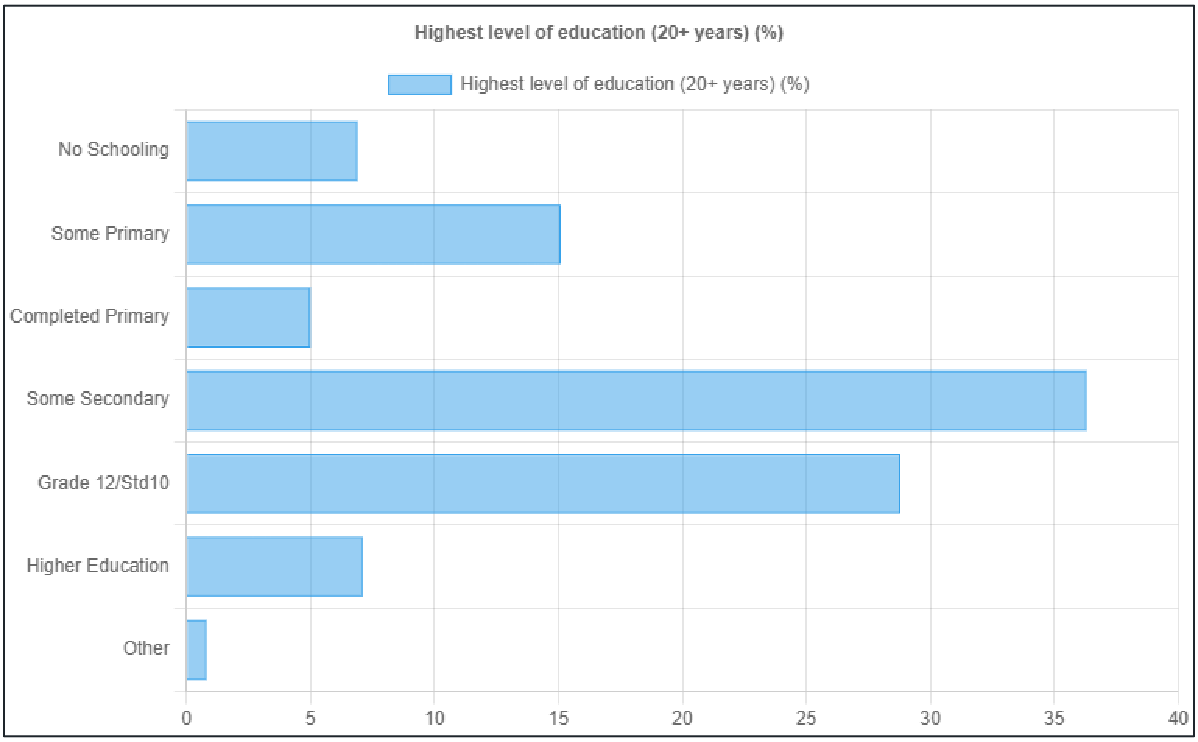


Figure 7-87 - Highest Level of Education (20 + years) (%)

According to (Statistics South Africa, 2022) 74.1 % of people aged 5 to 24 have attended educational institutions. Of these, only 7.1 % have obtained higher education beyond matric. This may indicate a shortage of skilled labourers for the project and a potential surplus of low- to semi-skilled labourers.

LABOUR PROFILE

A country's labour force consists of all working-age individuals who are either seeking employment or are employed. See **Figure 7-88** below.

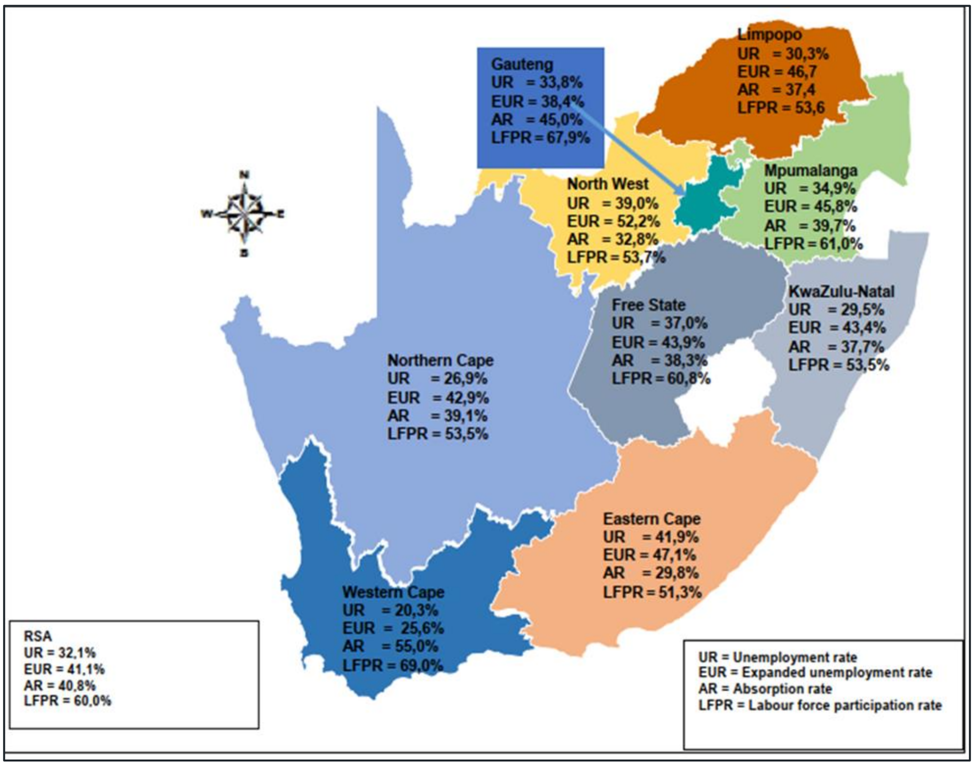


Figure 7-88 - Summary of the Labour Market Measures at a Glance, Q4:2023

According to (Statistics South Africa, 2011), the unemployment rate for Free State Province is 25.3 % lower than the country's overall 32.1 % unemployment rate and 37.0 % unemployment rate of the Free State Province. (Stats SA, 2023)

COMMUNITY HEALTH

According to the Phumelela municipality, IDP indicates a shortage of health facilities, with one hospital located at Vrede. Four clinics, three mobile clinics, and two community care centres (Phumelela Local Municipality, 2022-2027) (See **Table 7-26)**

Table 7-26 – Health Facilities

Area	Hospital	Clinic	Mobile Clinic	Community Care Centre
Vrede	1	1	0	0
Thembalihle	0	1	1	1 (Disability Centre)
Warden	0	1	1	1 (Soup Kitchen)
Ezenzeleni	0	0	0	0
Memel	0	1	1	0
Zamani	0	0	0	0

7.3.6 NOISE

The following is extracted from the Acoustic Scoping Input Report compiled by WSP and included as Appendix G.14.

Sensitive Receptors

Sensitive receptors are identified as areas that may be impacted negatively due to noise associated with the proposed WEF. Examples of receptors include, but are not limited to, schools, shopping centres, hospitals, office blocks and residential areas. Being such a remotely located site, dominant receptors in the area surrounding the site include small farmsteads and farmhouses. Impacts in the context of this report will relate to inhabitants (humans and animals1) of such farmsteads/ farmhouses. From a desktop assessment of the site using Google EarthTM imagery, 21 farmhouse receptors have been identified within the site boundary (**Figure 7-89**), which will all be considered in this study. As per the IFC EHS guidance for Wind Energy, receptors within 2 km of the proposed site are considered. It was not possible to confirm whether every one of these identified receptors is currently inhabited. As such, in order to represent a worst-case assessment, it was assumed that they are all inhabited.

Existing Noise Climate

The existing noise climate surrounding the Kromhof 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.

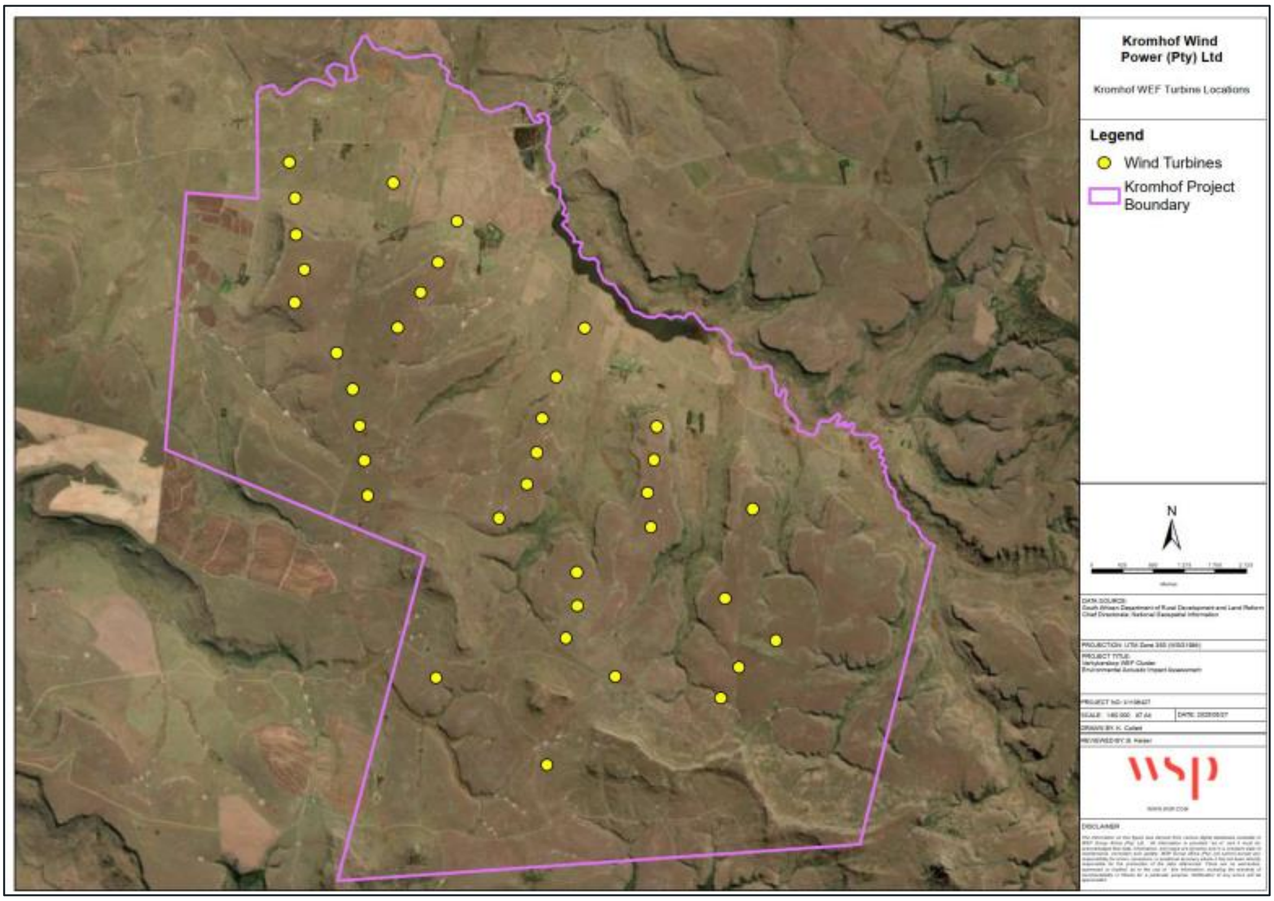


Figure 7-89 - Layout of the proposed Kromhof WEF (DEIR assessed layout)

Wind Turbines and noise

Noise from wind turbines can be classified into two categories, namely mechanical noise generated from the turbine's mechanical components and aerodynamic noise, produced by the flow of air over the turbine blades.

Mechanical Noise

The mechanical noise generated by a wind turbine is predominantly tonal (dominated by a narrow range of frequencies), but may also be broadband in character, displaying a wide range of frequencies (Council of Canadian Academics, 2015). Such noise is produced by the physical movement of the following components:

- Gearbox
- Generator
- Yaw drives
- Cooling fans
- Auxiliary equipment

Over time, appropriate design and manufacturing have reduced the mechanical noise produced by wind turbines. As such, the aerodynamic noise from the blades has become the dominant source of noise for modern turbines, however, low-frequency tones associated with mechanical sources are audible for some turbines (Hau, 2006; Manwell et al., 2009; Oerlemans, 2011).

Aerodynamic Noise

Aerodynamic noise is typically broadband in nature and is generated by the interaction between airflow and different parts of the turbine blades. These interactions depend on the speed and turbulence of the wind; the shape of the blade; the angle between the blade and relative wind velocity flowing over the blade; and the distance from the hub. The noise levels produced are relative to the velocity of the airflow, with higher rotor speeds resulting in higher noise levels. Specifically, parts of the blade closer to the tips move faster than those closer to the hub, resulting in faster relative air velocities and creating higher aerodynamic noise levels. As such, most of the aerodynamic noise is produced near (but not at) the blade tips. This is partly why turbines with longer blades have a higher sound power level (Oerlemans, 2011).

Aerodynamic noise from wind turbines also has a strong directional component, projecting primarily downward, upward, or even perpendicular depending on the dominant mechanism (Oerlemans, 2011). As such, noise levels measured at a particular location can vary depending on the direction, speed and turbulence of the prevailing wind. Furthermore, as the rotor turns, the orientation of each blade changes in relation to a stationary receiver. As such, the noise levels at the receiver will vary as the blades rotate, resulting in periodic regular changes in noise levels over time (Renewable UK, 2013).

As wind speed increases, the aerodynamic noise of the turbines also increases. At low speeds, the noise created is generally low and increases to a maximum at a certain speed (around 10 m/s) where it either remains constant or can even slightly decrease.

Low Frequency Noise and Infrasound

Wind turbines also produce some steady, deep, low-frequency sounds (between 1 – 100 Hz), particularly under turbulent wind conditions. Sound waves below 20 Hz are called infrasound. These infrasound levels are only audible at very high sound pressure levels. Older wind turbines that had downwind rotors created noticeable amounts of infrasound. Levels produced by modern-day, up-wind style turbines are below the hearing threshold for most people (Jakobsen, 2005).

The human ear is substantially less sensitive to sound at very low or very high frequencies. For most people, a very low-pitch sound (20 Hz) must have a sound pressure level of 70 dB to be audible. Levels of infrasound near modern commercial wind turbines are far below this level and are generally not perceptible to people (Leventhall, 2006).

Low-frequency sound, like all other sound, decreases as it travels away from the source. Siting wind turbines further away from sensitive receptors will therefore decrease the risk of infrasound. It is, however, important to note that in flat terrain, low-frequency sound can travel more effectively than high-frequency sound. Most environmental sound measurements and noise regulations are based on the A-weighed decibel scale (dB(A)), which under-weights low frequency sounds in order to mimic the human ear. Thus, noise limits based on the dB(A) levels do not fully regulate infrasound. The dB(C) scale offers an alternative to measuring sound that provides more weight to lower frequencies (Jakobsen, 2005; Bolin et al., 2011).

SANS 10103 proposes a methodology to identify whether low-frequency noise could be an issue. The method suggests that if the difference between LAeq and LCeq is greater than 10 dB, then a predominantly low-frequency component may be present. However, in all cases, the existing acoustic energy in low frequencies associated with wind must be considered.

Substation and Transformer Noise

In addition to the noise from wind turbines, wind farms require a substation and transformers, which produce a characteristic “hum” or “crackle” noise. Utility companies have experience with building and siting such sources to minimise their impact. Substation-related noise is relatively easy to mitigate should this be required, based on the use of acoustic shielding and careful planning regarding placement away from sensitive receptors. As such, noise associated with this source is not considered in this assessment.

7.3.7 HEALTH, SAFETY AND ENVIRONMENT RISK

The following is extracted from the High-level Safety, Health and Environment Risk Assessment compiled by ISHECONcc and included as Appendix G.15.

The map below show that the BESS facilities are planned in relatively isolated locations.

Figure 7-90 shows 500m circles around the proposed BESS Facilities (blue) as well as local farmsteads / occupied facilities with (red) and near-by water courses/bodies (green). commercial mining farther from the facility, i.e., over 5km.

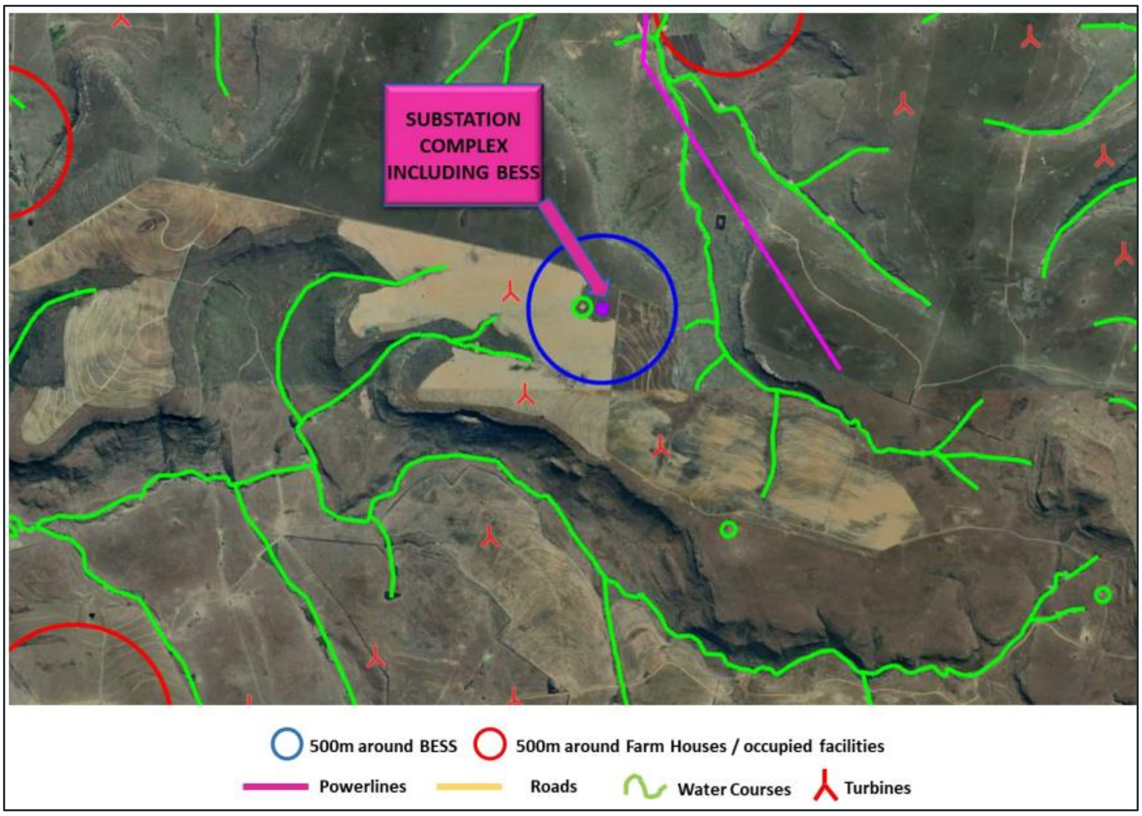


Figure 7-90 - 500m circles around the BESS Facilities (Blue) and Location of Farmhouses / Mines(Red) and Nearby Water Courses/Bodies (Green) in the immediate vicinity of the BESSLithium-Ion Battery Chemical Hazards

Lithium batteries in general

One of the battery types being considered by the project proponent is lithium-ion based batteries.

Lithium-ion based battery systems are becoming one of the dominant technologies for utility systems in Europe and America. For this reason, this assessment assumes that lithium-based batteries will be used in the BESS facilities. Should sodium-based batteries be used, the hazards are likely to be similar at a high level but different in their details, and therefore the Risk Assessment may need to be reviewed.

Primary (non-rechargeable) batteries use lithium metal anodes. Lithium is one of the lightest and most reactive metallic elements and is highly reactive towards water and oxygen. Exposure of lithium metal to water even as humidity can decompose exothermically to produce flammable hydrogen gas and heat. These lithium metal batteries are not used in BESS systems. However, if secondary batteries discussed below are charged at temperatures below 0 °C, then lithium can plate out onto the anode surface and in this manner lithium metal could be present even in lithium-ion batteries.

Secondary, rechargeable lithium batteries, as used in bulk BESSs, use cathodes that contain lithium in the crystal structure of the cathode coating and/or lithium salts in an electrolyte that is in the battery. These are called lithium-ion batteries. Lithium-ion batteries operate at room temperature and have significant limitations outside the 0 – 50 °C range. The exact lithium-ion composition of the batteries can vary with suppliers. In addition, the technology allows for many combinations of chemistry to suit the particular application.

Lithium Battery Chemistry

Generally, for all lithium-ion based batteries the anode is made of solid carbon (graphite) and the cathode of a solid lithium metal oxide or phosphate. So the cathode can be for example lithium iron phosphate or lithium nickel manganese cobalt.

In between the cathode and anode is an electrolyte through which the electrons migrate. This electrolyte can come in many different forms.

Lithium-ion liquid batteries generally have a liquid electrolyte that is typically a lithium salt in an organic solvent. The electrolytes are typically ethylene carbonate or di-ethyl carbonate. The flash points of these carbonates can vary from 18 – 145 °C which means they can be highly flammable (FP < 60 °C) or merely combustible if involved in an external fire (FP > 60 °C). They may produce toxic and flammable gasses if involved in a fire.

Lithium-polymer batteries have a gel-like electrolyte that contains the lithium-ions in a flexible polymer, which is less flammable than the liquid solvent based system.

Lithium-solid state batteries have an electrolyte that contains the lithium-ions in a solid matrix that can be either an inorganic solid, solid polymer, polymer ceramic composite or a metal organic framework. These solid electrolyte have the advantage that they cannot leak out if the battery is damaged and that they can be made of non-flammable materials reducing the fire hazards. Some of the lithium compound in the electrolyte include lithium hexafluorophosphate, lithium perchlorate, lithium cobalt oxide etc.

Hazard - Thermal Decomposition

Upon heating of the contents of a battery due to shorting (e.g. due to dendrite formation, physical damage, water ingress etc), contaminants, external heat or exposure to water and reaction heat, the lithium salts in batteries can begin to break down exothermically to release either oxygen (oxidants) that enhances combustion, possibly leading to explosion, or fumes such as hydrogen fluoride or chlorine that are toxic.

These exothermic break down reactions are self-sustaining above a certain temperature (typically 70 °C for liquid batteries and) and can lead to thermal run away. In this process the battery gets hotter and hotter, the decomposition reactions happen faster and faster and excessive hot fumes are generated in the battery. Eventually the pressure in the battery builds up to the point where those gases need to be vented, usually via the weakest point in the system. These vented fumes can be flammable due to vaporization of the electrolyte (especially if liquid solvents but generally if hydrocarbon based) and can ignite as a flash fire or fire ball (if large amounts) leading to the fire spreading to any surrounding combustible materials, e.g., plastic insulation on cables, the electrolyte, the electrodes and possibly even the plastic parts of the battery casing etc. If the vented flammable vapours do not ignite immediately, they can accumulate within the surrounding structures. If this flammable mixture is ignited later, e.g., due to a spark, this can lead to a violent explosion of the module, cabinet, room, container etc.

In addition to being flammable the vented gases will contain toxic components. These could include:

- - the products of combustion such as carbon dioxide/monoxide, hydrogen cyanide,
- - VOCs like benzene and ethylene,
- - Depending on the exact battery chemical composition, decomposition products such as hydrogen fluoride, hydrogen chloride, phosphorous pentafluoride, phosphoryl fluoride and oxides of aluminium, cobalt, copper etc.

The temperature in the batteries and of these vented gases can be extremely high, e.g., > 600 °C.

In the situation where oxygen is released internally as part of the decomposition (e.g., lithium perchlorate) the oxygen is available to react with the combustible electrolyte and if all this happens extremely fast in a self-sustaining manner within the confines of the device, an explosion of the device can occur with only localized impacts.

Hazard – Propagation

A BESS is composed of individual batteries which are combined into different size packs such as modules and racks, as illustrated on the diagram below.

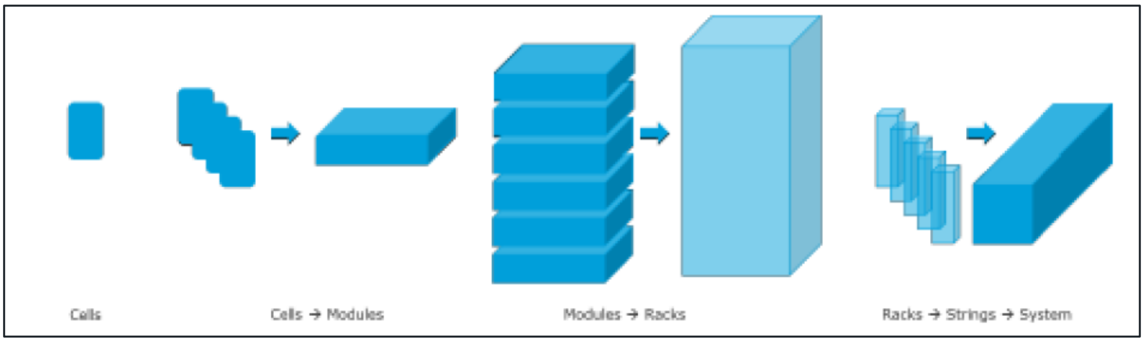


Figure 7-91- Diagram of battery structure

The very high temperature generated by one battery cell in thermal runaway could lead to overheating of adjacent cells. This cell in turn then starts thermal decomposition and so the process propagates through the entire system, as illustrated on the diagram below (**Figure 7-92**). In order to prevent propagation, there are separation requirements between cells, modules etc. Separation could be with physical space or insulating materials.

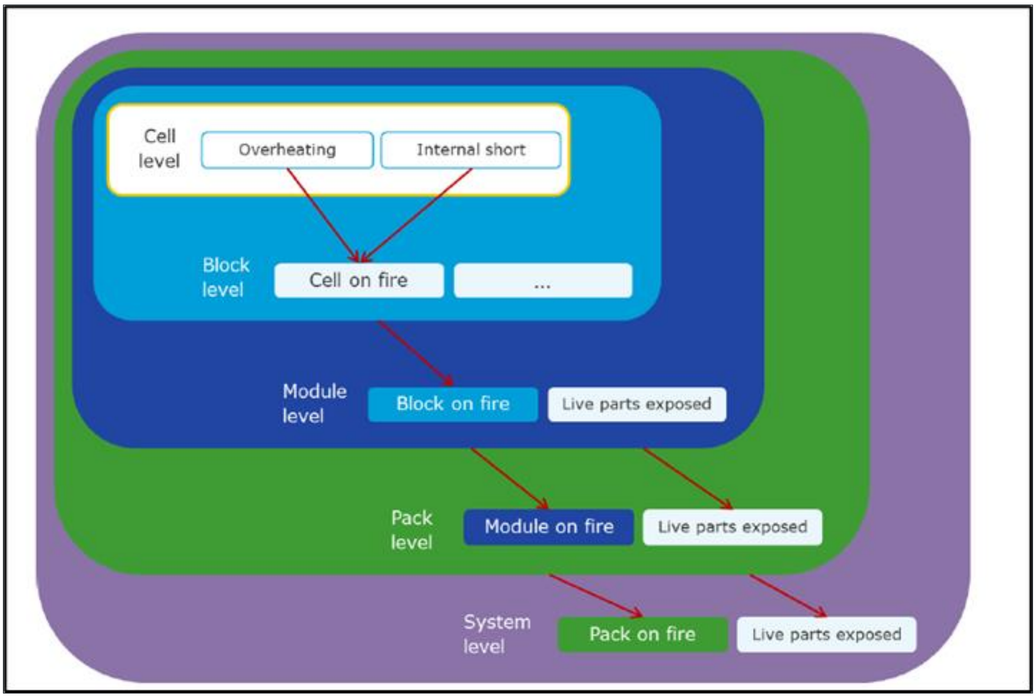


Figure 7-92- Diagram of battery structure

Hazard - Electrolyte Leaks from Liquid Phase Batteries

In the case of liquid or polymer batteries, although extremely unlikely due to the structure of the batteries, should electrolyte liquid leak out of the batteries, it can be potentially flammable as well as corrosive or toxic. If ignited as fire, or explosion, the smoke would contain toxic components. If unignited it can still be extremely harmful especially if its decomposition products include hydrofluoric acid.

One of the main safety advantages of solid state batteries is that flammable electrolyte leaks are not possible.

Hazard – Electrical Shock/Arc

Electrical shock presents a risk to workers and emergency responders, if the energy storage system cannot be “turned off”. This is referred to as “stranded energy” and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V. Lithium-ion systems operate from 48 - 1000 V, depending on the battery design.

Vanadium Redox Flow Battery Hazards

Redox Flow Batteries in General

All electrochemical energy storage systems convert electrical energy into chemical energy when charging, and the process is reversed when discharging. With conventional batteries, the conversion and storage take place in closed cells. With redox flow batteries, however, the conversion and storage of energy are separated. Redox flow batteries differ from conventional batteries in that the energy storage material is conveyed by an energy converter. This requires the energy storage material to be in a flowable form. In redox flow batteries, charging and discharging processes can take place in the same cell. Redox flow batteries thus have the distinguishing feature that energy and power can be scaled separately. The power determines the cell size, or the number of cells and the energy is determined by the amount of the energy storage medium. In theory, there is no limit to the amount of energy that can be produced and/or stored thereby allowing for scalability of these systems.

Figure 7-93 shows the general operating principle of redox flow batteries. The energy conversion takes place in an electrochemical cell which is divided into two half cells. The half cells are separated from each other by an ion-permeable membrane or separator, so that the liquids of the half cells mix as little as possible. The separator ensures a charge balance between positive and negative half cells, ideally without the negative and positive active materials coming into direct contact with each other. In fact, however, separators are not perfect so some cross-over of the active materials always occurs and this leads to the self-discharge effect.

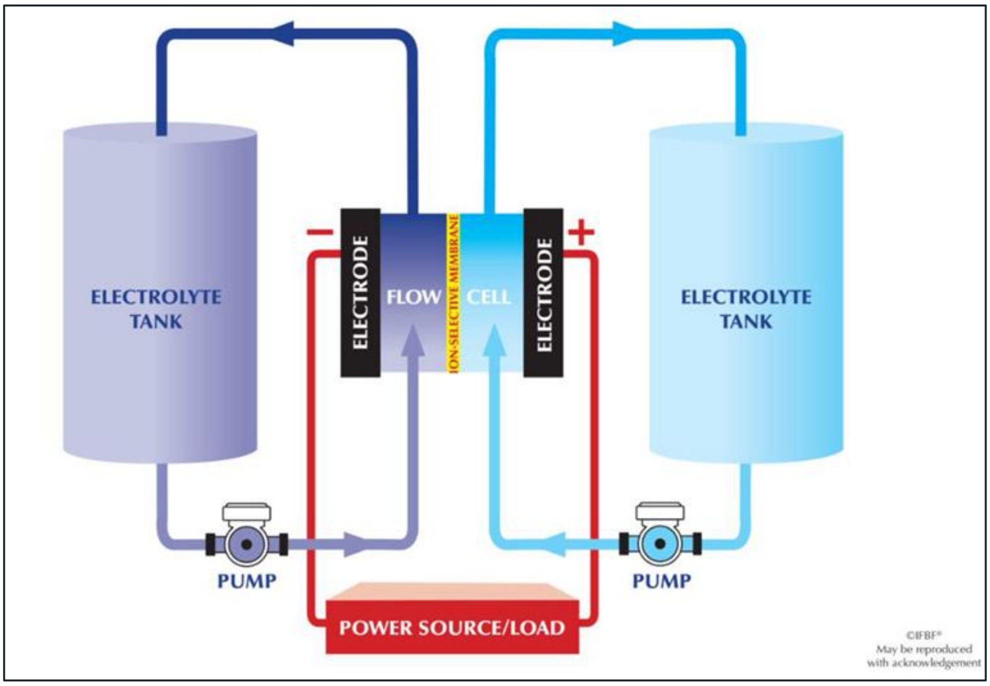


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Figure 7-93- Diagram of battery structure

Vanadium Battery Chemistry

The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) or vanadium redox flow battery (VRFB), is a type of rechargeable flow battery that employs vanadium ions in different oxidation states to store chemical potential energy. The vanadium redox battery exploits the ability of vanadium to exist in solution in four different oxidation states, and uses this property to make a battery that has just one electroactive element instead of two.

The possibility of creating a vanadium flow battery was explored by Pissoort in the 1930s, NASA researchers in the 1970s, and Pellegri and Spaziante in the 1970s, but none of them were successful in demonstrating the technology. The first successful demonstration of the all-vanadium redox flow battery which employed vanadium in a solution of sulfuric acid in each half was by Maria Skyllas-Kazacos at the University of New South Wales in the 1980s. In redox flow batteries, the electrodes should not participate in the reactions for energy conversion and should not cause any further side reactions (e.g., undesirable gas formation). Most redox flow batteries are therefore based on carbon electrodes.

The redox pair VO2+/VO2+ are at the positive electrode and the redox pair V2+/V3+ at the negative electrode. The use of the same ions in the positive and negative electrolytes permits relatively high concentrations of active material. It also overcomes the cross-contamination degradation issues which plague other flow type batteries. The energy storage solution consists primarily of vanadium sulphate in a diluted (2mol/L) sulphuric acid (possibly containing a low concentration of phosphoric acid) and is therefore roughly comparable to the acid of lead/acid batteries. The energy density is limited by the concentration of the pentavalent + VO2.

The vanadium redox flow battery is without doubt the best investigated and most installed redox flow battery For several reasons, including their relative bulkiness, most vanadium batteries are currently used for grid energy storage, i.e., attached to power plants or electrical grids. Currently, there are over 100 VRFB installations globally with an estimated capacity of over 209,800 kWh of energy and the use of vanadium in energy storage applications has doubled to 2.1% of the global vanadium consumption in 2018.

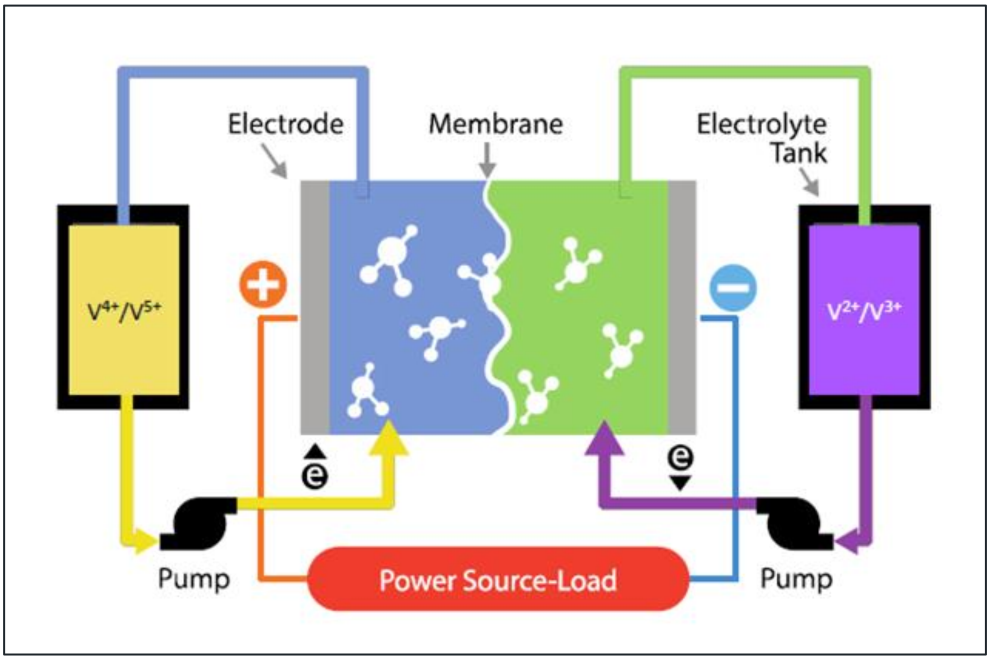


Figure 7-94- Diagram of battery structure

Hazard – Toxicity and Corrosivity

The electrolyte in the VRFB system is corrosive. It is composed of a sulphuric acid-based solution similar to common automotive lead acid batteries. Unlike traditional lead-acid batteries, VRBs do not include lead.

Therefore, VRBs do not have the toxicity issues of lead that conventional car batteries have. The only potential source of human toxicity in a VRB is Vanadium.

Vanadium in various physio-chemical states can have a relatively high aquatic and human toxicity. Acute oral exposure to high doses can lead to hemorrhaging, while chronic exposure leads to adverse effects on the digestive system, kidneys and blood (diarrhea, cramps etc.).

Inhalation hazards lead to irritation of the respiratory tract, bronchospasm, pulmonary congestion. There is little evidence that vanadium compounds are reproductive toxics or teratogens. There is also no evidence that it is carcinogenic (Source USA EPA Risk Assessment Information Systems, Toxicity Profiles, Vanadium 1998).

In the electrolyte the concentration levels of Vanadium are so low that when it is mixed into liquid form in the final product and put into operation, the VRB is deemed non-toxic. In addition, VRBs have a lower concentration of sulfuric acid than traditional lead-acid batteries. Vanadium poses a hazard when it is in powder form, i.e. when making up the electrolyte solution. The Kromhoffacilities will purchase electrolyte already made up and there will be no solid vanadium powder on site.

Toxicity or corrosion risks may be present from off-gassing produced by over-heating aqueous or vaporized electrolytes. In addition, flow batteries in fire scenarios may generate toxic gas from the combustion of hydrocarbons, plastics, or acidic electrolytes. Refer to sections on fire below for mitigation measures.

Hazard - Electrical Shock/Arc

Electrical shock presents a risk to workers and emergency responders, if the energy storage system cannot be “turned off”. This is referred to as “stranded energy” and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V.

In the area of shock hazard, a flow battery produces voltage only when electrolytes are in a cell stack. For most designs, if the motors are turned off and fluids drained from the cell stack, then the cell stacks have no measurable voltage at the terminals. This happens not only when the battery is forcible turned off but also in the standby mode as vanadium batteries do not include any metal plates to hold the chemical reactions / charges / voltages and can be fully drained when not in use.

If not fully drained, vanadium flow batteries are also unique in terms of short circuiting in that the internal dynamics of the battery are such that the energy discharge is limited to the fluid in the battery at any given time and the is typically less than 1% of the total stored energy. Therefore, together with the relatively low energy density of the vanadium electrolyte, the immediate release of energy, which occurs as a result of electrical shorting, is somewhat limited. The high heat capacity of the aqueous electrolyte is also beneficial in limiting the temperature rise.

Vanadium flow batteries have been tested under dead-short conditions resulting in normal operation with no danger to either equipment or personnel.

Hazard – Fire / Deflagration

Over 50% of the electrolyte solution is made up of water, which gives the electrolyte a non-flammable property. In the event of short circuiting, intense heat or high pressure, it is unlikely for the battery to catch fire. There is no “thermal runaway” risk when compared to other battery technologies.

Whilst some heat may be discharged from the battery, it will not be at a level that is deemed unsafe.

Like all other RFBs, VRFBs also have a battery management system. A battery management system ensures optimum and safe conditions for battery operation. Often a heat management system is integrated to avoid too high or too low temperatures.

Hazard - Hydrogen Generation

As with all other aqueous batteries, aqueous energy storage media from redox flow batteries are also subject to water limitations. In case of too high voltages or more precisely too high or too low half-cell potentials, the water is decomposed into its components, hydrogen and oxygen.

The generation of hydrogen in particular is often present as a very small but undesirable side reaction and causes a charge carrier imbalance between positive and negative half-cells, which leads to a slow loss of capacity. It also presents a fire / explosion hazard.

With VRFB, due to the flowability of the energy storage medium, the reaction products that would normally remain in the half-cell can be transported out of the cell and stored in separate tanks thus allowing the capability for a higher capacity than that attainable with conventional batteries. In addition, any deviations from safe operating parameter will trigger the shutdown of the system pumps ceasing to charge the electrolyte and thereby reducing the changes of accidental hydrogen generation. In addition, the thermal mass of the electrolyte tanks can provide an additional barrier to overcharging conditions by allowing ambient temperature during the discharge times to cool the VRFB for the next charge cycle.

Hazard – Waste Electrolyte

Unfortunately, pentavalent vanadium ions have a tendency to react with each other, which leads to the formation of larger molecules which precipitate as solids and can thus damage the system. The reaction depends on the temperature and the concentration of VO2+ (state of charge) but is also a function of the proton concentration. Temperature and concentrations therefore need to be controlled within specified ranges.

Should the concentration of undesirable components increase in the electrolyte, a part may need to be purged and replaced with fresh electrolyte. There may be facilities for regenerating purged electrolyte or it may have to be disposed of to a suitable hazardous waste facility.

Hazard - Electrolyte Leaks

Leaks must be expected in any hazardous-fluid handling equipment. Secondary containment is typically designed into the system and standard corrosive PPE is required for handling liquid. Reliable leak detection, warning alarms, and containment is paramount.   As with any chemicals plant, a suitable design with detection, alarm and trip instrumentation that has been subject to thorough Hazop study should be in place, e.g., detection of dry running of pumps, detection of dead heading of pumps, prevention of reverse flow, detection of drop in tank levels etc.

Other Chemicals or Hazards

The BESS is composed not only of the batteries, but also electrical connections, switches, power converters, cooling systems etc. The diagram below shows a typical complex system for a lithium solid state facility.

Cooling Systems

Due to the need to keep the batteries within a specified temperature range most of the containerized modular system have built-in air-conditioning systems while the VRFB building systems may have cooling water systems. Some have only fans for air cooling with filters to remove dust prior to cooling. Others, particularly those in hot environments requiring more cooling, may have refrigerant-based systems. These would have a refrigerant circuit usually containing non-flammable non-toxic refrigerant such as R134a (simple asphyxiant) etc as well as a low hazard circulating medium such as an ethylene glycol-based coolant. At high temperatures above 250 °C R134 may decompose and may generate hydrogen fluoride and other toxic gases. Ethylene glycol is really only harmful if swallowed. In the environment it breaks down quickly and at low concentrations that would typically occur from occasional small spills, it has no toxicity

Fire Suppression Systems

Although these are only effective for some fire scenarios, some of the solid-state containerized systems come fitted with “Clean agent” fire suppressant systems. These are pressurized containers of powder/gases that are released into the container to snuff a fire and do not leave a residue on the equipment. Some containers have water sprinkler systems installed to quench thermal run-away reactions.

In general fire fighters may respond with water cannons/hydrants, foam systems etc. Such responses may generate large amount of contaminated and hazardous water runoff. A system to contain as much of this as possible should be in place.

General Electrical and Electronic Equipment

Whatever the configuration of the battery containers/ buildings there will be electrical and electronic equipment in the battery compartment, the battery building as well as outside. In some installations the main electrical equipment such as the power conversion system is in a separate compartment separated by a fire wall. In others it can be in a separate container.

Wherever there is electrical equipment there is a possibility of shorting and overheating and fire.

8 SITE SENSITIVITIES

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 30 September 2024 and is attached as **Appendix E**. 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		X		
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Avian (Wind) Theme		X		
Bats (Wind) Theme		X		
Civil Aviation (Wind) Theme				X
Defence (Wind) Theme				X

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Flicker Theme	X			
Landscape (Wind) Theme	X			
Palaeontology Theme	X			
Noise Theme	X			
Plant Species Theme			X	
RFI (Wind) Theme				X
Terrestrial Biodiversity Theme	X			
Vulture Species Theme		X		

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:

- 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 8-2** below, 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;

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

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 compiled during the Scoping Phase is included in **Appendix F**.

Table 8-2 - Assessment Protocols and Site Sensitivity Verifications

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
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 gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) of 4 NEMA, 1998).	High Sensitivity	An Agricultural Agro-Ecosystem Specialist Assessment must be undertaken as the proposed activity is identified as high sensitivity for agricultural resources. The outcome of the site sensitivity verification can be found in Section 7 of the Agricultural Impact Assessment (Appendix G.1 of this Draft EIAr). The results of the DFFE Screening Tool indicated that the Agricultural theme has a High Sensitivity, and the specialist confirmed that those parts of the site, on which there are currently viable croplands, as being of High agricultural sensitivity and the rest of the site as being of medium agricultural sensitivity.
Landscape/Visual Impact Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been	Very High Sensitivity	The outcome of the sensitivity verification can be found in Section 5 of the Visual Impact Assessment and Sensitivity Receptors are found in

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.		Section 7 (Appendix G.12 of this Draft EIAr). The results DFFE Screening Tool indicates that large parts of the study area are of very high or high visual resource value, and that the areas of least concern are located along the lower-lying valley which was confirmed by specialist results that indicated that potential visual receptor base to the proposed development is somewhat limited but diverse. Furthermore, the visual resource value of the site within the context of the surrounding study area is very high, owing mainly to the low prevailing levels of development, highly characteristic topography, and largely intact Highveld grassland cover, and furthermore also has a low ability to absorb visual change.
Archaeological and Cultural Heritage Impact Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.	Low Sensitivity	The outcome of the sensitivity verification can be found in Appendix A of the Heritage Scoping Assessment (Appendix G.9 of this Draft EIAr). The results of the DFFE Screening Tool indicated that the Heritage theme has a Low Sensitivity, and the results of the specialist's desktop study confirmed that the proposed site has a Low Sensitivity.
Palaeontology Impact Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.	Very High Sensitivity	The outcome of the sensitivity verification for the palaeontological sensitivity can be found in Appendix A of the Heritage Scoping Assessment (Appendix G.10 of this Draft EIAr). The results of the DFFE Screening Tool indicated that the Palaeontological theme has a Very High Sensitivity, and the results of the specialist's desktop study indicated that the proposed site has Very High Sensitivity, and further studies will be required in the EIA phase.
Terrestrial Biodiversity Impact Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity where	Very High Sensitivity	The site sensitivity verification can be found in Section 3, 4 and 7 of the Terrestrial and Aquatic Biodiversity Assessment (Appendix G.3 of this Draft EIAr).

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	the site of the proposed activity is identified as very high sensitivity for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment. gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) of 4 NEMA, 1998).		The results DFFE Screening Tool indicated that the Terrestrial Biodiversity theme has a Very High Sensitivity due to its overlap with Critical Biodiversity Areas (CBA) 1 and 2, Ecological support Areas (ESA) 1 and 2, FEPA sub catchments and National Protected Areas Expansion Strategy (NPAES). However, this result was disputed by the results of the biodiversity study indicated that the terrestrial biodiversity would have a Medium Sensitivity in terms of ESA and High Sensitivity in terms of CBA. Although much of the Project area may be occupied by cultivated/secondary grasslands, areas that coincide with provincial conservation targets require special consideration in design phase to minimise impacts and possible offset requirements.
Aquatic Biodiversity Impact Assessment	Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation (GN 320, 20 March 2020)) provides the criteria for the assessment and reporting of impacts on aquatic biodiversity for activities requiring environmental authorisation.	Very High Sensitivity	The site sensitivity verification can be found in Section 5, 6 and 7 of the Freshwater Ecological (Aquatic Biodiversity) Assessment (Appendix G.4 of this Draft EIAr). The results of the DFFE Screening Tool indicated that the Aquatic Biodiversity theme has a Very High Sensitivity due to the presence of FEPA sub-catchments, Rivers_AB, Wetlands_(Rivers) and Wetlands Mesic Highveld Grassland Bioregion: Depression; Floodplain and Valley Bottom. The specialist confirmed the overall sensitivity of the project area is considered to be High due to the presence of NFEPA wetland cluster, and rivers in good ecological condition within 500 m of Project area.
Avian Impact Assessment	Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National	Low Sensitivity	The site sensitivity verification can be found in Section 5, of the avifauna Impact Assessment (Appendix G.7 of this Draft EIAr). The results DFFE Screening Tool indicated that the Avian theme has a Low Sensitivity. However, this result was disputed by the results of the Avifauna

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	Environmental Management Act, 1998 (Act No. 107 of 1998)., when applying for environmental authorisation (GN 320, 20 March 2020)) provides the criteria for the assessment and reporting of impacts on avifaunal species associated with the development of onshore wind energy generation facilities, where the electricity output is 20 megawatts or more, which require environmental authorisation		study which indicate that the Avian theme has a Very High Sensitivity best be described as supporting an abundance of birds, of which a very high proportion are of conservation importance.
Vulture Species Theme	Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998)., when applying for environmental authorisation (GN 320, 20 March 2020)) provides the criteria for the assessment and reporting of impacts on avifaunal species associated with the development of onshore wind energy generation facilities, where the electricity output is 20 megawatts or more, which require environmental authorisation	High Sensitivity	The site sensitivity verification can be found in Section 5, of the avifauna Impact Assessment (Appendix G.7 of this Draft EIAr The results DFFE Screening Tool indicated that the Vulture theme has a High Sensitivity, and this has been confirmed by the specialist results as a high number of priority species nests and roosts (including three Cape Vulture roosts), it is apparent that the project area is situated in an area of high avifaunal importance and sensitivity, particularly from a threatened vulture perspective.
Bat Impact Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Bats	High Sensitivity	The site sensitivity verification can be found in Section 6.2, of the Bat Impact Assessment (Appendix G.8 of this Draft EIAr). The results DFFE Screening Tool indicated that the Bat (Wind) theme has a High Sensitivity. This result was confirmed by the specialist.

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Civil Aviation Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on civil aviation installations	Low Sensitivity	Low Sensitivity The relevant stakeholders i.e. CAA and ATNS have been included on the project database. However, no comment has been received to date.
Defence Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on civil aviation installations	Low Sensitivity	Low Sensitivity The relevant stakeholders i.e. CAA and ATNS have been included on the project database. However, no comment has been received to date.
RFI Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Low Sensitivity	Low Sensitivity
Noise Impact Assessment	Protocol for specialist assessment and minimum report content requirements for noise impacts	Low Sensitivity	The results DFFE Screening Tool indicated that the noise theme has a Low Sensitivity. The specialist stated that the status of these receptors (inhabited or uninhabited) needs to be confirmed (ground-truthed) in the EIA phase in order to effectively quantify the noise impacts of the WEF. However, confirmed the overall impact of the project is considered to be Medium Sensitivity (Appendix G.14of this Draft EIAr).
Flicker Impact Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.	Very High Sensitivity	The specialist has confirmed a low sensitivity.
Traffic Impact Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site	No sensitivity identified by the screening tool	

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	sensitivity verification and must comply with Appendix 6 of the EIA Regulations.		
Geotechnical Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.	No sensitivity identified by the screening tool	
Socio Economic Assessment	Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.	No sensitivity identified by the screening tool	
Plant Species Assessment	Protocol (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24(5)(a) and (h) and 44 of NEMA, gazetted on 30 October 2020), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.	Medium Sensitivity	The executive summary and Section 3 of the specialist report outlines the specific sections of the report which align with the terrestrial biodiversity protocol. The site sensitivity verification is discussed in Section 3.3 section of the Plant Species Assessment (Appendix G.5 of this Draft EIAr) The results DFFE Screening Tool indicated that the Plant Species theme indicated Medium Sensitivity on account of the potential presence of at least 2 flora species of conservation concern, namely, sensitive species 1252 and 998, whose names have been withheld due to their vulnerability to illegal harvesting. The specialist confirmed that the site has Medium Sensitivity in disturbed areas since there is the presence of Primary and secondary grasslands could support plant Species of Conservation Concern (SCC).

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Animal Species Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) of 4 NEMA, 1998), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.	High Sensitivity	The executive summary and Section 3 of the specialist report outlines the specific sections of the report which align with the terrestrial biodiversity protocol. The site sensitivity verification is discussed in Section 3.3 section of the Animal Species Assessment (Appendix G.6 of this Draft EIAr) The results DFFE Screening Tool indicated that the Animal Species theme has a High Sensitivity due to the potential presence of due to the presence of 32 species (those identified in the screening report and the additional species identified from the literature review) that are likely to occur within the Project area. However, this result was disputed by the specialist who confirmed that the site has Medium Sensitivity due to the possible presence of protected species.

8.2 CONSOLIDATED SITE SENSITIVITY

The sensitivity input provided by specialists was utilised to compile Consolidated Site Sensitivity Map (**Figure 8-1**). The map in Figure 8-1 has been overlain by the preliminary project layout. Based on the input received from the specialists during the Scoping Phase, the layout was then optimised. The consolidated sensitivity map is overlain by the optimised project layout in **Figure 8-2**.

This “optimised” layout was further refined to produce the DEIR Assessed Layout which formed the basis of the specialist assessments included in this report. **Figure 8-3** illustrates the consolidated sensitivity map overlain by the DEIR Assessment Layout.

Given the nature of the data provided by the avifauna specialist, separate avifauna sensitivity maps were created to properly illustrate all avifaunal sensitivities including their respective buffers. **Figure 8-4** depicts the avifaunal sensitivities overlain by the optimised layout, and **Figure 8-5** depicts the avifaunal sensitivities overlain by the DEIR Assessed layout.

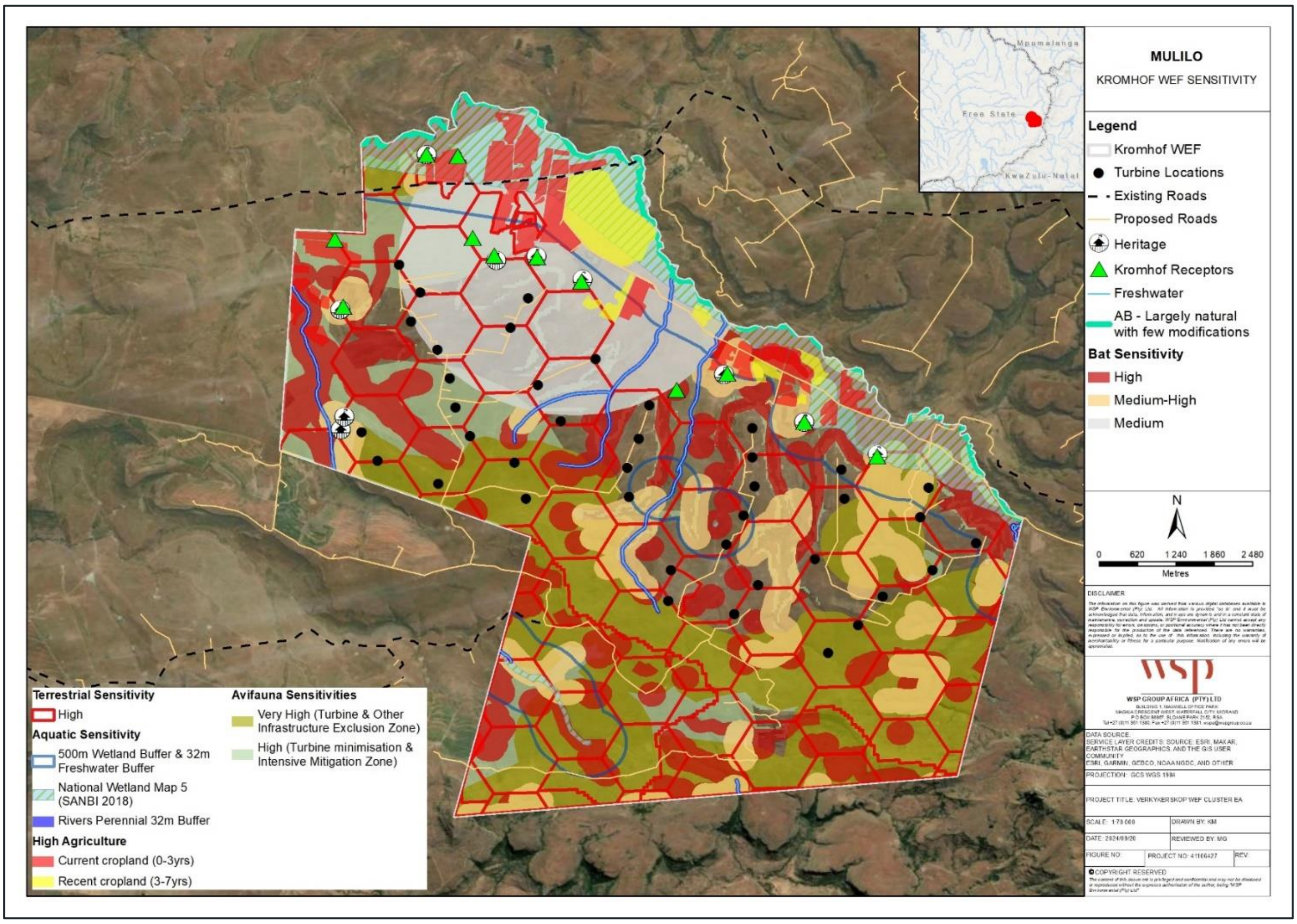


Figure 8-1 - Kromhof WEF - Consolidated Site Sensitivity Map overlain by Preliminary Project Layout (excluding avifauna)

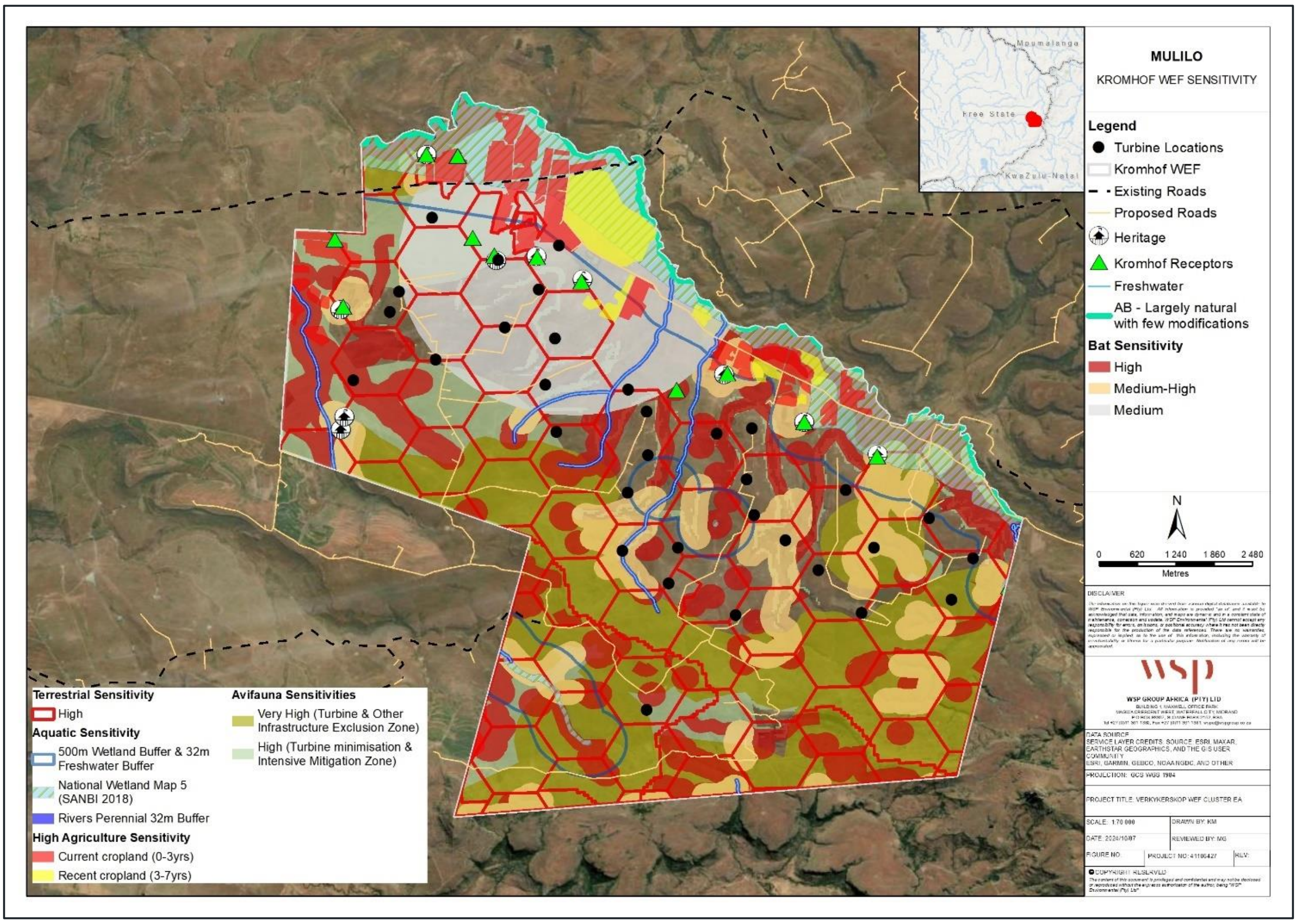


Figure 8-2 - Kromhof WEF - Consolidated Site Sensitivity Map overlain by Optimised Layout (excluding avifauna)

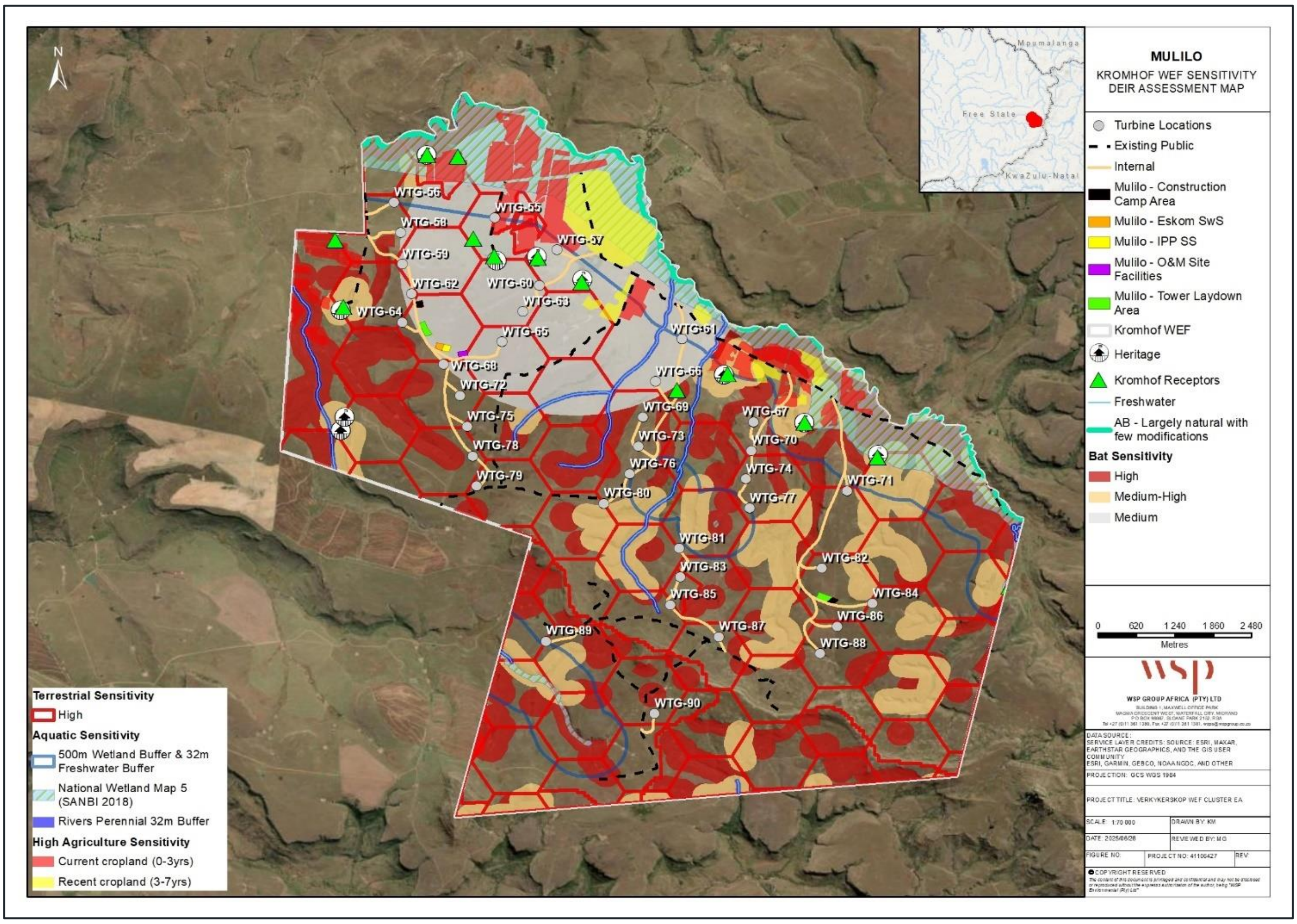


Figure 8-3 - Kromhof WEF - Consolidated Site Sensitivity Map overlain by the DEIR Assessed Layout (excluding avifauna)

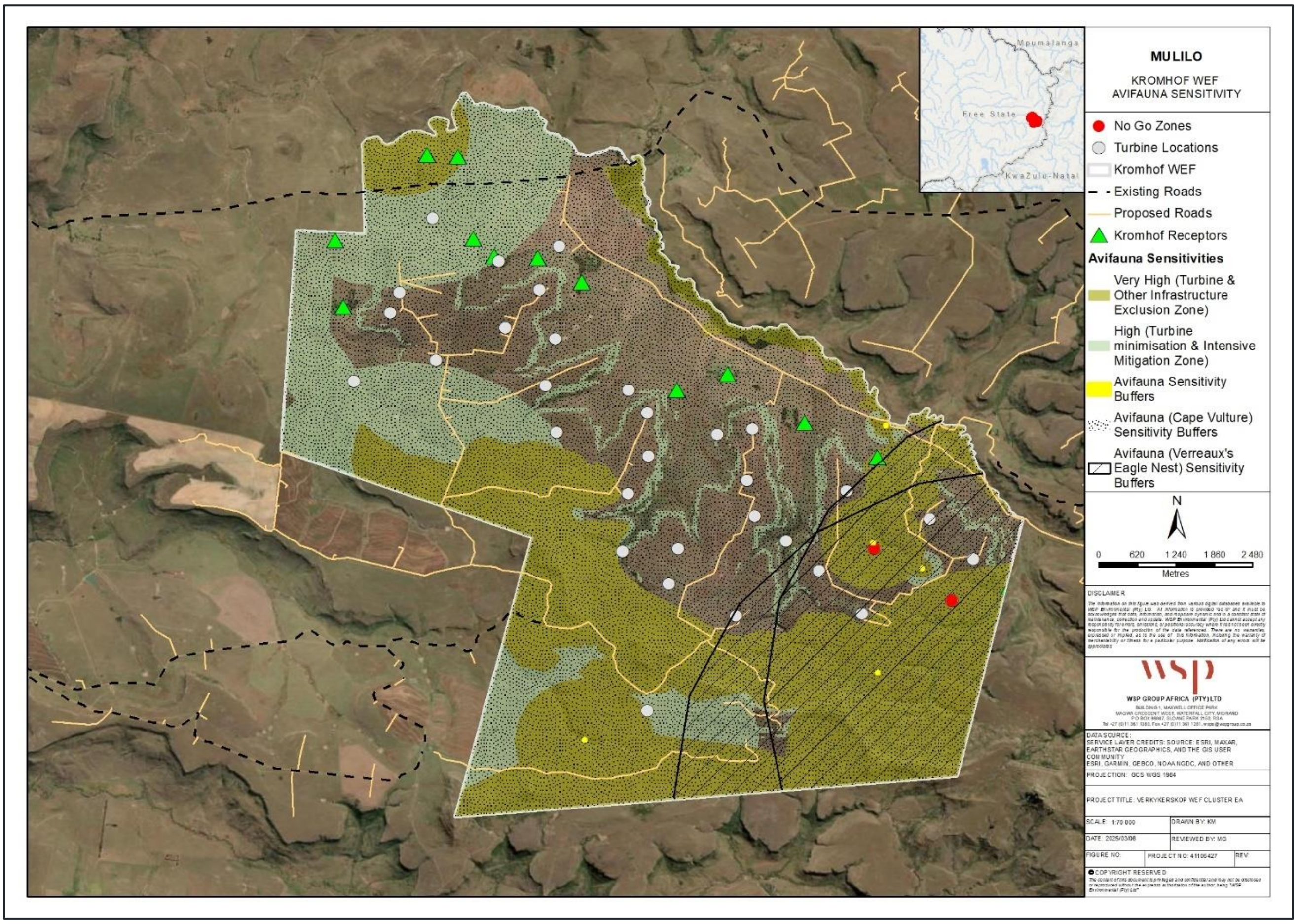


Figure 8-4 - Kromhof WEF - Avifauna Sensitivity Map overlain by the Optimised Layout

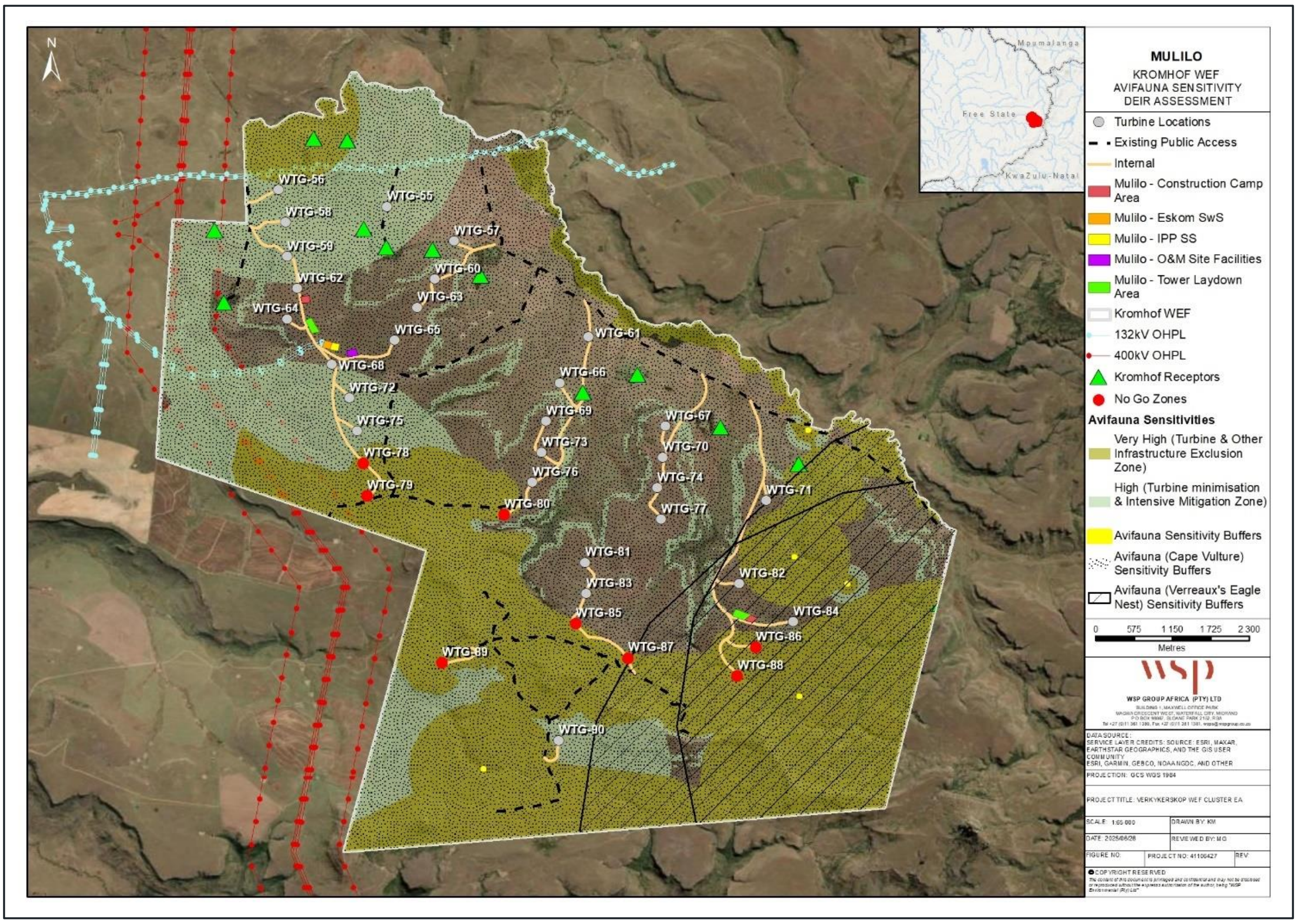


Figure 8-5 - Kromhof WEF - Avifauna Sensitivity Map overlain by the DEIR Assessed Layout

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 **Section 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 AGRICULTURE

It should be noted that an Agricultural Compliance Statement is not required to formally rate agricultural impacts by way of impact assessment tables.

There is only ever a single agricultural impact of any development, and that 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.

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.

The agricultural protocol requires an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development. As this assessment has shown, the agricultural use of the land will be integrated with the renewable energy facility, and it will continue with no discernible change in terms of production. The expected losses in production and employment will therefore be zero.

9.2 GEOTECHNICAL

Table 9-1 - Potential impacts Geotechnical (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Geotechnical													
Soil Erosion	Without Mitigation				3	3	3	3	4	48	**Medium**	(-)	**Medium**
	With Mitigation				2	1	1	2	2	12	**Very Low**	(-)	**Very Low**
	- 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. - Increase in soil and wind erosion due to clearance of structures. - Displacement of soil and damage to vegetation by vehicles	✓		✓	**Mitigation 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. - Use of temporary berms and drainage channels to divert surface water. - Minimize earthworks and demolish footprints. - Reinstate channelized drainage features. - Strip, stockpile and re-spread topsoil.								
Oil Spillages	Without Mitigation				3	3	3	3	4	48	**Medium**	(-)	**Medium**
	With Mitigation				2	2	1	1	2	12	**Very Low**	(-)	**Very Low**
	- Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources. - Potential oil spillages due to clearance of structures.	✓		✓	**Mitigation Measures:** - Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. - Frequent checks and conditional monitoring								
Disturbance of fauna and flora	Without Mitigation				3	1	3	3	3	30	**Medium**	(-)	**Medium**
	With Mitigation				2	1	1	2	2	12	**Very Low**	(-)	**Very Low**

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	▪ The displacement of natural earth material and overlying vegetation leading to erosion.	✓		✓	**Mitigation Measures:** ▪ Limit and control excavations								
Slope Stability	Without Mitigation				2	1	3	3	2	18	**Low**	(-)	**Low**
	With Mitigation				1	1	3	2	2	14	**Very Low**	(-)	**Very Low**
	▪ Slope instability around structures.	✓		✓	**Mitigation Measures**: ▪ Avoid steep slope areas. ▪ Design cut slopes according to detailed geotechnical analysis.								
Seismic activity	Without Mitigation				4	1	3	4	1	12	**Very Low**	(-)	**Very Low**
	With Mitigation				2	1	3	3	1	9	**Very Low**	(-)	**Very Low**
	▪ Damage of proposed development.	✓	✓		**Mitigation Measures:** ▪ Design according to expected peak ground acceleration. ▪ Monitor seismic activity in the area								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee													

9.3 TERRESTRIAL BIODIVERSITY

Table 9-2 - Potential impacts for Terrestrial Biodiversity (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Terrestrial Biodiversity													
Habitat loss	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	1	3	4	3	33	**Medium**	(-)	**Medium**
	Direct loss and disturbance of natural habitat.	✓			**Mitigation Measures:** ▪ As far as possible, proposed Project infrastructure should be located outside of land designated CBA 1 and CBA 2; ▪ As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields); ▪ 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 sites 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 footprints; ▪ 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/demarked work zones; ▪ 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 activities. The protocol should include: ▪ The correct stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ The correct contouring of the post-construction landform to limit potential erosion; ▪ Compacted soils should be ripped and loosened to facilitate vegetation establishment;								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					- Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and - Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial. - Following finalisation of the Project infrastructure layout and quantification of habitat losses, it is anticipated that biodiversity offsetting will be required to offset the losses of CBAs; - The biodiversity offset programme should be developed should be developed under consultation with the provincial conservation authority and in line with the NEMBA National Biodiversity Offset Guideline (2023).								
Habitat Connectivity and Integrity	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	2	3	4	3	36	**Medium**	(-)	**Medium**
	Fragmentation reducing natural habitat connectivity and integrity	✓		✓	**Mitigation Measures:** - Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks, and wherever possible micro-sited to already disturbed sites.								
Alien Species	Without Mitigation				4	2	3	4	4	52	**Medium**	(-)	**Medium**
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	**Low**
	Establishment and spread of alien invasive species	✓		✓	**Mitigation Measures:** - Identification of AIS management units - Prioritisation of sites and species requiring control; - Targets and indicators of success; - Scheduling of AIS 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 AIS monitoring.								
Soil Erosion	Without Mitigation				4	2	3	4	4	52	**Medium**	(-)	**Medium**
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	**Low**
	Increased soil erosion and sedimentation	✓		✓	**Mitigation Measures:**								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					■ All sites disturbed by construction activities should be contoured, stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and ■ Erosion and sedimentation prevention and control measures (e.g., brush-packing, gabions and silt-traps) should be implemented at any sites of erosion or sedimentation.								
Alien Species	Without Mitigation				4	2	3	4	3	39	**Medium**	(-)	**Medium**
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	**Low**
	Establishment and spread of alien invasive species		✓		**Mitigation Measures:** ■ Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme ■ 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.								
Increase in Wildfires	Without Mitigation				3	2	3	4	3	36	**Medium**	(-)	**Medium**
	With Mitigation				2	2	1	2	1	7	**Low**	(-)	**Low**
	Increase in wildfires from Project workers or faulty infrastructure		✓		**Mitigation 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; ■ 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.								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee													

9.4 AQUATIC BIODIVERSITY

9-3 - Potential impacts for Aquatic Biodiversity (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Aquatic Biodiversity													
Wetland impact	Without Mitigation				4	1	5	5	4	60	**Moderate**	(-)	High
	With Mitigation				3	1	5	4	3	39	**Moderate**	(-)	High
	Wetland Loss Partial loss of wetland habitat as a consequence of the proposed infrastructure development	✓			**Mitigation Measures:** • All development activity materials including fuels and oil should be stored in demarcated areas that are contained within berms/bunds to avoid the spread of any contamination into sensitive areas. • Proactive measures should be enforced to ensure that work vehicles are up to standard regarding maintenance and function. These measures should include routine leak checks prior to development activity and decommissioning of vehicles and machinery not up to par. • Dripping during the aforementioned leak checks and maintenance must be accommodated for by the provision of drip trays. • Handling of hazardous substances should be kept to a minimum within the development activity site. Additionally, thorough training should be administered to site personnel regarding handling of the aforementioned substances. • Regarding sanitation – portable chemical toilets should be made available to site personnel and should be located +- 30m away from sensitive environments. Waste from the toilets should be collected and disposed of appropriately by a waste contractor. • An emergency "clean up kit" containing spillage clean up materials should be readily available on site to be used in event of a spill. • Fuels, chemicals and other hazardous substances should be stored in the appropriate, marked containers with closed lids.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					• All spillages or contaminations are to be immediately reported to the Site Manager and Environmental Control Officer so that appropriate clean up measures may be enacted. • Temporary noise should be kept to a minimum with equipment, machinery and vehicles, especially in sensitive areas. • The site must be inspected frequently (daily during the development activity phase and monthly thereafter) to ensure that the integrity sensitive areas is maintained at all times. • Additionally, readiness and professional execution of the clean-up contingency plan as well as the mitigation and rehabilitation are essential to ensure that the integrity of the sensitive areas is not compromised.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Wetland impact	Without Mitigation				3	2	3	4	4	48	**Moderate**	(-)	High
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	High
	Hydrology Increase in hardened surfaces	✓			**Mitigation Measures:** • Refer to wetland loss mitigations above.								
Wetland impact	Without Mitigation				2	2	3	3	5	50	**Moderate**	(-)	High
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	High
	Geomorphology Sediment transport into wetland habitat and erosion of wetland soils	✓			**Mitigation Measures:** • Soil excavated during the construction activities should be kept in stockpiles outside of wetlands and watercourses and the determined buffers. The soil stockpiles should be draped with hessian to avoid downstream sedimentation of watercourses. • If erosion of stockpiled sediments is a risk, sediment barriers draped in hessian should be utilised to avoid erosion of sediments into wetlands and watercourses. • Site engineers should regularly inspect the erosion control measures to confirm their appropriateness and integrity.								
Wetland impact	Without Mitigation				3	2	3	3	3	33	**Moderate**	(-)	High

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Co n
	With Mitigation				3	1	3	2	1	9	**Very Low**	(-)	High
	Water Quality Accidental point source pollution and excessive downstream sedimentation increasing turbidity of watercourses	✓			**Mitigation Measures:** • Refer to wetland loss mitigations above.								
Wetland impact	Without Mitigation				3	2	3	3	4	44	**Moderate**	(-)	High
	With Mitigation				2	1	1	2	2	12	**Very Low**	(-)	High
	Vegetation Invasion of Alien Invasive Plants (AIPs)	✓			**Mitigation Measures:** • All invasive alien plant species should be removed and disposed of appropriately, as far as possible, prior to development activities. The development activity site should be inspected regularly during the construction and operational phase to identify and remove emerging invasive alien plants (AIPs) species. • The removal of alien vegetation, that establishes due to construction activities, should be undertaken manually by hand near sensitive areas. The use of heavy machinery should be kept to minimum near sensitive environments. • Fauna found within the development activity zone should be moved to the closest natural or semi-natural habitat zone away from the development activity site.								
Wetland impact	Without Mitigation				3	2	3	4	4	48	**Moderate**	(-)	High
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	High
	Hydrology Increase in hardened surfaces		✓		**Mitigation Measures:** • Refer to wetland loss mitigations above.								
Wetland impact	Without Mitigation				3	2	3	3	4	44	**Moderate**	(-)	High
	With Mitigation				2	1	1	2	2	12	**Very Low**	(-)	High
	Vegetation		✓		**Mitigation Measures:**								

Aspect	**Impact**	**C**	**O**	**D**	**M**	**E**	**R**	**D**	**P**	**S**		**Ca**	**Con**
	Invasion of Alien Invasive Plants (AIPs)				• Invasive alien plant species should be removed and disposed of appropriately, as far as possible, prior to development activities. The development activity site should be inspected regularly during the construction and operational phase to identify and remove emerging invasive alien plants (AIPs) species. • vegetation, that establishes due to construction activities, should be undertaken manually by hand near sensitive areas. The use of heavy machinery should be kept to minimum near sensitive environments. • Fauna found within the development activity zone should be moved to the closest natural or semi-natural habitat zone away from the development activity site.								
Aquatic ecosystems impact	Without Mitigation				3	2	3	2	3	30	**Low**	(-)	High
	With Mitigation				3	1	3	2	1	9	**Very Low**	(-)	High
	Water Quality Modifications due to sedimentation, run-off of construction materials (cement etc.)	✓			**Mitigation Measures:** • Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; • Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; • Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; • Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; • Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; • Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions;								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					• All vehicles must be frequently inspected for leaks; • No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; • All waste must be removed and transported to appropriate waste facilities; and • Where possible, high rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.								
Aquatic ecosystems impact	Without Mitigation				5	3	5	5	3	54	**Moderate**	(-)	High
	With Mitigation				5	3	5	5	1	18	**Low**	(-)	High
	Loss of Habitat Direct disruption of riparian habitat	✓			**Mitigation Measures:** • Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; • Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; • Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; • Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; • Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; • Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; • All vehicles must be frequently inspected for leaks;								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					- No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; - All waste must be removed and transported to appropriate waste facilities; and - Where possible, high rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.								
Aquatic ecosystems impact	Without Mitigation				3	3	3	5	3	42	**Moderate**	(-)	High
	With Mitigation				3	1	3	2	3	27	**Low**	(-)	High
	Introduction of alien species Altered ecosystem functioning due to competition with indigenous biota	✓			**Mitigation Measures:** - Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; - Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; - Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; - Storm water must be diverted from the construction site and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; - Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; - Construction chemicals, such as cement and hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; - All vehicles must be frequently inspected for leaks;								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					• No material may be dumped or stockpiled within any rivers or drainage lines in the vicinity of the proposed Project, and must be removed immediately without destroying habitat; • All waste must be removed and transported to appropriate waste facilities; and • Where possible, high rainfall periods (usually November to March) should be avoided during the construction phase to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.								
Aquatic ecosystems impact	Without Mitigation				5	3	3	4	3	45	**Moderate**	(-)	High
	With Mitigation				5	3	3	4	1	15	**Very Low**	(-)	High
	Water Quality Leakages (e.g. oil and gasoline) from vehicles during maintenance		✓		**Mitigation Measures:** • Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority); • Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; • Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and • Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.								
Aquatic ecosystems impact	Without Mitigation				2	3	3	4	2	24	**Low**	(-)	High
	With Mitigation				2	3	3	4	1	12	**Very Low**	(-)	High
	Flow Regime Increased surface flows due to impermeable surfaces		✓		**Mitigation Measures:** • Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority);								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					• Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; • Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and • Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.								
Aquatic ecosystems impact	Without Mitigation				3	3	3	5	3	42	**Moderate**	(-)	High
	With Mitigation				3	1	3	2	3	27	**Low**	(-)	High
	Establishment of alien species Altered ecosystem functioning due to competition with indigenous biota		✓		**Mitigation Measures:** • Runoff from the Project area should not be allowed to flow into the nearby watercourses, unless authorised by the DWS (or the competent authority); • Bare surfaces downstream from the developments, where silt traps are not an option, should be well vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; • Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly; and • Biannual aquatic biomonitoring assessments of the associated water courses should be conducted by an aquatic specialist to determine impacts, whereafter new mitigation actions should be implemented as per the specialist's recommendations.								

9.5 PLANT SPECIES BIODIVERSITY

Table 9-4 - Potential impacts for Plant Species Biodiversity (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Plant Biodiversity													
Flora habitat	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	1	3	4	3	33	**Medium**	(-)	**Medium**
	Direct loss and disturbance of natural habitat	✓			**Mitigation Measures:** - As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields); - 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 sites 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 footprints; - 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/demarked work zones; - Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. - The correct stockpiling of topsoil that was cleared from development footprints during site preparation; - The correct contouring of the post-construction landform to limit potential erosion; - 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 - Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.								
Flora habitat	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	2	3	4	3	36	**Medium**	(-)	**Medium**

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	Fragmentation reducing natural habitat connectivity and integrity	✓			**Mitigation Measures:** ▪ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks, and wherever possible micro-sited to already disturbed sites								
Flora SCC	Without Mitigation				5	2	5	1	4	52	**Medium**	(-)	**Medium**
	With Mitigation				3	1	3	1	3	24	**Low**	(-)	**Low**
	Loss of flora of conservation concern	✓			**Mitigation Measures:** ▪ Additional walkdown surveys of the proposed development footprints should be conducted during the wet/growing season to determine the identity and number of potentially impacted flora SCC; ▪ Conducting additional pre-construction micro-siting and walkdown surveys of proposed infrastructure footprints to identify and further delineate locations of Red List flora and provincially protected flora species; ▪ Management and monitoring of-site Red List flora species populations; and ▪ Procedure for rescuing and relocating provincial Protected flora species occurring within infrastructure footprints								
Flora habitat	Without Mitigation				5	2	5	1	4	52	**Medium**	(-)	**Medium**
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	**Low**
	Establishment and spread of alien invasive species	✓		✓	**Mitigation Measures:** ▪ An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by proposed Project activities. The plan must include: • Identification of AIS management units • Prioritisation of sites and species requiring control; • Targets and indicators of success; • Scheduling of AIS 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 AIS monitoring.								
Flora habitat	Without Mitigation				4	2	3	4	3	39	**Medium**	(-)	**Medium**

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	With Mitigation				2	1	3	2	2	16	**Low**	(-)	**Low**
	Establishment and spread of alien invasive species		✓		**Mitigation Measures:** - Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)													

9.6 ANIMAL BIODIVERSITY

Table 9-5 - Potential impacts for Animal Species Biodiversity (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Animal Biodiversity													
Fauna habitat	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	1	3	4	3	33	**Medium**	(-)	**Medium**
	Direct loss and disturbance of natural habitat	✓			**Mitigation Measures:** ▪ As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields); ▪ 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 sites 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 footprints; ▪ 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/demarked work zones; ▪ Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas ▪ The correct stockpiling of topsoil that was cleared from development footprints during site preparation; ▪ The correct contouring of the post-construction landform to limit potential erosion ▪ 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 ▪ Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.								
Fauna habitat	Without Mitigation				5	2	3	5	5	75	**High**	(-)	**High**
	With Mitigation				3	2	3	4	3	36	**Medium**	(-)	**Medium**

Aspect	**Impact**	**C**	**O**	**D**	**M**	**E**	**R**	**D**	**P**	**S**		**Ca**	**Con**
	Fragmentation reducing natural habitat connectivity and integrity	✓			**Mitigation Measures:** ■ Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and new road should be micro-sited to already disturbed sites.								
Fauna SCC	Without Mitigation				4	2	3	2	4	44	**Medium**	(-)	**Medium**
	With Mitigation				2	1	1	2	2	12	**Low**	(-)	**Low**
	Injury, mortality and disturbance of fauna	✓			**Mitigation 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; ■ No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers 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.								
Fauna SCC	Without Mitigation				5	2	5	2	4	56	**Medium**	(-)	**Medium**
	With Mitigation				4	1	5	2	2	24	**Low**	(-)	**Low**
	Loss of fauna species of conservation concern	✓			**Mitigation Measures:** ■ During the pre-construction walkdown of the development footprints, additional surveying should be conducted to identifying any Sensitive species 15 burrow sites;								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					- If Sensitive species 15 burrow sites are confirmed, then additional conservation actions should be identified, compiled in a species-specific management and monitoring plan for Sensitive species 15, and implemented; and - Key measures that should be included in the plan include the delineation of an avoidance/exclusion buffer of 400 m around each burrow site, as prescribed by SANBI (2020).								
Fauna, incl. SCC	Without Mitigation				4	2	3	3	3	36	**Medium**	(-)	**Medium**
	With Mitigation				2	1	1	2	2	12	**Low**	(-)	**Low**
	Injury and mortality of fauna, including SCC		✓		**Mitigation 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; - No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; - The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.								
Fauna, incl. SCC	Without Mitigation				4	2	3	5	3	42	**Medium**	(-)	**Medium**
	With Mitigation				2	2	3	3	2	20	**Low**	(-)	**Low**
	Vibrations from operating wind turbines		✓		**Mitigation Measures:** - The Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options; and - 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.								
Fauna, incl. SCC	Without Mitigation				4	2	3	2	3	33	**Medium**	(-)	**Medium**
	With Mitigation				3	1	1	2	2	14	**Low**	(-)	**Low**
	Injury and mortality of fauna, including SCC			✓	**Mitigation Measures:**								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con
					▪ 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; and ▪ The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.							
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)												

9.7 AVIFAUNA

Table 9-6 - Potential impacts for Avifauna (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Avifauna													
Loss or Alteration of Habitat	Without Mitigation				5	4	5	5	5	95	**Very High**	(-)	High
	With Mitigation				3	3	5	5	3	48	**Moderate**	(-)	High
	Habitat loss from wind farm developments is mainly associated with the construction of access roads, the turbine footprint itself, the electrical transmission infrastructure and the Battery Energy Storage Facility	✓			**Mitigation Measures:** • Spatial Avoidance. The establishment of any infrastructure must be avoided in all areas designated in the avifaunal sensitivity map (using the provided GIS spatial data) as all infrastructure exclusion zones; • It is recommended that all infrastructure is minimised if it cannot be completely avoided within all high sensitivity infrastructure minimisation areas. The developer has recently put forwarded an amended layout that avoids the placement of turbines and auxiliary infrastructure in Zone 1 and 2 areas which decreases the significance of the residual impact; • It is recommended that active croplands, close to existing roads, are prioritised for auxiliary infrastructure and wherever possible turbine placement; • The width of main existing servitudes must not be increased beyond their current width and that new or upgraded internal roads (as provided in the amended layout) will not exceed 6 m. • The development areas and access roads should be specifically demarcated so that during the construction phase, only the demarcated areas may be impacted upon; • A fire management plan needs to be compiled and implemented as informed by species authorities, to restrict the impact fire might have on threatened high altitude passerines; • Effective and gazetted conservation of these and other remaining natural grasslands through conservation stewardship and appropriate land								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Co n	
					management practices could reduce the significance of the residual impact; • In line with the Birdlife 6 October 2022 Guidance Note: Minimising the impacts of infrastructure development on Secretarybirds Sagittarius serpentarius, the developer should commit to respecting nest buffers and minimising the fragmentation large tracts of contiguous grassland habitat. In this regard the avoidance and protection of core habitat for threatened high altitude species and wetlands is key. • Areas of indigenous vegetation, even secondary communities outside of the direct construction footprint, should not be fragmented or disturbed. Clearing of vegetation should be minimised and avoided where possible. All activities must be restricted to flat areas as far as possible. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcate d areas be impacted upon. All footprints to be rehabilitated and landscaped after installation is complete. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.									
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Roadkill and Other Mortalities	Without Mitigation				2	2	5	3	2	24	**Low**	(-)	High
	With Mitigation				1	1	5	3	1	10	**Very Low**	(-)	High
	The influx of people and motor vehicle movement during construction will invariably increase bird-	✓			**Mitigation Measures:** • It is recommended that the clearance footprints for turbines and other infrastructure be thoroughly searched through walkdown to ensure that no nests, especially of threatened high-altitude species are destroyed • Signpost the entry of roads into areas zoned as core habitat for threatened high altitude species as "Environmentally Sensitive Area Reduce Speed"; and • All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Co n	
	vehicle collisions				with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.								
Sensory Disturbance	Without Mitigation				3	3	4	3	4	52	**Moderate**	(-)	High
	With Mitigation				2	2	3	3	2	20	**Low**	(-)	High
	Potential disturbance of Southern Bald Ibis from their roosts, particularly breeding colonies at Roosts 2, 6 and 11	✓			**Mitigation Measures:** • Spatial avoidance. The developer must adhere to the prescribed nest and roost buffers as well as the core habitat for wetland and grassland priority species. Staying out of the 1 km very high all infrastructure exclusion zone and 2.5 km high sensitivity infrastructure minimisation zone will reduce the disturbance to breeding colonies of Southern Bald Ibis; and • Temporal avoidance. Construction activities (e.g. blasting, excavating, earthmoving and turbine installation) should ideally be avoided during the critical breeding window for red-listed resident species (peaks November-February). Southern Bald Ibis bread October-December on site (with a peak in November) while cranes and threatened passerines typically breed December-March with a peak in February on site.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Collisions with turbines	Without Mitigation				4	4	5	5	5	90	**Very High**	(-)	High
	With Mitigation				4	3	5	5	4	68	**High**	(-)	High
	The high abundance and diversity of priority species recorded within the Groothoek WEF (53 of which 26 were		✓		Mitigation efficacy is limited by high Cape Vulture (tracking data, passage rate and flight time at rotor height), Martial Eagle (tracking data) and Southern Bald Ibis (passage rate and flight time) flight activity over the WEF and is highlighted as a significant risk. In the event that the WEF is authorised, the following is recommended to reduce turbine-related collisions: **Mitigation Measures:** • Spatial avoidance is paramount; • Temporal avoidance is also recommended. This involves turbine curtailment during peak flight times.								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con
	regionally red-listed species) suggests a high potential risk for significant mortalities during operation.				• Blade painting: Due to the high avifaunal sensitivity of the proposed WEF, it is recommended that all turbines have one blade painted in alternating red and white bands during manufacture (see below for details). • Turbine tower painting and reflectors. • Observer-based shut down on demand (OSDOD) should be implemented. • Automated shutdown on demand (ASDOD): Given the size of WEFs, terrain and inclement weather which limit human observer ability a combination of radar and intelligent camera systems (e.g. IdentiFlight) should be used in tandem to allow for near-continuous, automated SDOD. • It is recommended that pre-construction radar monitoring is conducted inform final micro-sighting of turbines. • A Vulture Food Management Programme will need to be implemented to ensure all dead livestock/wildlife on site are removed as soon as possible and transferred to designated vulture restaurants sufficiently far away from the WEF. • Birthing of livestock near turbines should not be permitted. • As there are currently no known active vulture restaurants in the immediate vicinity, it is recommended that one be established and maintained by the WEF's bird management team. Further recommendations included in the EMPr. • Develop a contingency mitigation budget to cater for significant mortality events. • A Biodiversity Management Plan (BMP) must be compiled for the project by an ornithologist prior to construction, outlining critical thresholds for fatalities and the appropriate management response; • Continue to collaborate with relevant NGOs such as Vulpro, BirdLife South Africa and the Endangered Wildlife Trust (EWT); • Continue to track martial eagles within the project area. Mulilo recently commissioned a study of this nature, and Dr. Gareth Tate of EWT has already captured and fitted a GPS logger on the first male eagle (May 2024);							

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Co n	
					• Track Southern Bald Ibis. Dr Carina Pienaar is currently tracking bald ibises from the Witkoppe Roost. It is recommended that she be contacted to consider fitting GPS loggers to fledglings from within the VWC.									
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15													
Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure	Without Mitigation				4		2	5	5	4	64	**High**	(-)	High
	With Mitigation				3		2	5	5	3	45	**Moderate**	(-)	High
	It is currently uncertain as to the extent, position or length of any new transmission lines to be established for the WEF or where exactly the grid connection point will be. However, the establishment of any transmission lines, and any overhead internal reticulation lines, poses a significant		✓		**Mitigation Measures:** • Install Eskom-approved flappers or coils (flight diverters), along the entire length of grid connection powerline at no more than 15 m intervals. Flight diverter structures should ideally alternate between light and dark shades to maximise visibility and contrast against background as seen from powerline level. The structures must be installed as the powerlines are being spanned. This will drastically help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated (Martin et al. 2010) • Fencing should be minimised but where required the following is recommended: The top two strands must be smooth wire, minimum 300 mm between wires and place markers on fences; • Anti-perch devices should be intensified on main Eskom powerlines to further reduce perch suitability; • All power cables within the project area should be thoroughly insulated and buried in demarcated corridors; • All above ground electrical transmission infrastructure should be fitted with the latest Eskom approved anti-bird structures and anti-collision line marking devices; and • Quarterly monitoring at Ingula Nature Reserve can be used to help assess the likely significance of powerline collisions, after mitigation. An average of 5 priority threatened species (e.g. Cape Vulture, cranes, Denham's Bustard) are killed by collision per annum along the Ingula-Majuba 400kV									

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con	
	potential collision and electrocution risk to birds given the high prevalence of vultures, cranes, bustards, korhaans which are all larger-bodied, less manoeuvrable species.				line, which traverses a similar habitat type, land use, and avifaunal species composition (BirdlifeSA, pers. comm. 2025).								
Sensory Disturbance	Without Mitigation				4	2	5	5	4	64	**High**	(-)	High
	With Mitigation				3	2	5	5	3	45	**Moderate**	(-)	High
	The main sensory disturbance to birds during operation centres on the noise the turbines generate. The noise generated by a wind turbine can often exceed 30 dBA even at a		✓		**Mitigation Measures:** • Spatial Avoidance. Avoid the placement of turbines in areas identified as core habitats identified for threatened high-altitude grassland species; and • Temporal Avoidance. Curtailment at selected turbines closest to the identified core habitats for threatened high altitude passerines should be implemented during peak display times during the peak breeding season (November – March). Displays occur throughout the day, but tended to be concentrated in the morning between 07:00 and 10:00. Another peak in display activity typically occurs in the late afternoon between 15:30 and 17:00.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con	
	distance of 800 m (Katinas et al., 2016; Rogers et al., 2006), the distance most often associated with avoidance behaviour (Santos et al., 2021).													
Effect on Migratory and Congregatory Species	Without Mitigation				4		5	5	4	4	72	**High**	(-)	High
	With Mitigation				4		5	5	4	3	54	**Moderate**	(-)	High
	Many flocks of migratory birds move across the project area in early summer including Amur Falcon and red-listed soaring species such as Bearded Vulture, Cape Vulture, Verreaux's Eagle,		✓		**Mitigation Measures:** • Due to the seasonal arrival of large migratory flocks, it is recommended that a combination of radar and observer-based shut-down on demand is employed to guide temporal avoidance (curtailment) to reduce the probability of collisions; and • Studies from Spain (Pescador at l. 2019) report significant decreases in collision rates of Lesser Kestrel simply by keeping the soil around the turbines tilled and devoid of vegetation. This mitigation measure is only likely to be feasible at turbines situated in croplands as tilling of natural highland grassland is not recommended from an avifauna habitat destruction perspective, given the high concentrations of threatened grassland species in the region. Considering that only 6 of the 33 proposed turbines are situated in active croplands, the contribution of this mitigation measure to reducing Amur and Red-footed Falcon mortality is likely to be minimal. It would also have financial, labour and crop production implications that would likely not outweigh the benefits. As with									

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Co n	
	Secretarybird, Martial Eagle, Black Stork and Yellow-billed Stork, which frequently move along the escarpment to access foraging grounds on either side of it.				carcass management this mitigation represents a form of habitat management and should only be implemented as a reactive measure at problematic turbines.								
Effect on migratory and congregatory species	Without Mitigation				2	2	5	3	2	24	**Low**	(-)	High
	With Mitigation				1	1	5	3	1	10	**Very Low**	(-)	High
	Temporary disturbance associated with turbine removal and rehabilitation			✓	**Mitigation Measures:** • Timing decommissioning to take place mainly outside of the critical breeding window for Southern Bald Ibis (near breeding roosts) and threatened high-altitude grassland species (November to February); • Minimise the disturbance footprint associated with de-construction of the turbine field and demolition of buildings; • Remove all redundant powerlines, turbine material and rubble from site; and • Landscape and rehabilitate old construction footprint areas.								

9.8 BATS

Table 9-7 - Potential impacts for Bats (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Bats													
Bat roosts	Without Mitigation				5	3	3	5	4	64	**High**	(-)	**High**
	With Mitigation				3	2	3	4	2	24	**Low**	(-)	**Low**
	Disturbance of bat roosts	✓			**Mitigation 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 developing turbines in Medium-High sensitive areas, where woody vegetation may be utilized by tree-roosting bats. ▪ Avoid blasting within 2 km of a confirmed roost. ▪ Minimise artificial light at night (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.								
Bat habitat	Without Mitigation				4	2	3	4	5	65	**High**	(-)	**High**
	With Mitigation				2	1	3	3	5	45	**Medium**	(-)	**Medium**

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	Terrestrial habitat loss, and possible displacement of bats	✓			**Mitigation Measures:** - Avoid High sensitive areas, in particular, prominent streams, dams and other hydrological features, and the prescribed buffers around these. - Avoid developing turbines in Medium-High sensitive areas where woody vegetation may be utilized by clutter and clutter-edge foraging insectivorous bats, and possibly also fruit bats. - 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 light at night (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 habitats by comprehensively and diligently implementing effective rehabilitation measures based on consultation with an appropriate vegetation specialist.								
Bat fatalities	Without Mitigation				5	3	5	4	5	85	**Very High**	(-)	**Very High**
	With Mitigation				3	2	3	4	5	60	**Medium**	(-)	**Medium**
	Bat fatalities from collision with turbines, and possible population declines		✓		**Mitigation 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.								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con
					▪ Avoid Medium-High sensitive areas where possible. No turbine towers should be positioned in woody vegetation, especially dense stands where bat activity may be concentrated. ▪ Minimize bat fatalities at all turbines that intercept the 2.5 km Medium sensitive buffer around VK5 (where a caveroost is suspected and high levels of bat activity were recorded) by implementing curtailment when ambient temperatures of 9-22˚C prevail, below the following cut-in wind speeds (measured at 88 m a.g.l.) and during the following periods: • • 1 May – 31 August: For 3 hours after sunset below a cut-in wind speed of 6 m/s. • • 1 September – 30 April: From sunset to sunrise below a cut-in wind speed of 6.5 m/s. ▪ Minimise artificial light at night (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 starts spinning – 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 starts spinning, 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							

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					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 (MacEwan 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.								
Ecosystem services	Without Mitigation				5	3	3	4	5	75	**High**	(-)	**High**
	With Mitigation				2	3	3	4	3	36	**Medium**	(-)	**Medium**
	If high bat fatalities lead to declines in certain species populations, the ecosystem services that these populations provide w ill be compromised.		✓		**Mitigation Measures:** This potential impact could be reduced to overall Moderate significance by implementing all mitigation measures that have been prescribed for potential bat roost disturbance, terrestrial habitat loss and possible displacement of bats, and bat fatalities from collision with turbines, and possible population declines.								
Bat roosts	Without Mitigation				5	3	3	5	4	64	**High**	(-)	**High**
	With Mitigation				3	2	3	4	2	24	**Low**	(-)	**Low**
	Disturbance of bat roosts			✓	**Mitigation Measures:**								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					- 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 developing turbines in Medium-High sensitive areas, where woody vegetation may be utilized by tree-roosting bats. - Avoid blasting within 2 km of a confirmed roost. - Minimise artificial light at night (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.									
Bat habitat	Without Mitigation				4	2	3	4	5	65	High	(-)	High
	With Mitigation				2	1	3	3	3	27	Low	(-)	Low
	Terrestrial habitat loss, and possible displacement of bats			✓	**Mitigation Measures:** - Avoid High sensitive areas, in particular, prominent streams, dams and other hydrological features, and the prescribed buffers around these. - Avoid developing turbines in Medium-High sensitive areas where woody vegetation may be utilized by clutter and clutter-edge foraging insectivorous bats, and possibly also fruit bats. - 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.									

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con
					▪ Minimise the degradation of terrestrial habitat by implementing and maintaining effective dust, stormwater, erosion, sediment, and invasive alien plant control measures. ▪ Minimise artificial light at night (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 habitats by comprehensively and diligently implementing effective rehabilitation measures based on consultation with an appropriate vegetation specialist							
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)												

9.9 HERITAGE

Table 9-8 - Potential impacts for Archaeological and Cultural Heritage (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Archaeological and Cultural Heritage													
Heritage Resources: burial site VK017	Without Mitigation				3	1	5	5	3	42	**Moderate**	(-)	**High**
	With Mitigation				3	1	5	5	1	14	**Very Low**	(-)	**High**
	During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.	✓			**Mitigation Measures:** ▪ Avoidance of the burial site with a 30m buffer zone; ▪ Implementation of a chance find procedure for the project.								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)													

9.10 PALAEONTOLOGY

Table 9-9 - Potential impacts for Palaeontology (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Palaeontology													
Heritage Resources	Without Mitigation				3	1	5	5	2	28	**Low**	(-)	**High**
	With Mitigation				3	1	5	5	1	14	**Very Low**	(-)	High
	During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.	✓			**Mitigation Measures:** ▪ Site VK017 should be indicated on development plans and avoided with a 30m buffer zone; ▪ Monitoring of the Project area by the ECO during pre-construction and construction phases for heritage and palaeontological chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9.								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f) (i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)													

9.11 TRAFFIC

Table 9-10 - Potential impacts for Traffic (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Traffic													
Traffic Impact	Without Mitigation				3	3	3	2	3	33	**Medium**	(-)	High
	With Mitigation				2	3	2	2	3	27	**Low**	(-)	High
	Increase in development trips for the duration of the construction/decommissioning phase.	✓		✓	**Mitigation Measures:** ■ Stagger component delivery to site ■ Stagger the construction phase ■ Use of licensed quarries in close proximity to the site to decrease the impact on the surrounding road network if possible ■ Staff and general trips to occur outside of peak traffic periods as much as possible ■ Monitoring and maintenance of haulage routes ■ Maintenance of internal roads ■ If possible, provide more than one access for the site to distribute construction vehicle trips and reduce the risk of congestion at a single access. ■ Maintenance and repairs of any road sections of the district roads being used by construction vehicles. ■ Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.								
Noise & Dust pollution	Without Mitigation				3	2	3	2	3	30	**Low**	(-)	High
	With Mitigation				2	2	2	2	3	24	**Low**	(-)	High
	Construction associated noise and dust pollution close to gravel surfaced haulage routes	✓		✓	**Mitigation Measures:** ■ Stagger component delivery to site ■ Stagger the construction phase								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					▪ Use of licensed quarries in close proximity to the site to decrease the impact on the ▪ surrounding road network if possible ▪ Staff and general trips to occur outside of peak traffic periods as much as possible ▪ Monitoring and maintenance of haulage routes ▪ Maintenance of internal roads ▪ If possible, provide more than one access for the site to distribute construction vehicle trips and reduce the risk of congestion at a single access. ▪ Maintenance and repairs of any road sections of the district roads being used by construction vehicles. ▪ Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.								
Damage to road surfaces	Without Mitigation				3	3	3	2	3	33	**Medium**	(-)	High
	With Mitigation				2	3	2	2	3	27	**Low**	(-)	High
	Potential damage to road surfaces caused by construction vehicles	✓		✓	**Mitigation Measures:** ▪ Stagger component delivery to site ▪ Stagger the construction phase ▪ Use of licensed quarries in close proximity to the site to decrease the impact on the ▪ surrounding road network if possible ▪ Staff and general trips to occur outside of peak traffic periods as much as possible ▪ Monitoring and maintenance of haulage routes ▪ Maintenance of internal roads ▪ If possible, provide more than one access for the site to distribute construction vehicle trips and reduce the risk of congestion at a single access. ▪ Maintenance and repairs of any road sections of the district roads being used by construction vehicles.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
					▪ Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.								
Traffic Impact	Without Mitigation				1	2	1	4	2	16	**Low**	(-)	High
	With Mitigation				1	2	1	4	2	16	**Low**	(-)	High
	Slight increase in trips due to permanent staff traveling to and from site; periodical maintenance trips.		✓		**Mitigation Measures:** ▪ Not required								
Listing Notice 1: GNR 983 – Activity 11 (i), 12(ii)(a)(c), 14, 19, 24(ii), 28 (ii), 48(i)(a)(c), 56(i)(ii); Listed Notice 2 GNR 984 – Activity 1,15;); Listed Notice 3 GNR 985 – Activity 4(f)(i)(cc)(ee), 10(f)(i)(cc) (ee))(hh), 12(f)(i)(ii), 14(ii)(a)(c)(f)(i)(dd)(ff), 18(f)(i)(cc)(ee), 23(ii)(a)(c)(f) (i)(cc)(ee)													

9.12 VISUAL

Table 9-11 - Potential impacts for Visual (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Visual													
Airborne dust	Without Mitigation				5	3	3	1	4	48	**Moderate**	(-)	High
	With Mitigation				3	3	3	1	2	20	**Low**	(-)	High
	Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	✓		✓	**Mitigation 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								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Construction activities	Without Mitigation				5	3	3	2	5	65	**High**	(-)	High
	With Mitigation				5	3	3	2	4	52	**Moderate**	(-)	High
	Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	✓		✓	**Mitigation 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								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Presence of turbines, other infrastructure	Without Mitigation				5	3	5	4	5	85	Very High	(-)	High
	With Mitigation				5	3	5	4	5	85	Very High	(-)	High
	Reduction in visual resource value due to presence of visually intrusive wind turbines and other project infrastructure in the landscape		✓		**Mitigation Measures:** • Employ micro-siting and orientation of turbines and other infrastructure to group with existing infrastructure and already disturbed areas								
Shadow flicker	Without Mitigation				3	2	3	4	2	24	**Low**	(-)	High
	With Mitigation				2	2	3	4	1	11	**Very Low**	(-)	High
	Shadow flicker nuisance from spinning blades		✓		**Mitigation 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								
Blade flicker	Without Mitigation				5	3	5	4	3	51	**Moderate**	(-)	High
	With Mitigation				4	3	5	4	3	48	**Moderate**	(-)	High
	Flicker nuisance from painted spinning blades		✓		**Mitigation 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								
Light pollution	Without Mitigation				5	3	3	4	5	75	**High**	(-)	High
	With Mitigation				4	3	3	4	4	56	**Moderate**	(-)	High
	Light pollution at night due to turbine safety and project site security lighting		✓		**Mitigation 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								

Aspect	Impact	C	O	D	M	E	R	D	P	S	Ca	Con
					• 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							

9.13 SOCIAL

Table 9-12 - Potential impacts for Socio-economic (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Social (Construction)													
Job Creation	Without Mitigation				4	3	3	3	3	39	**Moderate**	(+)	High
	With Mitigation				5	4	3	4	4	64	**High**	(+)	High
	The construction phase is estimated to be 36 months per 240 MW wind farm. The number of employees for the construction phase is estimated to be approximately 2000 spread across the development of the Verkykerskop WEF Cluster. Furthermore, the Project requires predominantly local South Africans to be employed during construction. Most workers will be low-skilled, with approximately 60% low-skilled and 40 % for semi-skilled and skilled workers. There will be a localised social benefit to the communities in the area, considering the relatively high unemployment levels and few employment opportunities. Potential for local businesses is probably constrained due to the regional financial diversification. Therefore, it is likely that contractors and	✓			**Mitigation Measures:** • Preparation and implementation of a Stakeholder Engagement Plan (SEP) and Grievance Mechanism before and during construction. • Where reasonable and practical, the Project should apply a 'locals first' policy, especially for semi and un-skilled jobs. The majority of skilled positions, however, are likely to be filled by individuals from outside the area due to the low skill levels in the area. • Communities near the Project should be given special consideration regarding the benefits arising from it, as they will be most affected. • The engineering, procurement, and construction contractor should prefer appropriate subcontractors in the surrounding communities, followed by those in the municipal area and those outside the province. • Resources required during construction should be sourced, preferably from local businesses. Accommodation needed for contractors should favour local guesthouses and hotels. • Wherever possible, the hiring process should promote gender equality and women's employment. • The proponent should liaise with the municipality regarding establishing a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies, etc.) before the commencement of									

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	engineering firms based outside of the municipality will reap most of the benefits. The development phase will also be advantageous to the area's service industry. The potential prospects would be related to the site's transportation, security, cleaning, catering, and lodging for the construction employees				the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Population Influx	Without Mitigation				3	3	3	3	4	48	**Moderate**	(-)	High
	With Mitigation				2	2	2	2	2	16	**Low**	(-)	High
	Based on a report by Statistics South Africa in 2023, the unemployment rate during the first quarter of the year stood at 32.9% (Statistics South Africa, 2023). This unemployment rate poses a significant challenge for job seekers who may feel compelled to relocate to areas experiencing development to secure employment opportunities. However, such a move can potentially negatively affect the local community. There will also be added pressure on the existing municipal infrastructure and services. This pressure includes an increase in traffic, water usage and housing demands. Additionally, the influx of people from different cultures and languages may impact the local	✓			**Mitigation Measures:** • A community awareness campaign will be implemented in the surrounding communities to sensitise community members to traffic safety risks and infectious disease awareness. • As part of onboarding workers, training should be provided on preventing GBV, Sexual Assault (SEA) and Sexual Harassment (SH). • The Project must engage with communities using a dedicated community liaison officer and have an effective stakeholder engagement plan, including a grievance mechanism for communities to access and lodge complaints. • Local employment should be a priority for the construction contractor to lessen the number of workers away from their homes. • Training programmes must be implemented to enable local participants to take advantage of employment opportunities. • No recruitment should occur at the Project gate to prevent informal settlements around the Project site. • Increased security in the Project area should be provided to regulate access to the site and prevent informal settlements.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	culture and family structures, leading to a sense of displacement for locals.												
Procurement From Local Businesses	Without Mitigation				2	2	2	2	2	16	**Low**	(+)	High
	With Mitigation				2	2	3	4	3	33	**Moderate**	(+)	High
	The Project and its employees will require various goods and services to support construction activities. Goods and services will include construction supplies and contracting services like transportation, equipment rental, and skilled labour. The Project will bolster the local economy by involving local suppliers and service providers. Involving local suppliers and service providers will stimulate economic growth by creating job opportunities, increasing demand for local products and services, and enabling the development of small and medium-sized enterprises. Additionally, the increased economic activity can lead to improved infrastructure, enhanced community services, and overall economic growth in the region.	✓			**Mitigation Measures:** • The project could partner with local suppliers through procurement programmes to develop local suppliers. • Procurement programmes should prioritise local procurement for locally available goods and services.								
Loss of Agricultural Land	Without Mitigation				2	2	4	3	3	33	**Moderate**	(-)	High
	With Mitigation				2	1	3	3	3	27	**Low**	(-)	High
	The project is located within agriculturally active farms. The physical construction of the	✓			**Mitigation Measures:**								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	infrastructure discussed in the project description will require vegetation clearance. The project proponent intends to develop a small portion of the area. A portion of the area will be within the croplands.				- The Project should limit construction infrastructure during planting and harvesting season. - Disturbed areas should be rehabilitated post-construction phase. - Preparation and implementation of a SEP before and during the construction phase. - The Project should agree with the local farmers in the area on how they will be compensated for damages. An agreement should be entered into before the construction phase starts. - All farm gates must be closed after passing through. - Contractors appointed by the Project should provide daily transport for low and semi-skilled workers to and from the site. - The Project should hold contractors liable for compensating farmers and communities in full for any losses or damage to farm infrastructure that can be linked to construction workers. - The Project should implement a Grievance Mechanism that provides locals with an effective and efficient mechanism to address issues related to the Project.								
Generate Income for Affected Landowners	Without Mitigation				2	1	3	4	3	30	**Low**	(+)	High
	With Mitigation				4	1	3	5	5	65	**High**	(+)	High
	The proponent will enter into lease agreements with the affected landowners to use the land to construct the proposed wind energy facilities. The affected landowners will be paid an annual sum based on the area affected under the terms of the lease agreement. The extra revenue will mitigate the landowner/farmer's livelihood risk posed by the project. The added	✓			**Mitigation Measures:** - The loss of high-quality agricultural land should be avoided and minimised where possible								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	income is a substantial benefit to the impacted landowner.												
Community Health, Safety and Security	Without Mitigation				2	3	3	1	2	18	**Low**	(-)	High
	With Mitigation				2	2	1	2	2	14	**Very Low**	(-)	High
	The project workers could damage farm fences and buildings, increase crime, theft or killing of livestock, and theft of farm produce. While the creation of jobs is positive, it may also introduce changes in lifestyle, such as multiple sexual relations, which could lead to a higher infection rate of HIV/STIs within the project area. The goal will be to hire as many un-skilled and semi-skilled people locally as possible. These employees will be local community members, and family networks will be kept intact—this task will lower the risks of social ills	✓			**Mitigation 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. • The proponent and the contractor should implement an HIV/AIDS and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. • The proponent and the contractor should implement an HIV/AIDS and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. • The contractor should transport workers to and from the site daily. • The contractor should supervise and manage the entrance and exit of the construction site to ensure no interaction with communities at the site. • No construction workers, except security personnel, should be permitted to stay overnight on the site.									
Noise	Without Mitigation				2	2	2	2	2	16	**Low**	(-)	High
	With Mitigation				1	2	2	1	2	12	**Very Low**	(-)	High

Aspect	**Impact**	**C**	**O**	**D**	**M**	**E**	**R**	**D**	**P**	**S**		**Ca**	**Con**
	During construction, noise affects people differently; the new noise will come from the WEF facilities. Road traffic, transportation of materials and equipment, and construction activity are expected to generate noise filtering to nearby receptors.	✓			**Mitigation Measures:** • Consulting with the community when planning construction activities to have the least intrusive impact, i.e. scheduling high-noise activities when they result in the least disturbance. Such as during the day. 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 of activities to take place and reasons for activities. – Provide the contact details of a responsible person on site should complaints arise.								
Dust	Without Mitigation				2	3	3	1	4	36	**Moderate**	(-)	High
	With Mitigation				2	3	2	3	2	20	**Low**	(-)	High
	The construction of facilities will result in traffic as construction materials and turbines are being transported to the Project site. Increased road traffic and cleared vegetation for site establishment and construction activities will increase the dust levels in the area.	✓			**Mitigation Measures:** • Implement environmentally and crop friendly dust suppression measures on unpaved road surfaces. • Roads must be adequately maintained to prevent deterioration of road surfaces due to heavy vehicle traffic. • Reduce and control construction dust using approved dust suppression techniques when required (i.e. whenever dust becomes apparent).								
Visual	Without Mitigation				4	4	4	4	4	64	**High**	(-)	High
	With Mitigation				3	3	3	3	4	**48**	**Moderate**	(-)	High
	During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the Project site	✓			**Mitigation Measures:** • Tree lines may be considered to shield the view of the facility.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Additionally, laydown areas, construction equipment and construction camps will have a visual impact.				• If possible, ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during construction. • Plan the placement of laydown areas and temporary construction equipment camps to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and disposed of regularly at licensed waste facilities.								
Social (Operational)													
Job Creation	Without Mitigation				4	3	3	4	3	42	**Moderate**	(+)	High
	With Mitigation				4	3	3	4	4	56	**Moderate**	(+)	High
	The total employment generated during the operational phase is estimated at 30 workers. Furthermore, the Project requires that local South Africans be employed during construction. Most workers will be low-skilled, with approximately 30 – 40 % semi-skilled.		✓		**Mitigation Measures:** • Where reasonable and practical, the Project should apply a 'locals first' policy, especially for semi and low-skilled jobs. The majority of skilled positions, however, are likely to be filled by individuals from outside the area due to the low skill levels in the area. • Communities near the Project should be given special consideration regarding the benefits arising from it, as they will be most affected. • The proponent should liaise with the municipality regarding establishing a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., maintenance companies, catering companies, waste collection companies, security companies, etc.) before the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Co n
Population Influx	Without Mitigation				4	3	3	4	3	42	Moderate	(-)	High
	With Mitigation				2	2	3	3	2	20	Low	(-)	High
	As discussed in the construction phase, there will also likely be an influx of job seekers during the operational phase. An increase in job seekers may increase pressure on the existing municipal infrastructure and services. An influx of job seekers includes increased road traffic, water usage and housing demands. The influx of people from different cultures and languages may impact the local culture, language, and family structures, leading to a sense of displacement for the locals. The influx of job seekers can potentially affect the local community negatively.		✓		**Mitigation Measures:** • A community awareness campaign will be implemented in the surrounding communities to sensitise community members to traffic safety risks and infectious disease awareness. • As part of onboarding workers, training should be provided on preventing GBV, SEA and SH. • The Project must engage with communities using a dedicated community liaison officer and have an effective SEP, including a grievance mechanism for communities to access and lodge complaints. • Local employment should be a priority for the operations contractor to lessen the number of workers away from their homes. • Training programmes must be implemented to enable local participants to take advantage of employment opportunities. • No recruitment should occur at the Project gate to prevent informal settlements around the Project site. • Increased security in the Project area should be provided to regulate access to the site and prevent informal settlements.								
Procurement From Local Businesses	Without Mitigation				2	2	2	2	2	16	Low	(+)	High
	With Mitigation				2	2	3	4	3	33	Moderate	(+)	High
	The project and its employees will require procurement of goods and services for operations. It increases local economic growth when local entrepreneurs and businesses are procured for supplies and services.		✓		**Mitigation Measures:** • The project could partner with local suppliers through procurement programmes to develop local suppliers. • Procurement programmes should prioritise local procurement for locally available goods and services.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Co n
Community Health, Safety and Security	Without Mitigation				2	2	3	4	2	22	**Low**	(-)	High
	With Mitigation				2	2	3	3	2	20	**Low**	(-)	High
	The movement of vehicles and increased human activity may damage infrastructure and increase crime, livestock theft, and farm produce theft or death. It could have a Low negative impact on the community's health, safety and security.		✓		**Mitigation Measures:** • The Project should employ security personnel onsite during operations 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 related to the Project. • The workers should be transported to and from the site daily. • The contractor should efficiently supervise and manage the entrance and exit of the site to ensure no interaction with communities at the site. • No workers, except security personnel, should be permitted to stay overnight on the site.								
Energy Generation	Without Mitigation				1	2	3	4	2	20	**Low**	(+)	High
	With Mitigation				4	3	3	4	4	56	**Moderate**	(+)	High
	The facility's operation will allow the renewable energy facility to produce electricity without waste or emissions during the operational phase. South Africa's per capita greenhouse emissions are the highest in Africa (Jainb, 2017). The Project will aid in reducing the carbon footprint and emissions.		✓		**Mitigation Measures:** • The power generated from the proposed project should be used to provide for homes, farms, and businesses in the surrounding communities. • The proposed Project should be used to encourage more renewable sources of energy.								
Noise	Without Mitigation				3	4	4	4	3	45	**Moderate**	(-)	High
	With Mitigation				3	4	4	4	3	45	**Moderate**	(-)	High

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	Wind turbines generate noise between 35-45 decibels when perceived from 300 metres (US Department of Energy, n.d.). This range falls between the noise generated by a whisper (approximately 20 decibels) and normal speech (approximately 60 decibels), far below the threshold of 140 decibels (Maine).		✓		**Mitigation Measures:** • The noise impact cannot be reduced. However, maintenance of the turbines, supporting structures, and infrastructure must be undertaken to keep the facility from increasing its visual impact.								
Visual	Without Mitigation				4	4	4	4	4	64	**High**	(-)	High
	With Mitigation				3	3	3	2	3	33	**Moderate**	(-)	High
	The potentially sensitive visual receptors are located within six kilometres of the proposed facility, meaning the visual impact will be high and moderate between three and six kilometres away.		✓		**Mitigation Measures:** • For the observers within one kilometre, no mitigation of this impact is possible (i.e. the structures will be visible regardless of mitigation measures). Still, general mitigation and management measures are recommended as best practices. • It is recommended that vegetation cover (i.e., natural or cultivated) be maintained in all areas outside the development footprint. Vegetation cover will minimise the visual impact. • Existing roads should be utilised wherever possible. New roads should be planned to limit cut and fill requirements. • Motion-sensing lighting should be investigated during the evening to lessen night-time light pollution. • Maintenance of the turbines, supporting structures, and infrastructure must be undertaken while they are in use to minimise visual impacts.								
Aspect	**Impact**	**C**	**O**	**D**	**M**	**E**	**R**	**D**	**P**	**S**		**Ca**	**Con**
Social (Decommissioning)													
Loss of Employment	Without Mitigation				4	4	3	4	3	45	**Moderate**	(-)	High

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	With Mitigation				2	1	2	4	3	27	**Low**	(-)	High
	During this phase, the operational workforce will lose their jobs, and it may lead to adverse social consequences in the municipality, such as: • Increase or return the unemployment rate to previous levels within the Project area. • Financial hardship. • Family tensions and breakdown. • Unemployment can result in alienation, shame and stigma. • Crime. It should be noted. However, wind energy facilities usually employ two maintenance employees per 30 wind turbines (Wind Enegry The Facts, n.d.)or, depending on capacity, seven to eleven personnel per 100 MW (Adelman).			✓	**Mitigation Measures:** • Timely and adequate consultation with employees dependent on the Project for employment should occur. • Assisting employees seeking alternative employment at other wind power plants or related facilities. • Training, educating and re-skilling employees to equip them with skills that could benefit them in other industries should occur.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Reduced Community Investment	Without Mitigation				3	4	3	3	3	39	**Moderate**	(-)	High
	With Mitigation				2	1	2	4	3	27	**Low**	(-)	High
	There will be reduced local spending by the project and its staff and contractors. Consequently, local			✓	**Mitigation Measures:** • Engage local and regional government concerning the decommissioning phase.								

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
	business revenue may be affected, and tax payments will decrease.				- Develop alternative projects which can support the local economy.								
Associated Infrastructure	Without Mitigation				3	3	3	3	4	48	**Moderate**	(-)	High
	With Mitigation				2	2	1	3	2	16	**Low**	(-)	High
	Structures used during operation will be abandoned and might attract criminal activity or house social ills. Maintenance of these structures might decrease after the Project operation, leading to hazards to the health and welfare of the community.			✓	**Mitigation Measures:** - An end-of-life shutdown procedure must be undertaken, including a risk assessment of the activities involved. - End-of-life, which is affected by temperature and time, cycles, etc., should be predefined, and monitoring should be in place to determine if it has been reached. - The proponent shall develop exit strategies for all its community development initiatives.								

9.14 NOISE

Table 9-13 - Potential impacts for Noise (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	C	O	D	M	E	R	D	P	S		Ca	Con
Noise													
Construction phase impacts of noise on sensitive receptors	Without Mitigation				3	2	1	1	3	21	**Low**	(-)	High
	With Mitigation				2	2	1	1	2	12	**Very Low**	(-)	High
		✓			**Mitigation 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. • Consideration of installing larger capacity wind turbines, limiting the number of turbines to be installed but having the same power generation potential. • Relocating these onsite receptors. • Relocating the offsite receptor (Rec 08) or offering them financial incentives.								
	Listing Notice 1: GNR 983 - Activity 1, 12, 19, 24 (ii); Listed Notice 2 GNR 984 – Activity 1, 4, 15												
Operational phase impacts of noise on sensitive receptors	Without Mitigation				3	2	1	4	4	40	**Moderate**	(-)	High
	With Mitigation				2	2	1	4	2	18	**Low**	(-)	High
			✓		**Mitigation 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. • Consideration of installing larger capacity wind turbines, limiting the number of turbines to be installed but having the same power generation potential.								

Aspect	**Impact**	**C**	**O**	**D**	**M**	**E**	**R**	**D**	**P**	**S**		**Ca**	**Con**
					• Relocating these onsite receptors. • Relocating the offsite receptor (Rec 08) or offering them financial incentives.								
Decommissioning phase impacts of noise on sensitive receptors	Without Mitigation				3	2	1	1	3	21	**Low**	(-)	High
	With Mitigation				2	2	1	1	2	12	**Very Low**	(-)	High
				✓	**Mitigation 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. • Consideration of installing larger capacity wind turbines, limiting the number of turbines to be installed but having the same power generation potential. • Relocating these onsite receptors. • Relocating the offsite receptor (Rec 08) or offering them financial incentives.								

9.1 HEALTH, SAFETY AND ENVIRONMENT RISK

Table 9-14 - Potential impacts for Health, Safety and Environment Risk - Solid State Lithium-Ion Battery Energy Storage Systems (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
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**
	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 (a)	C	(-)	**Moderate**	**Low**
	Human and Equipment Safety - exposure to fire radiation (b)	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 (a)	C	(-)	**Moderate**	**Low**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	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**	**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 (a)	O	(-)	**Moderate**	**Low**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human Health - chronic exposure to toxic chemical or biological agents (b)	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	(-)	**Moderate**	**Low**
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	**High**	**Low**
	Human and Equipment Safety - exposure to fire radiation (b)	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 (a)	O	(-)	**Low**	**Low**
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents(a)	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**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	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**	**Very Low**
	Public - Aesthetics	O	(-)	**Low**	**Low**
	Investors - Financial	O	(-)	**Moderate**	**Low**
	Employees and investors – Security (a)	O	(-)	**Moderate**	**Low**
	Employees and investors – Security (b)	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**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	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**
	Emergencies	D	(-)	**N/A**	**N/A**
	Investors - Legal	D	(-)	**Moderate**	**Low**

Table 9-15 - Potential impacts for Health, Safety and Environment Risk - Vanadium redox flow battery energy storage systems (C = Construction Phase, O = Operational Phase, D = Decommissioning phase, M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
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
	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 and Equipment Safety - exposure to explosion over pressures	C	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	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

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Environment - emissions to water	C	(-)	Low	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 (a)	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (b)	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	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (b)	O	(-)	Moderate	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 (a)	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	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	Very Low
	Public - Aesthetics	O	(-)	Moderate	Low
	Investors - Financial	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Employees and investors – Security (a)	O	(-)	Moderate	Low
	Employees and investors – Security (b)	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

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	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
	Emergencies	D	(-)	N/A	N/A
	Investors - Legal	D	(-)	Moderate	Low

Health, Safety and Environment Risk Mitigations:

Mitigation measures for the construction, operation and decommissioning phases includes:

- The construction phase must be managed according to all the requirements of the Occupational Health and Safety Act No. 85 of 1993 specifically the Construction Regulations.
- A SHEQ policy must be in place.
- A detailed construction Risk Assessment must be completed prior to work commencing.
- SHE appointees must be in place.
- Contractor’s safety files must be in place and up to date.
- All necessary health controls/ practices must be in place, e.g., ventilation of welding and painting areas.
- SHE monitoring and reporting programs must be in place.
- An emergency response plan must be in place prior to beginning construction and it must include aspects such as appointment of emergency controller, provision of first aid, and first responder contact numbers.
- A Health Risk Assessment must be undertaken to determine if equipment noise exceeds 85dB at workstation and 61dB at boundary of the site
- Employees must be provided with hearing protection if working near equipment that exceeds the noise limits.
- Construction site facilities must comply with the Occupational Health and Safety Act No. 85 of 1993, specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces.
- Adequate potable water for employees must 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.
- Training in lifting techniques must be provided.
- Ensure that despite the isolated location, all the necessary equipment is available (and well maintained) during construction. Otherwise employees may revert to unsafe practices.
- The BESS location must be isolated and maintenance of construction equipment to ensure safe operation must be undertaken. Ensure this is in place prior to project beginning.
- Fuels stored on site must be stored in dedicated, demarcated and bunded areas.
- Suitable fire-fighting equipment must be available on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc.
- 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. Furthermore, factory acceptance test are undertaken prior to leaving manufacture and batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood to assess the risk during transport and storage.
- The company responsible for the battery installation should ensure suitably competent transport companies are appointed.
- 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 must be trained in the hazards of containerized batteries.
- All necessary good hygiene practices must 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 must be in place.
- Awareness training for persons on site must be undertaken, and the safety induction must include animal hazards.
- First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc.
- The appointed transport company must ensure that transportation is done in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods..
- Components musty be transport in sealed packages that are kept upright, protected from movement damage etc.
- Components must be transported in such a way that prevents excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning.
- Pre-assembled containers must 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 must have Hazmat labels and Trem cards, and the driver must be trained in the hazards of the load.
- Waste segregation must be practiced on site (e.g., electronic equipment, chemicals) and management on the site.
- Water usage must be monitored on site during construction.
- Handling protocols must be provided by battery supplier.
- An end of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery units from day 1.
- Water management plan and spill containment plans must be implemented
- Fencing around electrical infrastructure must be according to SANS standards 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.
- Night lighting must be provided both indoors and outdoors where necessary.
- Except during shipping, the battery 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 the transfer and coordination of emergency response on-route is clear.
- Use only internationally reputable battery suppliers who comply with all known regulations/guidelines at the time of purchasing.
- Ensure only state of the art battery systems are used and not old technologies prone to fires/explosions etc.
- The operation and maintenance phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993.
- A detailed Risk Assessment of all normal operating and maintenance activities on site must be compiled, and form the basis of operating instructions, prior to commencing commissioning.
- All necessary health controls/ practices must be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place.

- An emergency response plan for the full operation and maintenance phase must be in place prior to beginning commissioning.
- Maintenance procedures must be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop etc.
- PPE for handling battery parts and other equipment on site must be specified.
- Training of staff in hazards of chemicals on site must be undertaken.
- Detectors with local alarms must be installed in case regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers.
- All equipment must be properly labelled.
- Confined space entry procedures must be in place for entering tanks.
- There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc.
- Safety Data Sheets (SDSs) must be available on site.
- Operating manuals must be provided, including start-up, shut-down, steady state, monitoring requirements.
- Maintenance manuals with make safe, decontamination and repair procedures must be available on site.
- A maintenance schedule e.g., checklists for weekly, monthly, annual etc must be in place.
- Portable equipment for calibration and for testing/verification of defective equipment must be provided, e.g., volt/current meters, infrared camera
- 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 must be provided during all phases of the project.
- Suitable lighting must be provided, including emergency lighting for safe building exit in the event of power failure.
- PPE for operations and maintenance staff must be suitable for the weather conditions.
- Staff rotation to other activities within the site must be considered and undertaken, where necessary.
- Performance monitoring of inspections / maintenance tasks in particular must be undertaken.
- Working at height procedure must be in place.
- Grass cutting must be undertaken and fire breaks must be implemented around the BESS installation to prevent veld fires. No combustible materials may be stored in or near the batteries or electrical infrastructure. The site diesel tank, and transformers must be adequately separated from BESS and vice versa.
- Detailed FMEA/Hazop/Bowtie must be undertaken during design at the component level and system level. Safety integrity level rating of equipment (failure probably) with suitable redundancy must be undertaken, if required. Site Acceptance Testing as part of commissioning of each unit and the overall system must be undertaken. Abuse tests must be conducted by supplier.
- A Battery Management System (BMS) should check individual cell voltage as well as stack, module, container, system voltages/current etc. The BMS should trip the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage.
- A fire resistant barrier between the batteries and the PCS side must be installed if in the same container, or separate containers.

- Suitable ingress protection level must be provided for electrical equipment, e.g., IP55 - 66. If air cooling into container, suitable dust filters must be provided. Smoke detectors must be linked to BMS & alerts in control room.
- Effects of battery aging must be considered. Solid state battery life starts to be impacted above 40 °C and significant impacts above 50 °C with thermal run away starting at 65-70 °C. BMS trips system at 50 °C, and as such, temperature monitoring must be in place and Regular infrared scanning must be undertaken. Data needs to be stored for trend analysis.
- Prior to commencement of cold commissioning, the emergency plan from the transport and construction phase must be extended to the operational phase and must include the hazards of the electrically live system. The emergency procedure must address solid state container fires - extinguishing, ventilating, entering as appropriate or not.
- PPE for container firefighting must include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets.
- A fire response plan must be in place to prevent escalation to an explosion or an environmental event.
- There must be a suitable supply of fire extinguishing medium and cooling medium on site.
- Fire water must be considered for cooling adjacent equipment – BESS units.
- Use of fogging nozzles to direct smoke must be considered.
- Ensure procedures are in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures.
- Procedures must be in place for IR scanning (or other suitable method) to determine if batteries are still smouldering / are sufficient cooled to handle as batteries may still be active some weeks after an event.
- Smoke or gas detector systems that are not part of the original battery container package, must be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.
- 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 run away.
- Suitable training of selected emergency responders who may be called out to the facilities must be undertaken.
- Apart from pumps, there should be no major moving parts during operation.
- Maintenance equipment must be serviced and personnel suitably trained in the use thereof.
- Traffic signs, rules etc. must be in place on site.
- All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc. must be in place.
- An emergency response plan must be in place.

For a full list of mitigation measures refer to the EMPr (**Appendix I**) and Specialist Study (**Appendix G.15**).

10 CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts refer to the successive, incremental, and/or combined effects of a project, activity, or action when considered alongside other existing, planned, or reasonably foreseeable developments. The assessment and management of cumulative impacts focus on those impacts that are scientifically significant or of concern to affected communities. While this assessment primarily addresses South African regulatory requirements, elements of internationally recognized standards, such as the IFC Performance Standards, provide valuable context for identifying and mitigating cumulative impacts. These standards will guide alignment during later stages of the project lifecycle.

Cumulative impacts are evaluated within the project's area of influence, which includes:

- Areas directly impacted by the project;
- Surrounding regions influenced by other existing and planned projects; and
- Broader geographic and temporal scales where unplanned but predictable impacts may emerge.

While compliance with IFC Performance Standards is not a requirement under South African EIA regulations, their guidance on addressing cumulative impacts is acknowledged. This includes analyzing the interaction of project impacts with other human activities and natural drivers affecting Valued Environmental and Social Components (VECs). During financial close and subsequent phases, the project will incorporate additional measures to align with international standards where necessary.

This cumulative impact assessment provides a foundation for understanding the broader environmental and social context of the Kromhof WEF. It evaluates the additive effects of the project in conjunction with other renewable energy developments within the region, with the goal of proposing actionable measures to mitigate cumulative impacts where feasible. These measures will be detailed in the Environmental and Social Management Plans (ESMPs) and broader Environmental and Social Management System (ESMS) as the project progresses. Cumulative impacts with existing and planned facilities may occur during construction and operation of the Kromhof 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 projects within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved) have been considered. The projects considered are from the latest REEA database from the DFFE (2024 Quarter 4). It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

The proposed Kromhof WEF is not located within one of the promulgated Renewable Energy Development Zones (REDZ). The projects located within a 50km radius of the site that should be considered in the cumulative impact assessment is included in **Table 10-1**, and illustrated in **Figure 10-1**. The projects located outside 50km radius of the site are included in **Table 10-2** and illustrated in **Figure 10-2**. Due to the fact that there are no neighbouring authorised or operational WEFs within 20km of the Kromhof WEF, no wake loss effect study is deemed required. The wake loss effect that may be associated with the neighbouring Normandien and Groothoek WEFs will be taken into account by the developer during the design of the WEFs. **It is important to note that the existence of an approved EA does not directly equate to actual development of the project.**

Table 10-1 – Projects within 50km of the Kromhof WEF

Project Name	**Applicant**	**EIA Process**	**Status**	**EAP**	**Reference Number**	**Technology**	**Megawatt**	**Approximate Distance away**	**Report availability**
Newcastle Gas Engine Power Plant (NGEPP), Newcastle, KwaZulu-Natal Province.	Newcastle Energy (Pty) Ltd	Scoping & EIA	Refused	SRK Consulting (South Africa) (Pty) Ltd	14/12/16/3/3/2/2074	Biomass Biofuels	18.5	35.6 km	No
Proposed Upgrade of Karbochem boilers and electricity project in Newcastle	Distributed Energy Generation (Pty) Ltd	BAR	In process	Savannah Environmental (Pty) Ltd	14/12/16/3/3/1/1164	Solar PV	75	36.6 km	No
Proposed Upgrade of Karbochem boilers and electricity project in Newcastle - Amendment	Distributed Energy Generation (Pty) Ltd	Amendment	Approved	Sustainable Environmental Solutions (Pty) Ltd	14/12/16/3/3/1/1164/AM1	Solar PV	0	36.6 km	No
Proposed Newcastle solar energy facility near Newcastle,	Building Energy (Pty) Ltd	BAR	Refused	Savannah Environmental (Pty) Ltd	14/12/16/3/3/1/1225	Solar PV	0	37.6 km	Yes

Project Name	Applicant	EIA Process	Status	EAP	Reference Number	Technology	Megawatt	Approximate Distance away	Report availability
KwaZulu-Natal Province									
Proposed Newcastle WEF 2 and associated grid infrastructure near Newcastle, KwaZulu-Natal Province	Mulilo Newcastle Wind Power 2 (Pty) Ltd	Scoping & EIA	Refused	Coastal and Environmental Services (Pty) Ltd. t/a CES	14/12/16/3/3/2/2213	Wind	200	26.1 km	No
Proposed Mulilo Newcastle WEF and associated grid infrastructure near Newcastle, KwaZulu-Natal Province	Mulilo Newcastle Wind Power (Pty) Ltd	Scoping & EIA	Approved	Coastal and Environmental Services (Pty) Ltd. t/a CES	14/12/16/3/3/2/2457	Wind	200	31.1 km	Yes
Proposed Mulilo Newcastle WEF 2 and associated	Mulilo Newcastle Wind Power 2 (Pty) Ltd	Scoping & EIA	Approved	Coastal and Environmental Services (Pty) Ltd. t/a CES	14/12/16/3/3/2/2458	Wind	160	26.8 km	Yes

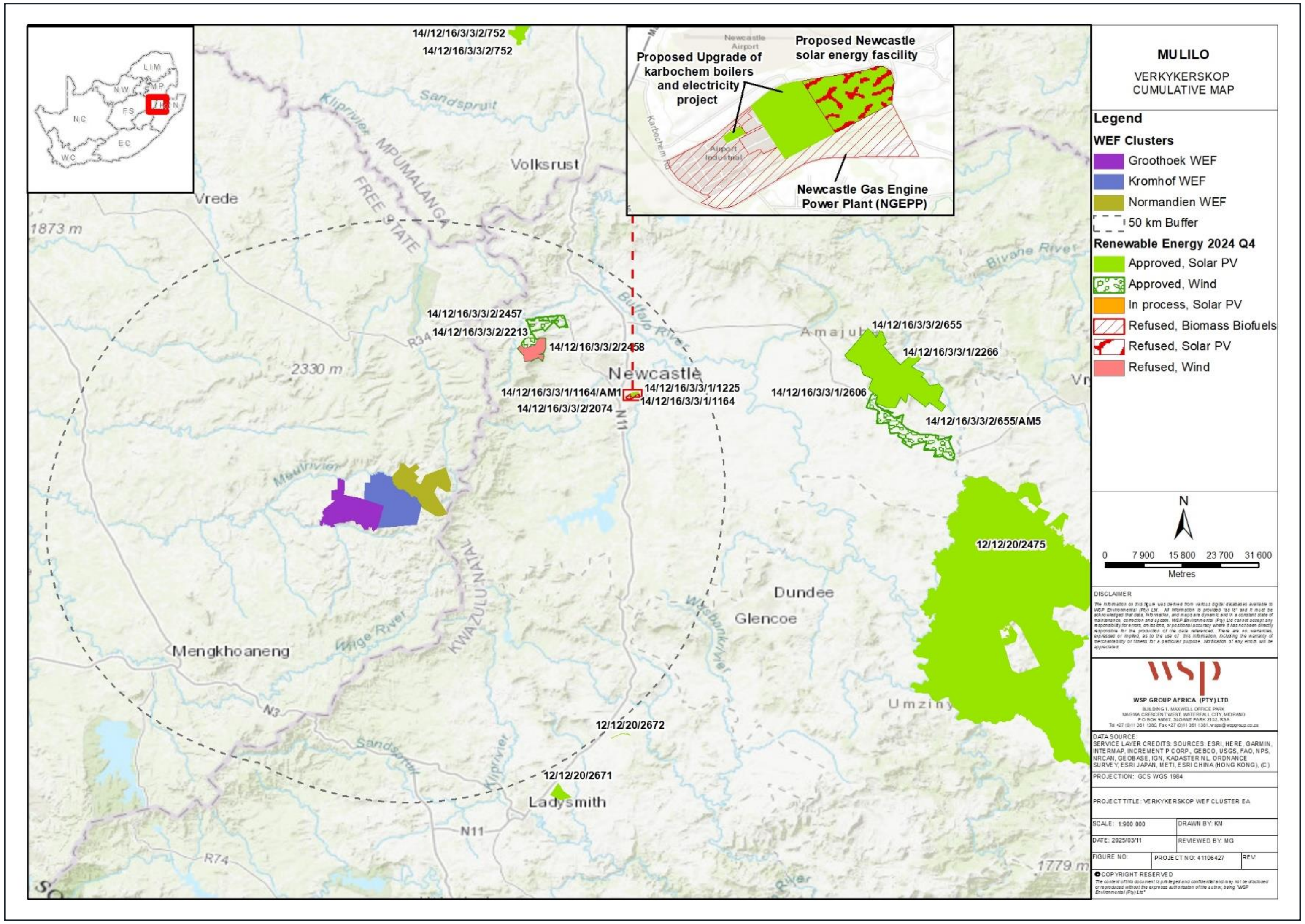
Project Name	Applicant	EIA Process	Status	EAP	Reference Number	Technology	Megawatt	Approximate Distance away	Report availability
grid infrastructure near Newcastle, KwaZulu-Natal Province									

Table 10-2 – Projects outside 50km of the Kromhof WEF

Project Name	Applicant	EIA Process	Status	EAP	Reference Number	Technology	Megawatt	Approximate Distance away	Report Availability
Proposed Construction Of A Photovoltaic (Pv) Solar Energy Facility Near Ladysmith, Kwa-Zulu Natal Province	Protea Energy	BAR	Approved	Geoff Silk Civil and Mining Consultant cc	12/12/20/2671	Solar PV	15	58.9 km	No
Proposed Waaihoek Wind energy facility, Utrecht	Megawatt one Photovoltaic (Pty) Ltd	BAR	Approved	Savannah Environmental (Pty) Ltd	14/12/16/3/3/2/655	Solar PV	5	76.6 km	Yes
The 140MW Waaihoek wind energy facility, South-East of	Waaihoek Wind Farm (Pty) Ltd	Amendment	Approved	Nala Environmental (Pty) Ltd	14/12/16/3/3/2/655/AM5	Wind	140	76.6 km	Yes

Project Name	Applicant	EIA Process	Status	EAP	Reference Number	Technology	Megawat t	Approximate Distance away	Report Availability
Utrecht in the KZN Province									
Proposed deviation to the powerline route and associated infrastructure from the authorised 88kV powerline Waaihoek Wind Energy Facility (WEF)	Waaihoek Wind Farm (Pty) Ltd	BAR	Approved	Nala Environmental (Pty) Ltd	14/12/16/3/3/1/2606	Wind	0	77.6 km	Yes
Proposed battery energy storage system (BESS) and reservoir, associated with the authorised waaihoek wind energy facility and power line near Utrecht, KwaZulu-Natal	Waaihoek Wind Farm (Pty) Ltd	BAR	Approved	Coastal and Environmental Services (Pty) Ltd. t/a CES	14/12/16/3/3/1/2266	Wind	0	79.5 km	No
Proposed Extension Of The Emondlo, St James And Leksand Substation Yards, Kwazulu Natal	Unknown	BAR	Approved	Kerry Seppings Environmental Management Specialists cc	12/12/20/2475	Solar PV	88	88.3 km	No
Proposed Construction Of A Photovoltaic (Pv) Solar Energy	Unknown	BAR	Approved	Geoff Silk Civil and Mining Consultant cc	12/12/20/2672	Solar PV	15	54.9 km	No

Project Name	**Applicant**	**EIA Process**	**Status**	**EAP**	**Reference Number**	**Technology**	**Megawatt**	**Approximate Distance away**	**Report Availability**
Facility Near Ladysmith, Kwa-Zulu Natal Province									
Proposed 65MW solar PV facility at Majuba Power Station in Mpumalanga Province	Eskom Holding SOC Limited	Scoping EIA	Approved	Savannah Environmental (Pty) Ltd	14//12/16/3/3/2/752	Solar PV	65	87.9 km	Yes



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PROJECTION: GCS WGS 1984

PROJECT TITLE: VERKYKERSKOP WEF CLUSTER EA

SCALE: 1:900 000	DRAWN BY: KM
DATE: 2025/03/11	REVIEWED BY: MG

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Figure 10-1 – Map showing projects within 50km of the Kromhof WEF

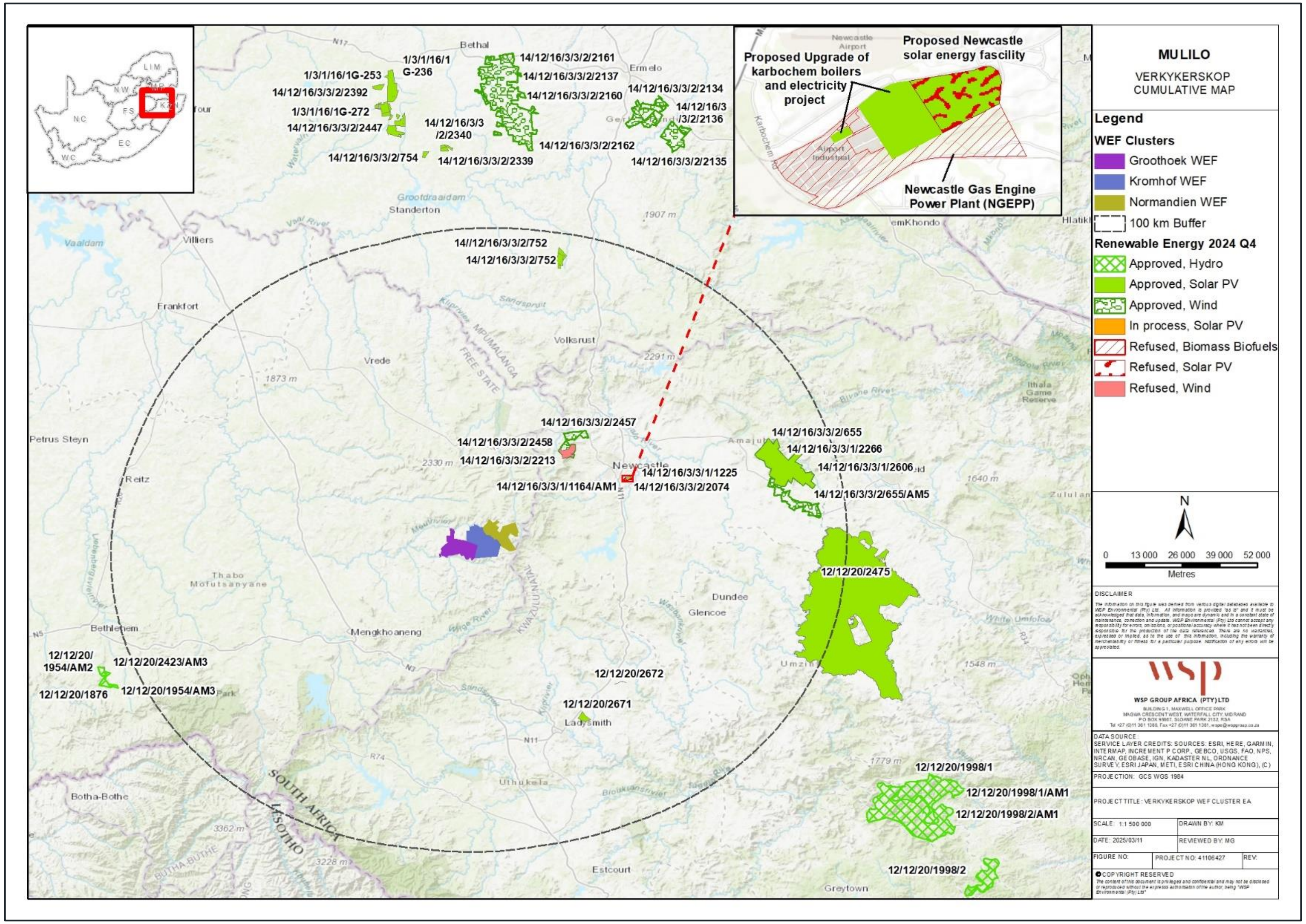

Figure 10-2 –Projects outside 50km of the Kromhof WEF

10.1 AGRICULTURE

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.

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of future agricultural production potential.

This cumulative impact assessment determines the quantitative loss of agricultural land if all renewable energy project applications within a 50 km radius become operational. These projects are listed in Appendix 4 of **Appendix G.1**. Note that electrical grid infrastructure projects do not contribute to a loss of agricultural land and are not therefore included in this calculation of cumulative land loss. The area of land taken out of agricultural use as a result of all the projects listed in Appendix 4 (total generation capacity of 1175 MW) will amount to a total of approximately 518 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30 km radius (approximately 282,700 ha), this amounts to only 0.18% of the surface area. This is well within an acceptable limit in terms of loss of low potential agricultural land, which is only suitable for grazing, and of which there is no scarcity in the country

10.2 GEOTECHNICAL INVESTIGATION

The assessment considers the entire development but the three main parts of the development, namely Wind turbines, cable trenches and access roads, are the primary consideration. Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the Kromhof WEF was found to be “Negative low to moderate impact - The anticipated impact will have negative effects and will require mitigation.” With mitigation measures the impact will be “Negative very low to low”. The assessment impact assessment matrix is presented in Appendix D of the specialist report.

The WEF application site is considered suitable for the proposed development provided that the recommendations presented in this report are adhered to and which need to be verified by more detailed geotechnical investigations during detailed design. The assessment impact assessment matrix is presented in Appendix D of the geotechnical investigation (**Appendix G.2**).

10.3 TERRESTRIAL BIODIVERSITY

Collectively, the various projects associated with the Verkykerskop WEF cluster, as well as the additional projects within a 50 km radius, will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single project, and this is a cumulative impact of concern with respects to terrestrial biodiversity.

Prior to any form of mitigation, the cumulative impact on terrestrial biodiversity from vegetation clearing is rated ‘high’. The proposed Project’s contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts can therefore be reduced to 'Low' significance.

10.4 AQUATIC BIODIVERSITY

The proposed Project area is located within a predominantly low density cultivated fields. Impacts associated with the land use activities include informal roads, farm dams, the use of fertilizers and pesticides, abstraction for irrigation, and livestock farming. Thus, some level of impact has occurred through habitat transformation within certain sections of the PAOI.

Should the proposed Project be authorised, associated activities are expected to contribute to water quality modifications through increases in sediment load and the spread of alien vegetation near watercourses. However, these impacts can be prevented through implementation of the management/mitigation measures recommended in this report. Furthermore, authorisation of the current project will require the monitoring of associated watercourses for compliance. This will be beneficial as it will aid in determining trends in ecological integrity of the aquatic ecosystems.

10.5 PLANT SPECIES

Collectively, the various projects associated with the Verkykerskop WEF cluster, as well as the additional projects within a 50 km radius, will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single project, and this is a cumulative impact of concern with respects to the conservation of local populations of flora SCC.

Prior to any form of mitigation, the cumulative impact on flora SCC from vegetation clearing is rated 'high'. The proposed Project's contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial flora SCC can therefore be reduced to 'Low' significance.

10.6 ANIMAL SPECIES

Collectively, the various projects associated with the Verkykerskop WEF cluster, as well as the additional projects within a 50 km radius, will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single project, and this is a cumulative impact of concern with respects to local fauna SCC metapopulations dynamics, and specifically their ability to move and disperse across the landscape to access key resources, in accordance with their life-cycle requirements.

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.

10.7 AVIFAUNA

The AOI is largely natural and, in most areas, pristine. There are currently no operational wind energy facilities in or within 50 km surrounding the project area. However, the Newcastle Wind Power 2 project has been approved at the bottom of the escarpment on the KZN side and there are two other prospective Mulilo WEF projects in the region: Phumelela (avifauna assessment conducted by TBC) and Goedehoop (avifauna monitoring conducted by Dr. Steven Evans). Additionally, EDF has prospective WEF projects on most of the land in between these WEFs. Including this project, there are at least 4 prospective wind developments planned for the Phumelela region. There is, however, also a vested birding interest in the region (e.g. Roberts Memel Birding Site, Memel Getaway Birding Routes) and NGOs such as BirdLifeSA and EWT are distinctly aware of the avifaunal importance and are actively working in the region. The proposed VWC is not located within one of the promulgated Renewable Energy Development Zones (REDZ). Additionally, a small portion of the VWC overlap an IBA (Grasslands) while large a large proportion of it overlaps a KBA (Eastern Frees State Grasslands). Known projects located within a 50km radius of the are listed in **Table 10-1** and mapped in **Figure 10-1**. Based on the information, the cumulative impact of wind energy developments in this region is likely to have a significant consequence for birdlife on a national to global scale.

10.8 BATS

According to the latest (2024 Quarter 4) Renewable Energy EIA Applications data from the Department of Fisheries, Forestry, and the Environment (DFFE; https://egis.environment.gov.za/), only one other WEF has been proposed within a 50 km radius of the Verkykerskop WEF cluster site (**Figure 10-1**). The proposed Newcastle Wind Power 2 WEF (up to 200 MW; DFFE Ref: 14/12/16/3/3/2/2213) located ~38 km to the north- east of the cluster appears to have been refused. As such, the cumulative impacts of WEFs in the area are currently limited to the three proposed WEFs that make up the Verkykerskop cluster.

Without very diligent monitoring and mitigation of bat fatalities and other impacts (e.g. roost disturbance) at all three WEFs comprising the Verkykerskop cluster, their potential cumulative impact on bat habitats, populations, and ecosystem services was rated with 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 see Table 7 of the of **Appendix G.8**.

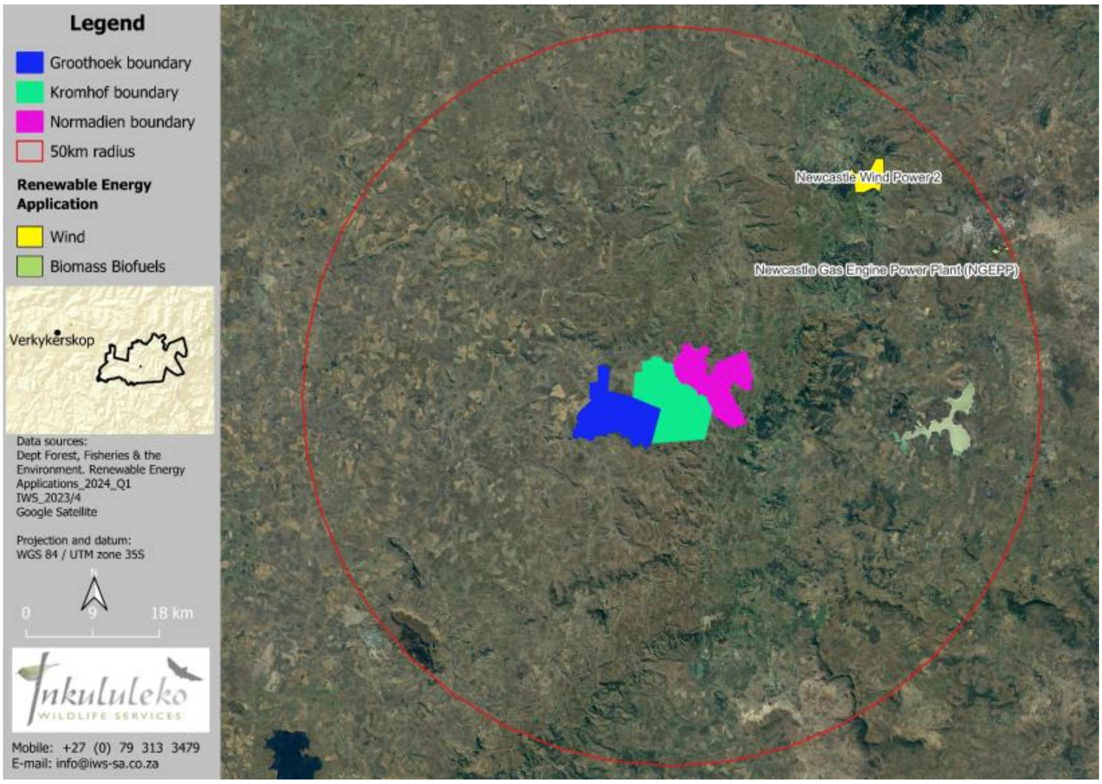

Figure 10-3 - Renewable energy development applications within 50 km of the proposed Verkykerskop WEF cluster

Without very diligent monitoring and mitigation of bat fatalities and other impacts (e.g. roost disturbance) at all three WEFs comprising the Verkykerskop cluster, their potential cumulative impact on bat habitats, populations, and ecosystem services was rated with 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 10-8**).

10.9 HERITAGE

Cumulative impacts in the Project area are expected to be low and can be mitigated to an acceptable level through implementation of the required mitigation measures. Renewable Energy Facility projects within a 50km radius are described in **Table 10-1** and illustrated in **Figure 10-2**.

10.10 PALAEONTOLOGICAL

Cumulative impacts in the Project area are expected to be low and can be mitigated to an acceptable level through implementation of the required mitigation measures. Renewable Energy Facility projects within a 50km radius are described in **Table 10-1** and illustrated in **Figure 10-2**.

10.11 TRAFFIC

To assess a cumulative impact, it is generally assumed that all wind farms within a 50 km radius, currently proposed and authorized, would be constructed at the same time. This is the 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.

Nature of the impact

- Temporary further increase in traffic, noise and dust pollution associated potential traffic
- Cumulative impact on road surfaces

10.12 VISUAL

The proposed Verkykerskop WEF Cluster is not located within one of the promulgated Renewable Energy Development Zones (REDZ). The projects located within a 50 km radius of the site that should be considered in the cumulative impact assessment is included in **Table 10-1** and illustrated in **Figure 10-2**. Projects within 100 km radius are not being evaluated as part of this VIA, as developments beyond this distance fall well outside of the range of cumulative visibility.

10.13 SOCIAL

Cumulative impacts on existing and planned facilities may occur during the construction and operation of the proposed Verkykerskop WEF Cluster. While one project may not significantly impact sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Therefore, several projects within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved) have been considered. The projects considered are from the latest REEA database from the DFFE (2023 Quarter 3). It is important to note that the existence of an approved EA does not directly equate to the actual development of the Project.

The proposed Verkykerskop WEF Cluster is not located within one of the promulgated Renewable Energy Development Zones. The projects located within a 50km radius of the site that should be considered in the cumulative impact assessment are included in **Table 10-3** and illustrated in **Figure 10-2.**

10.14 NOISE

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed Kromhof 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 projects 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.

The proposed Kromhof WEF is located adjacent to the proposed Groothoek WEF. There are no Kromhof turbines located within close proximity of the Groothoek turbines and/or receptors and as such, cumulative impacts are not anticipated.

Other identified projects, within a 50 km radius of the Groothoek WEF site, considered in the cumulative impact assessment. Based on the distances (>10 km) of all of the other renewable projects, cumulative impacts on receptors will not be perceived. Additionally, there are no other immediate activities (industrial or mining) located around the Groothoek WEF site which will contribute to any cumulative impacts.

10.15 HEALTH, SAFETY AND ENVIRONMENT 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.

10.1 CUMULATIVE ASSESSMENT PER ASPECT

The results of the cumulative impact assessment are represented in **Table 10-3** through **Table 10-10**1.

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10.1.1 GEOTECHNICAL

Table 10-3 – Potential Impacts on Geotechnical (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Geotechnical Investigation										
Erosion: • 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.	Without Mitigation	3	2	3	3	4	44	**Moderate**	(-)	High
	With Mitigation	2	1	1	2	2	12	**Very Low**	(-)	High
	• 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 **Mitigation 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).Develop a chemical spill response plan. Reinstate channelized drainage features									
Potential Oil Spillages - Contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources.	Without Mitigation	3	3	3	3	4	48	**Moderate**	(-)	High
	With Mitigation	2	1	3	1	2	14	**Very Low**	(-)	High
	Mitigation Measures: • Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. • Frequent checks and conditional monitoring.									
	Without Mitigation	3	1	3	3	3	30	**Low**	(-)	High

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Disturbance of fauna and flora - The displacement of natural earth material and overlying vegetation leading to erosion.	With Mitigation	2	1	1	2	2	12	**Very Low**	(-)	High
	Mitigation Measures: • Limited excavations									
Slope stability - Slope instability around structures.	Without Mitigation	2	1	3	3	2	18	**Low**	(-)	High
	With Mitigation	1	1	3	2	2	14	**Very Low**	(-)	High
	Mitigation Measures: • Avoid steep slopes areas. • Design cut slopes according to detailed geotechnical analysis.									
Seismic activity - Damage of proposed development.	Without Mitigation	4	1	3	4	1	12	**Very Low**	(-)	High
	With Mitigation	2	1	3	3	1	9	**Very Low**	(-)	High
	Mitigation Measures: • Design according to expected peak ground acceleration.									

10.1.2 TERRESTRIAL BIODIVERSITY

Table 10-4 – Potential Impacts on Terrestrial Biodiversity (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Terrestrial Biodiversity										
Cumulative impact of loss, disturbance and fragmentation of natural habitat	Without Mitigation	5	3	3	5	5	80	**High**	(-)	High
	With Mitigation	2	3	3	4	2	24	**Low**	(-)	High
	Cumulative impact of loss, disturbance and fragmentation of natural habitat. **Mitigation Measures:** - Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks, and wherever possible micro-sited to already disturbed sites.									

10.1.3 PLANT SPECIES

Table 10-5 – Potential Impacts on Plant Species(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Plant Species										
Flora habitat & SCC - Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation	Without Mitigation	5	3	3	5	5	80	**High**	(-)	High
	With Mitigation	2	3	3	4	2	24	**Low**	(-)	High
	Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation **Mitigation Measures:** • To limit the potential for AIS 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.									

10.1.4 ANIMAL SPECIES

Table 10-6 – Potential Impacts on Animal Species (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Animal Species										
Fauna habitat & SCC	Without Mitigation	5	3	3	5	5	80	**High**	(-)	High
	With Mitigation	2	3	3	4	2	24	**Low**	(-)	High
	Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation. **Mitigation Measures:** • As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields); • 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 sites 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 footprints; • 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/demarked work zones; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas • The correct stockpiling of topsoil that was cleared from development footprints during site preparation; • The correct contouring of the post-construction landform to limit potential erosion									
Fauna SCC	Without Mitigation	4	3	5	3	4	52	**Moderate**	(-)	High

Aspect	Impact	M	E	R	D	P	S		Ca	Con
	With Mitigation	2	3	5	3	2	22	**Low**	(-)	High
	Cumulative impact of fauna SCC due to injury, mortality and disturbance **Mitigation 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; • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers 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. • 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; • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; • The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.									

10.1.5 AVIFAUNA

Table 10-7 – Potential Impacts on Avifauna (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Avifauna										
Cumulative Impact	Without Mitigation	4	5	5	5	5	95	Very High	(-)	High
	With Mitigation	4	3	5	5	4	68	High	(-)	High
	Mitigation Measures: • Mitigating cumulative impacts is challenging, particularly in this context and considering that there are currently no operational wind energy facilities along the Great Escarpment. There are, however, other WEF applications in the region suggesting pooling of pre-construction monitoring data on predicted fatality rates and habitat loss estimates may one day be possible. • As the proposed development overlaps a Key Biodiversity Area (KBA), the KBA National Coordinator Group (NCG) and the KBA Regional Focal Point must be informed. This should be done during as soon as possible to allow the organisation adequate time to assess impacts on key avifauna (and other biodiversity) within the KBA as a result of the VWC and formulate a response in time for the EIA level public participation and commenting phase. • Especially with regards to threatened, habitat-specific species (in this case Rudd's Lark, Yellow-breasted Pipit and Botha's Lark) it is imperative that projected pre-construction fatality rate estimates from the various wind farm applications within their ranges are consolidated and contextualised in terms of their contribution towards the species' overall population viability. This needs to be informed by ecological niche modelling which takes into account the combined effects of habitat loss and climate change to better understand and quantify the cumulative risks to these species from growing numbers of wind energy applications in areas such as this. For now, locality data of threatened high altitude species gathered during the two-year pre-construction monitoring has been sent to Dr Robin Colyn (AfriAvian) who's research includes climate and habitat modelling for these species, an area of research that is dependent on the availability of high-quality locality data. Additionally, all data on threatened species has been shared with the BirdLife South Africa via BirdLasser's Threatened Species cause.									

10.1.6 BATS

Table 10-8 – Potential Impacts on Bats(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Bats										
Other WEFs - Cumulative impact of renewable energy developments in the area	Without Mitigation	3	3	5	5	4	64	High	(-)	High
	With Mitigation	2	3	3	4	3	36	**Moderate**	(-)	High
	Mitigation 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. No turbine towers should be positioned in Medium-High sensitive areas. Turbine blades are permitted to encroach on Medium-High sensitive areas. • 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. • Avoid blasting within 2 km of a confirmed roost. • 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. • Minimise the degradation of terrestrial habitat by implementing and maintaining effective dust, stormwater, erosion, sediment, and invasive alien plant control measures. • Rehabilitate disturbed terrestrial habitats by comprehensively and diligently implementing effective rehabilitation measures based on consultation with an appropriate vegetation specialist. • 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									

Aspect	Impact	M	E	R	D	P	S	Ca	Con
	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 starts spinning – 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 (at least on the VK8 met. mast) as soon as the first turbine starts spinning and whenever bat fatality monitoring is performed during the WEF's operation. • 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 (MacEwan 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.								

10.1.7 TRAFFIC

Table 10-9 – Potential Impacts on Traffic-(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Traffic										
Additional Traffic impact	Without Mitigation	4	3	3	2	4	48	**Moderate**	(-)	High
	With Mitigation	3	3	2	2	3	30	**Low**	(-)	High
	Further increase in development trips and consequently delays on external roads during the construction phase should several RE projects construction periods overlap. Mitigation Measures: • Same as for the Construction phase. However, it is noted that it is unlikely that the approved RE projects will be constructed at the same time.									
Damage to road surfaces	Without Mitigation	3	3	3	2	4	44	**Moderate**	(-)	High
	With Mitigation	2	3	2	2	2	18	**Low**	(-)	High
	Higher potential of damage to road surfaces caused by construction vehicles from several RE projects. Mitigation Measures: • Same as for the Construction phase. However, it is noted that it is unlikely that the approved RE projects will be constructed at the same time.									

10.1.8 VISUAL

Table 10-10 – Potential Impacts on Visual-(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Visual										
Alteration of landscape	Without Mitigation									
	With Mitigation	2	3	5	4	3	42	**Moderate**	(-)	**Moderate**
	Alteration of the existing rural character of the study area through the introduction of an expanse and visually prominent infrastructure into the landscape **Mitigation Measures:** ■ Employ micro-siting and orientation of turbines and other infrastructure to group with existing infrastructure and already disturbed areas									

10.1.9 SOCIAL

Table 10-11 – Potential Impacts on Social-(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Social										
Sense of Place	Without Mitigation	2	3	3	4	3	36	**Moderate**	(-)	High
	With Mitigation	2	2	3	4	2	22	**Low**	(-)	High
	Mitigation Measures: • The recommendations in the Visual Impact Assessment should be implemented.									
Local Services and Accommodation	Without Mitigation	3	3	1	3	2	20	**Low**	(-)	High
	With Mitigation	2	2	1	2	2	14	**Very Low**	(-)	High
	Mitigation Measures: • The proponent should liaise with the local municipality to address potential impacts on local services.									
Local Economy	Without Mitigation	2	2	1	2	2	14	**Very Low**	(+)	High
	With Mitigation	4	3	1	4	5	60	**Moderate**	(+)	High
	Mitigation Measures: • The proponent should liaise with the PLM to identify potential local economy and business opportunities.									

11 RECOMMENDED LAYOUT

During the course of the EIA phase, the DEIR Assessed layout was refined based on the specialist inputs and recommendations. These changes have led to an updated buildable area and layout (**Figure 11-1** to **Figure 11-4**). Furthermore, the changes have resulted in an updated project description that is outlined in **Table 11-1** below.

Due consideration has been given to the identified sensitivities and mitigation measures proposed during the draft EIA phase, which resulted in a reduction in the number of turbines being proposed for Kromhof from 36 to 18 turbines.

The specialist conclusions on the DEIR Assessed Layout are as follows:

- The layout is considered acceptable from an agricultural perspective. From an agricultural perspective, the proposed development is the preferred alternative between the development and the no-go option.
- From a heritage perspective, 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.
- From a socio-economic perspective, there will be numerous positive impacts that align with legislative an policy frameworks; and any potential negative impacts of the construction and operation phases can be mitigated
- From an avifaunal perspective, the study is situated in close proximity to the Great Escarpment (important for localised movements and actively utilised by soaring birds), high diversity and abundance of red-listed and/or endemic species and high number of priority species nests and roosts (including seven Cape Vulture roosts within 50 km of the WEF), it is apparent that the proposed WEF is situated in an area of considerable avifaunal importance and sensitivity. Although recent advances in mitigation have shown promising results in curbing fatalities, proactive planning to avoid high-risk regions for WEF development should take precedence over costly reactive measures to minimize fatalities.
- From a noise perspective, the layout is considered acceptable subject to the applicant implementing mitigation measures to reduce total noise level below 45 dBA at all NSR.
- From a terrestrial biodiversity perspective, the presence of CBA and ESA land in the LSA is a concern with respects to terrestrial biodiversity management. Even with adjustments to the infrastructure layout, CBA and ESA land will still be directly impacted by proposed Project activities. Additional conservation measures, such as the development of a biodiversity offset programme, will therefore be necessary to offset these CBA and ESA losses.
- From an aquatic biodiversity perspective, potential negative impacts upon the receiving aquatic ecosystems are likely to occur, especially during the rainfall season. Impacts are predicted to range between very low to moderate, however, the project is not fatally flawed and can be considered for environmental authorisation

Table 11-2 outlines the changes to the layout over the course of the project period.

Figure 11-1 illustrates the reduced buildable area now available for the placement of turbines. **Figure 11-2** to **Figure 11-4** illustrate the recommended layout.

The recommended layout has been circulated to the specialists for review and consideration. Specialist letters commenting on the recommended layout will be included in the Final EIAr.

It is important to note that the recommended layout included in this EIAr are not final and is not submitted for approval at this stage. It is recommended that subsequent to the decision-making phase, should environmental authorisation be granted for the Kromhof WEF, a pre-construction walkdown must be undertaken of the recommended layout to facilitate micro-siting and further layout refinement. The EMPr and layout must be amended to include measures as dictated by the micro-siting. The amended EMPr and final layout must be submitted to the DFFE for review and approval prior to the commencement of construction.

Table 11-1 - Proposed new project description for the EIA Phase

Design Specifications	
Total Buildable Area (I.e. likely footprint area)	▪ Approximately 150ha. ▪ (Subject to finalization based on technical and environmental requirements)
Export Capacity	▪ Up to 150MW ▪ (Subject to finalization based on technical and environmental requirements)
Technology	▪ Wind
Number of Wind Turbines	▪ Up to 18
Rotor Diameter	▪ Up to 200m
Hub Height	▪ Up to 150m
Hard Standing Footprint	▪ Up to 0,8ha per turbine
Turbine Foundations	▪ Excavation up to 4.5m deep, constructed of reinforced concrete to support the mounting ring. ▪ Once tower established, footprint of foundation is covered with soil.
Substation	▪ 1 x 33kV/132kV onsite collector substation (IPP Portion), each being up to 2ha.
Powerlines	▪ 33kV cabling to connect the wind turbines to the onsite collector substation, to be laid underground where practical and ecologically acceptable.
Construction camp and laydown area	▪ Construction compounds including site office inclusive of ▪ Concrete Batching plant of up to 1ha ▪ Site office of 4ha ▪ Laydown area of 8ha
Internal Roads	▪ Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14m wide including v-drains and trenching for cabling)
O&M Building	▪ O&M office of up to 1ha.
BESS	▪ Battery Energy Storage System (BESS) (200MW/800MWh). ▪ Pre-assembled solid state batteries ▪ Export Capacity of up to 800MWh

Design Specifications	
	■ Total storage capacity 200MW ■ Storage capacity of up to 6-8 hours The BESS will be housed in containers covering a total approximate footprint of up to 7ha

Figure 11-1 - Layout progression through the project period

LAYOUT ITERATION	TURBINE CAPACITY	MW APPLIED FOR	WGT IN TECH TABLE	WGT IN LAYOUT	MW
Pre-Scoping	5	320	55	55	319.0
Draft Scoping layout	7.5	300	55	40	300
Final Scoping Optimised layout	8	300	55	21	168
DEIR Assessed layout	8	300	36	36	288
Recommended layout (Avoidance of No-Go Areas)	8	200	25	25	200

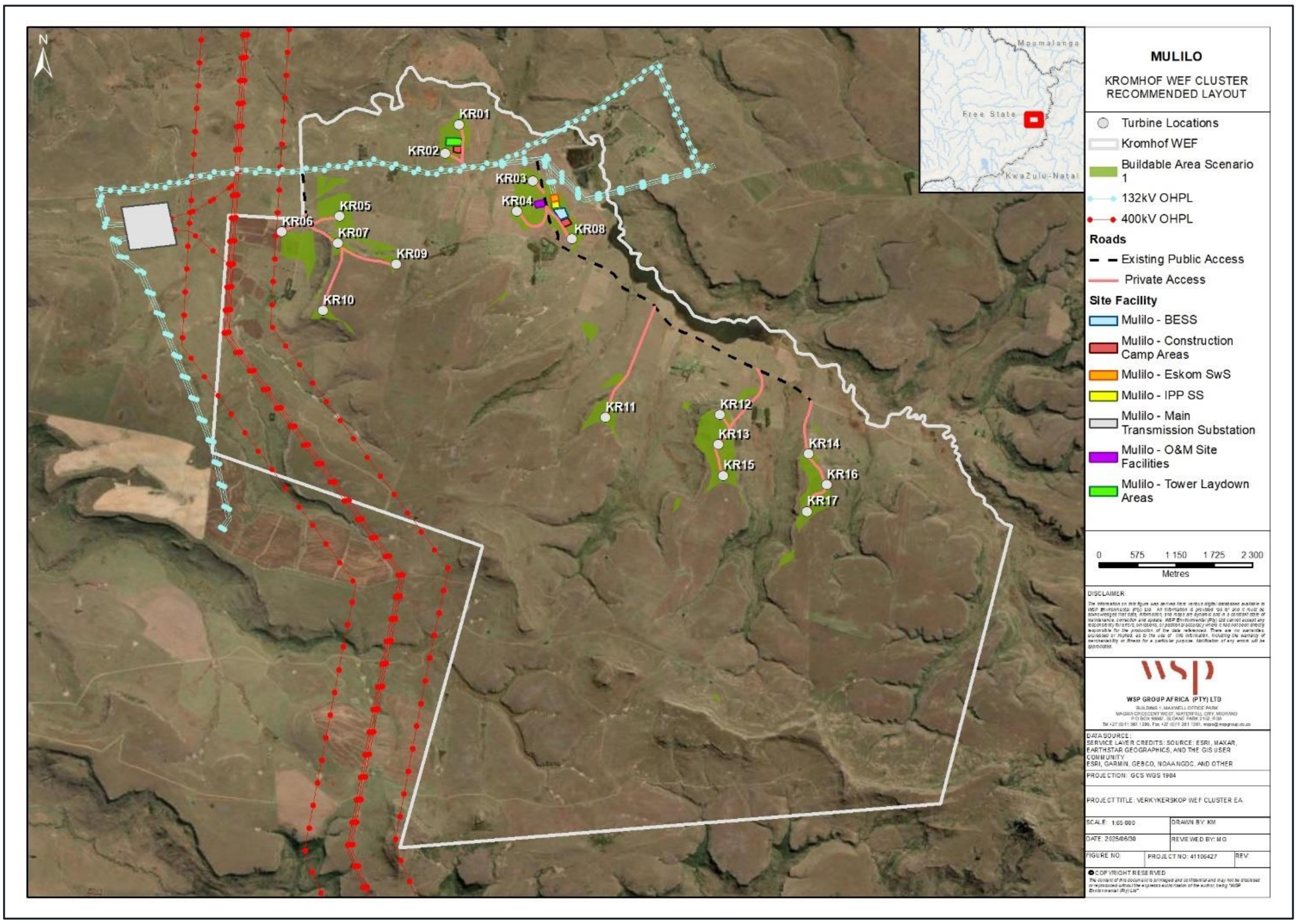

Figure 11-2 – Recommended Layout

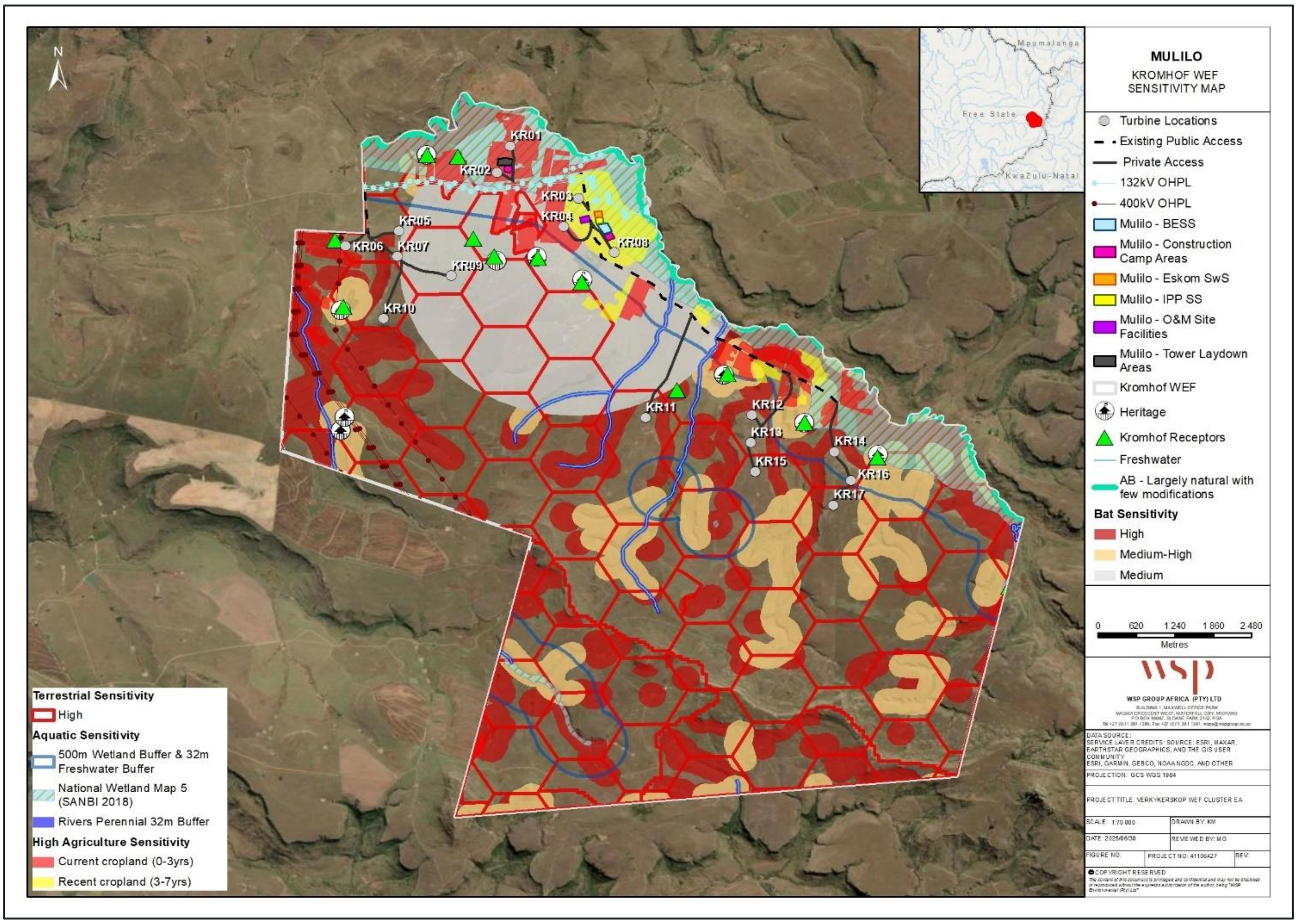

Figure 11-3 – Recommended Layout overlain on the Sensitivity Map

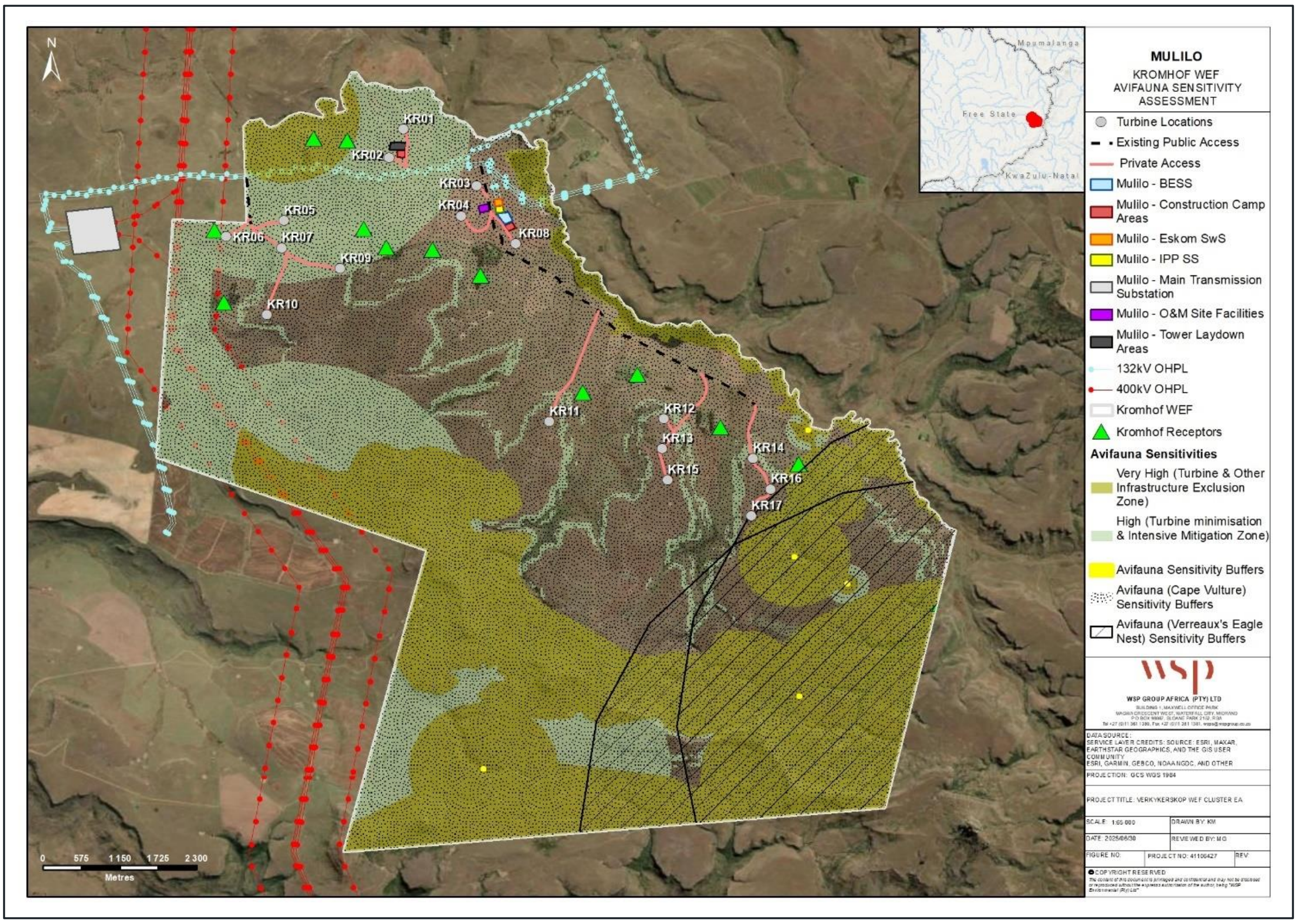

Figure 11-4 – Recommended Layout overlain on the Avifauna Sensitivity Map

It can be confirmed that the mitigation hierarchy has been utilised for the consideration of project impacts. As far as possible, impacts have been avoid or prevented, where this was not feasibly, they have been minimised by the reduction of the buildable area as well as the recommendation of mitigation and management measures for implementation. The goal of the development is to rehabilitate or restore areas back to their original form after project completion. Offsets have also been considered remedy residual negative impacts.

Due to the fact that the recommended layout cannot avoid all CBAs and sensitive areas, 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 on site and the potential residual impacts.

12 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 Final 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 was subject to public review, which was undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The Draft EIA has been updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

12.1 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed project is provided in **Table 12-1**.

Table 12-1 – Impact Summary

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Geotechnical	Soil Erosion	CD	(-)	**Medium**	**Very Low**
	Oil Spillages	CD	(-)	**Medium**	**Very Low**
	Disturbance of fauna and flora	CD	(-)	**Medium**	**Very Low**
	Slope Stability	CD	(-)	**Low**	**Very Low**
	Seismic activity	CO	(-)	**Very Low**	**Very Low**
Terrestrial Biodiversity	Habitat loss	C	(-)	**High**	**Medium**
	Habitat Connectivity and Integrity	CD	(-)	**High**	**Medium**
	Alien Species	CD	(-)	**Medium**	**Low**
	Soil Erosion	CD	(-)	**Medium**	**Low**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Alien Species	O	(-)	**Medium**	**Low**
	Increase in Wildfires	O	(-)	**Medium**	**Low**
Aquatic Biodiversity	Wetland Loss	C	(-)	**Medium**	**Medium**
	Hydrology	CO	(-)	**Medium**	**Low**
	Geomorphology	C	(-)	**Medium**	**Low**
	Water Quality	C	(-)	**Medium**	**Low**
	Vegetation	CO	(-)	**Medium**	**Low**
	Water Quality (Modifications)	C	(-)	**Low**	**Very Low**
	Loss of Habitat	C	(-)	**Medium**	**Low**
	Introduction of alien species	C	(-)	**Medium**	**Low**
	Water Quality (Leakages)	CO	(-)	**Medium**	**Low**
	Flow Regime	CO	(-)	**Low**	**Very Low**
	Establishment of alien species	CO	(-)	**Medium**	**Low**
Plant Biodiversity	Habitat Loss	C	(-)	**High**	**Medium**
	Fragmentation	C	(-)	**High**	**Medium**
	Flora SCC	C	(-)	**Medium**	**Low**
	Establishment of alien species	CD	(-)	**Medium**	**Low**
	Establishment of alien species	O	(-)	**Medium**	**Low**
Animal Biodiversity	Habitat Loss	C	(-)	**High**	**Medium**
	Fragmentation	C	(-)	**High**	**Medium**
	Fauna SCC (Injury and Mortality)	C	(-)	**Medium**	**Low**
	Fauna SCC (Loss of fauna)	C	(-)	**Medium**	**Low**
	Fauna SCC (Injury and Mortality)	O	(-)	**Medium**	**Low**
	Vibrations from wind turbines	O	(-)	**Medium**	**Low**
	Fauna SCC (Injury and Mortality)	D	(-)	**Medium**	**Low**
Avifauna	Loss or Alteration of Habitat	C	(-)	**High**	**Medium**
	Roadkill and other Mortalities	C	(-)	**Low**	**Very Low**
	Sensory Disturbance	C	(-)	**Low**	**Very Low**

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Collisions with turbines	O	(-)	Very High	High
	Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure	O	(-)	High	Moderate
	Sensory Disturbance	O	(-)	High	Moderate
	Effect on Migratory and Congregatory Species	O	(-)	High	Moderate
	Effect on Migratory and Congregatory Species	D	(-)	Low	Very Low
Bats	Bat roosts	CD	(-)	High	Low
	Bat habitat	C	(-)	High	Medium
	Bat fatalities	O	(-)	Very High	Medium
	Ecosystem services	O	(-)	High	Medium
	Bat habitat	D	(-)	High	Low
Archaeological and Cultural Heritage	Heritage Resources	C	(-)	Low	Very Low
Palaeontology	Heritage Resources	C	(-)	Low	Very Low
Traffic	Traffic Impact	CD	(-)	Medium	Low
	Noise & Dust pollution	CD	(-)	Low	Low
	Damage to road surfaces	CD	(-)	Medium	Low
	Traffic Impact	O	(-)	Low	Low
Visual	Airborne dust	CD	(-)	Medium	Low
	Construction activities	CD	(-)	High	Medium
	Presence of turbines, other infrastructure	CD	(-)	Very High	Very High
	Shadow flicker	O	(-)	Low	Very Low
	Blade flicker	O	(-)	Medium	Medium
	Light pollution	O	(-)	High	Medium
Social	Job Creation	C	(+)	Medium	High
	Population Influx	C	(-)	Medium	Low
	Procurement from Local Businesses	C	(+)	Low	Medium
	Loss of Agricultural Land	C	(-)	Medium	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Generate Income for Affected Landowners	C	(+)	Medium	Low
	Community Health, Safety and Security	C	(-)	Low	Very Low
	Noise	C	(-)	Low	Very Low
	Dust	C	(-)	Medium	Low
	Visual	CO	(-)	High	Medium
	Job Creation	O	(+)	Medium	Medium
	Population Influx	O	(-)	Medium	Low
	Procurement From Local Businesses	O	(+)	Low	Medium
	Community Health, Safety and Security	O	(-)	Low	Low
	Energy Generation	O	(+)	Low	Medium
	Noise	O	(-)	Medium	Medium
	Loss of Employment	D	(-)	Medium	Low
	Reduced Community Investment	D	(-)	Medium	Low
	Associated Infrastructure	D	(-)	Medium	Low
Noise	Construction phase impacts of noise on sensitive receptors	C	(-)	Low	Very Low
	Operational phase impacts of noise on sensitive receptors	O	(-)	Medium	Low
	Decommissioning phase impacts of noise on sensitive receptors	D	(-)	Low	Very Low

12.2 SPECIALIST CONCLUSIONS

12.2.1 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 site is classified as ranging from low to high agricultural sensitivity by the screening tool. This assessment confirms the high sensitivity of the screening tool. The verified areas of high sensitivity across the site differ somewhat from those classified as high sensitivity by the screening tool. This assessment verifies those parts of the site which have been assessed as viable croplands, as being of high agricultural sensitivity and the rest of the site as being of medium agricultural sensitivity with a land capability of <8.

The site is fairly mountainous and much of the land across the site has insufficient capability for viable crop production due to terrain and soil limitations (predominantly limited depth and rockiness). There are patches of land that are suitable for viable cropping. The crop-suitable versus unsuitable soils have been identified over time through trial and error. All the sufficiently deep, suitable soils are generally cropped, and uncropped soils that are used for grazing have various limitations, mostly depth limitations, that make them unsuitable for crop production.

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 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 (improved security; improved road network), 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.

Its acceptability is further substantiated because the proposed development will contribute to the country's urgent need for energy generation, particularly renewable energy that has much lower environmental and agricultural impact than existing, coal powered energy generation.

From an agricultural impact point of view, it is recommended that the proposed development be approved. The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions

12.2.2 GEOTECHNICAL IMPACT ASSESSMENT

The desktop assessment of the geotechnical conditions at the proposed development site for Kromhof WEF has shown the site to be generally suitable for the proposed development.

A “negative low to moderate” impact was assessed, from a geotechnical perspective, for the pre-mitigation situation. Post-mitigation, the assessed impact decreases to “negative very low to low”.

A geotechnical site investigation must be undertaken to provide detailed and site-specific geotechnical information for the design of the proposed structures and roads.

The proposed development should, from a geotechnical impact perspective, be authorized. The most significant geotechnical condition that will affect the development is the possibility of hard excavation conditions as shallow rock is anticipated.

12.2.3 TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

The LSA and the broader RSA are characterised by large intact tracts of natural habitat, comprising Natural Dry Grassland, Moist Grassland and Rocky Shrubland.

The prevailing regional vegetation type in the LSA is Eastern Free State Sandy Grassland, which is not listed as a threatened vegetation at a national level, according to the NEMBA Threatened Ecosystems (2021). According to the Free State Biodiversity Sector Plan technical report however, the adjusted/provincial status of Eastern Free State Sandy Grassland is Vulnerable.

In terms of conservation planning, large portions of the LSA are designated as CBA and ESA under the Fee State Biodiversity Conservation Plan (2019). The continued integrity and protection of CBAs is crucial to meet conservation targets, and the functional state of ESAs should not be compromised. The presence of CBA and ESA land in the LSA is therefore a concern with respects to terrestrial biodiversity management.

According to the National Protected Area Expansion Strategy (2018), the entire LSA is mapped as Priority Focus Areas for protected area expansion. Portions of the LSA are also located in the Eastern Free State Escarpment Key Biodiversity Area.

On-site natural habitats 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. Both flora and fauna SCC were recorded on-site during the field programme, and habitat suitability assessments suggest that several other SCC may be present.

The National Web Based Screening Tool rated the Terrestrial Biodiversity Theme for the Project site as ‘Very High’ sensitivity. The findings of this study confirm that patches of undisturbed natural habitat in the LSA have a Very High sensitivity rating.

Several potential negative impacts on terrestrial biodiversity have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. The successful implementation of the recommended mitigation measures presented in this report can effectively manage many of the identified impacts. It is recommended that all mitigation and management measures should be incorporated into the proposed Project’s environmental management plan (EMP).

It is noted however, that even with adjustments to the infrastructure layout, it is likely that CBA and ESA land will still be directly impacted by proposed Project activities. Additional conservation measures, such as the development of a biodiversity offset programme, will therefore be necessary to offset these CBA and ESA losses. A biodiversity offset programme should therefore be developed under consultation with the provincial conservation authority and in line with the NEMBA National Biodiversity Offset Guideline (2023).

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.

12.2.4 AQUATIC BIODIVERSITY

Extensive wetland habitat classified as Floodplain, Channelled and Unchanneled Valley Bottom, or Hillslope Seepage wetlands were identified, delineated and classified within the proposed Kromhof footprint. The Present Ecological State (PES) ranged from pristine systems situated in natural landscapes (Category A) to largely modified (Category D) wetlands with current impacts such as instream dams, agricultural plantations and road crossings. The Ecological Importance and Sensitivity of the wetlands ranged from Moderate to High across the study area.

In terms of the river systems, the drivers of biotic integrity were assessed, including *in situ* water quality and habitat integrity, as well as the response indicators aquatic macroinvertebrates and fish. The results obtained indicate that the Present Ecological State of the associated riverine systems ranged between moderately modified and largely modified. No aquatic species of conservation concern are expected to occur within the PAOI, nor were any recorded within the assessed streams during the field assessment.

To assess potential impacts to the river and wetland features, the project layout was overlayed against the delineated rivers and wetlands. The impact assessment focused on the proposed wind turbines. The road network and grid connections were excluded from this assessment. It was found that all infrastructures remain outside of the delineated rivers (watercourses). The majority of the proposed infrastructure lies outside of the delineated wetland habitats, with the exception of twelve (12) WTGs which extend into wetland boundaries.

Wetland loss associated with the turbine footprints can be avoided if the turbines are shifted to remain fully outside of all wetland habitats. If this can be achieved, this impact will fall away. However, the feasibility to adjusting the layout is currently unknown and therefore the option to avoid this impact has not been considered. If the turbines remain within wetland habitat, but are removed, and the footprints suitably rehabilitated at closure, the duration of the impact will be reduced and the reversibility increased. This rehabilitation measure has been considered in the “with mitigation” scenario, and results in a moderate impact.

The assessment of potential impacts to rivers determined that with appropriate mitigation measures applied, potential impacts can be reduced to low or very low significance. In addition to mitigation measures proposed in this report to address potential impacts, the following actions have been recommended based on the findings of the current study:

- The aquatic biomonitoring programme should be implemented to monitor any changes that occur within the receiving aquatic ecosystems in response to the proposed project activities, thereby allowing for adaptive management of any impacts that monitoring highlights
- The rivers and proposed 25m buffer should be considered as sensitive areas and all proposed infrastructures (WTGs) and the activities planned to remain outside of these areas, though this may not be applicable to linear infrastructure crossings that may be required.
- It is recommended from a best practice perspective that if there is opportunity to shift the turbines that currently fall within wetland habitat to areas outside of the wetland areas, this should be applied in any further design revisions.
- The wetlands and the proposed 30m buffer should be considered as sensitive areas and all proposed infrastructure and the activities planned so as to remain outside of these areas, with the exception of infrastructure that cannot feasibly be shifted.

The proposed Project should adopt a water and habitat quality preservation mindset throughout the life of the Project to prevent the deterioration of the aquatic ecosystems

Based on the findings of the baseline studies and the outcomes of the impact assessment, and assuming that all mitigation, management and monitoring measures are effectively implemented, the impact of the proposed Project components assessed to the aquatic environment is anticipated to be low to moderate. This can be further lowered if it is possible to relocate certain turbines outside of wetland habitat. Therefore, from an aquatic biodiversity perspective the project is not fatally flawed and can be considered for environmental authorisation. All mitigation, management and monitoring measures proposed in this report must be implemented as applicable through the project life cycle.

Should additional information come to light, or should the measures and actions recommended not be fully implementable, the specialist(s) reserve the right to revise the provided specialist opinion.

12.2.5 PLANT SPECIES IMPACT ASSESSMENT

The LSA and the broader RSA are characterised by large intact tracts of natural habitat, comprising Natural Dry Grassland, Moist Grassland and Rocky Shrubland. These habitats comprise important flora habitat.

One threatened flora species on the national Red List was recorded in the RSA during the field survey, namely *Khadia carolinensis* (Vulnerable). This species was recorded in the Normandien WEF site, but it was not recorded in the LSA for this specialist study (i.e. the Kromhof WEF Project site). However, there is suitable habitat Khadia carolinensis present on-site, and it is therefore possible that *Khadia carolinensis* is indeed present in the LSA. Habitat suitability assessments also suggest that a number of other Red List taxa may be present on-site. It is therefore possible that flora SCC may be negatively impacted by proposed Project activities, such as vegetation clearing and earth works.

The National Web Based Screening Tool rated the Plant Species Theme for the Project site as 'Medium' sensitivity. The findings of this study indicate that patches of undisturbed natural habitat have a High sensitivity rating.

Several potential negative impacts on flora species have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. The successful implementation of the recommended mitigation measures presented in this report can effectively manage the identified impacts. 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

12.2.6 ANIMAL SPECIES IMPACT ASSESSMENT

The LSA, as well as the broader RSA, are characterised by extensive tracts of natural mountainous habitat, comprising Natural Dry Grasslands, Moist Grassland and Rocky Shrubland. Various forms of linear infrastructure, such as powerlines, district roads, farm roads and tracks, and numerous farm fences are present and have caused a degree of habitat fragmentation. However, overall habitat connectivity across the landscape remains very high.

Areas of natural habitat in the RSA and LSA therefore provide suitable habitat and a network of movement and dispersal corridors for local fauna species. The continued integrity and functioning of on-site natural habitat is therefore important in maintaining the metapopulation dynamics of local fauna, including SCC.

During the field programme, four mammal SCC were documented in the RSA, including Grey Rhebok (Near Threatened), Serval (Near Threatened), Cape Clawless Otter (Near Threatened) and Brown Hyaena (Near Threatened). Habitat suitability assessments indicate that several other SCC may also be present, including the Spotted-necked Otter, which was highlighted by the DFFE screening tool as potentially sensitive features.

The proposed Project will result in several ecological impacts, which may negatively impact local fauna SCC populations. Several mitigation measures have been recommended in this report to manage the anticipated ecological impacts, and it is recommended that these are incorporated into the proposed Project's environmental management plan report (EMPr).

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.

12.2.7 AVIFAUNA IMPACT ASSESSMENT

At a regional scale, the Kromhof WEF is surrounded by five IBAs (within 30 km radius). Predominantly in recognition of its avifaunal importance, large tracts of intact plateau grasslands (4598 ha) in the southern region of the Kromhof WEF were recently zoned as global KBA (Eastern Free State Escarpment) effectively occupying 63% of the proposed WEF. Additionally, several well-established birding routes traverse the AOI. At a local scale 31 regionally red-listed species (of which 19 are Threatened) have been documented within the proposed Kromhof WEF, a high number in the South African context. The proposed WEF intersects 24 nest buffers of priority species namely Cape Vulture Roosts 1-5, Southern Bald Ibis Roosts 5, 11, 14, 16, 17, 18 and 19, Blue Crane Nests 1-3, Jackal Buzzard Nest 3, Lanner Falcon Nests 2-3, Rock Kestrel Nest 1, and Verreaux's Eagle Nests 2 and 3.

Three key habitats were identified in the proposed Kromhof WEF that are particularly important from an avifaunal perspective and have development implications (in terms of infrastructure exclusion) namely the cliffs and ridges, plateau grasslands and wetlands (particularly along the Muel River floodplain). Several distinct cliffs and ridgelines were identified for their importance in providing nesting and / or soaring habitat for several priority species, of which the Mont Pelaan ridge and the cliffs along the Muel floodplain are considered most significant. This habitat supports four Southern Bald Ibis Roosts (14, 16, 17 and 18), one Rock Kestrel Nest (1), one Jackal Buzzard Nest (3) and one Verreaux's Eagle Nest (4). In terms of grasslands the Kromhof WEF supports some of most extensive and representative plateau grassland habitat to be found within the VWC. The highest and most pristine plateau grassland habitat (associated with the Mont Pelaan ridge along the southern boundary) has been identified as important core habitat for threatened high-altitude grassland species. Most significant in this regard are the breeding populations of Rudd's Lark (Endangered) and Yellow-breasted Pipit (Vulnerable). Both species engage in protracted aerial displays throughout the summer months. The modelled habitat exclusion zones for these species within the proposed WEF are large due to it being; "…*in the core area of occupancy and global hotspot for all three of these endemic, threatened and habitat specialist species. This area hosts some of the highest densities and most intact habitats for these species globally"* (Dr. R. Colyn pers. comm, 2025). The plateau grasslands are also frequently used by Denham's Bustard (Vulnerable) Blue Korhaan (Near-Threatened), Blue Crane (Vulnerable) and Southern Bald Ibis (Vulnerable). Wetlands in the Kromhof WEF provides important habitat for Maccoa Duck, Southern Bald Ibis and all three of South Africa's crane species (Blue Crane, Grey-crowned Crane and Wattled Crane). The recently created dam along the Muel floodplain supports significant congregations of waterbirds (including a heronry) and may reach nationally or potentially globally significant thresholds for certain species. Additionally, a robust, field-validated habitat modelling exercise for Sensitive Species 23 conducted by AfriAvian (2025) revealed a large contiguous network of suitable core wetland patches for the species within the AOI, of which 11 occur within the Kromhof WEF. Their study highlights that "… *the Verkykerskop landscape may function as a critical stepping-stone or movement corridor within the species' fragmented range, further emphasizing the need for precautionary land-use planning and the protection of identified connectivity zones*".

Tracking data from Vulpro and EWT reveal that the Kromhof WEF is actively and extensively utilised by Cape Vulture, White-backed Vulture and Martial Eagle which all showed the greatest flight activity within the potential rotor sweep height range. The Vulpro (2025) data shows significant triangulation between the various roosts in the area and reveals the regular use of at least one favoured overnight pylon roosts occur in the Kromhof WEF which has been observed to host up 235 birds. The EWT (2025) Martial Eagle tracking report concluded that "*the tracked adult Male Martial Eagle, Brad, extensively utilises the project site, putting this individual at significant risk of turbine collisions, particularly within its core ranges (5-6 km from the active nest)*". Considering the sensitivity of the WEF for vultures as evidenced through the pre-construction monitoring data, supported by Vulpro tracking data and as indicated in the high SABAP2 reporting rates for the pentads as well as the Vulture Theme of the National Environmental Screening Tool (high), it is our informed opinion that the project poses a significant and direct risk to vultures through collision with turbines.

The main impacts anticipated for avifauna at Kromhof WEF involve habitat loss, collisions and cumulative effects (all of which have a high residual impact significance). Habitat loss has significant potential implications for threatened high-altitude grassland species such as Rudd's Lark which are patchily distributed and have a small extent of occurrence on a global scale. Any loss of there already restricted range should be considered significant and any loss of core breeding habitat should be avoided all together. In terms of collision risk Southern Bald Ibis, Cape Vulture, Amur Falcon and Jackal Buzzard stand out from a passage rate perspective. In terms of Southern Bald Ibis four breeding roosts have buffer implications for the Kromhof WEF. For Cape Vulture, seven distinct roosts on separate inselbergs have been identified within a 50 km radius of the Kromhof WEF. These include five to the south of the project area one to the west and one to the north-west. Of these, successful breeding was confirmed at Roost 3 on Nelson's Kop (27 km south-west). A strong seasonal variation in their flight activity was uncovered with flight activity peaking significantly in summer. Migratory Amur Falcon visit the WEF during the summer to forage and congregate annually along the Muel River floodplain where they perch in large numbers on the powerlines and trees. A pair of Jackal Buzzard breed at Nest 3 near VP 9 and thus the species is well represented in the flight path data and susceptible to collision, particularly in the eastern regions of the WEF. Additionally, in-field observations suggest that Yellow-breasted Pipit and Rudd's Lark may also be prime candidates for collision from a flight duration perspective, particularly in the summer months due to their breeding behaviour which involves protracted aerial displays at potential rotor sweep height. Predicted fatality rates (assuming 98% avoidance) are high. Lastly noise generated by the turbines is highlighted as a potentially significant impact for threatened songbirds. In this regard two species namely Rudd's Lark, and Yellow-breasted Pipit are particularly susceptible due to a combination of their Threatened status and call-dependant breeding behaviour. There are currently no operational wind energy facilities on high-altitude plateau grasslands associated with the Great Escarpment in the eastern Free State and the magnitude of collision risk to many of these species which occupy these areas remains unchartered territory. Considering the high degree of overlap between wind resources and the dense occurrence of threatened species along the Great Escarpment the cumulative impact of establishing wind farms in this region is anticipated to have a high cumulative impact over the long term.

Given the largely intact, high-altitude grassland nature of the project area, its close proximity to the Great Escarpment (important for localised movements and actively utilised by soaring birds), high diversity and abundance of red-listed and/or endemic species and high number of priority species nests and roosts (including seven Cape Vulture roosts within 50 km of the WEF), it is apparent that the proposed WEF is situated in an area of considerable avifaunal importance and sensitivity. Aside from the high collision potential posed to several Threatened soaring birds, another significant consideration at the proposed Kromhof WEF is the large proportion of the WEF identified as being core habitat for Threatened grassland (e.g. Rudd's Lark and Yellow-breasted Pipit) and wetland species (e.g. Sensitive Species 23) which significantly limits avoidance options.

Overall, based on robust, field-verified habitat modelling, intensive long term flight activity data (>2 years monitoring) and projected fatality rates it is the specialist's informed opinion that (in spite of micro-siting and mitigation) the establishment of wind turbine generators (and associated infrastructure) in this area poses a significant residual risk to several Threatened species through habitat alteration and collision with turbines and associated infrastructure. It is cautioned that significant mortalities of multiple Threatened species are likely to occur annually. Although recent advances in mitigation have shown promising results in curbing fatalities, proactive planning to avoid high-risk regions for WEF development should take precedence over costly reactive measures to minimize fatalities.

12.2.8 BAT MONITORING AND IMPACT ASSESSMENT

Under the current 36-turbine layout for the Kromhoff WEF, as shown in Figure 16, three turbines (WTG 57, WTG 60, and WTG 66) will encroach on High sensitive areas, and therefore need to be removed or shifted. Three turbines will encroach on Medium-High sensitive areas and, therefore, should be shifted slightly where possible, or removed. Eleven turbines intercept the Medium sensitive buffer around the VK5 monitoring location where high bat activity was recorded and, therefore, will require bat fatality mitigation.

Given the high recorded level of bat activity around the cluster, bat fatality mitigation is essential for the proposed Kromhof WEF, and the Verkykerskop WEF cluster. 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 high standard operational bat fatality and activity monitoring, and possible additional bat fatality mitigation – should the need for this arise.

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.

12.2.9 HERITAGE

The larger region around Verkykerskop is characterised by Later Iron Age stone walled sites likely an indicator of Batlokwa and Basia occupation with a memorial stone which commemorates the burial sites of at least eight Batlokwa chiefs situated near Verkykerskop on the farm Morgenlicht 869 which was declared a Provincial Heritage Site.

The landscape is dominated by fairly mountainous regions covered in a thick grass cover. The project area consists of mainly agricultural activities such as cattle and sheep farming as well as cultivated crops such as maize. Portions of the Project area were not accessible and the whole Kromhof WEF footprint was not covered during the survey. Within the surveyed areas, heritage resources were limited to a burial site (VK017) and a degraded circular enclosure (VK018). These two recorded features will not be impacted by turbines on the current layout. Due turbine optimisation after the initial survey and accessibility restraints, a Heritage Walk-Down of the final optimised turbine positions and final infrastructure development footprints will be required. On the 1971 topographic maps, structures are illustrated by a proposed optimised turbine (Mynburg 3) position (Figure 7.10 of **Appendix G.9**). These structures may be of Historical age and will be further assessed during the Heritage Walk-Down.

According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area of insignificant, moderate, and very high palaeontological sensitivity, and an independent study was commissioned for this aspect (Bamford 2025). A Fossil Chance Find Protocol should be added to the EMPr.

The impact to known heritage resources is expected to be low provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) ’s approval.

12.2.9.1 Recommendations for condition of authorisation

The following recommendations for Environmental Authorisation apply and the Project may only proceed based on approval from SAHRA:

- The final turbine positions will be subject to a Heritage Walk-Down prior to construction to ensure no heritage resources will be adversely affected;
- Although not impacted, burial site VK017 must be indicated on development plans and avoided with a 30m buffer zone;
- A Heritage Site Management Plan should be compiled for the sites within the Verkykerskop Cluster;
- 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 palaeontological chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9.

12.2.10 PALAEONTOLOGICAL IMPACT ASSESSMENT

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. Outcrops of the Beaufort Group (Normandien, Verkykerskop and Driekoppen Formations) in other parts of the country have fossil vertebrates and plants so there is a chance that they also occur in this area. The site visit and walk through in late August 2024 (winter), however confirmed that there were NO FOSSILS in the project footprint. There is a chance that fossils may occur below the ground surface in the mudstones, siltstones or shales of the Beaufort Group rocks so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations and infrastructure have commenced then they should be rescued, SAHRA informed and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, as far as the palaeontology is concerned, so the project should be authorised.

12.2.11 TRAFFIC IMPACT ASSESSMENT

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Kromhof WEF project were identified and assessed.

- The main impact on the external road network will be during the construction and decommissioning phases. This phase is temporary in comparison to the operational phase. The number of abnormal load vehicles was estimated and found to be accommodated by the road network including the recommended mitigation measures.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be of moderate negative impact. With mitigation measures, a rating of low negative significance was given.
- During operation, it is expected that some permanent staff and irregular maintenance trips visit will occur. The generated trips can be accommodated by the external road network and the impacts were rated low negative.
- The traffic generated during the decommissioning phase will be similar to or even less than the construction phase traffic and the impact on the surrounding road network was considered to be of low negative significance with mitigation.
- The other projects within a 50 km radius from the project site as listed in this report were taken into consideration for the cumulative impact. Mitigation measures would be important and can reduce the impact. The cumulative impact can then be rated as low negative with the mitigation measures.

The overall mitigation measures mentioned in the construction and decommissioning phases are:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access roads to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.
- The use of existing licensed quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place.
- If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes, will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.
- The haulage company is to provide evidence to the Contractor and the Developer that any affected overhead lines have been moved or raised.
- The preferred route should be surveyed by the developer to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification). After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. The “dry-run” should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.
- The Contractor needs to ensure that any gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design of any access and internal site roads according to the relevant design standards (i.e., SANRAL or Provincial guidelines, depending on the road the access is located on).

The construction and decommissioning phases of a wind energy facility are the only significant traffic generators. The duration of these phases is of a temporary nature, i.e., the impact of the WEF on the external traffic on the surrounding road network is temporary and operational WEFs not add significant traffic to the road network.

The proposed development of the Kromhof WEF and associated infrastructure is supported from a traffic engineering perspective, provided that the recommendations and mitigation contained in this report are adhered to.

12.2.12 VISUAL IMPACT ASSESSMENT

The Kromhof WEF project site is located in a rural setting, with limited areas of low-impact agricultural activity. The study area is sparsely populated with only farmsteads, isolated tourist attractions and small settlements occurring here, and the larger towns located further away from the site. As such, the potential visual receptor base to the proposed development is somewhat limited but diverse. Furthermore, the visual resource value of the site within the context of the surrounding study area is very high, owing mainly to the low prevailing levels of development, highly characteristic topography, and largely intact Highveld grassland cover, and furthermore also has a low ability to absorb visual change.

The proposed project will introduce numerous very tall and highly visible turbines and other associated infrastructure into the landscape. The presence of these elements will influence the prevailing rural character of the study area and may be deemed visually detrimental within the context of the existing visual setting, depending on the predisposition of individual receptors. Limited visual mitigation is likely to feasible and mainly relevant to the construction and decommissioning phases, as proposed in the specialist report (see **Appendix G.12**). The significance of the identified visual impacts was assessed and were determined to range from high to very high, with the most detrimental visual impacts associated with the presence of the turbines during the operational phase.

However, the visual impacts of the project, which are largely social in nature, should be weighed against other social and economic considerations to determine whether the project should be supported. Based on the fact that the project study area is located in a larger area with similar rural characteristics, and the ongoing and urgent need to secure additional power generation capacity for the country, it is recommended that, from a visual perspective, the project be supported, provided that the required visual mitigation measures be implemented.

12.2.13 SOCIAL IMPACT ASSESSMENT

The proposed development aligns with legislative and policy frameworks. The Project will create employment, training, and business opportunities during the construction and operation. As detailed above, the potential negative impacts of the construction and operation phases can be mitigated.

The proposed development will also represent an investment in clean, renewable energy infrastructure for the country, which will offset the negative environmental and socio-economic impacts of coal-based fossil fuel energy generation. Renewable energy also addresses climate change and assists the country in meeting its climate change reduction goals.

Construction, operation, and decommissioning phase impacts have been rated as medium negative and medium positive, respectively. As shown in **Table 12-1** below, if mitigation measures are implemented, it is anticipated that the consequence and probability of the negative impacts will be reduced. Given the above, it is strongly recommended that the mitigation measures described in this report be incorporated into the proposed Project's Environmental and Social Management Plan. Additionally, measures must be put in place to monitor and assess the implementation of these mitigation measures and take corrective action where necessary.

12.2.14 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 LA90 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 LA90 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 Kromhof WEF being located within a low noise environment a combination of the IFC and ETSU methodology was followed in this assessment.

Twenty-one sensitive receptors (farmhouses) were identified within 2 km of the Kromhof WEF site.

Of these receptors, twelve are located within the Project boundary (onsite) and nine are located outside of the Project boundary (offsite). 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 nine of the 21 receptors.
- However, being a low noise environment, with reference to the ETSU daytime limit range of 35 – 40 dB(A), LA90 noise levels at thirteen of the 21 receptor locations are below this threshold. Additionally, at night, LA90 levels at seventeen of the 21 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 to all onsite receptors. Predicted LA90 noise levels at all onsite receptor locations, except for Rec 09 and Rec 10, 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 at the offsite receptors. Predicted LA90 noise levels at all offsite receptors, except for Rec 21, are below the ETSU 40 dB(A) threshold.
- Based on the above, complaints may be anticipated at Rec 09, Rec 10 and Rec 21. It is therefore recommended that:
  - The closest wind turbines to the onsite receptors Rec 09 and Rec 10 be located slightly away from the receptors, so that noise levels remain below the incentivised 45 dB(A) threshold.
  - The closest wind turbines to offsite receptor Rec 21 be slightly relocated north-westwards away from this receptor, so that the noise levels remain below the 40 dB(A) threshold; or
  - Receptor 21 be offered incentives so that the 45 dB(A) threshold can apply as noise levels at this location are below such a threshold for this current layout.

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 09, 10 and 21. Should the nearby turbines be relocated slightly, or financial incentives provided to Rec 21, impacts are anticipated to become "low".

From an environmental noise perspective, it is therefore advised that the Kromhof WEF be authorised, provided one of the above recommendations is applied.

12.2.15 HIGH LEVEL SAFETY HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

- **. General**
  - 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 Groothoek WEF 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. (Refer to tables in section 4 under preventative and mitigative measures). 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.
  - For most projects, from an acute health and safety point of view, the No-Go option will usually be a preferred option since there are no immediate health and safety risks associated with not doing a project, i.e. no one can get hurt if something does not exist. However, some projects aim to reduce adverse effects elsewhere and can be viewed at offsetting either current or future risks. In this case, renewable energy projects should help to mitigate possible adverse impacts of climate change, create jobs and contribute to sustainable energy, i.e. the project risks are offset against future social risk reduction
- **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, radiation impacts at the closest isolated farmhouses 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, explosion impacts at the closest isolated farmhouses 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 Groothoek WEF, 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 Groothoek WEF, the BESS location is over 500m from any water course and 80m from any borehole/water reservoir 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. (Refer to tables in section 4 under preventative and mitigative measures).

- **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

12.3 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 12-2 outlines the preferred alternatives considered feasible and preferred from an environmental perspective (that is, as per the input from the Specialists).

Table 12-2 – Preferred Site Alternatives

Alternative	Preferred	Comment
Site	Kromhof WEF ▪ Remaining Extent of Farm Leiden No. 2 ▪ Remaining Extent of Farm Myn-Burg No. 3 ▪ Remaining Extent of Farm Naauw Kloof No. 4 ▪ Remaining Extent of Farm Krom Hof No. 530 ▪ Remaining Extent of Farm Puntje No. 1240 ▪ Remaining Extent of Farm Aanfield No. 253 ▪ Portion 1 of Farm Aanfield No. 253 ▪ Remaining extent of Farm Ox Hoek No. 98 ▪ Portion 1 of Farm Ox Hoek No. 98 ▪ Portion 2 of Farm Ox Hoek No. 98 ▪ Portion 3 of Farm Ox Hoek No. 98 ▪ Remaining Extent of Farm Markgraaff's Rest No. 478	There is no site alternative for the Kromhof WEF. The location of the project infrastructure was subjected to a site selection process as described in **Section 5**.
Activity	Wind Technology	Wind technology has been identified as the preferred activity in terms of generating electricity from a renewable resource.
Layout and Design	Recommended Layout (25 turbines)	The Kromhof WEF layout, including the associated infrastructure was revised during the EIA Phase based on the specialist assessment and recommendation. The turbine layout was further revised in order to avoid sensitive features and buffer areas, which has resulted in a reduced buildable area and a reduction in the number of turbines from 36 to 25. It is recommended that this layout is not approved, pending a pre-construction

Alternative	Preferred	Comment
		walkdown and micro-siting to further enhance the avoidance of sensitive areas.
BESS	Pre-assembled solid-state batteries	▪ 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. ▪ Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. ▪ There are no fatal flaws associated with the proposed Kromhof battery installation for either technology type.

12.3.1 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 Kromhof WEF would be avoided, and the current status quo will continue. This includes continued use of the land for agriculture.

Should development not proceed, the current poor land management would continue, therefore, current impacts such as overgrazing by cattle, fire patterns, and control the spread of alien invasive could not be mitigated resulting in further degradation to the study area.

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

- **Agricultural Agro-Ecosystem Assessment**

Specialist assessments for environmental authorisation are required to include a comparative assessment of alternatives, including the no-go alternative. 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 option. 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.

- **Terrestrial Biodiversity Assessment:**

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, along with current flora SCC, will likely remain unchanged.

- **Plant Species Assessment:**

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, along with current flora SCC, will likely remain unchanged.

- **Animal Species Assessment:**

Should the proposed Project not proceed, the existing agricultural practices (i.e., crop cultivation, cattle, and sheep farming) will persist across the LSA. Consequently, the condition and character of on-site natural habitat, along with current fauna populations, including SCC, will remain unchanged.

- **Avifaunal Assessment:**

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, will likely remain unchanged.

- **Bat Assessment:**

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 2 m 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.

- **Heritage Impact Assessment:**

No alternatives were provided, but the area assessed allows for siting of the development to avoid impacts to heritage resources.

- **Palaeontological Impact Assessment:**

There are no ‘no-go’ areas because the fossils, if present, can be removed and curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.

- **.Traffic Impact Assessment:**

This alternative considers the option of ‘do nothing’ and maintaining the status quo. Should the proposed activity not proceed, the site will remain unchanged. 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.

- **Visual Impact Assessment:**

From a visual perspective, the “no-go” alternative, i.e. whereby the Kromhof Project will not be developed, would mean that none of the project elements that may be deemed visually detrimental would be introduced into the landscape and thereby retaining the existing visual character and associated resource value of the project site. It is noted that the project area has very low existing levels of development, a distinct and definable rural character, and high visual resource value of the ridges and low cliffs that characterise the site. It is also unlikely that significant visual mitigation could be implemented should the project proceed, given the great height of the turbines and the nature of the project technology.

- **Noise Impact Assessment:**

From a noise perspective, should the proposed Project not go ahead, the status quo will remain the same.

- **Health, Safety and Environment Risk Assessment:**

For most projects, from an acute health and safety point of view, the No-Go option will usually be a preferred option since there are no immediate health and safety risks associated with not doing a project, i.e. no one can get hurt if something does not exist. However, some projects aim to reduce adverse effects elsewhere and can be viewed at offsetting either current or future risks. In this case, renewable energy projects should help to mitigate possible adverse impacts of climate change, create jobs and contribute to sustainable energy, i.e. the project risks are offset against future social risk reduction.

12.4 UPDATED PROJECT DESCRIPTION

These changes have led to an updated project description that is outlined in **Table 12-3** below.

Table 12-3 – Proposed new project description for the EIA Phase

Design Specifications	
Total Buildable Area (I.e. likely footprint area)	▪ Approximately 150ha. ▪ (Subject to finalization based on technical and environmental requirements)
Export Capacity	▪ Up to 150MW ▪ (Subject to finalization based on technical and environmental requirements)
Technology	▪ Wind
Number of Wind Turbines	▪ Up to 18
Rotor Diameter	▪ Up to 200m
Hub Height	▪ Up to 150m

Design Specifications	
Hard Standing Footprint	Up to 0,8ha per turbine
Turbine Foundations	Excavation up to 4.5m deep, constructed of reinforced concrete to support the mounting ring. Once tower established, footprint of foundation is covered with soil.
Substation	1 x 33kV/132kV onsite collector substation (IPP Portion), each being up to 2ha.
Powerlines	33kV cabling to connect the wind turbines to the onsite collector substation, to be laid underground where practical and ecologically acceptable.
Construction camp and laydown area	Construction compounds including site office inclusive of Concrete Batching plant of up to 1ha Site office of 4ha Laydown area of 8ha
Internal Roads	Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14m wide including v-drains and trenching for cabling)
O&M Building	O&M office of up to 1ha.
BESS	Battery Energy Storage System (BESS) (200MW/800MWh). Pre-assembled solid state batteries Export Capacity of up to 800MWh Total storage capacity 200MW Storage capacity of up to 6-8 hours The BESS will be housed in containers covering a total approximate footprint of up to 7ha

12.5 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 below-listed conditions are proposed for inclusion in the EA, based on the guidance provided in the draft National Biodiversity Offset Guideline:

- The EA holder must select a biodiversity offset site(s) from the identified candidate portfolio that is sufficient to meet the targets for offset, to be confirmed based on the footprint of the final design (to be determined post EA).
- Only in situations that the proposed offset sites within the LSA are not feasible can the EA holder select a biodiversity offset site that is not identified in the Biodiversity Offset Report but still meets the requirements for a biodiversity offset under the circumstances – in this situation, the guidance of the relevant conservation planning authority, i.e. DESTEA, DFFE will be sought.
- A request for the declaration of the chosen biodiversity offset site as a protected area should be submitted to the Minister or an MEC. Other means of securing the biodiversity offset site (such as the registration of a conservation servitude) may be pursued if the Minister or MEC refuses to declare a protected area under the circumstances.
- A Biodiversity Offset Management Plan must be prepared for the biodiversity offset site and incorporated into the EMPr or a Biodiversity Offset Implementation Agreement.
- A Biodiversity Action Plan (BAP) should be prepared for the Project, subsequent to the finalised layout, in consultation with the relevant authorities and conservation organisations.
- A Water Use License must be obtained for road crossings in wetlands, and the need for an offset investigated as part of the Water Use License Application (WULA) process.
- The duration of the liability period for is at least 30 years or as long as the duration of the authorised activity, whichever is longer.

The following specialist recommendations have been made in respect of the project and have been included in the EMPr (**Appendix I**):

- Agricultural Potential
  - There are no agricultural no-go areas that need to be strictly avoided by all wind farm infrastructure. No buffers apply. In terms of the allowable development limits of the agricultural protocol, wind farm infrastructure is allowed to occupy croplands, if necessary, but only up to a certain limit. It is often necessary, due to spacing, that certain turbines be located within croplands. However, other wind farm infrastructure should generally be located outside of croplands, wherever possible.
- Geotechnical impact
  - A geotechnical site investigation must be undertaken to provide detailed and site-specific geotechnical information for the design of the proposed structures and roads.
- Terrestrial Biodiversity Impact Assessment
  - Several potential negative impacts on terrestrial biodiversity have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. The successful implementation of the recommended mitigation measures presented in this report can effectively manage many of the identified impacts. It is recommended that all mitigation and management measures should be incorporated into the proposed Project's environmental management plan (EMP).
  - It is noted however, that even with adjustments to the infrastructure layout, CBA and ESA land will still be directly impacted by proposed Project activities. Additional conservation measures,

such as the development of a biodiversity offset programme, will therefore be necessary to offset these CBA and ESA losses. A biodiversity offset programme should therefore be developed under consultation with the provincial conservation authority and in line with the NEMBA National Biodiversity Offset Guideline (2023).

- 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.

- Aquatic Ecology Impact Assessment
  - The developed Aquatic Biomonitoring Programme must be adopted as specified.
  - The rivers and proposed 25m buffer should be considered as sensitive areas and all proposed infrastructures and the activities planned to remain outside of these areas, though this may not be applicable to linear infrastructure crossings that may be required.
  - It is recommended from a best practice perspective that if there is opportunity to shift the turbines that currently fall within wetland habitat to areas outside of the wetland areas, this should be applied in any further design revisions.
  - The wetlands and the proposed 30m buffer should be considered as sensitive areas and all proposed infrastructure and the activities planned so as to remain outside of these areas, with the exception of infrastructure that cannot feasibly be shifted.
  - The proposed Project should adopt a water and habitat quality preservation mindset throughout the life of the Project to prevent the deterioration of the aquatic ecosystems.
- Plant Species Assessment
  - Several potential negative impacts on flora species have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. The successful implementation of the recommended mitigation measures presented in this report can effectively manage the identified impacts. 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.
- Animal Species Assessment
  - The proposed Project will result in several ecological impacts, which may negatively impact local fauna SCC populations. Several mitigation measures have been recommended in this report to manage the anticipated ecological impacts, and it is recommended that these are incorporated into the proposed Project's environmental management plan report (EMPr).
  - 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.

- Heritage Impact Assessment
  - The optimised turbine situated within the extent of VK009 should preferably be moved to avoid the site with a 30m buffer zone;
  - If avoidance is not possible, Phase 2 archaeological mitigation will be required including recording, mapping and possible excavations prior to applying for a destruction permit;
  - Although not directly impacted, burial site VK008 and a large LSA rock shelter with lithics VK010 must be avoided with a 30m buffer zone;
  - Additionally, ongoing impact on the rock shelter VK010 by the farm owner must cease immediately to preserve the rock art;
  - The final development footprint (including turbine positions, access roads and laydown areas) must be subject to a Heritage Walk-Down to ensure no heritage resources will be adversely affected;
  - A Heritage Site Management Plan should be compiled for the identified heritage sites within the Verkykerskop Cluster;
  - 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 palaeontological chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9
- Health, Safety and Environment Risk Assessment
  - There are numerous different battery technologies, but using one consistent battery technology system for the BESS installations associated with all the developments in the Verkykerskop Cluster would allow for ease of training, maintenance, emergency response and could significantly reduce risks.
  - 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 Groothoek battery installation for either technology type.
  - The tables in Section 4 of this report contains technical and systems suggestions for managing and reducing risks. Ensure the items listed in these tables under preventative and mitigative measures are included in the design.
  - 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. The battery supplier should be able to provide guidance as well as technical proof that the proposed container to container separation distances are adequate. Suitable separation must also be ensured between the BESS containers and other onsite facilities such as transformers, O&M areas, any high voltage overhead powerlines etc. In this regard there are National Fire Protection Agency (NFPA - USA) and Eskom guidelines.
- 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.

12.5.1 FINALISATION OF THE EMPR AND LAYOUT

It is important to note that the EMPr (**Appendix I**) and project layout included in this EIR are not final and although included in this EIR, these are not submitted for approval at this stage. Subsequent to the decision-making phase, if environmental authorisation is granted for the Kromhof WEF, the EMPr must be amended to include measures as dictated by the final layout map and micro-siting, including the requirements of the EA. The amended EMPr and final layout subjected to micro-siting will be submitted to the DFFE for review and approval following detailed design.

The following conditions are requested to be included in the EA:

- The layout submitted in the final EIR is not considered final. A copy of the final site layout map must be made available for comments to the registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final development layout map must be submitted to the DFFE for written approval prior to commencement of the activity. Existing infrastructure must be used as far as possible e.g., roads.
- The Final layout map must indicate the following:
  - The position of the wind turbines,

- All associated infrastructure,
- Powerline and the coordinates,
- Onsite Substation and the coordinates,
- The BESS and the coordinates,
- Operations and maintenance (O&M) building infrastructure
- The proposed internal road (length and width),
- Construction laydown areas, buildings and their coordinates,
- All sensitive features, i.e., graves, CBA, wetlands, etc., and
- All "no-go" and buffer areas.

- The EMPr submitted as part of the EIAr is not submitted for approval and must be amended to include measures as dictated by the final site lay-out map. The EMPr must be made available for comments by registered Interested and Affected Parties and the holder of the environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the DFFE for written approval prior to commencement of the activity. Once approved the EMPr must be implemented and adhered to.

The EMPr must be implemented and strictly enforced during all phases of the project. It shall be seen as a dynamic document and shall be included in all contract documentation for all phases of the development when approved.

12.6 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.

13 CONCLUSION AND WAY FORWARD

The overall objective of the EIA 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.

In assessing the environmental feasibility of the Kromhof WEF, the requirements of all relevant legislation have been considered. The identification and development of appropriate management and mitigation measures that should be implemented in order 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 EIA process has found that the proposed project will involve activities which will lead to a number of direct and indirect negative impacts on the biophysical and socio-economic environment. These impacts were found to vary in terms of their consequence and probability. Positive impacts are limited to the creation of employment opportunities and other socio-economic benefits as a result of the multiplier effect. This includes the potential to improve energy security in South Africa, increase the generation of renewable energy and reduce the reliance on coal powered energy to meet the country's electricity demand. Positive impacts also include the potential recovery, removal and placement of fossils in a recognised institution (if uncovered).

The Kromhof WEF is located in an area that supports extensive areas of natural grassland and wetland habitat, some of which has been defined as CBAs in the Free State Biodiversity Sector Plan (FSBSP). In addition, populations of bird species of conservation concern (SCC) (e.g. Southern Bald Ibis, Species 23, Blue Crane, Secretary bird, Yellow-breasted Pipit, Gurney's Sugarbird, Denham's Bustard, White-bellied Korhaan) are also present. A high residual impact remains due to the risk of collision with wind turbines. Therefore, the implementation of a Biodiversity Offset as part of the Mitigation Hierarchy, should the project be approved and the layout has been finalised is recommended.

Avoidance has been demonstrated, resulting in a reduced footprint that considered all specialist inputs including the avoidance of critical no-go areas. Furthermore, stringent mitigation measures have been proposed. The anticipated Project interaction with these factors (habitat loss, collision mortality of bird species of concern) is expected to result in moderate to high residual impacts, which then require offset. The project will be required to commit to Environmental Duty of Care and any contraventions subject to suitable consequences.

Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix I**). The mitigation measures are necessary to ensure that the project is planned, constructed and operated in an environmentally responsible manner. It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced. It is the applicant's responsibility to ensure that this EMPr is made binding on the contractor by including the EMPr in the contract documentation.

It is the opinion of WSP that the information contained in this document is sufficient for the DFFE to make an informed decision for the environmental authorisation being applied for in respect of this project. For the majority of environmental themes, negative environmental impacts associated with the proposed Kromhof WEF can be mitigated to acceptable levels. It is therefore the opinion of the EAP that the project can be authorised, provided that the outlined mitigation measures of the S&EIA process, this EMPr and the Biodiversity Offset Strategy are implemented effectively.

It must be noted that the Kromhof WEF has been awarded Strategic Infrastructure Project (SIP) Status. Proof of award is included in Appendix J.

WAY FORWARD

Kromhof Wind Power (Pty) Ltd is proposing the development of the 150MW Kromhof WEF located near Harrissmith, Free State. 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 DEIR will be available for public review from **02 July 2025** to **01 August 2025**.

All issues and comments submitted to WSP during the scoping phase have been incorporated in the PPR (**Appendix C**). The Final 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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