IMPUMELELO WIND (PTY) LTD

PROPOSED IMPUMELELO UP TO 132KV OVERHEAD POWERLINE AND SUBSTATION NEAR SECUNDA, MPUMALANGA

DRAFT BASIC ASSESSMENT REPORT

23 March 2023

DRAFT

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IMPUMELELO WIND (PTY) LTD

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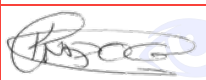
Signature	 Digitally signed by Naidoo, Kavilan (ZAKN05267) DN: cn=Naidoo, Kavilan (ZAKN05267), ou=Active, email=Kavilan.Naidoo@wsp.com Date: 2023.03.17 08:56:05 +02'00'			
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This Draft Basic Assessment Report (report) for the proposed Impumelelo up to 132 kV Grid Connection Transmission Line has been prepared by WSP Group Africa Proprietary Limited (WSP) on behalf and at the request of Impumelelo Wind Proprietary Limited (Client), as part of the application process for Environmental Authorisation.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

DOCUMENT DESCRIPTION

CLIENT

Impumelelo Wind (Pty) Ltd

PROJECT NAME

Impumelelo up to 132 kV Grid Connection, Secunda, Mpumalanga

REPORT TYPE

Draft Basic Assessment Report

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EXECUTIVE SUMMARY

Impumelelo Wind (Pty) Ltd (the Applicant) is proposing the development Impumelelo Wind Energy Facility (WEF) located approximately 19 km North-East of the Town of Greylingstad in the Mpumalanga Province. The proposed project will be applied for under a Special Purpose Vehicle (SPV), and the Project Applicant is Impumelelo Wind (Pty) Ltd. This report is specific to the up to 132kV Grid Connection (inclusive of an overhead powerline (OHPL) and substation).

In order for the proposed project to proceed, it will require an Environmental Authorisation (EA) from the Competent Authority (CA) (i.e. the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA).

PROJECT OVERVIEW

The proposed Project is located in the Dipaleseng and Govan Mbeki Local Municipality under the jurisdiction of the Gert Sibande District Municipality, near the town of Secunda, in the Mpumalanga Province of South Africa (**Figure 4-1**). The proposed Project entails the construction of a 132 kV OHPL from the onsite substation at the proposed Impumelelo WEF to connect to the Eskom Zandfontein Substation. The project area traverses 45 farm portions.

PROJECT DESCRIPTION

The proposed project entails the construction of 1 x up to 132kV OHPL from the Alternative 1 substation (preferred Impumelelo WEF onsite substation) to the to connect to the Eskom Zandfontein Substation. A brief overview of the physical/technical requirements of the project is as follows:

- 1 x up to 132kV OHPL (either single or double circuit) between the Alternative 1 substation (preferred Impumelelo WEF onsite substation) and the Eskom Zandfontein Substation;
- Straight line distance between Alternative 1 substation (preferred Impumelelo WEF substation) and Eskom Zandfontein substation is approximately 33 km;
- An assessment corridor of 500m has been included along the alignment of the 132kV OHPL to allow for micrositing.
- The maximum height for an up to 132kV OHPL structure is approximately 40m.
- Minimum conductor clearance is between 8.1 and 12.6m.
- Span length between pylon structures is typically up to 250m apart, depending on complexity and slope of terrain.
- The design of 132kV structure is currently unknown, the following options will be used to determine preferred design:
  - Intermediate self-supporting monopole
  - Inline or angle-strain self-supporting monopole
  - Suspension self-supporting monopole
  - Triple pole structure
  - Steel lattice structure
- The up to 132 kV structures will have a concrete foundation and the sizes may vary depending on design type up to 80m^2 (10m by 8m), with depths reaching up to 3.5m typically in a rectangular ‘pad’ shape. The actual number of structures required will vary according to the final route alignment determined.
- Two alternative substation locations have been proposed for the Impumelelo GRIDLINE (Gridline Alternative 1 via the onsite substation located on portion 5/543 of Farm Platkop). It must be indicated that both substation alternatives are planned to be constructed on approximately 5 ha. Based on the plan, an IPP substation and an Eskom / Offtaker substation will be constructed for each of the alternatives. The substations will be constructed next to each other on area of 2.5ha each. It should be noted that the IPP substation is being authorised as part of a separate application for the WEF (MDARDLEA REF: 1/3/1/16/1 G/269). Electricity generated from the Impumelelo WEF will be distributed through the IPP substation to

the Eskom/Offtaker substation, from the Eskom/Offtaker substation electricity will be distributed by the proposed up to 132kV OHPL into the Zandfontein Substation.

- A 200m buffer has been included around the Zandfontein substation to allow for micrositing should it require expansion.
- Standard substation electrical equipment, i.e., transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed.
- The control building, telecommunication infrastructure, oil dam(s) etc,
- All the access road infrastructure to and within the substation
- Associated infrastructure including but not limited to lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area and storerooms).

NEED AND DESIRABILITY

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh 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

The development of renewable energy and the associated energy infrastructure is strongly supported at a national, provincial, and local level. The development of, and investment in, renewable energy and associated energy distribution infrastructure is supported by the National Development Plan, New Growth Path Framework and National Infrastructure Plan, which all highlight the importance of energy security and investment in energy infrastructure. The development of the proposed power line is therefore supported by key policy and planning documents and is in line with South Africa's strategic energy planning context (Refer to **Section 2**).

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

The transition towards renewable energy will improve the socio-economic conditions of the Gert Sibande District Municipality. The Gert Sibande District Municipality recorded an unemployment rate of 26.7% in 2017, 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 Gert Sibande District Municipality, namely the cost of electricity and lack of adequate employment opportunities. The Project will be the first large-scale wind energy facilities being developed in Mpumalanga. The proponent foresees this project as being the catalyst to realising a true Just Energy Transition for Mpumalanga. As various career opportunities are presented by the wind industry, and these are divided into four pillars that are aligned with the value chain.

The wind 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 Mpumalanga to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

As mentioned previously, five of Eskom's coal-fired power stations have been targeted for decommissioning in the short term: Komati , Camden, Grootvlei, Arnot, and Hendrina. Eskom is looking to decommission 5 400MW of electricity from coal generation by the year 2022, increasing to 10 500MW by 2030 and 35 000MW by 2050. Simultaneously Eskom has been looking at options for repurposing these power stations with the core aims of reusing existing power transmission infrastructure, developing new generation capacity, providing ancillary services, and mitigating socio-economic impact.

The Impumelelo WEF project also supports the countries drive to roll out new generation capacity as outlined in the IRP 2019 and supports National Governments aim of a low carbon economy as set out in the National Development Plan 2030.

The social environment of the study area can be described as a working agricultural / industrial environment. Numerous large industrial companies are operating in the vicinity of the project area. The development of the proposed Impumelelo WEF would strengthen the existing electricity grid for the area. The electricity generated from this development would be supplied to private off-takers, including commercial users. Long term off-take agreement with surrounding businesses is envisaged with the proponent. The use of this land for renewable energy has a considerable potential to improve the reliability of the supply of electricity to surrounding commercial users, as well as generate the much-needed employment opportunities within the Local and District Municipalities.

The energy security benefits associated with the proposed Impumelelo WEF is dependent upon it being able to connect to the national grid via the establishment of grid connection infrastructure. The proposed OHPL is therefore essential supporting infrastructure to the WEF development, which, once developed, will generate power from renewable energy resources.

No physical or economic displacement will be required along the proposed route.

NEED FOR A BASIC ASSESSMENT

In terms of Section 24(2) of the NEMA, the Minister may identify activities, which may not commence without prior authorisation. The Minister thus published GNR 983 (as amended) (Listing Notice 1), GNR 984 (as amended) (Listing Notice 2) and GNR 985 (as amended) (Listing Notice 3) listing activities that may not commence prior to authorisation.

The regulations outlining the procedures required for authorisation are published in the EIA Regulations of 2014 (GNR 982) (as amended). Listing Notice 1 identifies activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity.

WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed below are considered applicable to the development: A BA process must be followed.

- GNR 983 Listed Activities: 11 (i), 12 (ii) (a) (c),19, 27, 28 (ii), 30 and 48 (i) (a) (c)
- GNR 985 Listed Activities: 4 (f) (ii) (ee), 12 (f) (ii), 14 (ii) (a) (c) (f) (i) (ff), 18 (f) (i) (ee) and 23 (ii) (a) (c) (f) (i) (ee)

OBJECTIVES OF THE BA PROCESS

As defined in Appendix 1 of the EIA Regulations, 2014 (as amended), the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
    - The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    - The degree to which these impacts—
        - Can be reversed;
        - May cause irreplaceable loss of resources; and

- Can be avoided, managed, or mitigated.

— Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to–
  - Identify and motivate a preferred site, activity and technology alternative;
  - Identify suitable measures to avoid, manage or mitigate identified impacts; and
  - Identify residual risks that need to be managed and monitored

SPECIALIST STUDIES

Based on the selected classification, and the environmental sensitivities of the proposed OHPL and substation footprints, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening:

— Agricultural Impact Assessment
— Archaeological and Cultural Heritage Impact Assessment
— Palaeontology Impact Assessment
— Terrestrial Biodiversity Impact Assessment
— Aquatic Biodiversity Impact Assessment
— Geotechnical Assessment
— Socio-Economic Assessment
— Civil Aviation Impact Assessment
— Defence Assessment
— Plant Species Assessment
— Animal Species Assessment

SITE SENSITIVITY VERIFICATION

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 below.

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL	DFFE SCREENING TOOL SENSITIVITY	SPECIALIST SENSITIVITY VERIFICATION
Agricultural Compliance Statement	*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*	High Sensitivity	Low Sensitivity
Terrestrial Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity*	Very High Sensitivity	Medium Sensitivity

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL	DFFE SCREENING TOOL SENSITIVITY	SPECIALIST SENSITIVITY VERIFICATION
Aquatic Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity*	High Sensitivity	High and Low Sensitivity
Plant Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species*	Medium Sensitivity	Low Sensitivity
Animal Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*	High Sensitivity	Medium Sensitivity
Avifauna Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*	No Sensitivity Identified	High Sensitivity
Archaeological and Cultural Heritage Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	High Sensitivity	Medium to Low Sensitivity
Palaeontology Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Very High Sensitivity	Low Sensitivity
Visual (Landscape) Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	No Sensitivity Identified	Low Sensitivity
Social Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	No Sensitivity Identified	Low to Medium Sensitivity
Civil Aviation Theme	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	High Sensitivity Identified	Medium Sensitivity
Defence Theme	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Low Sensitivity Identified	Low Sensitivity

IMPACT ASSESSMENT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed powerline is provided below.

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
Air Quality	Generation of Dust and PM	Construction	**Moderate**	**(-)**	**Low**	**(-)**
Noise	Noise Emissions	Construction	**Low**	**(-)**	**Low**	**(-)**
Soils, Land Capability and Agricultural Potential	Agricultural Production Potential	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
Geological	Soil Erosion	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Oil Spillage	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Disturbance of fauna and flora	Construction	**Low**	**(-)**	**Very Low**	**(-)**
	Slope Stability	Construction	**Low**	**(-)**	**Very Low**	**(-)**
	Seismic Activity	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
	Soil Erosion	Operation	**Low**	**(-)**	**Very Low**	**(-)**
	Oil Spillage	Operation	**Moderate**	**(-)**	**Very Low**	**(-)**
	Soil Erosion	Decommissioning	**Moderate**	**(-)**	**Very Low**	**(-)**
	Oil Spillage	Decommissioning	**Moderate**	**(-)**	**Very Low**	**(-)**
	Disturbance of fauna and flora	Decommissioning	**Low**	**(-)**	**Very Low**	**(-)**
	Slope Stability	Decommissioning	**Low**	**(-)**	**Very Low**	**(-)**
Groundwater	Deterioration of Groundwater Quality	Construction	**Moderate**	**(-)**	**Low**	**(-)**
Aquatic	Changes in Water Flow Regime	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Changes In Sediment Entering And Exiting The System	Construction	**Moderate**	**(-)**	**Low**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Introduction and spread of alien vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	loss and disturbance of watercourse habitat and fringe vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	Changes in water quality due to pollution	Construction	**Moderate**	(-)	**Low**	(-)
	Loss of Aquatic Biota	Construction	**Moderate**	(-)	**Low**	(-)
	Changes in Water Flow Regime	Operation	**Moderate**	(-)	**Low**	(-)
	Changes in sediment entering and exiting the system	Operation	**Moderate**	(-)	**Low**	(-)
	Introduction and spread of alien vegetation	Operation	**Moderate**	(-)	**Low**	(-)
	loss and disturbance of watercourse habitat and fringe vegetation	Operation	**Moderate**	(-)	**Low**	(-)
	Changes in water quality due to pollution	Operation	**Moderate**	(-)	**Low**	(-)
	Loss of Aquatic Biota	Operation	**Moderate**	(-)	**Low**	(-)
Biodiversity	Clearing Natural Vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	The Loss Of Threatened, Protected & Endemic Plant Species	Construction	**Moderate**	(-)	**Low**	(-)
	Loss Of Faunal Habitat	Construction	**Moderate**	(-)	**Low**	(-)
	Direct Faunal Mortalities Due To Construction And Increased Traffic	Construction	**Moderate**	(-)	**Low**	(-)
	Increased Dust Deposition	Construction	**Low**	(-)	**Very Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Increased Human Activity, Noise And Light Levels	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Establishment Of Alien Vegetation	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Establishment Of Alien Vegetation	Operation	**Low**	**(-)**	**Very Low**	**(-)**
	Faunal Mortalities	Decommissioning	**Very Low**	**(-)**	**Very Low**	**(-)**
	Increased Dust Deposition	Decommissioning	**Low**	**(-)**	**Very Low**	**(-)**
	Establishment Of Alien Vegetation	Decommissioning	**Low**	**(-)**	**Very Low**	**(-)**
Avifauna	Displacement due to disturbance associated with the construction	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Displacement due to habitat transformation associated with the construction	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Mortality of priority species due to collisions	Operation	**High**	**(-)**	**Low**	**(-)**
	Electrocution of priority species on the on-site substation infrastructure	Operation	**High**	**(-)**	**Low**	**(-)**
	Displacement of priority species due to disturbance associated with decommissioning of the on-site substation and 132kV overhead power line	Decommissioning	**Moderate**	**(-)**	**Low**	**(-)**
Visual	Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure	Construction	**Low**	**(-)**	**Low**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Potential visual impact on sensitive visual receptors located during the operational phase	Operation	**Low**	**(-)**	**Low**	**(-)**
	Potential visual impact on sensitive visual receptors located during the decommissioning phase	Decommissioning	**Low**	**(-)**	**Low**	**(-)**
Heritage	Impacts to Archaeological resources (Alt 1)	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
	Impacts to Archaeological resources (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to Graves (Alt 1)	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Impacts to Graves (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape (Alt 1)	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape	Operation	**Moderate**	**(-)**	**Moderate**	**(-)**
	Impacts to the Cultural Landscape	Decommissioning	**Moderate**	**(-)**	**Low**	**(-)**
Palaeontology	Impacts on palaeontological resources	Construction	**Moderate**	**(-)**	**Very Low**	**(+)**
Socio-economic	Creation of employment and business opportunities during the construction phase	Construction	**Low**	**(+)**	**Moderate**	**(+)**
	Potential impacts of Construction Workers On Local Communities	Construction	**Low**	**(-)**	**Low**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Potential risk to safety, livestock and damage to farm infrastructure associated with the presence of construction workers on site	Construction	**Moderate**	(-)	**Low**	(-)
	Potential noise, dust and safety impacts associated with movement of construction related activities and movement of traffic to and from the site	Construction	**Low**	(-)	**Low**	(-)
	Potential impact of increased risk of veld fire	Construction	**Moderate**	(-)	**Low**	(-)
	Potential impacts associated with the loss of farm land	Construction	**Moderate**	(-)	**Low**	(-)
	Development of infrastructure to improve energy security and support the renewable sector	Operation	**Moderate**	(-)	**Moderate**	(+)
	Creation Of Employment And Business Opportunities	Operation	**Low**	(+)	**Low**	(+)
	Generate Income For Affected Landowners	Operation	**Low**	(+)	**Moderate**	(+)
	Visual Impact And Impact On Sense Of Place	Operation	**Moderate**	(-)	**Low**	(-)
	Land Uses And Farming Operations	Operation	**Moderate**	(-)	**Low**	(-)
	Impact On Farming Operations During Maintenance	Operation	**Moderate**	(-)	**Low**	(-)

STAKEHOLDER ENGAGEMENT

Stakeholder engagement (public participation) is a requirement of the BA 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 BA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to

understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

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

A SER (**Appendix D**) has been compiled and included in the Draft BAR detailing the projects' compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

IMPACT STATEMENT

The overall objective of the BA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed Project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for MDARDLEA to make an informed decision for the environmental authorisation being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the site specific and generic EMPRs (**Appendix G**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the environmental aspects is expected to be low. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires "where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised" must be included in the BA Report.

The EA is required for a period of 10 years from the date of issuance of the EA to the end of the construction period (including rehabilitation), when the proposed activities applied for are completed. This is a reasonable period as it allows Impumelelo WEF to conduct its internal processes which can only begin after issuance of the EA, when the proposed route is confirmed.

ACRONYMS

AC	Alternating current
AIS	Alien and Invasive Species
AMA	Astronomy Management Authority
ATNS	Air Traffic and Navigation Services
BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CBA	Critical Biodiversity Area
CR	Critically Endangered
CSP	concentrated solar power
DD	Department of Defence (SA Army)
DD	Data Deficient
DoE	Department of Energy
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EHS	Environmental Health and Safety
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Sensitivity
ESA	Ecological Support Area
ESMS	Environmental and Social Management System
ERA	Electricity Regulation Act (No. 4 of 2006)
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
FI	financial institutions

GA	General Authorisation
GHG	greenhouse gas
GNR	Government Notice Regulation
HIA	Heritage Impact Assessment
HR	Human Resources
IEP	the Integrated Energy Plan
IFC	International Finance Corporation
ILO	International Labour Organisation
ILS	International Labour Standards
IRP	Integrated Resource Plan
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MEGDP	Mpumalanga Economic Growth and Development Path
MHRA	Mpumalanga Heritage Resources Authority
MHSA	Mine Health and Safety Act, 1996
MIDP	Mpumalanga Industrial Development Plan
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
MTPA	Mpumalanga Tourism and Parks Agency
NDP	National Development Plan
NIP	National Infrastructure Plan
NEMA	National Environmental Management Act (No. 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)
NEMWA	National Environmental Management: Waste Act (59 of 2008)
NHRA	National Heritage Resource Act (Act No. 25 of 1999)
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OHS	Occupational Health and Safety
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
ONA	Other Natural Areas
OHPL	overhead powerline
UN	United Nations
PEPUDA	Promotion of Equality and Prevention of Unfair Discrimination Act, 2000
PES	Present Ecological State

PICC	Presidential Infrastructure Coordinating Commission
PS	Performance Standards
PV	Photovoltaic
REC	Recommended Ecological Category
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SANS	South African National Standards
SAWS	South African Weather Services
SDF	Spatial Development Framework
SER	Stakeholder Engagement Report
SPV	Special Purpose Vehicle
ToPS	Threatened or Protected Species
VU	Vulnerable
WMA	Water Management Area
WBG	World Bank Group
WEF	Wind Energy Facility
WSP	WSP Group Africa (Pty) Ltd
WUL	Water Use License

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1 INTRODUCTION

1.1 BACKGROUND AND TERMS OF REFERENCE

Impumelelo Wind (Pty) Ltd (the Applicant) is proposing the development Impumelelo Wind Energy Facility (WEF) located approximately 19 km North-East of the Town of Greylingstad in the Mpumalanga Province. The proposed project will be applied for under a Special Purpose Vehicle (SPV), and the Project Applicant is Impumelelo Wind (Pty) Ltd. This report is specific to the up to 132kV Grid Connection (inclusive of an overhead powerline (OHPL) and substation).

In order for the proposed project to proceed, it will require an Environmental Authorisation (EA) from the Competent Authority (CA) (i.e. the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA).

1.2 PURPOSE OF THIS REPORT

This report documents the process and findings of the Basic Assessment (BA) process for the proposed Impumelelo up to 132kV OHPL and substation (hereafter referred to as the "Project" located approximately 19 km North-East of the Town of Greylingstad in the Mpumalanga Province of South Africa.

The BA 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. In the context of this report, the purpose of the BA process is to inform decision-makers and the public of potential negative and positive consequences of the proposed construction of Impumelelo up to 132 kV Grid Connection Transmission Line. This provides the CA sufficient information to make an informed decision with regards to granting or refusing the EA applied for.

1.3 DETAILS OF KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

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

Table 1-1: Details of Project Proponent

PROPONENT:	**IMPUMELELO WIND (PTY) LTD**
Contact Person:	Mercia Grimbeek / Sandhisha Jay Narain
Postal Address	Suite 104, Albion Springs, 183 Main Road, Rondebosch, Cape Town, South Africa 7700
Telephone:	+27 10 003 0717
Email:	Mercia.Grimbeek@enertrag.com / Sandhisha.JayNarain@enertrag.com

1.3.2 COMPETENT AUTHORITY

Section 24C(2)(a) of the National Environmental Management Act 107 of 1998 (NEMA) stipulates that the Minister of Forestry, Fisheries and the Environment ("the Minister") must be identified as the CA if the activity has implications for international environmental commitments or relations. GN 779 of 01 July 2016 identifies the Minister as the CA for the consideration and processing of environmental authorisations and amendments thereto for activities related to the Integrated Resource Plan (IRP) 2010 – 2030.

However, due to the fact that the power generated by the Impumelelo WEF will be made available to private off-taker, the project is not related to the IRP, and therefore, the CA was confirmed to be the MDARDLEA.

The CA (i.e. MDARDLEA) was confirmed during the Pre-Application Meeting held on **14 July 2022**.

Table 1-2 provides the relevant details of the competent authority on the Project.

Table 1-2: Competent Authority

ASPECT	COMPETENT / COMMENTING AUTHORITY	CONTACT DETAILS
Competent Authority: Environmental Authorisation	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA	Case Officer: Okwethu Fakude Email: oqfakude@mpg.gov.za

1.3.3 COMMENTING AUTHORITIES

The following commenting authorities have been identified for this application:

- Department of Mineral Resources and Energy (DMRE);
- Department of Forestry, Fisheries and Environment (DFFE): Biodiversity and Conservation;
- DFFE: Protected Areas;
- Department of Water and Sanitation (DWS);
- Vaal Water Management Area (WMA) Authority;
- South African Heritage Resource Agency (SAHRA);
- Mpumalanga Heritage Resources Authority (MHRA);
- Mpumalanga Tourism and Parks Agency (MTPA);
- Civil Aviation Authority (CAA);
- Air Traffic and Navigation Services (ATNS);
- Department of Defence (SA Army) (DD);
- Astronomy Management Authority (AMA);
- South African Weather Services (SAWS);
- South African National Roads Agency Limited (SANRAL);
- Gert Sibande District Municipality;
- Govan Mbeki Local Municipality; and
- Dipaleseng Local Municipality.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP Group Africa (Pty) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the BA process for the development of the Project. The CV of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table**

1-3 details the relevant contact details of the EAP. In order to adequately identify and assess potential environmental impacts, a number of specialists will support the EAP.

Table 1-3: Details of the Environmental Assessment Practitioner

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	WSP GROUP AFRICA (PTY) LTD
Contact Person:	Ashlea Strong
Postal Address:	Building C, Knightsbridge, 33 Sloane Street, Bryanston, 2191, South Africa
Telephone:	011 361 1392
Fax:	011 361 1381
E-mail:	Ashlea.Strong@wsp.com
Professional Registration:	EAPASA (2019/1005)
Qualifications:	— Masters in Environmental Management, University of the Free State — B Tech, Nature Conservation, Technikon SA — National Diploma in Nature Conservation, Technikon SA

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.

1.4 SPECIALIST

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

Table 1-4: Details of Specialists

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Agriculture	Johann Lanz	Independent consultant	Section 6.1.4 Section 7.1 Section 8.3 **Appendix F-8**
Avifauna	Chris van Rooyen	Chris van Rooyen Consulting	Section 6.2.6 Section 7.6 Section 8.8 **Appendix F-1**
Terrestrial Ecology (including Plant and Animal Species Themes)	Dr Noel van Rooyen and Prof. Gretel van Rooyen	Ekotrust CC	Section 6.2.1 – 6.2.5 Section 7.2, 7.4 and 7.5 Section 8.7 **Appendix F-2**

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Aquatic	Rudi Bezuidenhout	Iggdrasil Scientific Services & Limosella Consulting	Section 6.1.5 Section 7.3 Section 8.6 **Appendix F-6**
Heritage and Palaeontology	Jayson Orton	ASHA Consulting (Pty) Ltd	Section 6.3.2 and 6.3.3 Section 7.7 and 7.8 Section 8.10 and 8.11 **Appendix F-3 and F-4**
Socio-economic	Tony Barbour	Tony Barbour Environmental Consulting	Section 6.3.5 Section 7.10 Section 8.12 **Appendix F-5**
Visual	Kerry Schwartz	SLR Consulting	Section 6.3.4 Section 7.9 Section 8.9 **Appendix F-7**
Geotechnical	Heather Davis	WSP Group Africa (Pty) Ltd	Section 6.1.3 Section 8.4 **Appendix F-9**

1.5 BASIC ASSESSMENT TERMS OF REFERENCE

The 2014 Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, identifies the proposed Impumelelo up to 132 kV OHPL and substation development as an activity being subject to a Basic Assessment process due to the applicability of the EIA Listing Notices 1 (GNR 983, as amended) and Listing Notice 3 (GNR 985, as amended).

As defined in Appendix 2 of GNR 982, as amended, the objective of the BA process is to, through a consultative process:

- Identify the relevant policies and legislation relevant to the activity;
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- Identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- Identify the key issues to be addressed in the assessment phase;
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration, and probability of the impacts to inform the location of the development footprint within the preferred site; and

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

Public participation is a requirement of Basic Assessment ; it consists of a series of inclusive interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the 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.

1.6 BASIC ASSESSMENT REPORT STRUCTURE

As per the EIA Regulations 2014, as amended, Appendix 1 of GNR 982 identifies the legislated requirements that must be contained within a BAR for the CA to consider and come to a decision on the application. **Table 1-5** below details where the required information is located within this report.

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

APPENDIX 1 OF GNR 326	DESCRIPTION	RELEVANT REPORT SECTION
3(1) (a)	Details of the EAP who prepared the report and the expertise of the EAP, including a curriculum vitae	Section 1.3.4 and **Appendix A**
3(1) (b)	The location of the activity	Section 4.1
3(1) (c)	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale	Section 4.1
3(1) (d)	A description of the scope of the proposed activity	Section 4
3(1) (e)	A description of the policy and legislative context within which the development is proposed	Section 2
3(1) (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	Section 4.5
3(1) (g)	A motivation for the preferred site, activity and technology alternative	Section 5
3(1) (h)	A full description of the process followed to reach the proposed alternative within the site	Section 5

APPENDIX 1 OF GNR 326	DESCRIPTION	RELEVANT REPORT SECTION
3(1) (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity	Section 10.3
3(1) (j)	An assessment of each identified potentially significant impact and risk	Section 8
3(1) (k)	Where applicable, a summary of the findings and impact management measures identified in 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 report	Section 6, Section 7, Section 8 and Section 9
3(1) (l)	An environmental impact statement	Section 10
3(1) (m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the Environmental Management Programme (EMPr).	Section 8 Section 10.4
3(1) (n)	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 10.4
3(1) (o)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 3.7
3(1) (p)	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 10.5
3(1) (q)	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 conducted, and the post construction monitoring requirements finalised	Section 10.5
3(1) (r)	An undertaking under oath or affirmation by the EAP	**Appendix B**
3(1) (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	N/A
3(1) (t)	Any specific information that may be required by the competent authority	N/A
3(1) (u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A

2 GOVERNANCE FRAMEWORK

2.1 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 2-1**.

Table 2-1: Applicable National Legislation[1]

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	In terms of Section 24(2) of the NEMA, the Minister may identify activities, which may not commence without prior authorisation. The Minister thus published GNR 983 (as amended) (Listing Notice 1), GNR 984 (as amended) (Listing Notice 2) and GNR 985 (as amended) (Listing Notice 3) listing activities that may not commence prior to authorisation. The regulations outlining the procedures required for authorisation are published in the EIA Regulations of 2014 (GNR 982) (as amended). Listing Notice 1 identifies activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed in in this section are considered applicable to the transmission line. A BA process must be followed. An EA is required and will be applied for with the MDARDLEA.
Listing Notice 1: GNR 983, as amended	***Activity 11(i):*** *The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* *excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development.*

[1] It should be noted that all dimensions outlined in relation to Listing Notice 1, 2 and 3 are provisional and are subject to final design.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Applicability: The proposed powerline and substation are located outside urban areas. The project entails the construction of an up to 132kV overhead powerline (OHPL) and associated Eskom Substation to connect the Impumelelo WEF to the Zandfontein substation. The substation will consist of a high voltage substation yard to allow for up to 132kV feeder bays and transformers.
Listing Notice 1: GNR 983, as amended	***Activity 12 (ii), (a) and (c):*** *The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse* **Applicability:** The OHPL will require the erection of tower structures and an access road, which may require a construction area of approximately 100m^2. The powerline or access road will need to transverse a watercourse (or drainage line) and maybe constructed within 32 m of the delineated watercourses on site..
Listing Notice 1: GNR 983, as amended	***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.* **Applicability:** The OHPL will require the erection of tower structures and an access road. The powerline or access road will need to transverse a watercourse (or drainage line) which will require excavation or removal of soil or sand from the delineated watercourses on site.
Listing Notice 1: GNR 983 as amended	***Activity 27:*** *The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.* **Applicability:** The OHPL is considered a linear activity and therefore this activity is not triggered by the proposed construction of the transmission lines. However, the construction of the common 132 kV Eskom portion substation will require the clearance of indigenous vegetation of more than 1ha but less than 20 ha.
Listing Notice 1: GNR 983, as amended	***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;* **Applicability:** The substation is considered a commercial and/or industrial development and is located on several farm portions outside an urban area, used for agricultural purposes. The total area to be developed for the substations will exceed 4ha (i.e. greater than 1 hectare within agricultural use land).

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
Listing Notice 1: GNR 983, as amended	***Activity 30*** *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).* **Applicability:** The grid connection infrastructure is located within, and will require vegetation clearance or disturbance of the Soweto Highveld Grassland and potentially the Tsakane Clay Grassland. The Tsakane Gray Grassland occurs on the western boundary and covers less than one hectare of the site. Both ecosystems are confirmed to be listed in the National List of Ecosystems that are Threated and in Need of Protection (as indicated in GNR 1002 of 9 December 2011). Due to the fact that these ecosystems are listed as threatened it is assumed that various threatened or protected species may be found within the development area. The restricted activity of "cutting, chopping off, uprooting, damaging or destroying, any specimen" has been identified in terms of NEM:BA and is therefore applicable to the vegetation clearance that will be required to construct the development.
Listing Notice 1: GNR 983, as amended	***Activity 48(i)(a)(c)*** *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **Applicability:** The construction of the access road along the powerline alignment may require the expansion of existing access roads, culverts or similar drainage crossing infrastructure collectively exceeding 100m2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site.
Listing Notice 3: GNR 985, as amended	***Activity 4(f)(ii)(ee) –*** *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *f. Mpumalanga* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans* **Applicability:** The proposed 132kV OHPL will be constructed on undisturbed areas. An access road will be required along the powerline alignment where it is not adjacent to existing roads. The access road is typically a two track gravel road that will potentially be wider than 4m. The alignment of the OHPL is traverses both Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA). The entire OHPL (including substations), is located inside the urban edge. However, portions of the area are zoned as a major open space system. This activity is therefore triggered by the proposed construction of the transmission infrastructure and the access road.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
Listing Notice 3: GNR 985, as amended	***Activity 12(f)(ii)*** *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *f. Mpumalanga* *ii. Within critical biodiversity areas identified in bioregional plans; or* **Applicability:** The route for the proposed OHPL traverses CBAs. The OHPL will require the erection of tower structures, an access road, and a common 132 kV on-site substation which will cumulatively require the clearance of indigenous vegetation of more than 300m2.This activity is therefore triggered by the proposed construction of the transmission infrastructure and the access road
Listing Notice 3: GNR 985, as amended	***Activity 14(ii)(a)(c)(f)(i)(ff)*** *The development of—* *(ii) infrastructure or structures with a Physical footprint of 10 Square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Applicability:** The physical footprint of the transmission infrastructure will be within 32 m of the outer extent of the delineated watercourses on site located within CBA and ESA. The entire OHPL (including substations), is located inside the urban edge. However, portions of the area are zoned as a major open space system. This activity is therefore triggered by the proposed construction of the transmission infrastructure and the access road.
Listing Notice 3: GNR 985, as amended	***Activity 18(f)(i)(ee)*** *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *f. Mpumalanga* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Applicability:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads where by more than 4 metres or in excess of 1km within the Mpumalanga Province and outside urban areas. Such widening will be located within CBA and ESA.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
Listing Notice 3: GNR 985, as amended	***Activity 23(ii)(a)(c)(f)(i)(cc)(ee)*** *The expansion of—* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs —* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Applicability:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 10m^2 or more within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. The development activity contemplated will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site, located within CBAs and ESA.
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 following environmental themes were applicable to the Impumelelo up to 132kV OHPL and substation project: — Agricultural Theme — Animal Species Theme — Aquatic Biodiversity Theme — Archaeological and Cultural Heritage Theme — Avian Theme — Civil Aviation Theme — Defence Theme — Palaeontology Theme — Plant Species Theme — Terrestrial Biodiversity Theme
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013), as amended: 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, as amended.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	However, the contents of this Environmental Management Programme (EMPr) 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. During screening CBAs were identified, 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 screening, a significant part of the Project Area falls within CBA (Irreplaceable and Optimal), especially the especially the western part of the site. There are also some Ecological Support Area (ESA) Local and Landscape corridors demarcated along the Impumelelo up to 132kV OHPL corridor and substation. According to the description for the Mpumalanga Biodiversity Sector Plan (MBSP) Terrestrial Assessment categories, CBAs are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The management approach is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages. CBAs in the Province can be divided into two sub-categories: — Irreplaceable (parts of the site are within this sub-category), and — Optimal (northern parts of the site are within this sub-category). The site is located in the Soweto Highveld Grassland vegetation type (Mucina & Rutherford 2006, SANBI 2006-2018) which is classified as "Vulnerable" (NEMA 2011, Skowno et al. 2018). Terrestrial ecology studies have been undertaken (**Appendix F-2**) to inform the assessment of impacts and will include flora surveys of the project footprint to determine the presence of flora species of concern (SoC), and bird surveys of the area to define the potential risks to bird SoC. The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the Environmental Management Programme (EMPr).
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. The study area is not located within a protected area. According to the National Protected Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area. In addition, the site is also not earmarked in the 5-year plan of the Mpumalanga PAES (data supplied by M. Lötter, MTPA).

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
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 DWS if they are under certain thresholds or meet certain criteria. The list of water uses applicable to the proposed Project include: *a) Taking water from a water resource;* *c) Impeding or diverting the flow of water in a watercourse;* *g) Disposing of waste in a manner which may detrimentally impact on a water resource;* *i) Altering the bed, banks, course or characteristics of a watercourse;* The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use Authorisation Application (WUA) as determined by the risk assessment will be undertaken in compliance with procedural regulations published by the DWS within General Notice 267 (GN267). These regulations specify required information per water use and the reporting structure of required supporting technical information.
The National Heritage Resources Act (No. 25 Of 1999)	The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resources Agency (SAHRA), and lists activities that require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. Part 2 of the NHRA details specific activities that require a Heritage Impact Assessment (HIA) that will need to be approved by SAHRA. Parts of Section 35, 36 and 38 apply to the proposed project, principally: — Section 35 (4) - No person may, without a permit issued by the responsible heritage resources authority- — destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; — destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite. — Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as- — any development or other activity which will change the character of a site— (i) exceeding 5 000 m^2 in extent, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed Impumelelo 132kV Grid connection, a permit is required to be obtained prior to disturbing or destroying such resources as

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). A desktop Heritage Scoping Report (**Appendix 3**) has been carried out by a suitably qualified specialist, revealing five finds (three stone features, one grave site and a historic building). The proposed project will be loaded onto the SAHRIS portal for comment by SAHRA.
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 approval 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.
Mine Health and Safety Act, (Act No 29 of 1996)	Regulation 17(8) of the Mine Health and Safety Act, 1996, (MHSA) Regulations state that "no person may erect, establish or construct any buildings, roads, railways, dams, waste dumps, reserve land, excavations or any other structures whatsoever within a horizontal distance of 100 (one hundred) meters from workings, unless a lesser distance has been determined safe by a professional geotechnical specialist and all restrictions and conditions determined by him or her or by the Chief Inspector of Mines are complied with." Some of the proposed Project infrastructure traverse areas that may have been undermined, and this must be further investigated during the detailed design phase of the Project. Regulation 17 Approval will therefore be required due to the fact that the project is located 100m from mining activities.
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 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.*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Under NEMAQA, the Noise Control Regulations were updated and are to be applied to all provinces in South Africa. The Noise Control Regulations give all the responsibilities of enforcement to the Local Provincial Authority, where location specific by-laws can be created and applied to the locations with approval of Provincial Government. Where province-specific regulations have not been promulgated, acoustic impact assessments must follow the Noise Control Regulations. Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and national noise standards. These have not yet been accomplished and as a result all monitoring and assessments are done in accordance with the South African National Standards (SANS) 10103:2008 and 10328:2008.
Conservation of Agricultural Resources Act (No. 43 of 1983)	The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) provides for the implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas. In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DFFE and the DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners' cost and risk. The CARA Regulations with regards to alien and invasive species have been superseded by NEMBA Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
Civil Aviation Act (No. 13 of 2009)	Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by South African Civil Aviation Authority (SACAA) as an agency of the Department of Transport (DoT). SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. The DEA Screening Tool Report identified Civil Aviation as having medium sensitivity for the proposed Impumelelo up to 132kV Grid Connection, and as being located within 5km of an air traffic control or navigation site. An Application for the Approval of Obstacles were be submitted to ATNS in July 2021 and an amended application was submitted in February 2022, however no permits have been received as yet. SACAA is included on the project stakeholder database. They have been informed of the proposed Project, and comment has been 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 propose 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, transmission, distribution, trading and the import and export of electricity are regulated.

2.2 POLICES AND PLANS

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

Table 2-2: 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 a number of enabling milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing citizens with the means to improve their own lives and boost their incomes. Infrastructure is essential to development. Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges. In terms of implementation the NDP identifies three phases. The first two are of specific relevance to the proposed project. The first phase (2012–2017) notes that ensuring the supply of energy and water is reliable and sufficient for a growing economy. The second phase (2018–2023) involves building on the first phase to lay the foundations for more intensive improvements in productivity. The provision of affordable and reliable energy is a key requirement for this to take place. Chapter 4, Economic infrastructure, notes that economic infrastructure provides the foundation for social and economic development. In this regard South Africa must invest in a strong network of economic infrastructure designed to support the country's medium- and long-term economic and social objectives. The plan envisages that, by 2030, South Africa will have an energy sector that promotes: — Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. — Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. More specifically, South Africa should have adequate supply security in electricity and in liquid fuels, such that economic activity, transport, and welfare are not disrupted. 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

APPLICABLE POLICY	DESCRIPTION OF POLICY
	policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: energy, transport, communication, water, and housing.
National Infrastructure Plan	The South African Government adopted a National Infrastructure Plan (NIP) in 2012. The NIP aims to transform the South African economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, ***electricity plants***, hospitals, schools and dams will contribute to improved economic growth.
Integrated Energy Plan	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 also take into account 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

APPLICABLE POLICY	DESCRIPTION OF POLICY
	the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives. As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios: – The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term. – The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy. – The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply. – The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met. The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of existing electricity generation capacity, the IEP indicates that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth. By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs. In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy. An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered. In terms of promoting job creation and localisation potential the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller contribution. The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.
National Protected Area Expansion Strategy, 2010	The 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

APPLICABLE POLICY	DESCRIPTION OF POLICY
	(NPAES, 2010). According to the NPAES, there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore **outside the NPAES focus area**.

2.3 PROVINCIAL AND MUNICIPAL LEGAL FRAMEWORK

Table 2-3: Provincial Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Mpumalanga Growth and Development Path	The primary objective of the Mpumalanga Economic Growth and Development Path (MEGDP) (2011) is to foster economic growth that creates jobs, reduce poverty and inequality in the Province. The MEGDP identifies supporting the development of clean forms of energy such as wind and hydro power generation opportunities, as well as opportunities including gas production from landfill and organic waste, as one of the key interventions to facilitate growth and job creation in the manufacturing sector. A focal point of the MEGDP is massive investments in infrastructure as a key driver of job creation across the economy, with alternative energy production identified as one of the key opportunities in the Mpumalanga Economic sectors.
Mpumalanga Spatial Development Framework (MSDF), 2019	The Mpumalanga Spatial Development Framework (SDF) (2019) identifies that tourism is an important economic sector and has emerged as a robust driver of growth for emerging economies. The SDF also notes that a significant portion of Mpumalanga's land area is classified as Moderate to High-Very High agricultural potential which can be utilised for agricultural production. However, there are other factors affecting the agricultural sector including loss of agricultural land to other activities, availability of water, contamination of the water used for irrigation by other economic activities, and access to the market. The SDF further notes that mining is the largest economic sector in the province and has assisted other sectors such as manufacturing and power generation, to grow in the province. However, the mining sector has posed some key challenges, including soil and water contamination and environmental pollution, development of mines on good agricultural soil thus threatening food security, restriction of animal movement due to open cast mining thus affecting the ecosystem etc. It also notes that Mpumalanga's manufacturing plants and coal fired power plants are the key polluters of air, with climate change also identified as a key challenge in the province. Therefore, the province must carefully design interventions that provide a gradual shift from mining oriented sectors to the sustainable economic sectors to maintain sustained growth of the provincial economy. The SDF notes that a significant amount of the country's electricity comes from coal-fired stations in Mpumalanga. It also observes that there is a steady increase in the demand for electricity in the province, mostly attributed to residential, commercial and industrial development, including mining and heavy industry. The Provincial SDF also notes that the abundance of coal has led to the development of many coal-fired power stations in the province, however these coalfields are depleting, therefore making it necessary to consider renewable power sources in Mpumalanga. The SDF also recognises that Mpumalanga's Coal Mining and Coal Fired Power Plant region (mainly the Highveld area) will be under immense pressure for environmental considerations and as a result, the region will witness a possible decline in demand of coal and large-scale employment. The SDF proposes to diversify the regional economy and facilitate the gradual transition of economic activities in the region.

APPLICABLE PLAN	DESCRIPTION OF PLAN
Mpumalanga Industrial Development Plan	In terms of industry, the purpose of the Mpumalanga Industrial Development Plan (MIDP) (2015) is to promote the establishment of new industries and promote growth of existing industries in the province.
Mpumalanga Conservation Act (No. 10 of 1998)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: — Various species are protected; — The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province. According to the Mpumalanga Nature Conservation Act, a permit is required for the removal of any species on this list.

Table 2-4: District and Local Municipality Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Gert Sibande Municipality Integrated Development Plan	According to the Municipal Systems Act (Act 32 of 2000) (MSA), all municipalities have to undertake an Integrated Development Plan (IDP) process. The IDP is a legislative requirement thus it has legal status and supersedes all other plans that guide development at local government level. The Gert Sibande Municipality (GSM) IDP Review (2019/ 2020) and Final IDP (2020/2021) has identified the following development priorities: — Municipal Transformation and Organisational Development — Basic Service Delivery and Infrastructure Development — Local Economic Development — Municipal Financial Viability and Management — Good Governance and Public Participation — Spatial Development Analysis and Rationale The main goal and strategic objective of the Basic Service Delivery and Infrastructure Development priority is a reliable and sustainable service. One of the main strategic objectives for reaching the goal is the provision of basic services such as water and electricity to an approved minimum level of standards in a sustainable manner; as per the national guidelines.
Dipaleseng Local Municipality IDP	The Dipaleseng Revised IDP (2020/2021) has identified the following key Municipal priorities: — Enhancement of revenue collection; — Basic Service Delivery (Water, sanitation, roads, electricity, refuse removal, fire & rescue services) Ensuring the financial sustainability of the Municipality; — LED and Job Creation; — Attraction of investors; — Public Participation and Good Governance;

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— Institutional Development; and — Social Services (COVID 19, Education, Health, HIV/AIDS, Crime and Drugs Prevention) The Vision, Mission and Corporate Values are focused on the Dipaleseng Local Municipality being a 'center of quality, affordable services, good governance and sustainable economic growth'. The primary objective of the Mpumalanga Economic Growth and Development Path (MEGDP) is to foster economic growth that creates jobs, reduce poverty and inequality in the province. The following are the main economic sectors (all of which occur in the Gert Sibande District) that have been identified as pivotal in spurring economic growth and employment creation: — Agriculture and forestry — Mining and energy — Tourism and cultural industries — The green economy and ICT — Manufacturing and beneficiation
Dipaleseng Local Municipality Spatial Development Framework	The Dipaleseng SDF is informed by six strategic objectives, including: — Strategic Objective 1: Movement and Transportation Corridors; — Strategic Objective 2: Sustainable Economic Development and Concentration — Strategic Objective 3: Environmental Conservation and Utilisation — Strategic Objective 4: Sustainable Human Settlement Development — Strategic Objective 5: Infrastructure Investment; and — Strategic Objective 6: Rural Development and Transformation Strategic Objective 2, 3 and 5 are relevant to the proposed development: — Strategic Objective (S0)2: Of specific relevance SO 2 refers to the need to diversify the local economy by the development of the primary and secondary sectors while taking the necessary steps to transform the municipality's economy to an advanced and knowledge-based one. — Strategic Objective (SO) 3: Of specific relevance SO3 highlights the need to minimise the consumption of scarce environmental resources, particularly water, electricity and land and protect biodiversity, water, and agricultural resources. — Strategic Objective (SO) 5: Of specific relevance SO5 highlights the need to ensure efficient supply of electricity and water install green infrastructure, including renewable energy.
Govan Mbeki Integrated Development Plan	The Govan Mbeki Municipality is located in the south-eastern part of Mpumalanga Province and is one of seven local municipalities that make up the Gert Sibande District Municipality (GSDM). The GMM is made up of eight towns and 32 electoral wards. The project site is located within Ward 5 to the east and south east of Secunda. The vision of the Govan Mbeki Municipality (GMM) as set out in the 2020/2021 IDP review is "To be a Model City and Centre of Excellence" The associated Mission Statement is to serve our community by: — Providing sustainable, quality services. — Enabling diversified local economic development and job creation. — Ensuring the financial sustainability of the Municipality. — Working together with our stakeholders. — Empowering our workforce. — Ensuring sound corporate governance.

APPLICABLE PLAN	DESCRIPTION OF PLAN
	The Vision, Mission and Values are informed by six (6) Key Strategic objectives of which Strategic Objective 3, To facilitate and create an enabling environment for diversified local economic development, social cohesion, and job creation and Strategic Objective 5, To develop spatially integrated, safe communities and a protected environment, are relevant to the proposed development. A SWOT analysis undertaken as part of the IDP process identified key strengths, weaknesses, opportunities, and threats. The key findings relevant to the project include: — Strengths — Petro-Chemical and synthetic fuels plant — Good tourism potential — Good infrastructure — Rail Network — Mining Area — University /satellite campus — Opportunities — Economic development opportunities — SMME Development — Industrial Park West of Secunda — Weaknesses — Ageing electricity infrastructure. — Pressure on energy sources. — Threats — Eskom Price increases. — Unemployment and poverty. — Climate change. — Air pollution. — Water shortages. — Limited lifespan of mines. — Increasing population (informal settlements, pressure on housing, unemployment, infrastructure, and municipal services). — Closure of mining and petrochemical industry. The IDP provides a summary of the key socio-economic challenges facing the GMM, of which the following are relevant to the project. — High and rising in unemployment. — Youth unemployment. — Creating of local economic development opportunities. — Closure of mines. — Increasing dependency rates. — Low education levels and declining matric pass rate. — Social development concerns such as clinics, police stations, schools, The IDP notes that the key economic sectors that contribute to the local economy within in Govan Mbeki community are: — Trade (including tourism). — Mining.

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— Manufacturing. — Finance. — Agriculture. The IDP lists the Local Economic Development (LED) Strategic Objectives as per the LED Strategy. Of relevance these include: — Industrialisation of the Govan Mbeki economy using current and future comparative and competitive advantages; and newly targeted industries. — Diversification of the local economy to reduce overreliance on the two complimentary sectors of coal mining and fuel from coal SASOL production. — Improvement of living standards of the local citizenry through business and employment opportunities across economic sectors and industries The LED strategy for the GMM is underpinned by six strategic pillars or programmes, namely: — **Pillar One:** Govan Mbeki Industrialisation Programme. Of key relevance the programme the programme focuses on manufacturing activities based on sectors and industries with future growth prospects especially agro-processing and ***alternative energy sources***. The aim is to diversify the economy and reduce dependence on the two dominant and complimentary sectors of coal mining and fuel production. — **Pillar Two:** SMME and Cooperatives Incubation Programme. Agriculture and agro processing have been identified as key sectors and industries that can provide leverage for SMME and cooperatives incubation. — **Pillar Three:** Tourism Hub Development Programme. — **Pillar Four:** Warehousing and Logistics Hub Development Programme. – — **Pillar Five:** Education, Skills and Capacity Development Programme. The programme thrust is to develop and or boost the skills and capacity of small businesses and cooperatives within the GMM. — **Pillar Six:** Marketing and Investment Promotion Programme. The IDP also refers to the establishment of a Special Economic Zone (SEZ) in the GMM, including the establishment of an industrial park. The proposed Industrial Park is to be located on an identified portion of land north west of Secunda. The success of the park and other industrial developments in the GMM will be dependent on the provision of reliable energy. Section 7.1 of the IDP provide an overview of the Spatial Development Framework for the GMM. Six strategic objectives (SOs) are listed namely: — Strategic Objective 1: Economic development and job creation supporting and guiding development. — Strategic Objective 2: Promoting education, training, and innovation. — Strategic Objective 3: Accommodating urbanisation and transforming human settlements. — Strategic Objective 4: Promote the development of the rural areas within Govan Mbeki that can support sustainable economic, social, and engineering infrastructure. — Strategic Objective 5: Protect biodiversity, water, and agricultural resources. — Strategic Objective 6: Infrastructure Investment. Strategic Objective 1, 5 and 6 are relevant to the proposed development. — ***Strategic Objective (S0)1:*** Of specific relevance SO 1 refers to the need to diversify the local mining dependent economy by phasing in renewable energy options, which include concentrated solar power, wind, and natural gas, reducing dependence on coal resources.

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— ***Strategic Objective (SO) 5:*** Of specific relevance SO5 highlights the need to minimise the consumption of scarce environmental resources, particularly water, electricity and land and protect biodiversity, water, and agricultural resources. — ***Strategic Objective (SO) 6:*** Of specific relevance SO6 highlights the need to ensure efficient supply of electricity and water install green infrastructure, including renewable energy. At the local ward level, the needs analysis for Ward 5 indicated that the key challenges and community relevant to the project and that could be supported by SED contributions include repair of street lights, general maintenance of verges, up-grading of taxi rank next to Secunda Mall, cemetery and sports facilities

2.4 INTERNATIONAL ENVIRONMENTAL AND SOCIAL STANDARDS

2.4.1 IFC PERFORMANCE STANDARDS

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

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

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

The IFC’s Sustainability Framework articulates the Corporation’s strategic commitment to sustainable development and is an integral part of IFC’s approach to risk management. The Sustainability Framework comprises IFC’s Policy and Performance Standards on Environmental and Social Sustainability, and IFC’s Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC’s commitments, roles, and responsibilities related to environmental and social sustainability. IFC’s Access to Information Policy reflects IFC’s commitment to transparency and good governance on its operations and outlines the Corporation’s institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-

level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs may also be applied by other financial institutions (FIs).

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

The objectives and applicability of the eight PSs are outlined in **Table 2-5.**

Table 2-5: IFC Performance Standards Applicability to the Project

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts			
Overview	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.		
Objectives	– To identify and evaluate environmental and social risks and impacts of the project. – To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. – To promote improved environmental and social performance of clients through the effective use of management systems. – To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. – To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.		
Aspects	1.1	Policy	The IFC Standards state under PS 1 (Guidance Note 23) that "*the breadth, depth and type of analysis included in an ESIA must be proportionate to the nature and scale of the proposed project's potential impacts as identified during the course of the assessment process.*" This document is the first deliverable from the BA process undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been compiled during this EIA phase of the project. A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr (**Appendix G**) will serve as the basis for an ESMS for the proposed Project.
	1.2	Identification of Risks and Impacts	
	1.3	Management Programmes	
	1.4	Organisational Capacity and Competency	
	1.5	Emergency Preparedness and Response	
	1.6	Monitoring and Review	
	1.7	Stakeholder Engagement	
	1.8	External Communication and Grievance Mechanism	
	1.9	Ongoing Reporting to Affected Communities	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Performance Standard 2: Labour and Working Conditions;			
Overview	Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.		
Objectives	— To promote the fair treatment, non-discrimination, and equal opportunity of workers. — To establish, maintain, and improve the worker-management relationship. — To promote compliance with national employment and labour laws. — To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. — To promote safe and healthy working conditions, and the health of workers. — To avoid the use of forced labour.		
Aspects	2.1	— Working Conditions and Management of Worker Relationship — Human Resources Policy and Management — Working Conditions and terms of Engagement — Workers organisation — Non- Discrimination and Equal Opportunity — Retrenchment — Grievance Mechanism	The construction activities will require contractors for completion. A safe working environment and fair contractual agreements must be in place. The operational phase will have permanent employees for day-to-day activities as well as contractors who will all need a safe working environment and fair contractual agreements. Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the ESIA stage. Recommendations are provided concerning development of a detailed Human Resources (HR) and Occupational Health and Safety (OHS) system by the developer and its partners as the Project moves towards implementation. In addition, measures to address the Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 are referenced. The EMPr (**Appendix G**) incorporates the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.
	2.2	— Protecting the Workforce — Child Labour — Forced Labour	
	2.3	Occupational health and Safety	
	2.4	Workers Engaged by Third Parties	
	2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.		
Objectives	— To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. — To promote more sustainable use of resources, including energy and water. — To reduce project related GHG emissions.		
Aspects	3.1	— Policy Resource Efficiency	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
		— Greenhouse Gases — Water Consumption	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in **Section 7** of this report. There are no material resource efficiency issues associated with the Project. The EMPr includes general resource efficiency measures (**Section 6 of Appendix G**). The project is not GHG emissions intensive and a climate resilience study or a GHG emissions-related assessment is not deemed necessary for a project of this nature. However, the Impumelelo WEF seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. Dust air pollution in the construction phase has been adequately addressed in the EMPr (**Section 6** (**Air Quality Management**) **of Appendix G**). The Project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr (**Appendix G)**. Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern. The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr (**Appendix G)**. Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr identifies these anticipated hazardous materials and recommends relevant mitigation and management measures. Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr identifies these anticipated hazardous materials and recommends relevant mitigation and management measures (**Section 6 of Appendix G**).
	3.2	— Pollution Prevention — Air Emissions — Stormwater — Waste Management — Hazardous Materials Management — Pesticide use and Management	
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	— To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. — To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.		
Aspects	4.1	— Community Health and Safety — Infrastructure and Equipment Design and Safety — Hazardous Materials Management and Safety — Ecosystem Services — Community Exposure to Disease	The requirements included in PS 4 will be addressed in the BA process and the development of the EMPr. During the construction phase there will be an increase in vehicular traffic along public roads, largely due to the need for importation of construction material. Pedestrian and road safety risks will be qualitatively evaluated in the BA process and the clients' standard safety and security measures, as well as potential additional measures recommended by WSP, are detailed in the EMPr (**Appendix G**).

		— Emergency Preparedness and Response	
	4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives	— To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. — To avoid forced eviction. — To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. — To improve, or restore, the livelihoods and standards of living of displaced persons. — To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	— Displacement — Physical Displacement — Economic Displacement — Private Sector Responsibilities under Government Managed Resettlement	PS5 is not applicable to the proposed Impumelelo 132kV Grid Connection as no physical or economic displacement or livelihood restoration will be required. The proposed Impumelelo 132kV OHPL will traverse privately owned land that is utilised for agriculture by the landowners. The significance of all potential agricultural impacts is kept low by the very small proportion of the land that is impacted.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	— To protect and conserve biodiversity. — To maintain the benefits from ecosystem services. — To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	Protection and Conservation of Biodiversity	A significant part of the grid connection corridor falls within CBAs (Irreplaceable and Optimal) and some ESA Local and Landscape corridors are demarcated along the Impumelelo 132kV OHPL corridor and substation locations. A Biodiversity Impact Assessment as well as an Avifaunal Impact Assessment and Freshwater Ecology Impact Assessment have been included in the EIA scope, **Appendix F** of this report. These specialist assessments comprise of a combination of literature review, in-field surveys and sensitivity mapping, as well as the assessment of impacts on biodiversity associated with the proposed project. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues, as well as the risks and impacts identification process requirements. The

			determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa. Specific mitigation and management measures for alien invasive species control are included in the EMPr (**Appendix G)**.
Performance Standard 7: Indigenous People			
Overview	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.		
Objectives	— To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. — To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. — To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. — To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. — To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. — To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Aspects	7.1	General — Avoidance of Adverse Impacts — Participation and Consent	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area. The Project does not involve displacement. PS7 will not be triggered.
	7.2	Circumstances Requiring Free, Prior, and Informed Consent — Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use — Critical Cultural Heritage — Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
	7.3	Mitigation and Development Benefits	
	7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	— To protect cultural heritage from the adverse impacts of project activities and support its preservation. — To promote the equitable sharing of benefits from the use of cultural heritage.		
Aspects	8.1	Protection of Cultural Heritage in Project Design and Execution	A Heritage Impact Assessment Report (**Appendix F-3**) has been carried out by a suitably qualified specialist, revealing that no archaeological sites of significance were noted, and finds were limited to several ruins and graves recorded in the Project area. Based on the current layout, none of the recorded sites will be directly impacted on. A Chance Find Procedure has been included in the EMPr (**Appendix G)**.

2.4.2 EQUATOR PRINCIPLES

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

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

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

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

The requirements and applicability of the EPs are outlined in **Table 2-6**.

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

Table 2-6: Requirements and Applicability of the Equator Principles

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

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
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 BA process has been undertaken in accordance with NEMA (the host country's relevant legislation).
Principle 4: Environmental and Social Management System and Equator Principles Action Plan		
Overview	For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
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,	Th BA 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 Stakeholder Engagement Report (SER) included in **Appendix D.**

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	including those laws implementing host 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 includes a *Grievance Mechanism Process for Public Complaints and Issues* (**Appendix G**). *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.
Principle 7: Independent Review		
Overview	For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.	This principle will only become applicable in the event that that the project is developed in the future.
Principle 9: Independent Monitoring and Reporting		
Overview	To assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting for all Category A, and as appropriate, Category B projects. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information, which will be shared with the EPFI in accordance with the frequency required.	This principle will only become applicable in the event that the project is developed in the future.

2.4.3 INTERNATIONAL LABOUR STANDARDS

The International Labour Organisation (ILO) brings together governments, employers, and workers of 187 member states, to set labour standards, develop policies and devise programmes promoting decent work for all women and men. The ILO advocates and governs a set of International Labour Standards (ILS). The ILS is a system of standards that are fundamental, universal, and invisible human rights for all working people across the world. The aim of the international labour standards is to ensure that the growth the of the global economic provides benefits to all. These standards are legal instruments drawn up by ILO's constituents setting out basic principles and rights at work. These instruments are either Conventions (or Protocols), which are legally binding international treaties that may be ratified by member states, or recommendations, which serve as non-binding guidelines. The fundamental instruments of the ILO and ILS outlined in **Table 2-7**.

Table 2-7: Fundamental Instruments of the ILO and ILS.

INTERNATIONAL LABOUR STANDARDS: FUNDAMENTAL INSTRUMENTS	PROJECT SPECIFIC APPLICABILITY
1. Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	The Constitution of the Republic of South Africa (1996) allows for all workers to: — Section 18: Freedom of Association — Section 23: Labour Relations — Everyone has the right to fair labour practices; — Every worker has the right to form and join a trade union and to participate in the union's activities; — Every worker has the right to strike — Every employer has the right to form and join an employers' organization and to participate in the activities of the organization; and — Every trade union, employers' organization and employer has the right to engage in collective bargaining. The Impumelelo WEF project (inclusive of the grid connection) shall abide by all laws and rights enshrined by The Constitution of The Republic of South Africa (1996).
2. Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	
3. Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)	The South African Constitution (1996) and Basic Conditions of Employment Act (as amended) prohibits any forced labour in the country. Therefore, the Impumelelo WEF project (inclusive of the grid connection) commits to not undertake any forced labour over the lifespan of the project. During the operational phase labour audits will be conducted on the project's main contractors and subcontractors.
4. Abolition of Forced Labour Convention, 1957 (No. 105)	
5. Minimum Age Convention, 1973 (No. 138)	According to the South African Basic Conditions of Employment Act and entrenched in the Constitution of the Republic of South Africa (1996), it is a criminal offence to employ a child younger than 15, except in the performing arts with a permit from the Department of Labour. Children aged 15 to 18 may not be employed to do work inappropriate for their age or work that place them at risk. The project will not employ individuals 18 years old or younger.
6. Worst Forms of Child Labour Convention, 1999 (No. 182)	
7. Equal Remuneration Convention, 1951 (No. 100)	This WEF project will follow The Promotion of Equality and Prevention of Unfair Discrimination Act, 2000 (PEPUDA or the Equality Act, Act No. 4 of 2000). This is a comprehensive South African anti-discrimination law. It prohibits unfair discrimination by the government and by private organisations and individuals and forbids hate speech and harassment. The project will ensure employment equity across all individuals employed by the project, and all employment opportunities will be free of discrimination.
8. Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	
9. Occupational Safety and Health Convention, 1981 (No. 155)	The Impumelelo WEF development (inclusive of the grid connection) will abide by the South African Occupational Health and Safety Act 85 of 1993. This act intends to:
10. Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)	

INTERNATIONAL LABOUR STANDARDS: FUNDAMENTAL INSTRUMENTS	PROJECT SPECIFIC APPLICABILITY
	— to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; — the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; — to establish an advisory council for occupational health and safety; and — to provide for matters connected therewith.

2.5 OTHER GUIDELINES AND BEST PRACTICE RECOMMENDATIONS

2.5.1 WORLD BANK GROUP ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES

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

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

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

EHS GENERAL GUIDELINES

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of GIIP. They contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The EHS General Guidelines contain information on cross-cutting environmental, health and safety issues potentially applicable to all industry sectors, used together with the relevant industry sector guideline(s), to guide the development of management and monitoring strategies for various project-related impacts.

EHS GUIDELINES FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

The EHS Guidelines for Electric Power Transmission and Distribution (2007) include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

The Guidelines includes industry-specific impacts and management, provides a summary of EHS issues associated with electric power transmission and distribution that occur during the construction and operation phases of a facility, along with recommendations for their management. Additionally, it includes performance indicators and monitoring related to the environment an occupational health and safety.

These Guidelines have been considered in the impact assessment and formulation of mitigation measures in this BAR.

2.5.2 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*."[2]

The generic EMPrs (for both OHPL and Substations) are attached in the Site-Specific EMPr included as **Appendix G.**

[2] DEA (2019) *Appendix 1: Generic Environmental Management Programme (EMPr) for the Development and Expansion for Overhead Electricity Transmission and Distribution Infrastructure*

3 BASIC ASSESSMENT PROCESS

3.1 OBJECTIVES OF THE BASIC ASSESSMENT PROCESS AS PER THE PROCEDURAL FRAMEWORK

As defined in Appendix 1 of the EIA Regulations, 2014 (as amended), the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
    - The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    - The degree to which these impacts—
        - Can be reversed;
        - May cause irreplaceable loss of resources; and
        - Can be avoided, managed, or mitigated.
- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to–
    - Identify and motivate a preferred site, activity and technology alternative;
    - Identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

3.2 DFFE SCREENING WEB-BASED ENVIRONMENTAL 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 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.

Four Screening reports for the proposed 132kV OHPL and substation, were generated on **07 February 2023** and are attached in **Appendix H**. The Screening Reports for the project identified various sensitivities for the

proposed alternative alignments and substation sites. The reports also generated a list of specialist assessments that should form part of the BA 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 3-1 below provides a summary of the sensitivities identified for the OHPL footprints.

Table 3-1: Sensitivities identified in the screening report

THEME	VERY HIGH SENSITIVITY	HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVIY
132kV OHPL				
Agricultural Theme	✓			
Animal Species Theme		✓		
Aquatic Biodiversity Theme	✓			
Archaeological and Cultural Heritage Theme		✓		
Civil Aviation Theme		✓		
Defence Theme				✓
Palaeontology Theme	✓			
Plant Species Theme			✓	
Terrestrial Biodiversity Theme	✓			
SUBSTATIONS				
Agricultural Theme			✓	
Animal Species Theme		✓		
Aquatic Biodiversity Theme				✓
Archaeological and Cultural Heritage Theme				✓
Civil Aviation Theme			✓	
Defence Theme				✓
Palaeontology Theme			✓	

THEME	VERY HIGH SENSITIVITY	HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVIY
Plant Species Theme			✓	
Terrestrial Biodiversity Theme	✓			

Based on the selected classification, and the environmental sensitivities of the proposed OHPL and substation footprints, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening tool (please refer to Section 3.2.1 below for the EAP motivation applicable to this list):

- Agricultural Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Aquatic Biodiversity Impact Assessment
- Geotechnical Assessment
- Socio-Economic Assessment
- Civil Aviation Impact Assessment
- Defence Assessment
- Plant Species Assessment
- Animal Species Assessment

3.2.1 MOTIVATION FOR SPECIALIST STUDIES

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

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

- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Impact Assessment;
- Visual Impact Assessment;
- Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species);
- Avifauna Impact Assessment;
- Social Impact Assessment; and
- Desktop Geotechnical Assessment

Three of the identified specialist studies will not be undertaken as part of the BA process for the proposed Impumelelo 132kV Grid Connection. Motivation for the exclusion of these specialist studies is provided below:

- **Detailed Geotechnical**

  A desktop Geotechnical Assessment has been commissioned and has been incorporated into the BAR. However, a detailed Geotechnical Assessment will not be undertaken as part of the BA Process as this will be undertaken during the detailed design phase.
- **Civil Aviation**

According to the DFFE Screening Tool Report, civil aviation is regarded as having medium sensitivity. The proposed development site is located within 5km of an air traffic control or navigation site. As this theme has been identified as high, a compliance statement has been prepared by the EAP. Furthermore, the relevant Authorities have been included on the project stakeholder database. 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. An Application for the Approval of Obstacles will also be submitted to ATNS and the required permits will be obtained prior to the development of the project. The South African Civil Aviation Authority (SACAA) was included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.

— **Defence**

The Department of Defence was included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from this authority as applicable. As this theme has been identified as a low sensitivity, no compliance statement is required.

3.3 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with MDARDLEA and subsequently completing the appropriate application form as well as the submission and registration of the application for EA with the MDARDLEA. The pre-application meeting was held with DFFE on **14 July 2022** (meeting minutes attached as **Appendix I**) and the application form will be submitted to the MDARDLEA on **23 March 2023**. A reference number will be included in the Final BAR following acknowledgment of receipt from the MDARDLEA.

3.4 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping. The specialist teams undertook site investigations between December 2021 and October 2022 to provide impact assessments for the proposed transmission line route.

3.5 IMPACT ASSESSMENT METHODOLOGY

3.5.1 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,[3] indirect,[4] secondary[5] as well as cumulative[6] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[7] presented in **Table 3-2**.

Table 3-2: Impact Assessment Criteria 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**	**Moderate**	**High**	**Very High**

[3] Impacts that arise directly from activities that form an integral part of the Project.
[4] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[5] Secondary or induced impacts caused by a change in the Project environment.
[6] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[7] 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**	**Moderate**	**High**	**Very High**

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

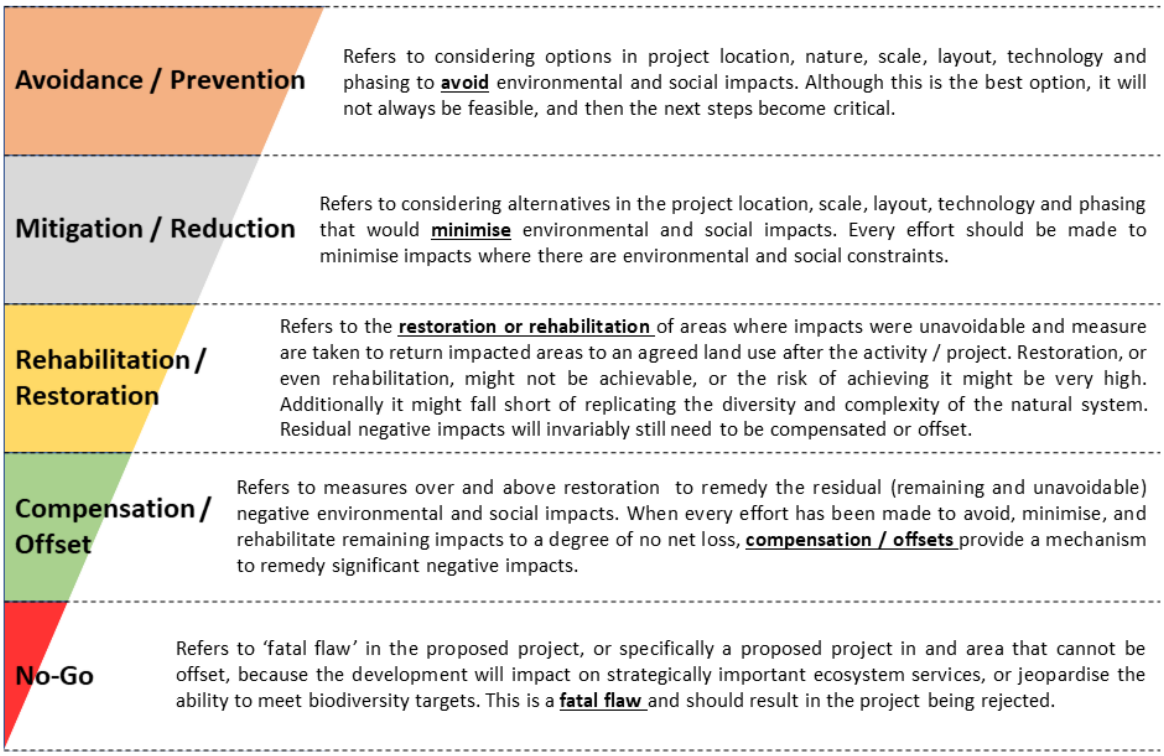


Figure 3-1: Mitigation Sequence/Hierarchy

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

3.6 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement (public participation) is a requirement of the BA 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 BA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

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

A Stakeholder Engagement Report (SER) has been included in **Appendix D** and will be updated in the final BAR, detailing the project's compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

3.6.1 PUBLIC REVIEW

The Draft BAR will be placed on public review for a period of 30 days from **23 March 2023** and **25 April 2023**, at the following public places:

- Hard Copy: Secunda Public Library: Govan Mbeki Library and Information Services (01 Louwrens Muller Street, Secunda, 2302);
- Hard Copy: Balfour (Dipaseleng) Public Library (Joubert Street, Balfour, 2410Hard Copy: Nthoroane Public Library (739 Simunye street, Nthoroane location, Greylingstad);
- Hard Copy: Nthoroane Public Library (739 Simunye street, Nthoroane location, Greylingstad);
- Electronic Copy; WSP website (https://www.wsp.com/en-ZA/services/public-documents); and
- Electronic Copy: Datafree Website (https://wsp-engage.com/).

All registered stakeholders and authorising/commenting state departments will be notified of the public review period as well as the locations of the draft BAR via email and SMS.

3.6.2 COMMENT AND RESPONSE REPORT

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') will continue to be documented and responded to adequately in the Comment and Response Report. The Comment and Response Report records the following:

- List of all issues raised;
- Record of who raised the issues;
- Record of where the issues were raised;
- Record of the date on which the issue was raised; and
- Response to the issues.

WSP will collate the comments received during the public review phase and will compile a Comments and Responses Report (CRR) that will be included in the SER and attached to the Final BAR .

3.6.3 NOTIFICATION OF ENVIRONMENTAL AUTHORISATION

All stakeholders will receive a letter at the end of the process notifying them of the authority's decision, thanking them for their contributions, and explaining the appeals procedure as outlined in the national Appeal Regulations, 2014 (GNR 993 of 2014).

3.7 ASSUMPTIONS AND LIMITATIONS

General assumptions and limitations relating to the BA process are listed below:

- The information provided by Impumelelo, and the specialists is assumed to be accurate;
- WSP's assessment of the significance of impacts of the proposed project on the affected environment has been based on the assumption that the activities will be confined to those described in Section 4. If any substantial changes to the project description are made, impacts may need to be reassessed;
- Where detailed design information is not available, the precautionary principle (i.e. a conservative approach that overstates negative impacts and understates benefits) has been adopted;
- The competent authority would not require additional specialist input, as per the proposals made in this report, in order to make a decision regarding the application; and
- All information is assumed to be accurate and relevant at the time of writing this report.

Aquatic

- The study focussed on the identification, delineation and functional assessment of wetlands found within/along the powerline and substation footprint area. Although all wetlands occurring within 500 m of the footprint were mapped at a desktop level in fulfilment of Regulation GN509 of the NWA, the field assessment was confined to only those areas to be impacted by the current operational and rehabilitation activities associated with the footprint, which was deemed sufficient for the purposes of this assessment.
- Whilst every effort was made to ensure that all wetland features potentially within the 500 m DWS Regulated Area were identified and delineated, less distinct features within these access-controlled areas may not have been identified.
- Sampling by its nature means that the entire study area cannot be assessed. In this case, the entirety of the study site could not be assessed due to time constraints and access restrictions. Therefore, the assessment findings are only applicable to the areas sampled and extrapolated to the rest of the study site. Some reliance was also made on a previous wetland assessment done in the area.
- Formal vegetation sampling was not done by the specialist. All vegetation information recorded was based on the onsite visual observations of the author. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- The information provided by the client forms the basis of the planning and layouts discussed.
- It should be noted that at the time of the assessment, the exact location of the infrastructure was not available.
- All watercourses within 500 m of any developmental activities should be identified as per the DWS authorization regulations. In order to meet the timeframes and budget constraints for the project, watercourses within the study sites were delineated on a fine scale based on detailed soil and vegetation sampling. Watercourses that fall outside of the site, but that fall within 100m of the proposed activities were delineated based on desktop analysis of vegetation gradients visible from aerial imagery.
- Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage.

- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.
- Description of the depth of the regional water table and geohydrological and hydropedological processes falls outside the scope of the current assessment
- Floodline calculations fall outside the scope of the current assessment.
- A Red Data scan, fauna and flora, and aquatic assessments were not included in the current study
- Species composition described for landscape units aimed at depicting characteristic species and did not include a survey for cryptic or rare species.
- The recreation grade GPS used for wetland and riparian delineations is accurate to within five meters.
- Watercourses delineation plotted digitally may be offset by at least five meters to either side. Furthermore, it is important to note that, while converting spatial data to final drawings, several steps in the process may affect the accuracy of areas delineated in the current report. It is therefore suggested that the no-go areas identified in the current report be pegged in the field in collaboration with the surveyor for precise boundaries. The scale at which maps and drawings are presented in the current report may become distorted should they be reproduced by for example photocopying and printing.
- The calculation of buffer zones does not consider climate change or future changes to watercourses resulting from increasing catchment transformation.
- Due to the amount of rainfall during the field work, several access roads were not driveable and access was thus limited in these areas during the initial fieldwork in March 2022.
- Due to the large extent of the study site several areas did not have access, and extrapolation was used here.
- The access road of the conveyer belt running parallel to the proposed powerline was locked and thus this section was inaccessible.

Avifauna

This study made the basic assumption that the sources of information used are reliable and accurate. The following must be noted:

- The focus of the study was primarily on the potential impacts of the proposed on-site substation and 132kV overhead power line on powerline sensitive species.
- Powerline sensitive species were defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- The assessment of impacts is based on the baseline environment as it currently exists in the PAOI, as well as the broader are comprising the six SABAP2 pentads associated with the Impumelelo Grid Connection project site.
- The SABAP2 dataset is a comprehensive dataset which provides a reasonably accurate snapshot of the avifauna that could occur at the proposed site. For purposes of completeness, the list of species that could be encountered was supplemented with personal observations, general knowledge of the area, and the results of the pre-construction monitoring for the associated WEF which was conducted over 12 months.
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- Information on the proposed grid connections of renewable energy projects within a 30km radius around the project was sourced from public documents available on the internet. In some instances, information was not readily available, or specifications may have changed, therefore the confidence in the information is moderate.
- Conclusions drawn in this study are based on experience of the specialists on the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.

Biodiversity

The following assumptions, limitations or uncertainties are listed regarding the evaluation of the impacts of the proposed Impumelelo project on the terrestrial biodiversity and ecology:

- The area has been moderately collected in the past and the list of plant species that could potentially occur on site as obtained from the NewPosa database, is thus considered to provide a fair representation of the flora on site.
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species. Information on rare and threatened plant and animal species was supplemented by data provided by MTPA (M. Lötter) on localities of such species at farm level.
- Rare plant species usually occur in specialised and localised habitats, thus special attention was given to these habitats.
- The site visit was undertaken in December 2021 after the region had received good rains, thus the botanical assessment was conducted under favourable conditions.
- No aerial census, road census or trapping (either camera trapping or by way of Sherman traps) was conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available. Faunal lists were sourced from literature and the website of the Animal Demography Unit of the University of Cape Town.

Heritage

- The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface.
- A large proportion of the routes were not accessible and had to be examined remotely. The longest inaccessible section follows a conveyor servitude and is expected to be somewhat disturbed, while part also follows the R547 and R50 (in total some 24 km follow these existing conveyor and road servitudes). Other areas are within ploughed or disturbed lands, but some intact grassland is also included. It is assumed that archaeological features will not be present in ploughed lands and that the road and conveyor servitudes will be heavily disturbed. In some non-planted areas the grass was also very dense which greatly reduced ground visibility. It is assumed that stone features would, however, generally be protruding from the grass but due to the height of the grass it is easily possible to miss small features and/or graves located more than a few meters away. Nonetheless, aerial photography was scrutinised to locate any further obvious sites.
- Cumulative impacts are difficult to assess due to the variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable. As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

Palaeontology

- Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and only some contain fossil plant, insect, invertebrate and vertebrate material. The dolerite and the overlying soils and sands of the Quaternary period would not preserve fossils.

Socio-economic

- Strategic importance of the project: The strategic importance of promoting renewable energy and associated grid infrastructure is supported by the national and provincial energy policies.
- Fit with planning and policy requirements: Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported. However, the study recognises the strategic importance of renewable energy and the technical,

spatial and land use constraints required for renewable energy facilities and the associated grid infrastructure.

- Demographic data: The information contained in some key policy and land use planning documents, such as Integrated Development Plans etc., may not contain data from Community Household Survey if 2016. However, this will not have a material impact on the findings of the study

Visual

Assumptions, knowledge gaps and limitations relevant to this study are outlined below:

- This visual study has been undertaken based on the project description provided by the Developer and the EAP at the inception of the project.
- Powerlines are very large structures by nature and could impact on receptors that are located relatively far away, particularly in areas of very flat terrain. Given the nature of the receiving environment and the height of the various components of the proposed development, the study area or visual assessment zone is assumed to encompass a zone of 5 km from the outer boundary of the combined powerline assessment corridors. This 5 km limit on the visual assessment zone relates to the importance of distance when assessing visual impacts. Although the proposed development may still be visible beyond 5 km, the degree of visual impact would be diminished considerably and as such the need to assess the impact on potential receptor locations beyond this distance would not be warranted.
- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken between the 25th and 26th of January 2022. Due to the extent of the study area however and the number of receptors that could potentially be sensitive to the proposed development, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, several broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus, the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that any visual impact will be experienced.
- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and, although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen merely as a representation of the likely visual impact at a receptor location.
- The exact status of all the receptors could not be verified during the field investigation and as such the receptor impact rating was largely undertaken via desktop means.
- Receptors that were assumed to be farmsteads were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were thus assessed as part of the VIA.
- Based on the project description provided by the Developer, all analysis for this VIA is based on a worst-case scenario where the maximum height of powerline towers and associated structures is assumed to be 40m.
- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area, derived from the NGI's 5 m Contour Database, is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the DEM used to generate the viewshed(s) and visibility analysis conducted in respect of the proposed development.
- In addition, the viewshed analysis did not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.

- No feedback regarding the visual environment has been received from the public participation process to date. Any feedback from the public during the review period of the Draft Basic Assessment Report (DBAR) will however be incorporated into further drafts of this report, if relevant.
- This study includes a broad assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at the time of writing the report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.
- No visualisation modelling was undertaken for the proposed development as this is not normally required for linear infrastructure. This can however be provided should the Public Participation process identify the need for this exercise.
- It should be noted that the site visit was undertaken in late January 2022, during mid-summer, which is characterised by higher levels of rainfall and increased vegetation cover. In these conditions, slightly reduced levels of visual impact will be experienced from receptor locations in the surrounding area.
- In clear weather conditions, powerlines and associated infrastructure would present a greater contrast with the surrounding landscape than they would on a cloudy overcast day. The field investigation was conducted during clear to partly cloudy weather conditions.

Agriculture

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

Geotechnical (Desktop study):

- 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.

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 LOCATION OF THE PROPOSED PROJECT

The proposed Project is located in the Dipaleseng and Govan Mbeki Local Municipalities under the jurisdiction of the Gert Sibande District Municipality, near the town of Secunda, in the Mpumalanga Province of South Africa (**Figure 4-1**). The proposed Project entails the construction of a 132 kV OHPL from the onsite substation at the proposed Impumelelo WEF to connect to the Eskom Zandfontein Substation. The project area traverses 45 farm portions as shown in **Table 4-1**.

Table 4-1: Farm portions on which the proposed development is located

FARM NAMES	FARM NUMBER	PORTION NUMBER	SURVEYOR-GENERAL 21-DIGIT CODE
Zandfontein	130	3	T0IS00000000013000003
Zandfontein	130	2	T0IS00000000013000002
Zandfontein	130	5	T0IS00000000013000005
Zandfontein	130	8	T0IS00000000013000008
Zandfontein	130	9	T0IS00000000013000009
Grootspruit	279	0	T0IS00000000027900000
De Bank of Vaalbank	280	1	T0IS00000000028000001
De Bank of Vaalbank	280	2	T0IS00000000028000002
De Bank of Vaalbank	280	4	T0IS00000000028000004
De Bank of Vaalbank	280	6	T0IS00000000028000006
Kaalspruit	528	2	T0IR00000000052800002
Kaalspruit	528	3	T0IR00000000052800003
Kaalspruit	528	9	T0IR00000000052800009
Kaalspruit	528	6	T0IR00000000052800006
Kaalspruit	528	7	T0IR00000000052800007
Roodebank	323	16	T0IS00000000032300016
	542	0	T0IR00000000054200000
Holgatsfontein	535	3	T0IR00000000053500003
Holgatsfontein	535	4	T0IR00000000053500004
Holgatsfontein	535	20	T0IR00000000053500020
Holgatsfontein	535	18	T0IR00000000053500018
Holgatsfontein	535	17	T0IR00000000053500017
Holgatsfontein	535	19	T0IR00000000053500019

FARM NAMES	FARM NUMBER	PORTION NUMBER	SURVEYOR-GENERAL 21-DIGIT CODE
Holgatsfontein	535	16	T0IR00000000053500016
Holgatsfontein	535	15	T0IR00000000053500015
Holgatsfontein	535	14	T0IR00000000053500014
Uitspan	529	0	T0IR00000000052900000
Platkop	543	2	T0IR00000000054300002
Platkop	543	4	T0IR00000000054300004
Platkop	543	5	T0IR00000000054300005
Platkop	543	9	T0IR00000000054300009
Sprinbokdraai	277	3	T0IR00000000027700003
Sprinbokdraai	277	8	T0IR00000000027700008
Sprinbokdraai	277	5	T0IR00000000027700005
Roodebank	323	20	T0IS00000000032300020
Wolvenfontein	534	1	T0IR00000000053400001
Wolvenfontein	534	18	T0IR00000000053400018
Wolvenfontein	534	19	T0IR00000000053400019
Wolvenfontein	534	20	T0IR00000000053400020
Leeuwpan	532	16	T0IR00000000053200016
Mahemsfontein	544	0	T0IR00000000054400000
Mahemsfontein	544	7	T0IR00000000054400007
Mahemsfontein	544	8	T0IR00000000054400008
Hartbeestfontein	522	25	T0IR00000000052200025
Hartbeestfontein	522	6	T0IR00000000052200006

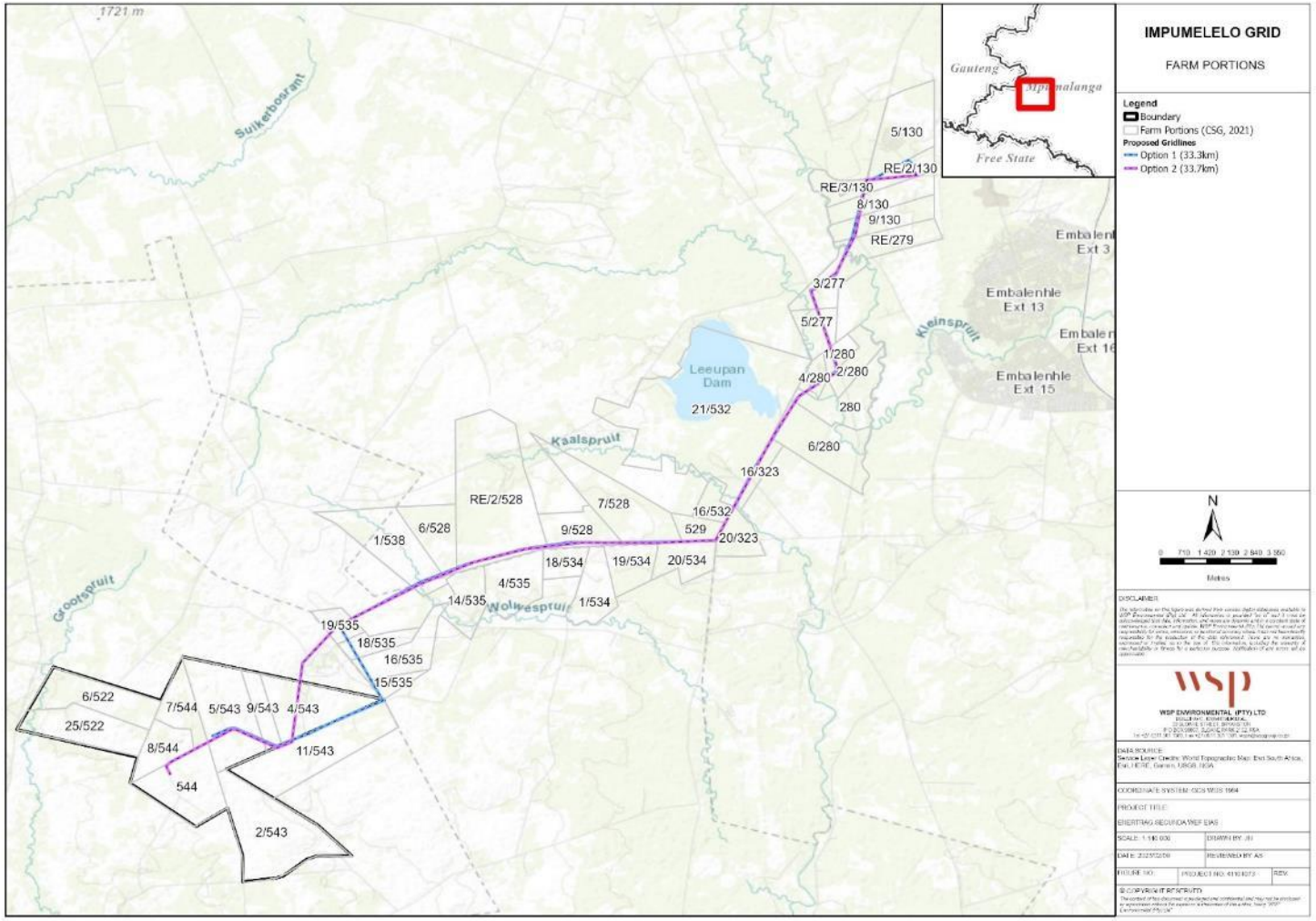


Figure 4-1: Locality Map illustrating the farm Portions traversed by the proposed Impumelelo up to 132 kV OHPL

4.2 ELECTRICITY POWER TRANSMISSION AND DISTRIBUTION

Electricity is carried at high voltages (kilovolts, or kV) along transmission lines in order to reduce the electrical losses that occur over long distances between power generation and consumption points. In order for electricity to be transmitted safely and efficiently over long distances, it must be at a high voltage and a low current.

The voltages at which power is generated at the power generation facility are too low for transmission over long distances. To overcome this problem, transformers are installed at the power stations and substations to increase the voltage level. Transformer's step-up the voltage from, for example, 11 or 22 kV to higher voltages such as 66 kV, 132kV, 220 kV, 275 kV, 400 kV or 765 kV, and feed the generated power into the Eskom Zandfontein Substation.

When the electricity arrives at a distribution substation, bulk supplies of electricity are taken for primary distribution to towns and industrial areas, groups of villages, farms and similar concentrations of consumers. The lines are fed into intermediate substations where transformers reduce (step-down) the voltage level. This could be 11 kV in large factories and 380/220 Volts in shops and homes. Power is distributed to end-users via reticulation power lines and cables. Figure illustrates a typical distribution system.

As of March 2019, South Africa's transmission network comprised 32,802 km of line length, 167 substations and 152,135 MVA of transformer capacity. All the high voltage lines, plus the transformers and related equipment, form the transmission system also known as the national grid.

4.2.1 COMPONENTS OF A TYPICAL TRANSMISSION LINE SYSTEM

The main components of a typical electrical transmission system include the following:

TRANSMISSION STRUCTURES

Transmission structures are the most visible components of the power transmission system. Their function is to inter alia, keep the high-voltage conductors separated from their surroundings and from each other. Some structure designs reflect the specific function of the structure, while others have come about as a result of technological progress. Structure design alternatives for this project are discussed in Section 5.2.

CONDUCTORS

Conductors carry the power through and from the grid. Generally, several conductors per phase are strung from structure to structure. The number of conductors per phase depends on the performance of the line, typically, more than one conductor per phase is used when the operating voltage exceeds 132kV. Conductors are constructed primarily of aluminium, aluminium-alloy, steel or other types of materials as appropriate.

SUBSTATIONS

The very high voltages used for power transmission are converted at substations to lower voltages for further distribution and consumer use. Substations vary in size and configuration but may cover several hectares; they are cleared of vegetation and typically surfaced with gravel. They are fenced, and are normally reached by a permanent access road. In general, substations include a variety of indoor and outdoor electrical equipment such as switchgear, transformers, control and protection panels and batteries, and usually include other components such as control buildings, fencing, lighting etc.

For the substation to perform it needs sophisticated protection equipment to detect faults and abnormal conditions that may occur on the network. Action may consist for example, of automatically tripping a transmission line to cater for abnormal conditions such as lightning strikes, fires or trees falling on transmission lines. This action is necessary for safety reasons in the event of an accident or to maintain electricity supply and limit the disruption caused.

Figure 4-2 provides an illustration of a typical substation layout.

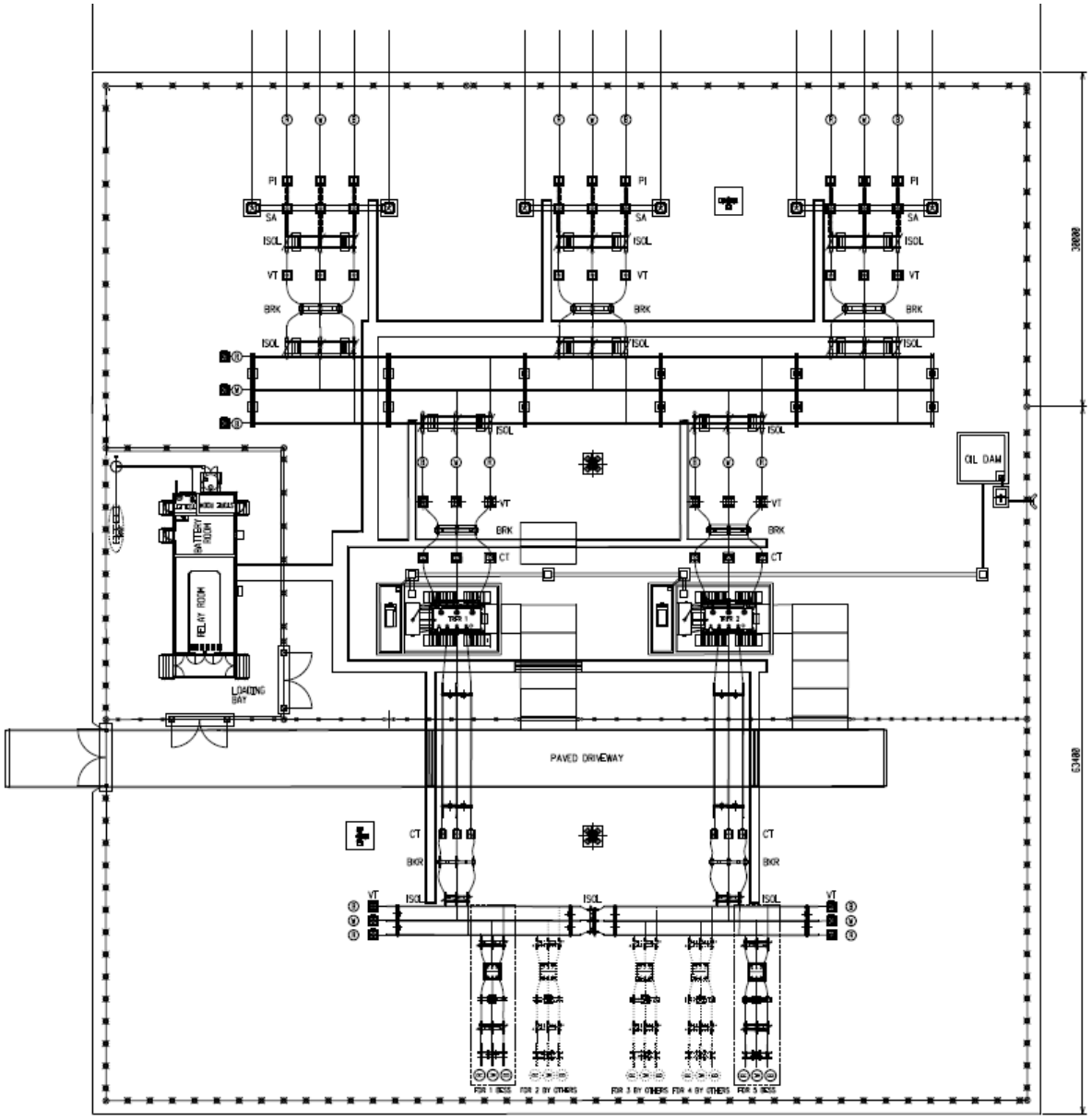


Figure 4-2: Typical Substation Layout

TRANSFORMERS

Transformers are major items found in a transmission or distribution substation. There may be a number of different types of transformers in a substation such as power transformers, voltage transformers or current transformers.

A power transformer is a very simple device piece of electrical equipment where alternating current (AC) is led through a primary coil of wire, which produces an alternating magnetic field in the ring-shaped core of soft iron. This in turn creates a voltage in a secondary coil, from which the output current can be drawn. If the secondary coil has more turns than the primary coil, the output voltage is higher than the input voltage. This is a step-up transformer. A step-down transformer has more turns in the primary coil than in the secondary coil to reduce the voltage.

4.3 PROJECT INFRASTRUCTURE

The proposed project entails the construction of 1 x up to 132kV OHPL from the Alternative 1 substation (preferred Impumelelo WEF onsite substation) to the to connect to the Eskom Zandfontein Substation. The proposed project will comprise the following key components:

- On-site substation of approximately 2.5ha. The substation will consist of a high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building telecommunication, and other substation components as required; and
- Standard substation electrical equipment, i.e., transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed.
- The control building, telecommunication infrastructure, oil dam(s) etc,
- All the access road infrastructure to and within the substation
- Associated infrastructure including but not limited to lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area and storerooms).

4.3.1 COMPONENTS OF THE TRANSMISSION LINE

A brief overview of the physical/technical requirements of the project is as follows:

- 1 x up to 132kV OHPL (either single or double circuit) between the Alternative 1 substation (preferred Impumelelo WEF onsite substation) and the Eskom Zandfontein Substation;
- Straight line distance between Alternative 1 substation (preferred Impumelelo WEF substation) and Eskom Zandfontein substation is approximately 33 km;
- An assessment corridor of 500m has been included along the alignment of the 132kV OHPL to allow for micrositing.
- The maximum height for an up to 132kV OHPL structure is approximately 40m.
- Minimum conductor clearance is between 8.1 and 12.6m.
- Span length between pylon structures is typically up to 250m apart, depending on complexity and slope of terrain.
- The design of 132kV structure is currently unknown, the following options will be used to determine preferred design:
  - Intermediate self-supporting monopole
  - Inline or angle-strain self-supporting monopole
  - Suspension self-supporting monopole
  - Triple pole structure
  - Steel lattice structure
- The up to 132 kV structures will have a concrete foundation and the sizes may vary depending on design type up to 80m^2 (10m by 8m), with depths reaching up to 3.5m typically in a rectangular ‘pad’ shape. The actual number of structures required will vary according to the final route alignment determined.

4.3.2 CLEARANCE REQUIREMENTS FOR TRANSMISSION LINES

For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:

- The minimum vertical clearance distance between the ground and the transmission line is 6.7m.
- The minimum vertical clearance to any fixed structure that does not form part of the OHPL is 9.4m - 11m.
- The minimum distance between a 132kV transmission line and an existing road is 60m – 120m (depending on the type of road).

- Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to.
- Minimum servitude to other parallel lines.

4.3.3 PROPOSED ASSOCIATED INFRASTRUCTURE

The proposed Grid Connection project will require the following with respect to the permanent infrastructure:

- Where the OHPL crosses a fence between neighbouring landowners and there is no suitable gate in place, a suitable gate will be erected in consultation with the landowner. These gates are necessary in order to ensure access to the line for maintenance and repair purposes.
- Existing road infrastructure will be used as far as possible to provide access for construction vehicles during the construction of the line. Thereafter, the roads are used for inspection and maintenance purposes. Where appropriate roads may be upgraded to access transmission lines and substations. Where no roads exist, access roads may be created for maintenance and inspection purposes.
- Fibre Optic cable could be strung on the earth cable if required for telecommunication
- Associated infrastructure including but not limited to lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area and storerooms).

PROPOSED SWITCHING SUBSTATION

Two alternative substation locations have been proposed for the Impumelelo GRIDLINE (Gridline Alternative 1 via the onsite substation located on portion 5/543 of Farm Platkop). It must be indicated that both substation alternatives are planned to be constructed on approximately 5 ha. Based on the plan, an IPP substation and an Eskom / Offtaker substation will be constructed for each of the alternatives. The substations will be constructed next to each other on area of 2.5ha each. It should be noted that the IPP substation is being authorised as part of a separate application for the WEF (MDARDLEA REF: 1/3/1/16/1 G/269). Electricity generated from the Impumelelo WEF will be distributed through the IPP substation to the Eskom/Offtaker substation, from the Eskom/Offtaker substation electricity will be distributed by the proposed up to 132kV OHPL into the Zandfontein Substation. A 200m buffer has been included around the Zandfontein substation to allow for micrositing should it require expansion.

The substation will consist of a high voltage substation yard to allow for multiple up to 132kV feeder bays and transformers, control building telecommunication, and other substation components as required. Supporting infrastructure such as Control room, parking, oil spillage containment dam/bund wall, fence, and other infrastructure will be constructed as part of the Eskom section substation (**Figure 4-3**).

There is a potential that the electricity generated will only feed into either the national electricity grid or a private off-taker, in which instance the substations will be either privately owned and managed or transferred to Eskom.

Figure 4-3: Example of substation

4.4 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

- The typical steps involved in the construction and operation of a transmission line is summarised below:
- Planning Phase
  - Step 1: Surveying of the development area and negotiation with affected landowners; and
  - Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities.
- Construction Phase
  - Step 3: Vegetation clearing;
  - Step 4: Assembly and erection of infrastructure on site;
  - Step 5: Stringing of conductors; and
  - Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.
- Operation Phase
  - Step 7: Continued maintenance during operation.

4.4.1 CONSTRUCTION PHASE

CONSTRUCTION SCHEDULE

Construction of the Transmission Line is anticipated to take 6 - 12 months.

SITE ESTABLISHMENT AND TRANSPORTATION OF MATERIALS AND EQUIPMENT TO SITE

The selected contractor will establish a temporary site camp including, but not be limited to, temporary offices, laydown areas for equipment and materials, storage facilities, ablutions, waste storage and handling area, and parking area. The location and extent of the Contractors camp, to be established within the Project, are undertaken as part of a different application and are not covered in the EMPr. It is anticipated that materials will be collected on a daily basis from the contractor laydown area for the construction activities along the servitude. This limits areas to be impacted for storage along the servitude as well as for security purposes when activities cease at the end of each day.

The required materials and equipment will be transported to the site via public roads and private farm roads/tracks along the proposed servitude, as far as possible. Large mobile plant including mechanical/hydraulic augers, mobile cranes, bucket trucks/cherry pickers will be used during installation of the OHPL.

Labour Requirements

During site preparation and installation of Project related infrastructure the selected Contractor, working on behalf of Impumelelo WEF, is anticipated to require 20-30 people to undertake the required works. Approximately 5% of workers would be highly skilled, 15% medium skilled, and 80% low skilled.

VEGETATION CLEARING

Due to the nature of the vegetation within the Project area, which is predominantly sparse, low shrubs and grasses, limited vegetation clearing will be required. Clearing of vegetation will be limited to pylon areas to facilitate installation of each pylon and that required for the substation and associated infrastructure footprints. Clearing will be done in phases along the OHPL route as required prior to installation activities.

INSTALLATION OF OHPL

Standard OHPL installation methods will be employed, which entails the excavations for foundations, planting of tower (concrete casting may be required) and stringing of the conductors.

A number of tower options could be utilised with a maximum height up to 40m above ground level, which are reported to have a life expectancy of more than 25 years. The actual height of the pylons will vary based on the site topography to maintain the specified clearance of the transmission lines.

Once the pylons have been installed, the lines will be strung. The Contractor will be responsible for functional testing and commissioning of the OHPL. This consists of connecting the line from the Impumelelo IPP substation to the Eskom Zandfontein substation.

ONSITE SUBSTATION

A new onsite substation will be established within the extent of the authorized Impumelelo WEF. The Impumelelo WEF IPP substation environmental authorisation is undertaken as part of a different process; however, the Eskom/Offtaker Section Substation is part of this application. The Switching Substation will be constructed on an area of approximately 2.5 ha.

DEMOBILISATION

Upon completion of the installation phase, any temporary infrastructure will be removed, and the affected areas rehabilitated.

4.4.2 OPERATIONAL PHASE

Typically Eskom would be responsible for managing the operations of the OHPL in line with their internal management systems, however there is a potential that the electricity generated will only feed into either a private off-taker or the national electricity grid, in which instance the substations will be privately owned and managed or transferred to Eskom. The Offtaker and/or Eskom are considered to have the requisite expertise to operate and maintain the transmission line. The Offtaker and/or Eskom will adhere to all existing Safety Codes and Guidelines for the operation and maintenance of the OHPL infrastructure.

During the operational phase there will be little to no Project-related movement along the servitude as the only activities are limited to maintaining the servitude (including maintenance of access roads and cutting back or pruning of vegetation to ensure that vegetation does not affect the OHPL), inspection of the powerline infrastructure and repairs when required. Limited impact is expected during operation since there will not be any intrusive work done outside of maintenance in the event that major damage occurs to site infrastructure.

Operation of the OHPL will involve the following activities, discussed below.

SERVITUDE MANAGEMENT AND ACCESS ROAD MAINTENANCE

Servitude and access road maintenance is aimed at eliminating hazards and facilitating continued access to the OHPL. The objective is to prevent all forms of potential interruption of power supply due to overly tall vegetation/climbing plants or establishment of illegal structures within the right servitude. It is also to facilitate ease of access for maintenance activities on the OHPL. During the operational phase of the project, the servitude will be maintained to ensure that the OHPL functions optimally and does not compromise the safety of persons within the vicinity of the OHPL.

TRANSMISSION LINE MAINTENANCE AND OPERATIONS

The Offtaker (Private or Eskom) will develop comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for the OHPL. The maintenance activities will include:

- The Offtaker's Maintenance Team (Private or Eskom) will carry out periodic physical examination of the OHPL and its safety, security and integrity.
- Defects that are identified will be reported for repair. Such defects may include defective conductors, flashed over insulators, defective dampers, vandalised components, amongst others.
- Maintenance / repairs will then be undertaken.

4.4.3 DECOMMISSIONING PHASE

Decommissioning will be considered when the OHPL is regarded obsolete and will be subject to a separate authorisation and impact assessment process. This is not expected to occur in the near future.

4.5 NEED AND DESIRABILITY OF THE PROJECT

The DEA&DP Guideline (2013) states that the essential aim of need and desirability is to determine the suitability (i.e. is the activity proposed in the right location for the suggested land-use/activity) and timing (i.e. is it the right time to develop a given activity) of the development. Therefore, need and desirability addresses whether the development is being proposed at the right time and in the right place. Similarly, the 'Best Practicable Environmental Option' (BPEO) as defined in NEMA is "*the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.*"

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh 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

The development of renewable energy and the associated energy infrastructure is strongly supported at a national, provincial, and local level. The development of, and investment in, renewable energy and associated energy distribution infrastructure is supported by the National Development Plan, New Growth Path Framework and National Infrastructure Plan, which all highlight the importance of energy security and investment in energy infrastructure. The development of the proposed power line is therefore supported by key policy and planning documents and is in line with South Africa's strategic energy planning context (Refer to **Section 2**).

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

The transition towards renewable energy will improve the socio-economic conditions of the Gert Sibande District Municipality. The Gert Sibande District Municipality recorded an unemployment rate of 26.7% in 2017, 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 Gert Sibande District Municipality, namely the cost of electricity and lack of

adequate employment opportunities. The Project will be the first large-scale wind energy facilities being developed in Mpumalanga. The proponent foresees this project as being the catalyst to realising a true Just Energy Transition for Mpumalanga. As various career opportunities are presented by the wind industry, and these are divided into four pillars that are aligned with the value chain.

The wind 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 Mpumalanga to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

As mentioned previously, five of Eskom's coal-fired power stations have been targeted for decommissioning in the short term: Komati , Camden, Grootvlei, Arnot, and Hendrina. Eskom is looking to decommission 5 400MW of electricity from coal generation by the year 2022, increasing to 10 500MW by 2030 and 35 000MW by 2050. Simultaneously Eskom has been looking at options for repurposing these power stations with the core aims of reusing existing power transmission infrastructure, developing new generation capacity, providing ancillary services, and mitigating socio-economic impact.

The Impumelelo WEF project also supports the countries drive to roll out new generation capacity as outlined in the IRP 2019 and supports National Governments aim of a low carbon economy as set out in the National Development Plan 2030.

The social environment of the study area can be described as a working agricultural / industrial environment. Numerous large industrial companies are operating in the vicinity of the project area. The development of the proposed Impumelelo WEF would strengthen the existing electricity grid for the area. The electricity generated from this development would be supplied to private off-takers, including commercial users. Long term off-take agreement with surrounding businesses is envisaged with the proponent. The use of this land for renewable energy has a considerable potential to improve the reliability of the supply of electricity to surrounding commercial users, as well as generate the much-needed employment opportunities within the Local and District Municipalities.

The energy security benefits associated with the proposed Impumelelo WEF is dependent upon it being able to connect to the national grid via the establishment of grid connection infrastructure. The proposed OHPL is therefore essential supporting infrastructure to the WEF development, which, once developed, will generate power from renewable energy resources.

No physical or economic displacement will be required along the proposed route.

Furthermore, negative environmental impacts associated with the activity will be mitigated to acceptable levels in accordance with the EMPr (**Appendix G**). Refer to **Section 8** below for the Environmental Impact Assessment and recommended mitigation measures.

5 PROJECT ALTERNATIVES

In terms of the EIA Regulations, feasible alternatives are required to be considered. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic, and technical factors. A key challenge of the BA Process is the consideration of alternatives. Most guidelines use terms such as 'reasonable', 'practicable', 'feasible' or 'viable' to define the range of alternatives that should be considered.

Effectively there are two types of alternatives:

- Incrementally different (modifications) alternatives to the project; and
- Fundamentally (totally) different alternatives to the project.

"Alternatives", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to –

a) the property on which or location where it is proposed to undertake the activity;
b) the type of activity to be undertaken;
c) the design or layout of the activity;
d) the technology to be used in the activity;
e) the operational aspects of the activity; and
f) the option of not implementing the activity (i.e. no-go).

All alternatives outlined below are considered both feasible and reasonable with no apparent advantages or disadvantages. .

5.1 ACTIVITY ALTERNATIVE

Only one activity has been assessed (i.e. an overhead powerline and substation). Alternative activities for the current Project are not reasonable or feasible as the purpose of this project is to transmit electrical energy generated by the proposed Impumelelo WEF to the Impumelelo onsite substation for distribution to the Eskom Zandfontein Substation.

5.2 TECHNOLOGY ALTERNATIVES

5.2.1 GRID CONNECTION

There are two methods of power transmission, these being overhead lines and underground cables. Underground cables are considerably more difficult and expensive to install and maintain, relative to overhead lines. Considering the proposed terrain of the proposed OHPL, which traverses several delineated wetlands and CBA 1 areas, underground cables would require extensive trenching which would result in greater environmental impacts. Underground powerlines are therefore not considered feasible for the proposed Project.

Therefore, only one technology has been assessed, namely distribution of electricity via a 132 kV OHPL and onsite 33/132kV substation, as this is considered the most appropriate technology and is in line with Eskom design requirements.

Two types of tower structures have been considered for the OHPL, monopole towers or steel lattice towers, which have been detailed below.

MONOPOLE-TYPE TOWERS

The type of tower to be used depends on the topography and the alignment of the powerline corridors. In general, monopole-type towers are used for transmission lines with shorter spans.

132KV INTERMEDIATE SELF-SUPPORTING DOUBLE CIRCUIT MONOPOLE (PREFERRED)

Self-supporting galvanised steel Monopole Intermediate or Suspension structure with no stays/anchors. The monopole is designed to support a double electrical circuit with a twin conductor arrangement. The monopole height varies between 26 m and 32 m (**Figure 5-1**).

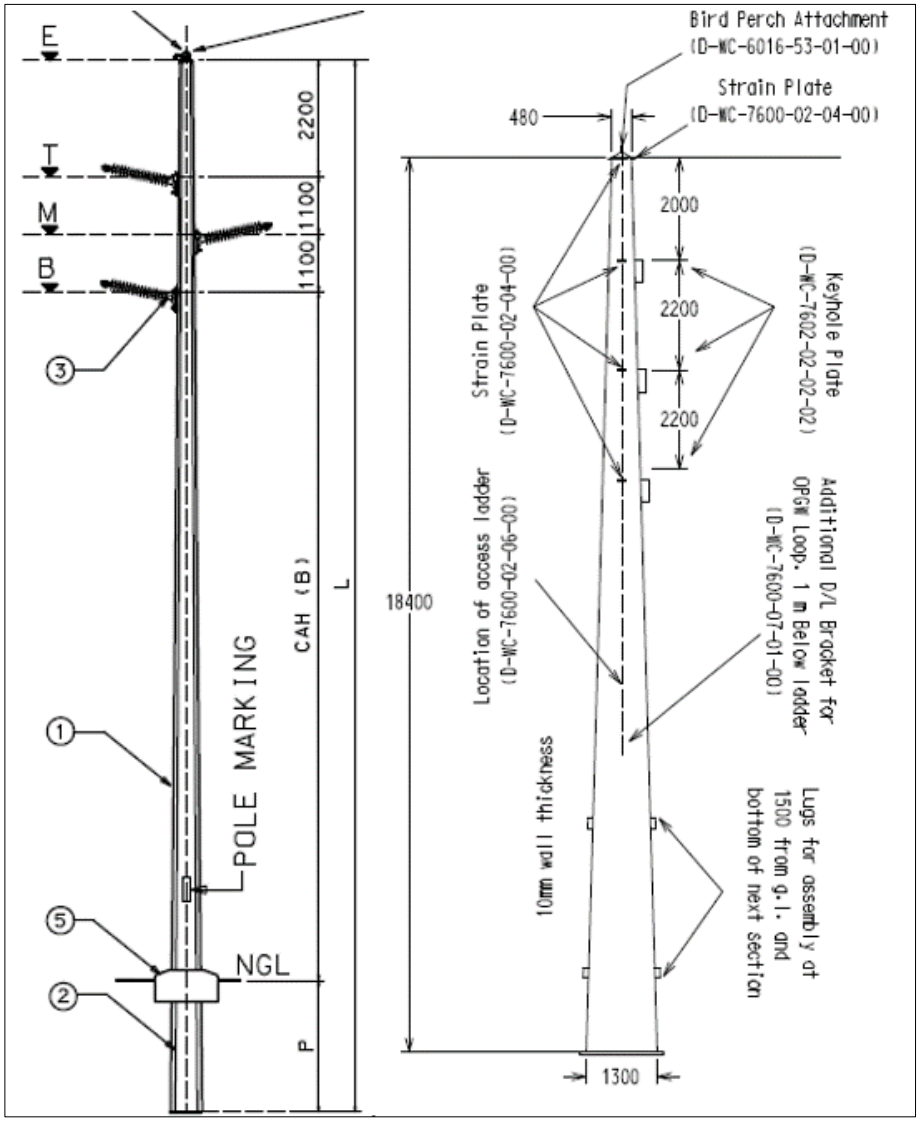


Figure 5-1: 132kV Intermediate Self-Supporting Double Circuit Monopole

132KV INLINE OR ANGLE STRAIN SELF-SUPPORTING DOUBLE CIRCUIT MONOPOLE.

Self-supporting galvanised steel Monopole inline or Angle Strain structure with no stays/anchors. The monopole is designed to support a double electrical circuit with a twin conductor arrangement (**Figure 5-2**),

This structure will be used as the strain structure and will be positioned at the angle points along the line or as an inline position where a strain point is required due to the ground elevation. The monopole height varies between 26 m and 32 m.

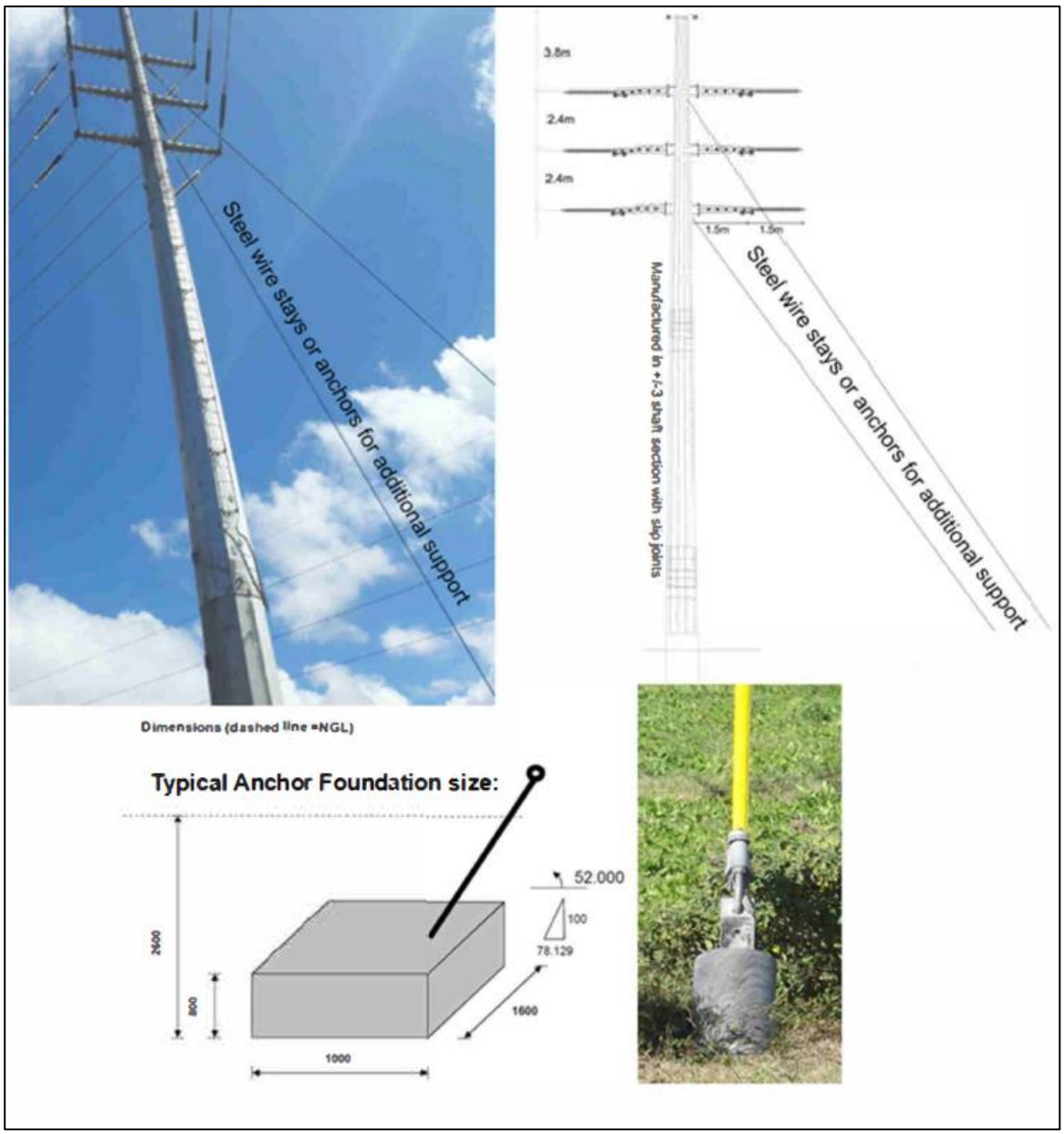


Figure 5-2: 132kV Inline Or Angle Strain Self-Supporting Double Circuit Monopole

132KV SUSPENSION SELF-SUPPORTING SINGLE CIRCUIT MONOPOLE WITH SINGLE CONDUCTOR

Self-supporting galvanised steel Monopole Suspension structure with no stays/anchors. The monopole is designed to support a single electrical circuit with a single conductor arrangement. The monopole height varies between 22m and 26m (**Figure 5-3**).

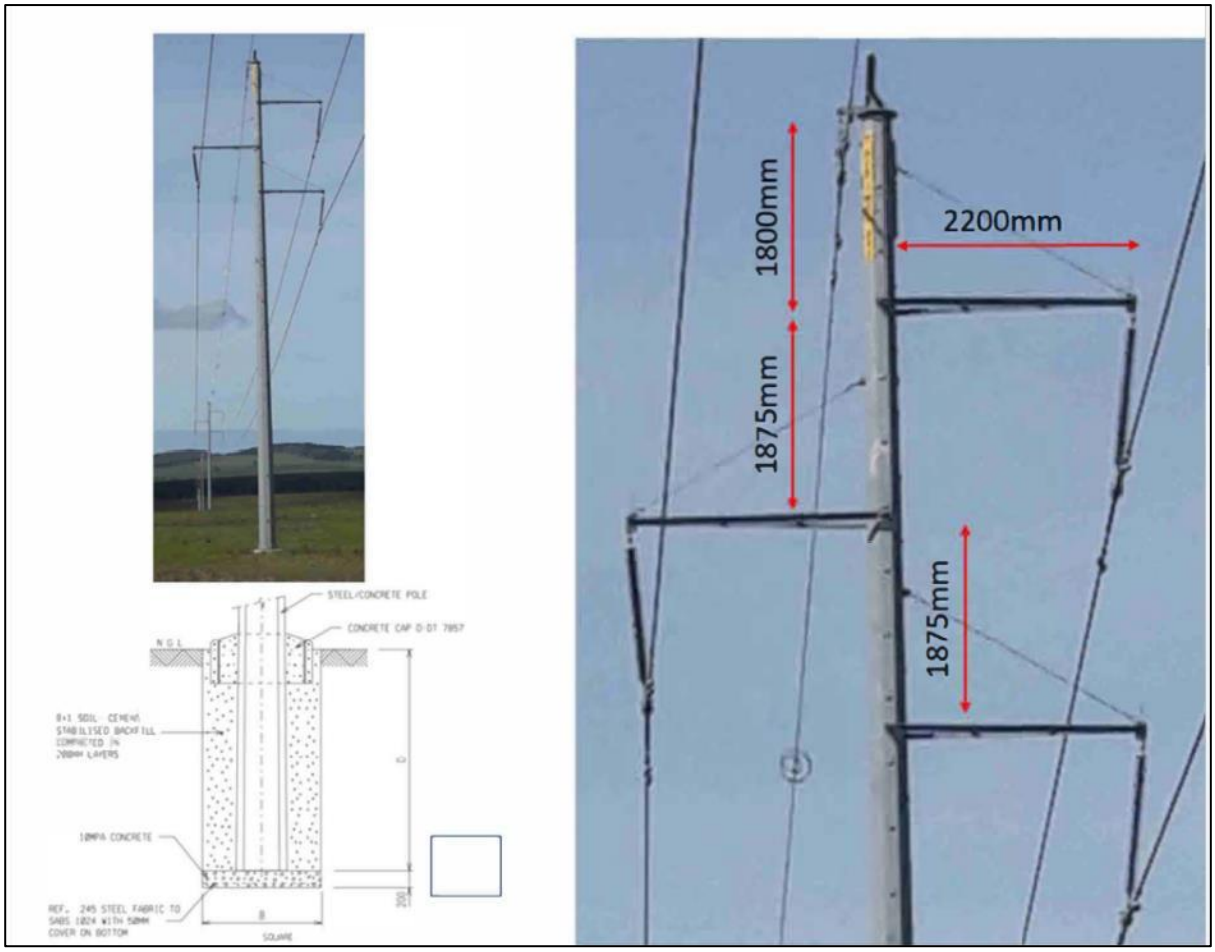


Figure 5-3: 132kV Suspension Self-Supporting Single Circuit Monopole With Single Conductor

132KV INLINE OR ANGLE STRAIN SELF-SUPPORTING SINGLE CIRCUIT MONOPOLE WITH SINGLE CONDUCTOR

Self-supporting galvanised steel Monopole Inline or Angle Strain structure with no stays/anchors. The monopole is designed to support a single electrical circuit with a single conductor arrangement. The monopole height varies between 24 m and 26 m. The foundation will consist of a typical pad foundation with bolts inside the concrete foundation (**Figure 5-4**).

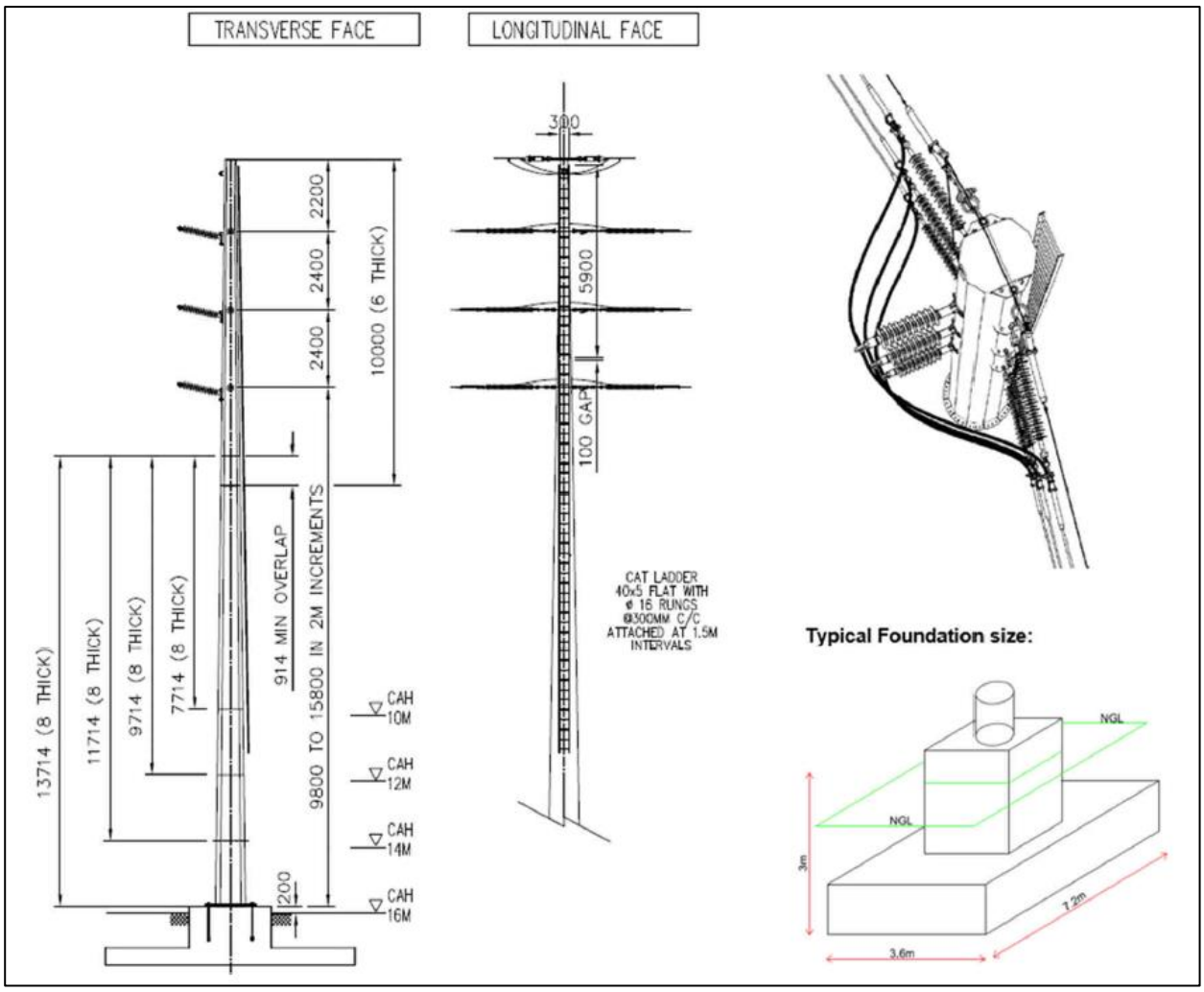


Figure 5-4: 132kV Inline Or Angle Strain Self-Supporting Single Circuit Monopole With Single Conductor

STEEL LATTICE TOWERS

Steel lattice-type pylons are only used where long spans (>500m) across valleys and rivers are required.

132KV/275KV POWERLINE DOUBLE CIRCUIT SUSPENSION TOWERS

Consist of a steel framework of individual structural components that are bolted or welded together. Can be designed to carry either one or two electrical circuits, referred to as single-circuit and double-circuit structures. The lattice pylons height varies between 25 m and 40 m (**Figure 5-5**).

Figure 5-5: 132KV/275KV Powerline Double Circuit Suspension Towers

FOUNDATIONS

The type of foundation required for each pylon is dependent on the geo-technical conditions. Foundations may be drilled, mechanically excavated, or dug by hand. All foundations are backfilled and stabilised through compaction and capped with concrete at ground level. Below are two examples of monopole foundations for different soil conditions (**Figure 5-6**).

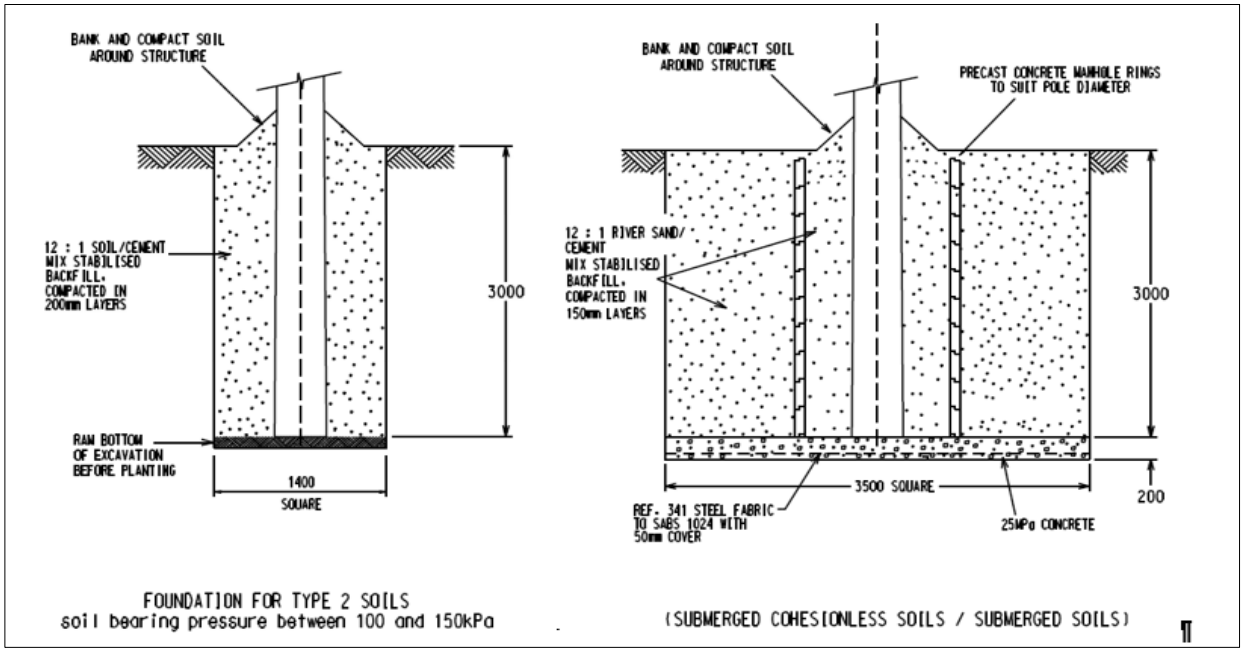


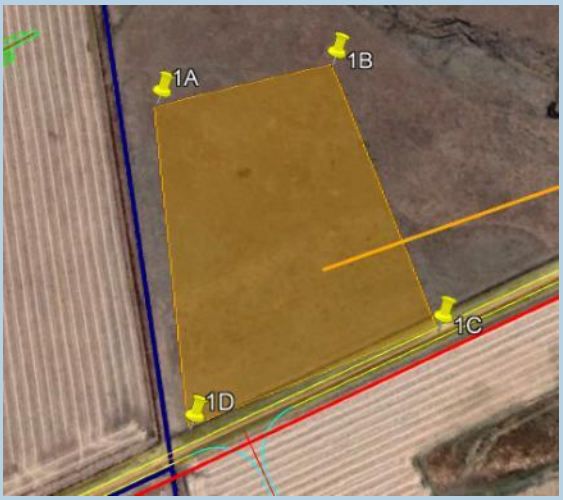
Figure 5-6: 132kV Power Foundations

5.3 LOCATION ALTERNATIVES

The purpose of the OHPL and onsite substation is to connect the proposed Impumelelo WEF to the Eskom Zandfontein Substation.. The onsite substation has a footprint of approximately 2.5ha. No alternative location for the Eskom Zandfontein Substation is required as it is an existing substation. A 200m buffer around the substation has been assessed to allow for micrositing should the substation require expansion.

Two alternative locations for the 33/132kV switching substation at the Impumelelo WEF have been assessed as part of this BAR, each with a 135m x 150m (2 ha) footprint. These alternatives are depicted in **Figure 4-1. Table 5-1** outlines the corner co-ordinates of the substation alternative sites.

Table 5-1: Substation Alternative co-ordinates

POINT	LATITUDE	LONGITUDE
Impumelelo Substation - Option 1 (Preferred)		
		
1A	26°39'41.79"S	28°51'3.65"E
1B	26°39'40.13"S	28°51'8.98"E
1C	26°39'47.54"S	28°51'12.98"E
1D	26°39'50.84"S	28°51'5.89"E
Impumelelo Substation - Option 2		
		
2A	26°40'24.86"S	28°50'27.31"E

POINT	LATITUDE	LONGITUDE
2B	26°40'22.45"S	28°50'33.10"E
2C	26°40'29.50"S	28°50'38.23"E
2D	26°40'32.50"S	28°50'31.61"E

5.4 LAYOUT ALTERNATIVES

As mentioned before, two (2) alternatives have been developed for the proposed project.

The study area comprises of two powerline and substation options. Option 1 (including Substation Option 1) and Option 2 (including Substation Option 2) follows the same route from the same Zandfontein Substation towards the Sasol Impumelelo Mine where the route diverges around the mine respectively.

Thus Option 1 approximately 33.3 Km while Option 2 is approximately 33.7 km These alternatives, are illustrated in **Figure 5-7** and **Figure 5-8**, and are described below:

- **OHPL Route Option 1:** approximately 33.3 km in length in its entirety from Substation Option 1 to the Eskom Zandfontein Substation;
- **OHPL Route Option 2:** approximately 33.7 km in length in its entirety from Substation Option 2 to the Eskom Zandfontein Substation;

A 500m corridor along the powerline (125m either side of centreline) as well as a 200m buffer around the substation has been assessed as part of this BAR. The co-ordinates for the bend points of each of the above alternatives are included in **Table 5-2**.

Table 5-2: Bend point co-ordinates for the Alternative Powerline Routes

BEND POINT	CO-ORDINATES	
OHPL Option 1 (Preferred)		
Start	029° 02' 41.65425960" E	26° 30' 17.52291720" S
1	029° 02' 45.01785480" E	26° 30' 15.09085080" S
2	029° 02' 42.86016960" E	26° 30' 12.95731800" S
3	029° 02' 07.99231920" E	26° 30' 31.68164160" S
4	029° 02' 01.01356440" E	26° 30' 32.27142960" S
5	029° 01' 47.02735560" E	26° 31' 28.71467040" S
6	029° 01' 31.18888200" E	26° 32' 06.37495440" S
7	029° 01' 05.29572720" E	26° 32' 23.07176160" S
8	029° 01' 22.98662400" E	26° 33' 11.04416640" S
9	029° 01' 31.96424280" E	26° 33' 42.30678600" S
10	029° 00' 52.50463920" E	26° 34' 09.12281880" S
11	028° 59' 31.10848080" E	26° 36' 31.39841520" S
12	028° 57' 05.27640480" E	26° 36' 33.19539840" S
13	028° 56' 19.01889240" E	26° 36' 39.92953680" S
14	028° 55' 23.03872320" E	26° 36' 54.88315920" S

BEND POINT	CO-ORDINATES	
15	028° 54' 37.13172480" E	26° 37' 12.68153400" S
16	028° 53' 16.38232440" E	26° 37' 56.11422720" S
17	028° 53' 59.83001520" E	26° 39' 10.80152640" S
18	028° 52' 13.59053400" E	26° 39' 55.89081000" S
19	028° 51' 32.25719520" E	26° 39' 37.93635360" S
End	028° 51' 09.31781880" E	26° 39' 46.11756600" S
OHPL Option 2		
Start	029° 02' 42.30974760" E	26° 30' 20.31512760" S
1	029° 02' 42.92738160" E	26° 30' 21.37064040" S
2	029° 02' 45.01649040" E	26° 30' 19.97264880" S
3	029° 02' 50.94816000" E	26° 30' 28.07624160" S
4	029° 02' 01.08579840" E	26° 30' 32.80687560" S
5	029° 01' 50.04073200" E	26° 31' 27.29628480" S
6	029° 01' 30.94168440" E	26° 32' 05.18098920" S
7	029° 01' 06.08637720" E	26° 32' 23.72014320" S
8	029° 01' 33.34406880" E	26° 33' 42.88947840" S
9	029° 00' 54.45811080" E	26° 34' 07.16479320" S
10	029° 00' 30.39818760" E	26° 34' 43.99220640" S
11	028° 59' 30.87609360" E	26° 36' 31.09158000" S
12	028° 58' 30.35124120" E	26° 36' 33.73340760" S
13	028° 57' 17.17327800" E	26° 36' 33.49069920" S
14	028° 56' 21.39411480" E	26° 36' 39.91883040" S
15	028° 55' 30.00465480" E	26° 36' 53.04006000" S
16	028° 54' 38.42176680" E	26° 37' 14.01419280" S
17	028° 53' 14.76078000" E	26° 37' 56.02148760" S
18	028° 52' 39.78560640" E	26° 38' 33.32536800" S
19	028° 52' 29.07949800" E	26° 39' 51.80605920" S
20	028° 52' 14.31798240" E	26° 39' 57.74441760" S
21	028° 51' 33.29832960" E	26° 39' 39.43060920" S
22	028° 51' 29.64656880" E	26° 39' 39.28368960" S
23	028° 50' 27.76531920" E	26° 40' 12.25692480" S
24	028° 50' 24.10985760" E	26° 40' 16.15980360" S
End	028° 50' 28.35807360" E	26° 40' 24.49297920" S

5.5 'NO PROJECT' ALTERNATIVE

In the "no project" alternative, the Impumelelo 132kV Grid Connection 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 associated with the development of the Impumelelo WEF would be avoided.

Conversely, negative environmental impacts of the project (as outlined in **Section 8**) associated with the development of the Impumelelo 132kV Grid Connection would be avoided.

The "no project" alternative has been considered in this BAR as a baseline against which the impacts of the Impumelelo 132kV Grid Connection project have been assessed.

Figure 5-7: Bend point co-ordinates for OHPL Alternative 1 (Preferred)

Figure 5-8: Bend point co-ordinates for OHPL Alternative 2

6 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 following characteristics of the receiving environment for the proposed Project area are described in **Table 6-1** below.

Table 6-1: Characteristics of the receiving environment

RECEIVING ENVIRONMENT	CHARACTERISTICS	
Physical Environment	— Climate — Topography — Geology — Soils and Agriculture — Surface Water	This information was extracted from the following studies: — Visual Impact Assessment (**Appendix F-7**) — Desktop Geotechnical Assessment (**Appendix F-9**) — Agricultural Assessment (**Appendix F-8**) — Aquatic Impact Assessment (**Appendix F-6**)
Biological Environment	— Vegetation — Conservation Plans — Protected Areas — Plant Species — Fauna Specialist — Avifauna	This information was extracted from the following studies: — Terrestrial Ecology Impact Assessment (**Appendix F-2**) — Avifauna Impact Assessment (**Appendix F-1**)
Social and Economic	— Land use — Heritage — Palaeontology — Landscape and Visual — Socio-Economic	This information was extracted from the following studies: — Visual Impact Assessment (**Appendix F-7**) — Heritage Impact Assessment (**Appendix F-3**) — Palaeontological Impact Assessment (**Appendix F-4**) — Social Impact Assessment (**Appendix F-5**)

6.1 PHYSICAL ENVIRONMENT

6.1.1 CLIMATE AND METEOROLOGY

REGIONAL CLIMATE (MUCINA & RUTHERFORD 2006)

The site falls in a strongly seasonal summer-rainfall, cool-temperate region, with very dry winters. The mean annual precipitation of the Soweto Highveld Grassland is 662 mm with a peak in rainfall from November to January. The annual precipitation coefficient of variation is 27%. Mean annual potential evaporation is 2060 mm, while the mean annual soil moisture stress is 75%. Mean annual temperature is 14.8°C and frost is frequent in winter with a mean of 41 days per annum.

RAINFALL

The mean annual rainfall in the region ranges from 667 mm at the farm Zandfontein to 738 mm at the farm Driefontein, both close to Secunda (**Table 6-2**). The mean annual rainfall as measured at Secunda is 693 mm (**Table 6-2, Table 6-3** and **Figure 6-1**). The total annual rainfall at Secunda during dry and wet years respectively may range from 558 mm to 965 mm, indicating a moderate variation in the annual rainfall. The rainy season at Secunda is predominantly from October to March when about 86% of the annual rainfall occurs. December and January are the wettest months and the driest period is from May to August, when less than 15 mm of rain per month is recorded. Maximum rainfall measured over a 24-hour period at Secunda was 82 mm, recorded in November. The highest monthly rainfall recorded was 241 mm, also measured in November.

Table 6-2: Rainfall at some weather stations in the environs of the Impumelelo site (Weather Bureau, 1998).

	Mean Annual Rainfall (mm)				
Month	Secunda	Zandfontein	Driefontein	Bethal	Standerton
Jan	114	125	121	146	122
Feb	93	97	100	75	87
Mar	64	84	80	61	66
Apr	35	34	44	48	44
May	8	24	21	14	12
June	14	6	7	7	9
July	2	12	9	6	7
Aug	8	5	10	13	12
Sep	33	24	27	28	29
Oct	82	62	71	78	86
Nov	104	100	116	129	117
Dec	136	116	118	106	104
Year	693	667	738	711	695

Table 6-3: Maximum rainfall (mm) in 24 hours, highest maximum and lowest monthly minimum rainfall at Secunda: 26° 30' S; 29° 11' E; 1628 m (Weather Bureau, 1998).

	Rainfall (mm)			
Month	Mean (month)	24 h max	Max per month	Min per month
Jan	114	66	168	50
Feb	93	69	142	41
Mar	64	55	121	31
Apr	35	56	119	2
May	8	12	18	0
June	14	41	75	0
July	2	6	13	0
Aug	8	24	24	0
Sep	33	26	107	0
Oct	82	59	146	0
Nov	104	82	241	0
Dec	136	76	200	89
Year	693	82	965	558

TEMPERATURE

The mean annual temperature for Secunda is 15.8°C (**Table 6-4**) with the extreme maximum and minimum temperatures 33.0°C and -4.3°C respectively. The mean daily maximum for January is 27.2°C and for July it is 18.1°C, whereas the mean daily minimum for January is 13.5°C and for July it is 0.9°C.

Table 6-4: Temperature data (°C) for the Secunda region: 26° 30' S; 29° 11' E; 1628 m (Weather Bureau, 1998).

	Temperature (°C)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Max	27.2	25.9	25.2	23.0	20.8	17.3	18.1	21.5	22.3	24.3	23.8	26.0	27.2
*Ext. Max	33.0	32.5	30.0	30.6	25.5	25.3	25.3	27.0	31.0	32.0	31.0	31.5	33.0
Min	13.5	12.9	12.0	9.8	5.9	2.3	0.9	4.1	6.9	10.0	11.1	13.6	0.9
*Ext. Min	10.1	10.5	7.1	4.2	2.0	-2.6	-4.3	-1.5	1.1	4.3	6.3	8.8	-4.3
Mean	20.4	19.3	18.6	16.3	13.4	9.8	9.5	12.8	14.6	17.1	17.5	19.9	15.8

- Max = mean daily maximum temperature for the month
  *Ext. Max = extreme maximum temperature recorded per month
- Min = mean daily minimum temperature for the month
  *Ext. Min = extreme minimum temperature recorded per month
- Mean = mean monthly temperature for each month and for the year

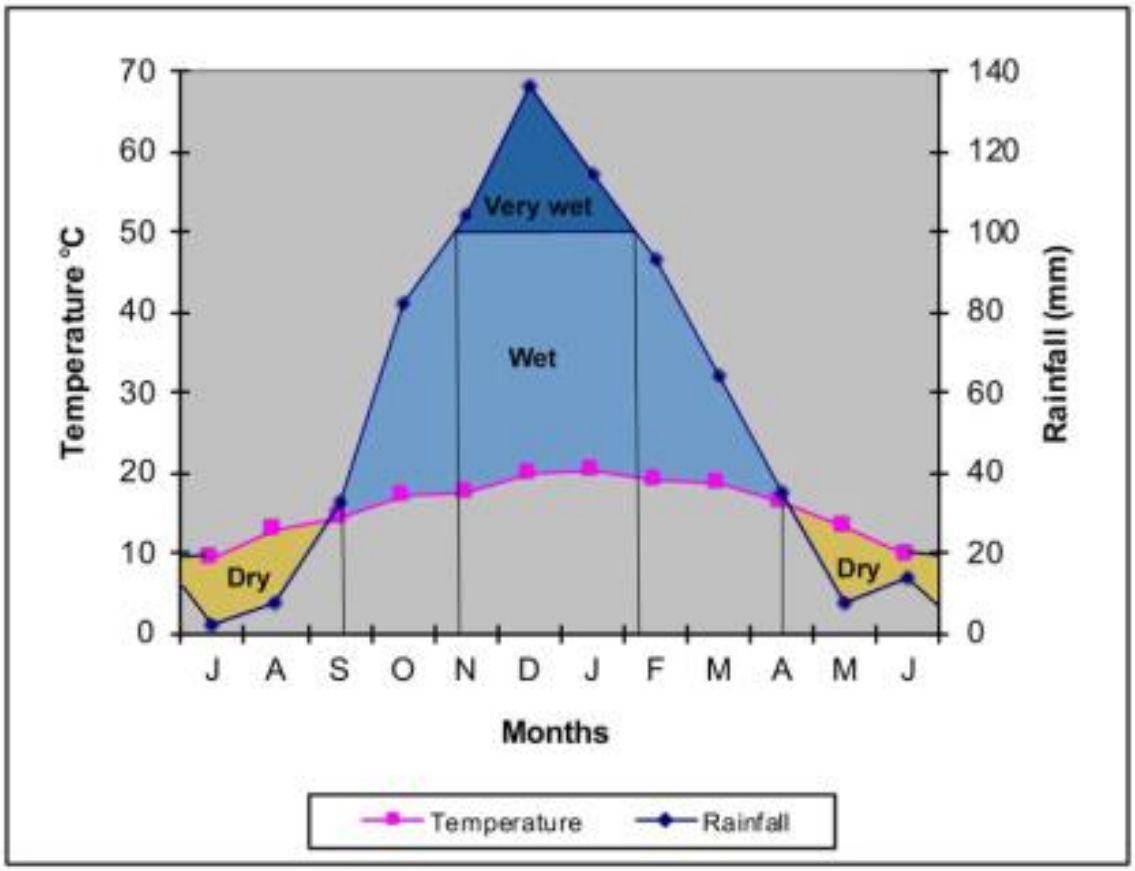


Figure 6-1: Climate diagram for the Secunda region. Months on X-axis are from July to June. When the rainfall curve is below the temperature curve, it indicates a dry period and when the monthly rainfall is higher than 100 mm it indicates a very wet period.

CLOUDINESS AND RELATIVE AIR HUMIDITY

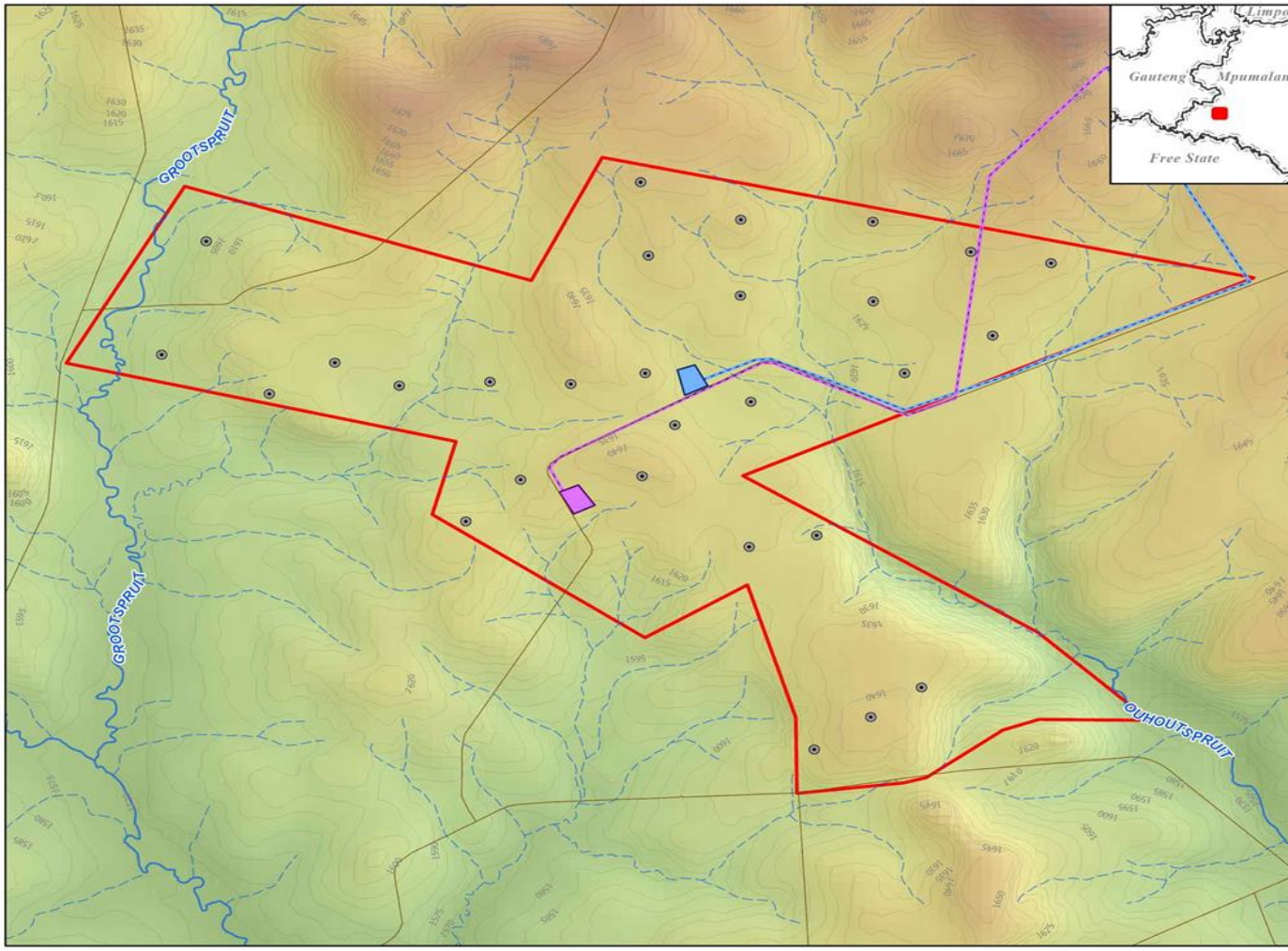
At Bethal weather station, approximately 25 km east of Secunda, cloud cover at 14:00 is the highest from November to January (5.1 – 5.3 eights) and the lowest in June, July and August (1.5 – 1.9eights) (**Table 6-5**). The highest mean relative air humidity (%) at 08:00 occurs during the late summer and autumn months (February to April; 83 – 84%) and the lowest relative air humidity at 14:00 (31%) occurs in early spring (August) (Weather Bureau 1998).

Table 6-5: Cloud cover at 14:00 and percentage relative air humidity at 08:00 and 14:00 at Bethal: 26° 27' S; 29° 29' E; 1663 m (Weather Bureau, 1998)

	Cloud (0-8)	Relative air humidity %	
	14:00	08:00	14:00
Jan	5.2	80	51
Feb	4.9	83	48
Mar	4.9	83	44
Apr	4.1	84	41
May	2.4	80	34
June	1.6	81	34
July	1.5	79	33
Aug	1.9	75	31
Sept	3.1	74	33
Oct	4.6	75	41
Nov	5.3	77	49
Dec	5.1	77	48
Year	3.7	80	41

6.1.2 TOPOGRAPHY

The broader area surrounding the proposed Impumelelo EGI is characterised by a mix of flat to undulating plains intersected by shallow river valleys. Areas of slightly higher elevation occur in the central and north-eastern sectors of the study area. Slopes across the study area are relatively gentle to moderate, with steeper slopes being largely associated with the more incised river valleys. The topography and slope characteristics of the study area are illustrated in



and **Figure 6-3** respectively.

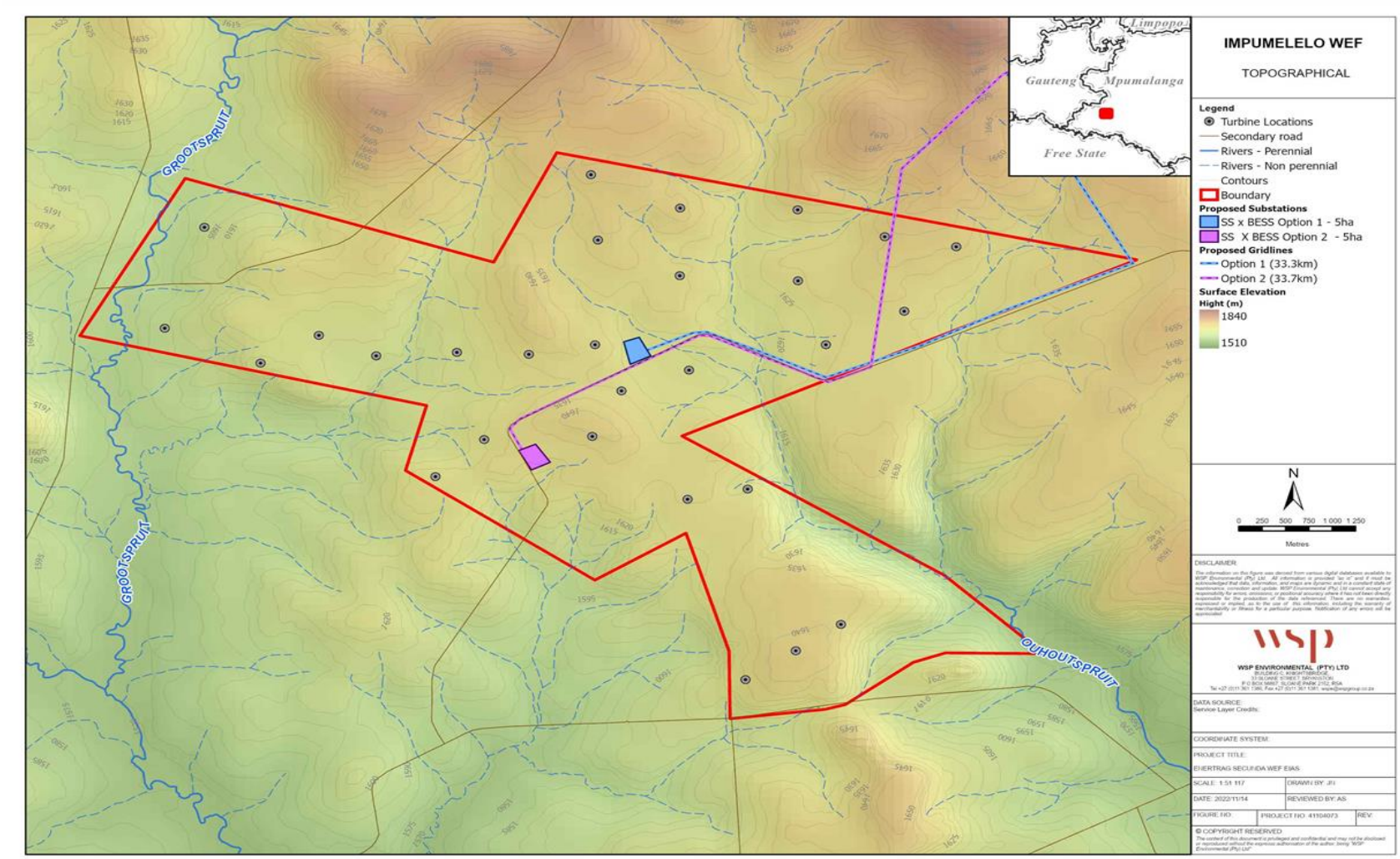


Figure 6-2: Topography at Impumelelo Powerline Corridor

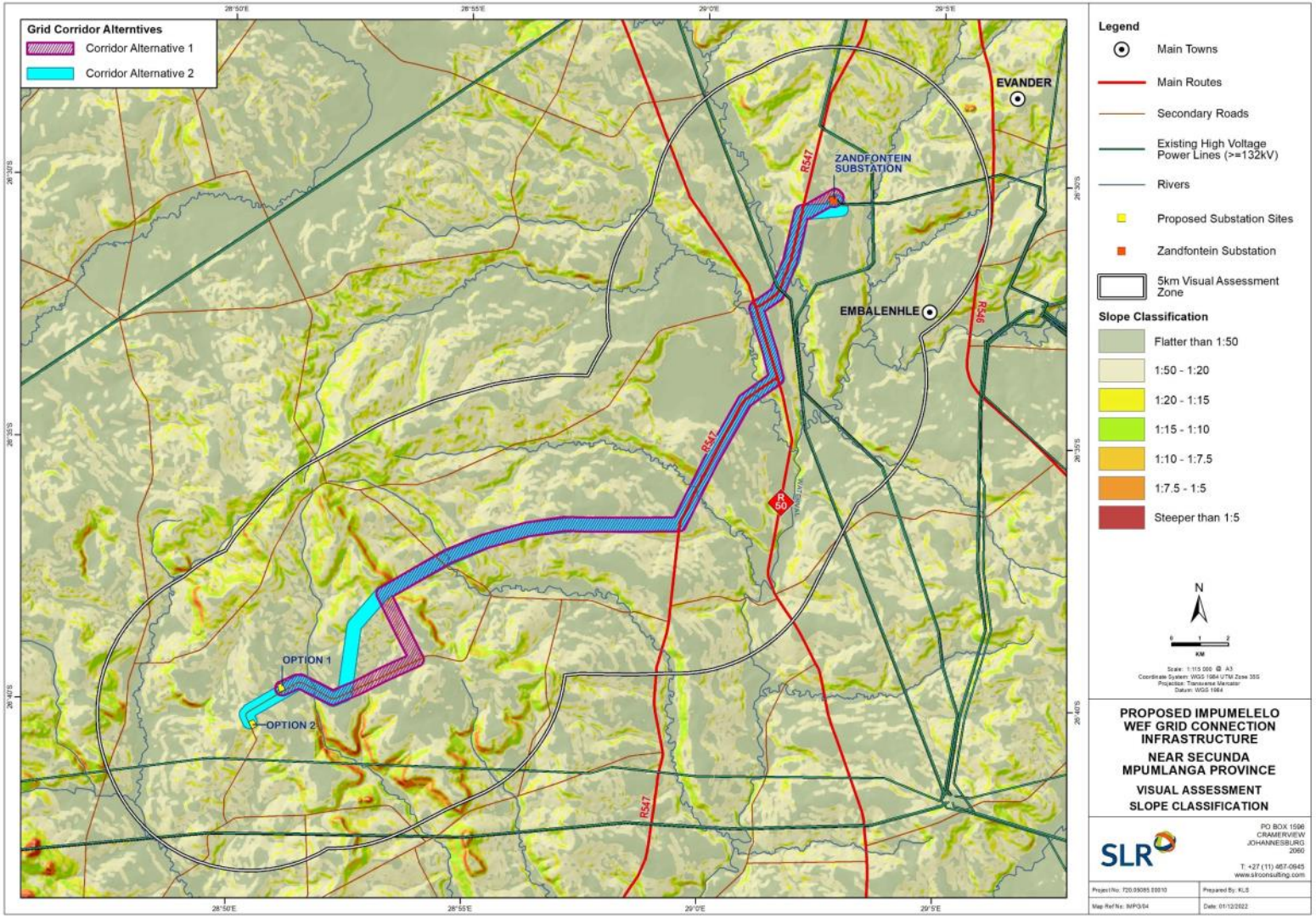


Figure 6-3: Slope Classification of the Impumelelo Powerline corridor

6.1.3 GEOLOGY

According to the published 1: 250 000 geological map (Sheet 2628 East Rand), the study area is underlain by rocks of the Vryheid Formation (Pv), Ecca Group of the Karoo Supergroup. This Vryheid Formation comprises sandstone, shale and coal beds.

The Vryheid Formation has been extensively intruded by Jurassic age dolerite (Jd). The dolerites occur both as sills and linear dyke structures that may extend over tens of kilometers.

Significant recent surficial deposits, alluvium, blanket the areas along the drainage features in the southern portion of the site.

An excerpt of the published geological map showing the project areas is presented as **Figure 6-4** and the lithostratigraphy is presented as

Table 6-6.

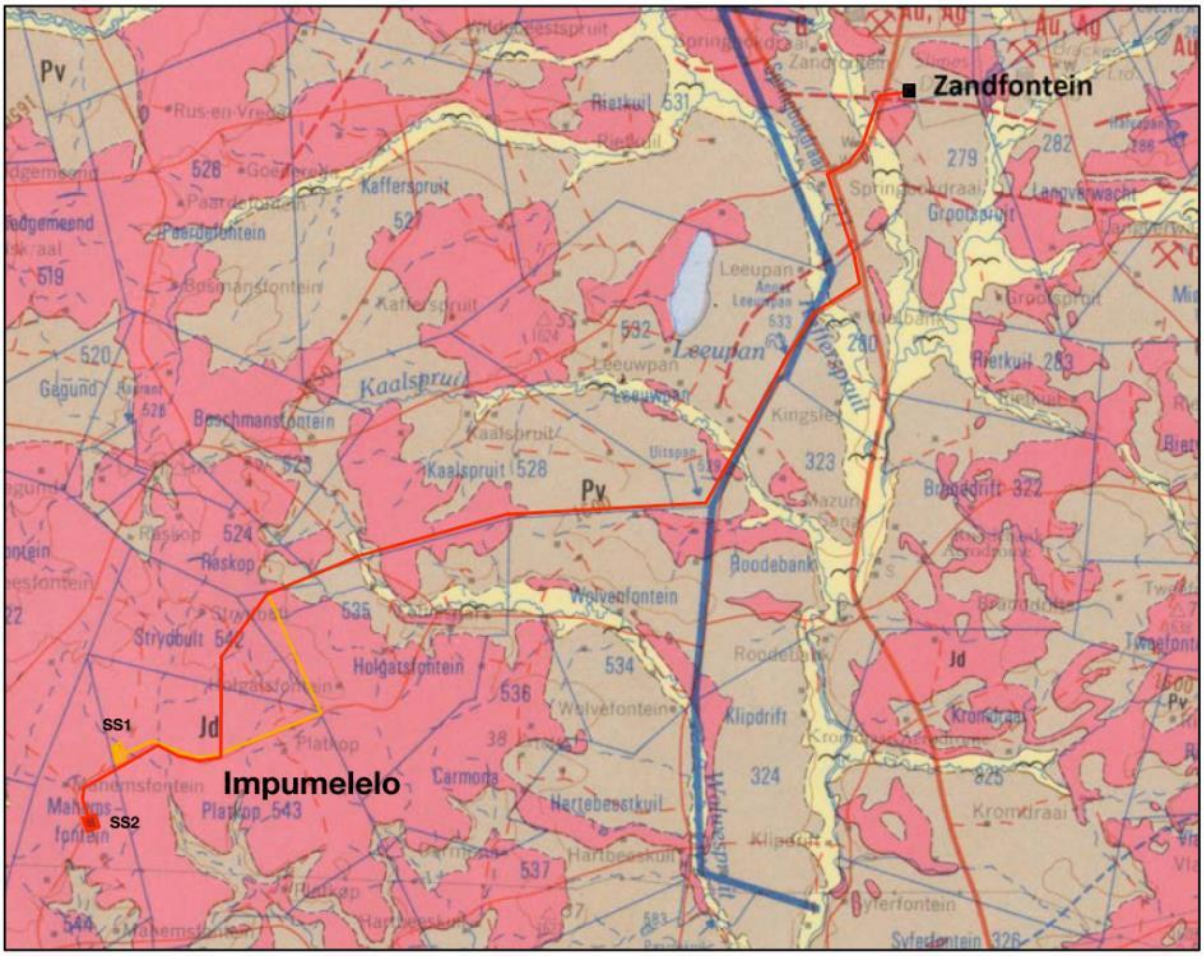


Figure 6-4: Geological map of the area around the Impumelelo 132kV Grid Connection

Table 6-6: Lithostratigraphy of the Area

SUPERGROUP	GROUP	FORMATION	LITHOLOGY	MAP SYMBOL
			Alluvium	~
			Dolerite	Jd
Karoo	Ecca	Vryheid	Sandstone, shale, coal beds	Pv

ENGINEERING GEOLOGY

Engineering geology relates to the engineering characteristics of the natural earths material for founding structures and suitability for use as construction materials. The turbine positions are underlain by two different lithologies as listed in **Table 6-7** below.

Table 6-7: Geological Formations Underlying the OHPL and Substations

	GRID AND ASSOCIATED INFRASTRUCTURE
Dolerite	12.8km of Option 1 Powerline 13.5km of Option 2 Powerline
Vryheid Formation	18.5km of Option 1 Powerline 19km of Option 2 Powerline
Alluvium	1.7km of Option 1 Powerline 1.5km of Option 2 Powerline

ALLUVIUM

Alluvium is anticipated in the floodplains located along the two proposed powerline routes. Ponding of surface water is a common problem in such areas.

Alluvial deposits result from the transportation and deposition of sediment by rivers. The deposits vary in relation to the geology of the catchment area, the site of deposition and the strength of the river. Engineering problems related to alluvial deposits include:-

- Sandy materials being potentially collapsible
- Clayey and silty materials being compressible in the long tern
- Clay material being potentially expansive

VRYHEID FORMATION

Shale

Vryheid shale generally weathers to a clayey residual soil which is often compressible and potentially expansive. Expansive soils are those materials that exhibit volume change with a change in moisture content. These materials “shrink” when the moisture content decreases and “heave” or “expand” when the moisture content increases. Where the residual clay profile is thinly developed, it is recommended that the material should be stripped. Where thickly developed, the structural design needs to take cognizance of the potential expansiveness and compressibility of this material.

The residual shale was profiled as slightly moist, firm to stiff, intact, sandy silty clay with occasional angular gravelly shale rock fragments. The residuum was encountered from a depth of between 0.70m and 0.80m and extended to below the excavation depth of 2.50m.

Shale rock and excavated shale, which presents as a gravel, often deteriorates on exposure. Although shale material can be considered for use in construction, the potential for deterioration needs to be pre-determined in

the laboratory. If suitable, the gravel can be used in selected layers in road construction, but seldom as base course. Gravelly shales are occasionally used in the wearing course of gravel roads but not all types are suitable. During construction Karoo shales and siltstones can usually be excavated by ripping, but blasting might occasionally be required.

Slope instability may occur when sliding occurs on bedding planes which are inclined sufficiently. Ingress of water into layers and the resulting high pore-water pressure plays a major role in sliding failures. This is considered highly unlikely as the strata are mostly horizontally disposed.

Sandstone

Vryheid sandstone generally weathers into sandy residual soils. In some cases, the residual sandstone may develop a potentially collapsible grain structure. These collapsible materials exhibit additional settlement upon wetting up without any change in load. This can occur many years after construction and is usually due to an inundation of some kind such as a broken water pipe. If recognised at investigation stage, these collapsible materials can be easily dealt with during construction with some remediation being required.

Sands below the water table are likely to fail during the installation of augered piles and hence the pile system used should be carefully considered.

Residual sandstone does not weather uniformly, leading to dense layers of the horizon being underlain by less competent layers of the same soil.

Slope stability issues can arise in areas where closely intercalated sandstones and mudrock (shale and siltstone) exist. When shales and siltstones slake or disintegrate the exposed sandstone layers are undercut, this can result in rockfalls. Intercalated siltstone layers are relatively impermeable, and impede the flow of water, which leads to pore pressure build up and sliding along the interface. This can only happen if the rock is dipping at an angle, towards the slope face, greater than the friction angle of the material.

Where material is required for the construction of roads and laydown areas, natural sandstone gravel or crushed sandstone bedrock can potentially be a suitable source. Consideration must be given to the presence of excessive pyrite and muscovite which can cause distress where sandstone is used as basecourse. In addition, where chemical stabilization is required the clay matrix of sandstones make them suitable for stabilization with lime. The occurrence, nature, material quality and quantity of sandstone and other potential construction material will have to be assessed during the detailed geotechnical investigation.

Coals Beds

Coal seams are present within the Vryheid Formation with a thickness ranging from centimeters to 10m but are not generally encountered at surface.

DOLERITE

The majority of the site is underlain by dolerite. Shallow rock and surface dolerite outcrops are present across the site as illustrated in **Figure 6-5**. Dolerite generally weathers into a profile becoming coarser with depth eventually grading into dolerite rock. Cobbles and boulders are often present above the rock grading upwards into gravel, sand and finally residual clay. Cobbles and boulders of dolerite, however, are often present throughout the residual profile.

Residual doleritic clay is generally compressible and potentially expansive in the “medium to high” range. Where any structure straddles residual dolerite and a different soil type, the structure should be moved to avoid differential settlement or designed accordingly.

Dolerite rock, cobbles, boulders, gravel and sand are generally durable and are suitable for a variety of purposes. The material is commonly quarried and used as a construction material for use as concrete aggregate and road construction materials.

Figure 6-5: Shallow and surface dolerite in site

GEOTECHNICAL EVALUATION

It is anticipated that areas of shallow dolerite rock and relatively thickly developed residual shale will be present across some areas along the powerline route.

SURFACE DRAINAGE (FLOODING)

Flooding affects flat lying areas, areas confined to drained channels and flood plains. All construction areas are located on relatively flat areas where water ponding is a possibility during wet periods especially with shallow rock and clay being present. Stormwater management is recommended across all flat areas to facilitate water run-off and to alleviate the possibility of standing water at the foundation positions.

EROSION

The slope on site, as well as the soil structure will influence the amount of erosion. The low site gradient makes the probability of erosion unlikely. The presence of vegetation (grassland) reduces the risk of erodibility problems. The possibility of erosion will be brought on by the disturbance of vegetation during construction. Erosion must be mitigated, at each structure position, by revegetation after construction.

EXCAVATABILITY

The excavation characteristics of the soil horizons has been evaluated according to the South African Bureau of Standards standardized excavation classification for earthworks (SABS – sa1200D). The definition of the excavation classes is indicated in **Table 6-8** and the assessment of the in-situ profile in **Table 6-9.**

The ease of excavation is a critical financial factor for any development. Shallow dolerite bedrock characterizes much of the site and it is also anticipated that shallow bedrock will be present in those areas underlain by sandstone.

Table 6-8: COLTO Excavation Classes

CLASS OF EXCAVATION	GENERAL DEFINITION
Soft	Excavation in material which can be efficiently removed or loaded by any of the following plant without prior ripping: — A bulldozer with a mass of at least 22 tons (which includes the mass of the ripper, if fitted) and an engine developing approximately 145kW at the flywheel. Or — A tractor-scraper unit with a mass of at least 28 tons and an engine developing approximately 245kW at the flywheel, pushed during loading by a bulldozer as specified for intermediate excavation. Or — A track type front end loader with a mass of at least 22 tons and an engine developing approximately 140kW at the flywheel
Intermediate	Excavation (excluding soft excavation) in material which can be efficiently ripped by a bulldozer with a mass of at least 35 tons when fitted with a single tine ripper and an engine developing approximately 220kW at the flywheel.
Soft	Excavation (excluding boulder excavation) in material which cannot be efficiently ripped by a bulldozer with properties equivalent to those described for intermediate excavation. This type of excavation generally includes excavation in material such as formations of unweathered rock, which can be removed only after blasting.
Boulder Class A	— Excavation in material containing in excess of 40% by volume of boulders between 0.03m3 and 20m^3 in size, in a matrix of softer material or smaller boulders. — Excavation of fissured or fractured rock shall not be classed as boulder excavation but as hard or intermediate excavation according to the nature of the material.
Boulder Class B	Where material contains 40% or less by volume of boulders in a matrix or soft material or smaller boulders.

Table 6-9: Excavatability on Site

Alluvial material	Soft excavation
Dolerite	Soft excavation in residual clay, sand and gravel. Boulder Class A and Boulder Class B where boulders are encountered. Hard excavation in dolerite rock
Vryheid shale and residual shale	Soft excavation in residual shale and very soft to soft rock shale. Intermediate to hard excavation in medium hard and harder rock shale.
Vryheid sandstone and residual sandstone	Soft excavation in residual sandstone and very soft to soft rock sandstone. Intermediate to hard excavation in medium hard and harder rock sandstone.

SLOPE STABILITY

Development on site is unlikely to cause any slope instability as no significant cut slopes will be developed. Where excavations are required, up to a depth of 3m, excavations should be excavated at a batter of 1:1 in soil

where no water or seepage is evident and to 1:2, or flatter, where water is encountered. Rock can be excavated at a batter of 1:0.5 or vertically in the temporary case up to a depth of 3m.

SEISMIC HAZARD

According to the Seismic Hazard Map of South Africa (Kijko et al., 2003), the peak ground acceleration is 0.12g for the site. The peak ground acceleration may be described as the maximum acceleration of the ground shaking during an earthquake, which has a 10% probability of being exceeded in a 50-year period.

Mining induced seismicity is the failure of the earth's crust or rock mass as a result of mining induced changes in rock stress levels. Seismic events range in size from barely discernible ground motions to very large tremors.

There are three types of mining induced seismicity namely:

- Failure at pre-existing geological weaknesses such as faults, dykes and joints which result in medium to large events often far away from workings
- Failure of the intact rock mass in the form of shear fractures that result in larger events close to workings
- Localized bursting or failure of brittle rock types often referred to as strain bursting or face bursting (small events at the working face)

The most economically exploitable coal seams in South Africa are encountered within the Vryheid Formation and the Impumelelo mine boarders the north-eastern side of the WEF site. Thus, the WEF and associated OHPL could be influenced by mining induced seismic events due to the presence of the coal mine. All structures should be designed taking cognizance of this.

UNDERMINING

Subsidence at surface in undermined areas is caused by the collapse and failure of the underground mining voids relatively close to the surface (Heath and Engelbrecht, 2011).

Impumelelo Mine is an underground mine and could potentially pose problems for the proposed WEF site and associated OHPL. The proposed site is underlain by mudrock (shale and siltstone) and possibly sandstone. Areas with roof strata composed of shale are more susceptible to gradual movements. Roof strata composed of competent sandstone are less susceptible to deformation. Gradual subsidence and sudden collapse are accompanied by surface deformation including fractures, crevices, faults, step folds and slides.

The extent of any undermining below the site should be assessed, in detail, prior to development.

6.1.4 SOILS AND AGRICULTURAL POTENTIAL

The geology is Karoo dolerite suite. The soils include three broad types. The first are dark coloured, clay-rich, vertic soils of the Arcadia soil form, which are suitable as cropland if they are deep enough. The second are shallow, stony soils on underlying bedrock, of the Mispah, Glenrosa, Milkwood, and Mayo soil forms. Rock outcrops also occur. The third are predominantly shallow soils on underlying clay. The second and third groups of soils are generally not suitable as croplands. The agricultural potential of the soils is limited variously by the very high clay content, shallow depth and drainage limitations.

The development is located in a grain farming agricultural region, but the soils vary in their suitability for crop production. Because of the favourable climate and the fairly high grain yields, farmers in the area utilise all suitable soil for grain production. Only soil that is not suitable for grain production is used for cattle and sheep grazing. Limitations that render the soil unsuitable for grain production are depth limitations due to rock or dense clay in the subsoil, and the limited drainage associated with the dense, poorly drained clay layers in the subsoil. The grazing lands are rooigras (*Themeda triandra*) grasslands. Grass fields are burned or mowed from time to time..

6.1.5 SURFACE WATER

Several wetlands and rivers are located on the study site. The following wetlands were recorded within the powerline corridor and the substation corridor areas:

- 1 Depressional Pan Wetland;
- 1 Seepage Wetland;

- 3 Floodplain Wetlands;
- 9 Channelled Valley Bottom Wetlan; and
- 11 Unchannelled Valley Bottom Wetlands.

The main rivers associated with these wetlands include: Ouhoutspruit-, Wolwespruit-, Kaalspruit-, Xspruit- and Watervalspruit Rivers. These all drain southward into the Watervalspruit River before flowing into the important Vaal River.

Buffer zones were calculated for the wetlands following Macfarlane *et al.*, (2015). Results for each wetland unit are as follows:

- Floodplain Wetland – 43 m
- Channelled Valley Bottom Wetlands – 50 m
- Depressional Pan – 70 m
- Unchanneled Valley Bottom Wetlands – 42 m; and
- Seepage Wetland – 21 m

Figure 6-6 shows the hydrology of the study site and surrounds. **Figure 6-7** and **Figure 6-8** show the delineated watercourses relative to the study areas together with buffer zones and the 500m DWS regulated area.

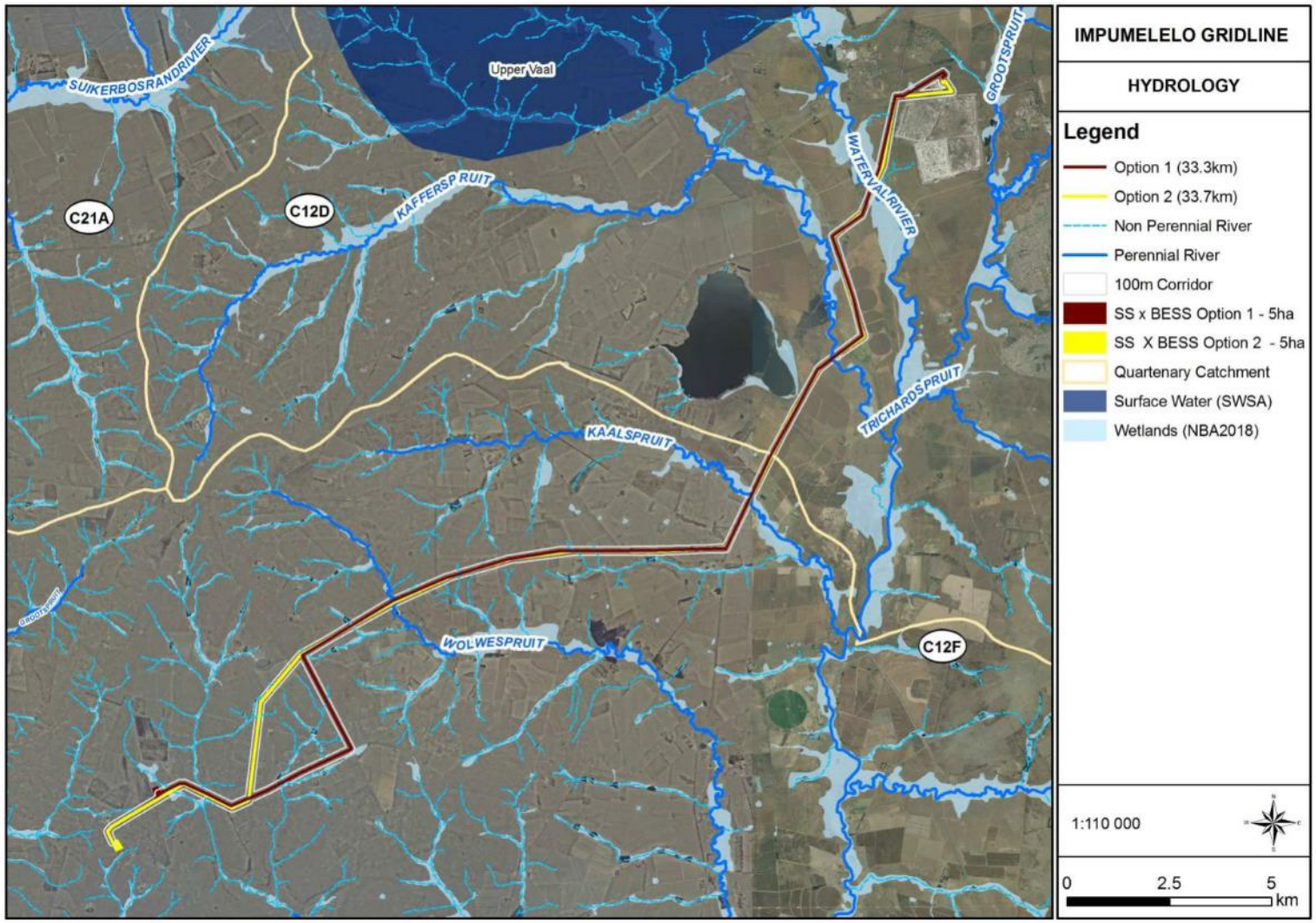


Figure 6-6: Hydrology of the study site and surrounds as per existing spatial layers

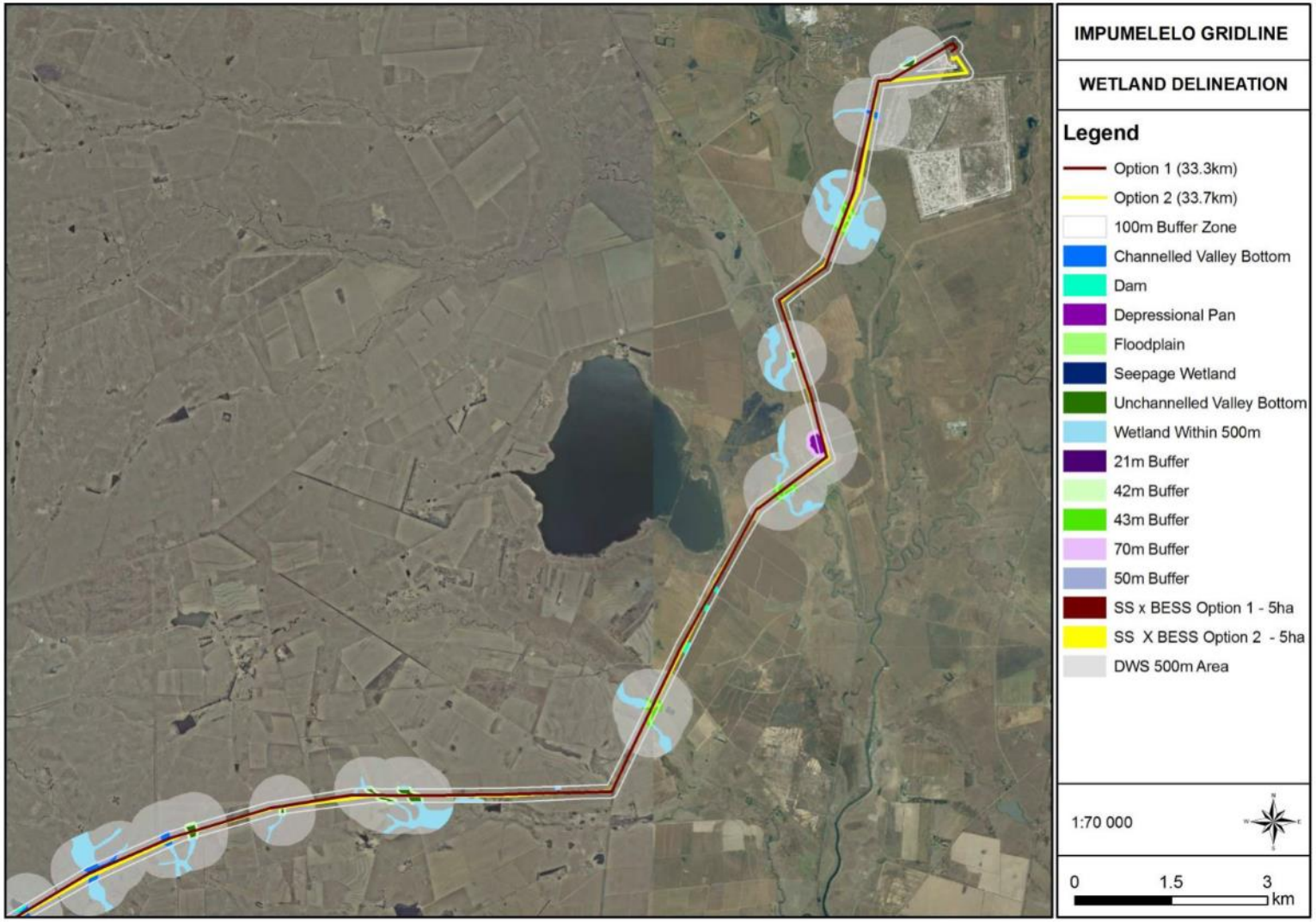


Figure 6-7: Delineated watercourses together with their calculated buffer zones and the 500 m DWS regulated area (northern section)

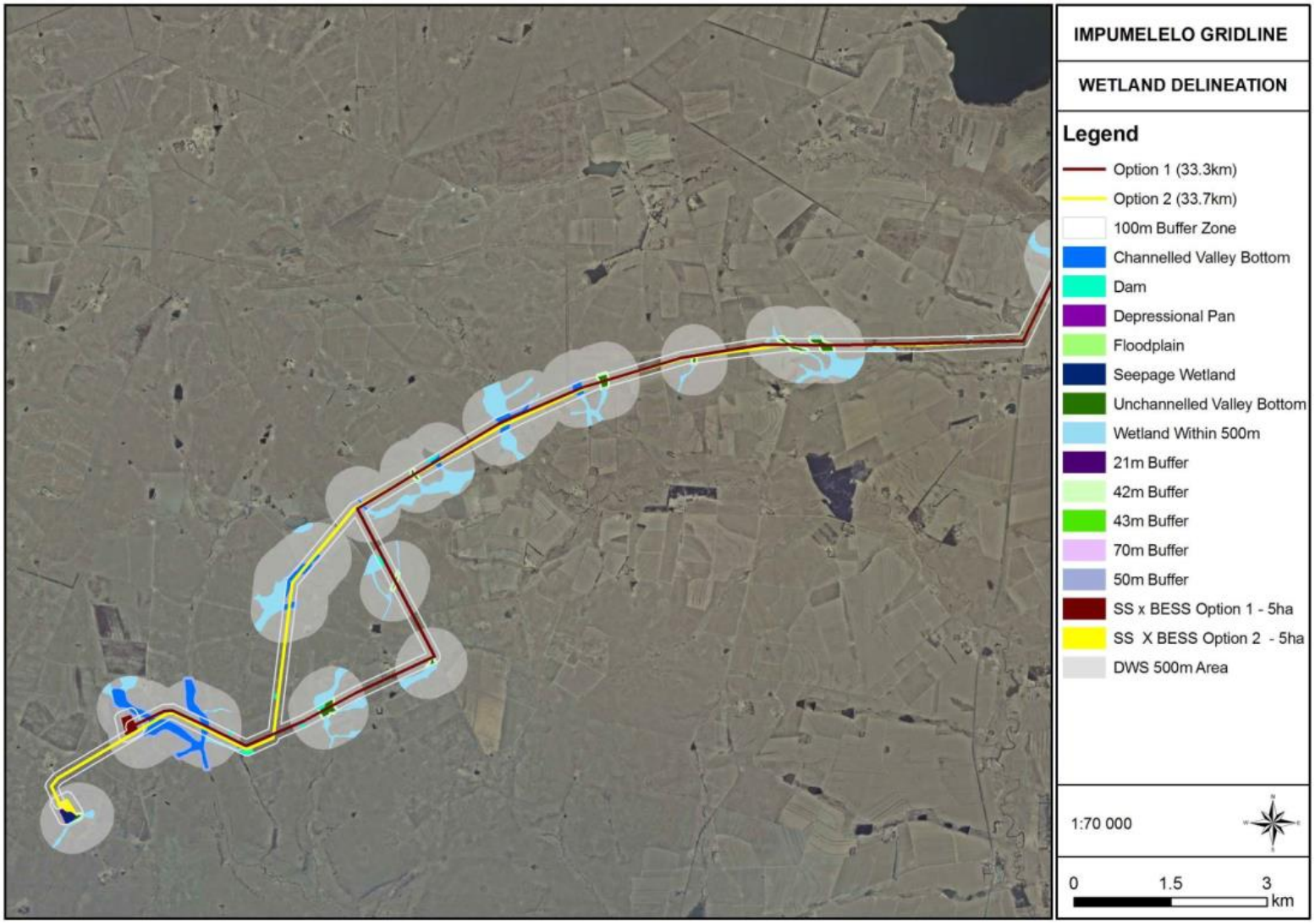


Figure 6-8: Delineated watercourses together with their calculated buffer zones and the 500 m DWS regulated area (southern section)

The study area comprises of two powerline and substation options. Option 1 (including Substation Option 1) and Option 2 (including Substation Option 2) follows the same route from the same Zandfontein Substation towards the Sasol Impomolelo Mine where the route diverges around the mine respectively. Substation Option 1 is located closer to the Sasol mine compared to Substation Option 2. Thus Option 1 approximately 33.3 Km while Option 2 is approximately 33.7 km. It should be noted that both the powerline options follows existing roads, conveyer belts and other previously built powerlines for the majority of the route, this greatly reduces potential impacts due to access roads and previously vegetation clearing. Both route options cross a similar amount of wetlands although the substation of option 2 encroaches on a small seepage wetland and is thus not a suitable location. Furthermore, a wetland does fall within 100 m (and thus within the DWS 500 m regulated areas) from substation option 1 although option 1 follow an existing gravel road for a longer distance compared to option 2. Based on these findings Option 1 is the preferred option although ideally the substation should ideally be reconsidered to be moved possibly across the road in an existing agricultural land, thereby reducing potential impacts.

PRESENT ECOLOGICAL STATE AND CONSERVATION IMPORTANCE

The Present Ecological State (PES) of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

The PES, EI and ES was determined per Sub Quaternary Reaches (SQR) for Secondary Catchments in South Africa. The SQRs within close proximity to the site are as follows:

- 1566(PES=D)(EI=Moderate)(ES=Moderate) – Associated with the Waterval River
- 1576(PES=D) (EI=Moderate)(ES=High) – Associated with the Waterval River
- 1607(PES=C) (EI=Moderate)(ES=High) – Associated with the Xspruit River
- 1674(PES=C) (EI=Moderate)(ES=Moderate) – Associated with the Kaalspruit River
- 1688(PES=D) (EI=Moderate)(ES=Moderate) - – Associated with the Wolwespruit River
- 1697(PES=C) (EI=Moderate)(ES=Moderate) – Associated with the Ouhoutspruit River
- 1752(PES=C) (EI=High)(ES=Moderate) – Associated with the Grootspruit River
- 1696(PES=C)(EI=Moderate)(ES=Moderate) Associated with the Grootspruit Rive

A PES of a C indicates the reach is moderately modified, D indicates the reach is largely modified.

Figure 6-9 illustrates the PES of the rivers and streams surrounding the study site based on the 2018 National Biodiversity Assessment.

- A summary of the integrity scores for each wetland along the OHPL alignment is listed in Table 6-10 and is visually presented in **Figure 6-10** and **Figure 6-11** and **Figure 6-12**.

Table 6-10: Summary of the scores of the wetland units

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
1	Seepage	B -Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - High Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – High Regulating services importance - High Provisioning and cultural services importance - Moderate	High (B)	B – Maintain at B
1	Depressional Pan	B -Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - High Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – High Regulating services importance - High Provisioning and cultural services importance - Moderate	High (B)	B – Maintain at B
1,2 and 3 (Same Wetland)	Channelled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the	Ecological Importance & Sensitivity – High Hydro-Functional Importance - Moderate	Biodiversity maintenance importance – High Regulating services importance - High	High (B)	B/C – Maintain at B/C

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
		natural habitat remains predominantly intact. Condition is likely to remain stable over the next 5 years	Direct Human Benefits - Moderate	Provisioning and cultural services importance - Moderate		
4	Channelled Valley Bottom	C -Moderately Modified	Ecological Importance & Sensitivity - Low	Biodiversity maintenance importance –Low	Moderate (C)	C - Maintain at C
5 & 6 (same wetland)	Channelled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - High Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance –Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
7	Channelled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	Ecological Importance & Sensitivity – High Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance –High Regulating services importance – High Provisioning and cultural services importance - Moderate	High (B)	B – Maintain at B

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
8	Channelled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	Ecological Importance & Sensitivity – High Hydro-Functional Importance - Moderate	Biodiversity maintenance importance –Moderate Regulating services importance – Moderate	Moderate (C)	C Maintain at C
9	Channelled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - Low Hydro-Functional Importance - Low Direct Human Benefits - Low	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
1	Unchanneled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. Condition is likely to	Ecological Importance & Sensitivity - Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
		remain stable over the next 5 years				
2	Unchanneled Valley Bottom	C- Moderately Modified. A moderate change in cosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
3&4 (Same wetland)	Unchanneled Valley Bottom	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Low Hydro-Functional Importance - Low Direct Human Benefits - Low	Biodiversity maintenance importance – Low Regulating services importance - Low Provisioning and cultural services importance - Low	Low/Marginal (D)	D Maintain at D
5	Unchanneled Valley Bottom	B-Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
		stable over the next 5 years				
6	Unchanneled Valley Bottom	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Low Hydro-Functional Importance - Low Direct Human Benefits - Low	Biodiversity maintenance importance – Low Regulating services importance - Low Provisioning and cultural services importance - Low	Low/Marginal (D)	D Maintain at D
7	Unchanneled Valley Bottom	C-moderately modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
8	Unchanneled Valley Bottom	C -moderately modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
9	Unchanneled Valley Bottom	B-Largely Natural. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
10	Unchanneled Valley Bottom	C -moderately modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
11	Unchanneled Valley Bottom	C -moderately modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity -Moderate Hydro-Functional Importance - Moderate Direct Human Benefits - Moderate	Biodiversity maintenance importance – Moderate Regulating services importance - Moderate Provisioning and cultural services importance - Moderate	Moderate (C)	C Maintain at C
1	Floodplain	B-Largely Natural. A slight change in	Ecological Importance & Sensitivity - High	Biodiversity maintenance importance – High	High (B)	B – Maintain at B

WETLAND NUMBER	WETLAND TYPE AND DRAINAGE	WETHEALTH V2 (EC/PES) (MACFARLANE *ET AL.*, 2020)	ECOLOGICAL IMPORTANCE (EI) (ROUNTREE & KOTZE., 2013 AND DWAF, 1999)	WETECOSYSTEM SERVICES V2 (ES) (KOTZE *ET AL.*, 2020)	ENVIRONMENTAL IMPORTANCE AND SENSITIVITY CATEGORY (EIS) (KOTZE *ET AL.*, 2020)	RECOMMENDED ECOLOGICAL CATEGORY (REC) ROUNTREE *ET AL.*, (2013)
		ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Hydro-Functional Importance - High Direct Human Benefits - High	Regulating services importance - High Provisioning and cultural services importance - High		
2	Floodplain	B-Largely Natural. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - High Hydro-Functional Importance - High Direct Human Benefits - High	Biodiversity maintenance importance – High Regulating services importance - High Provisioning and cultural services importance - High	High (B)	B – Maintain at B
3	Floodplain	B-Largely Natural. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. Condition is likely to remain stable over the next 5 years	Ecological Importance & Sensitivity - High Hydro-Functional Importance - High Direct Human Benefits - High	Biodiversity maintenance importance – High Regulating services importance - High Provisioning and cultural services importance - High	High (B)	B – Maintain at B

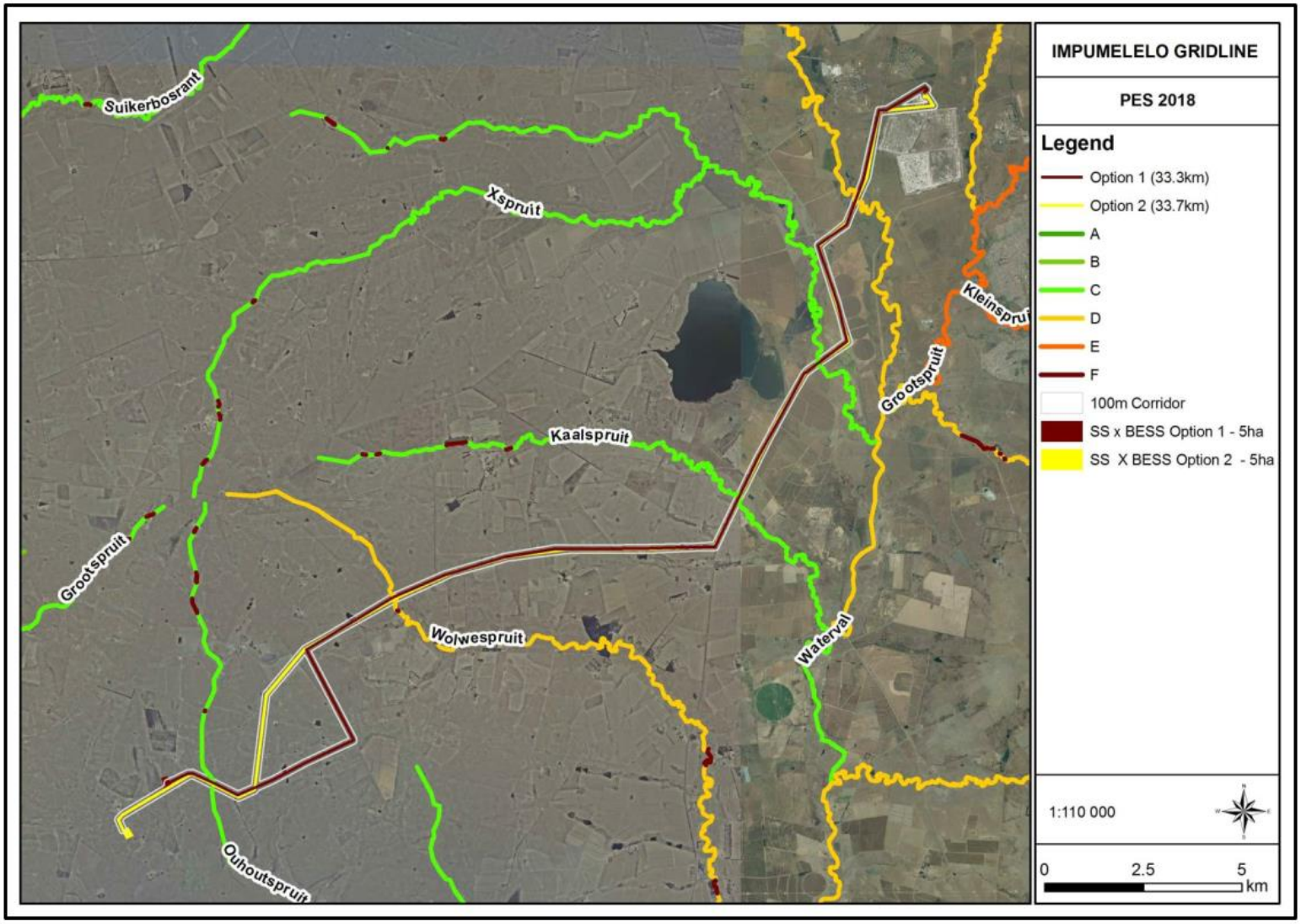


Figure 6-9: Present Ecological state of the rivers and streams surrounding the study site based on the 2018 National Biodiversity Assessment

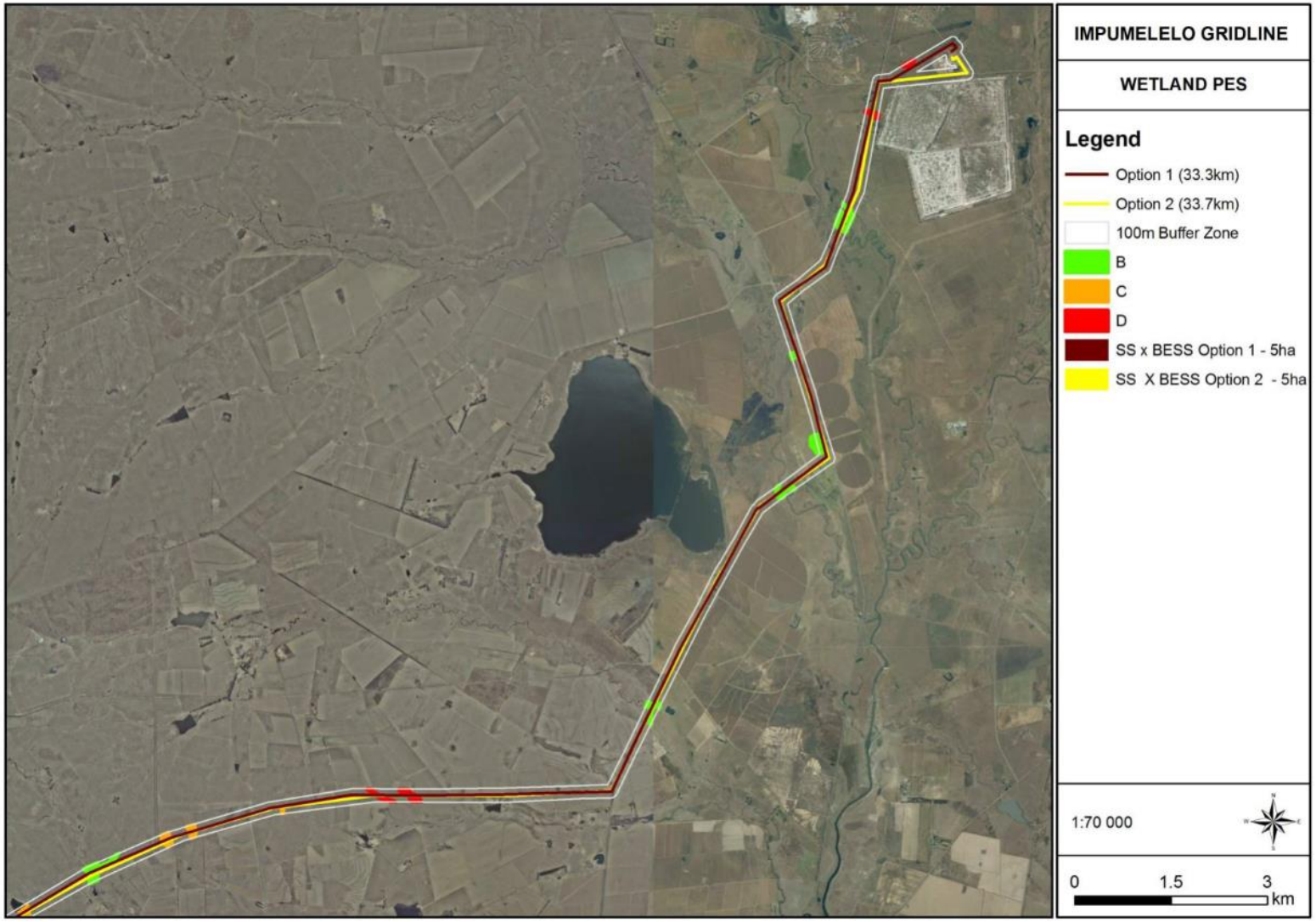


Figure 6-10: Present ecological state of each wetland unit in the proposed Impumelelo gridline of the northern section (Macfarlane et al., 2020).

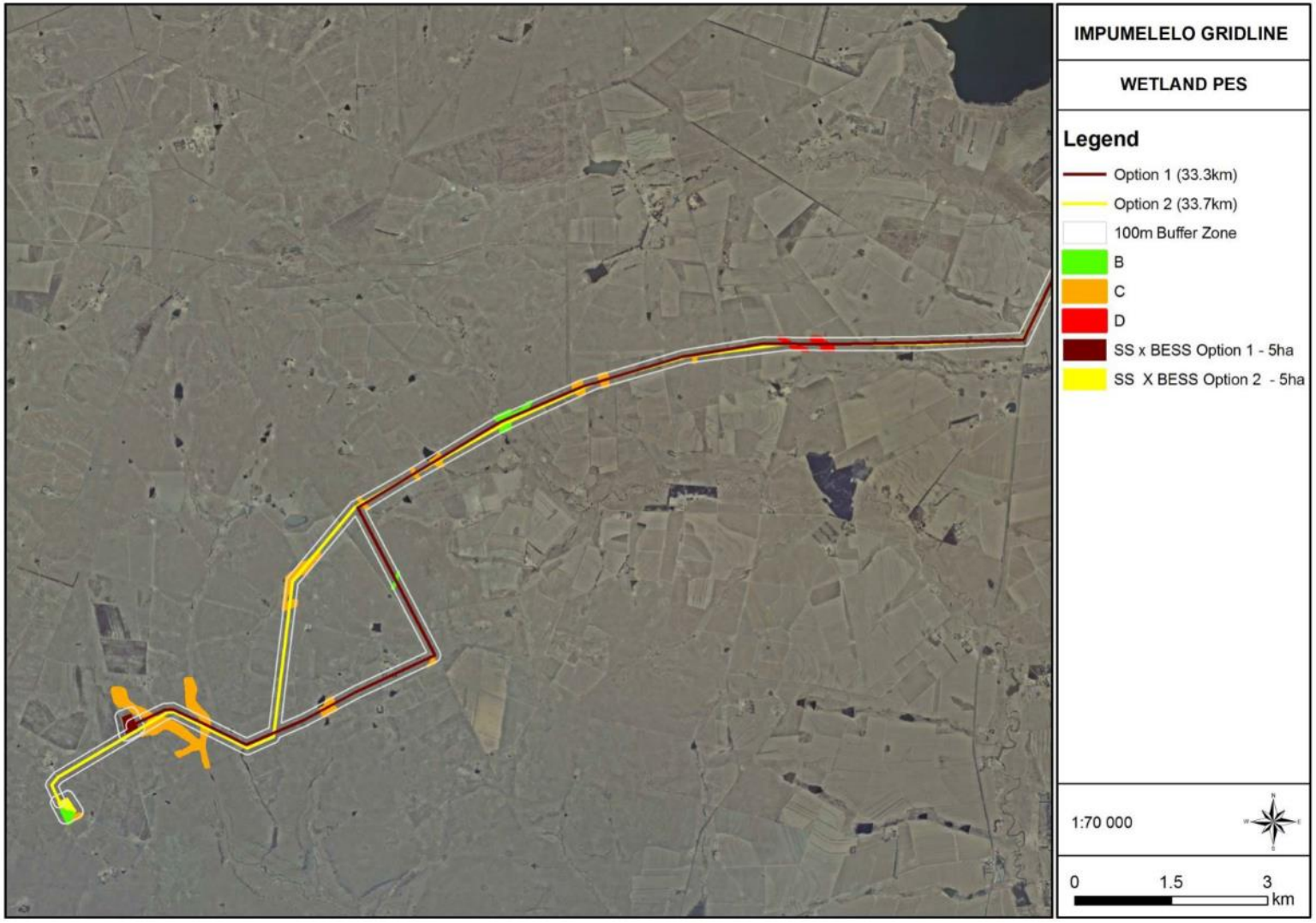


Figure 6-11: Present ecological state of each wetland unit in the proposed Impumelelo gridline of the southern section (Macfarlane et al., 2020).

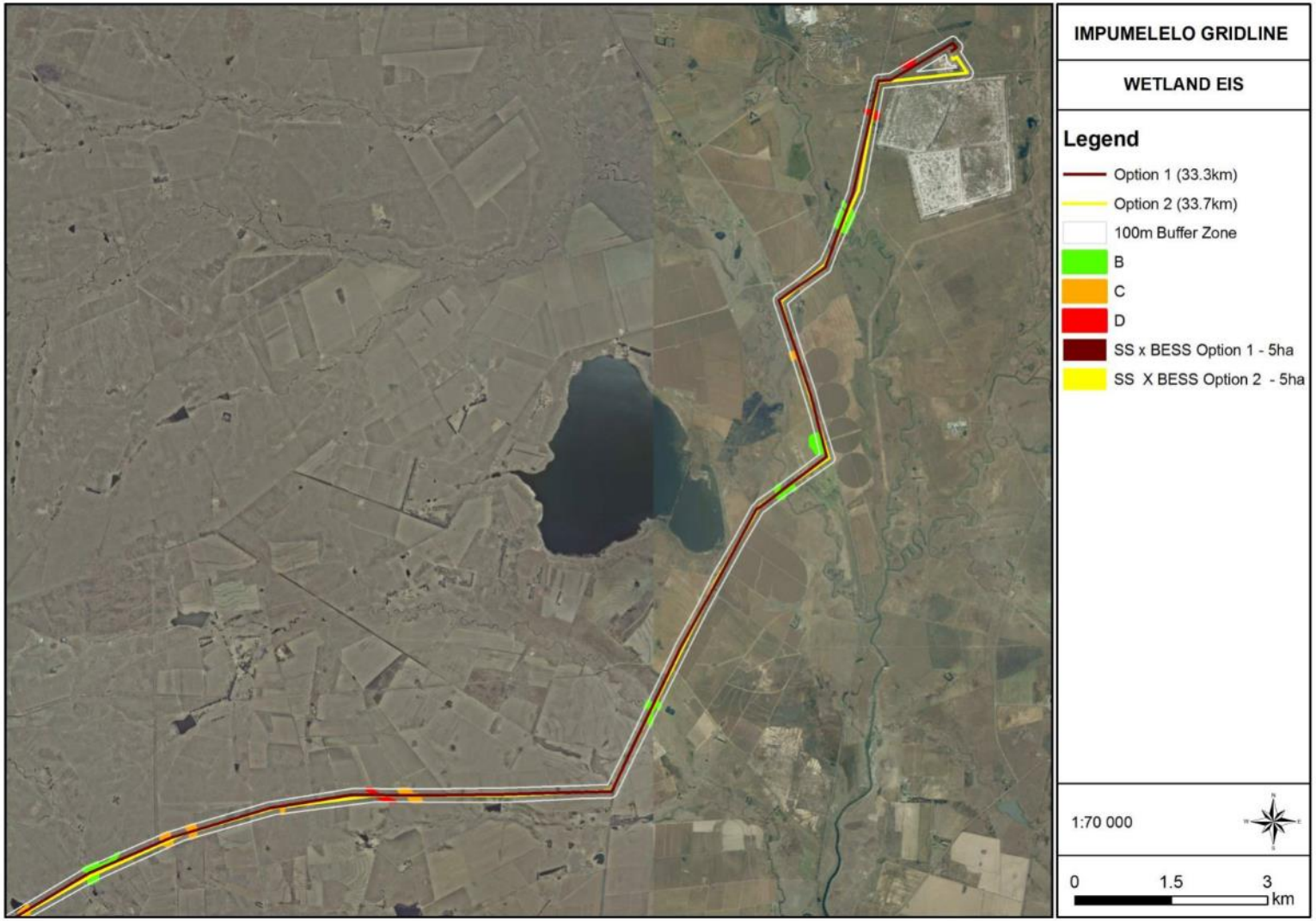


Figure 6-12: Environmental Importance and Sensitivity category (EIS) of the proposed Impumelelo gridline (*Kotze et al*., 2020)

In 2014, the Mpumalanga Parks and Tourism Agency developed the MBSP. In essence the MBSP is a map guiding areas of conservation concern for the Mpumalanga Province. The MBSP maps the freshwater ecosystems of Mpumalanga into the following categories:

- CBAs – areas of high biodiversity value, needed to meet biodiversity targets. These areas should be maintained in natural or near natural state;
- ESAs – these areas support CBAs, but are not essential for meeting conservation targets;
- Other Natural Areas – these areas have natural characteristics but have not been earmarked as priority areas for conservation but perform a range of biological as well as ecological functions; and
- Heavily Modified Areas – Areas that have been impacted and have had a significant or complete loss of natural habitat and ecological function.

In terms of the freshwater assessment of the MBSP, the site includes mostly other natural areas and heavily modified areas. The site does contain an ESA and there is a small CBA present to the south of the centre of the site.

ECOLOGICAL IMPORTANCE

Based on the Species Environmental Assessment Guideline (SANBI, 2020) wetlands and specialised habitats should be assessed based on their Site Ecological Importance (SEI). Based on these methods the wetlands are determined as per the following (**Table 6-11**):

Table 6-11: Ecological Importance of all wetland areas recorded on the study site

HABITAT	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
All Watercourses	High – Confirmed occurrence of watercourses within the development footprint	Medium Some historical impacts and AIS recorded	Medium – Based on CI and FI	Very Low – Watercourses are not easily restored without significant rehabilitation. Many species are dependent on functional wetland habitat.	Based on BI – Medium and RR – Very Low = High

EXISTING IMPACTS NOTED ON WATERCOURSES DURING SITE VISIT

Development has several impacts on the surrounding environment and particularly on a wetland. It is assumed that all structures will remain outside of the wetland and calculated buffer zone boundaries. Changing the runoff characteristics of the catchment will result in runoff that may exacerbate bank instability and erosion already present in some watercourses.

GN 320 of 20220 prescribes the extent of potential impacts to wetlands that should be assessed. That vegetation will be removed and that surface water will not be greatly impeded by these structures. Some of the impacts recorded including erosion, mining, agriculture and grazing.

6.2 BIOLOGICAL ENVIRONMENT

6.2.1 VEGETATION

The Impumelelo gridline falls in the Grassland Biome and more specifically in the Mesic Highveld Grassland Bioregion. It is located in the Soweto Highveld Grassland (Gm8) national vegetation type which has a "Vulnerable" conservation status because almost half of it has been transformed mostly by cultivation,

plantations, mining and urbanisation. Based on species composition, six habitats (plant communities) were distinguished, described and mapped for the Impumelelo WEF site of which five habitats were distinguished along the gridline routes (Habitats 1, 4, 5, 6 & 7). A further four units were also distinguished, i.e. croplands, infrastructure, disturbed areas and dams. The site does not fall within any Centre of Endemism..

SOWETO HIGHVELD GRASSLAND (GM 8)

The Impumelelo gridline is located within the Soweto Highveld Grassland (Gm8) vegetation type (SANBI 2006-2018). This vegetation type covers 14 513 km2 of Mpumalanga and Gauteng (and to a very small extent also in the neighbouring Free State and North-West provinces) and occurs at an altitude ranging from 1420 m to 1760 m above sea level (Mucina & Rutherford 2006).

The landscape is gently to moderately undulating on the Highveld plateau, supporting dense tufted grassland dominated by *Themeda triandra*. Other grass species include *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*. In undisturbed places scattered wetlands, narrow stream alluvia, pans and occasional ridges interrupt the grassland cover. Frost and frequent grass fires during winter play an important role in limiting the occurrence of trees and shrubs in the region.

The most prominent grass species include *Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Cynodon dactylon, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Heteropogon contortus, Setaria sphacelata, Themeda triandra* and *Tristachya leucothrix*. The forb layer is characterised by *Hermannia depressa, Acalypha angustata, Berkheya setifera, Dicoma anomala, Haplocarpha scaposa, Helichrysum nudifolium, Helichrysum rugulosum, Justicia anagalloides, Selago densiflora, Senecio coronatus, Hilliardiella elaeagnoides* and *Wahlenbergia undulata*.

Although the conservation status of this vegetation type was listed as “Endangered” by Mucina & Rutherford (2006) it is listed as “Vulnerable” by NEMA (2011) and the National Biodiversity Assessment (Skowno et al. 2018). Very few statutorily conserved areas occur in this vegetation type and almost half of it has been transformed mostly by cultivation, plantations, mining and urbanisation.

HABITATS

During the field survey, 20 sampling sites were surveyed at the proposed Impumelelo WEF. However, a further 60 sample plots were surveyed on the Vhuvhili and Mukondeleli sites in the nearby region and the total of 80 sample plots were used to improve the identification and description of habitat types in the area. Based on species composition, seven habitats (plant communities) were distinguished, described and mapped on the Impumelelo WEF site, however Habitats 2 and 3 were not found along the gridline route (**Figure 6-13**). A further four units were also distinguished, i.e. croplands, infrastructure, disturbed areas and dams.

List of plant communities and other units identified in the region (Habitats 2 & 3 were not distinguished on site):

1. *Euryops laxus - Microchloa caffra* grassland on shallow soils

2. *Elionurus muticus - Aristida diffusa* rocky grassland

3. *Diospyros lycioides - Tristachya biseriata - Ajuga ophrydis* rocky grassland

4. *Themeda triandra - Eragrostis chloromelas - Helichrysum pilosellum* natural grassland

5. *Eragrostis curvula - Hyparrhenia hirta* disturbed grassland

6. *Digitaria eriantha/Eragrostis curvula* planted pasture

7. *Trisetopsis imberbis - Crinum bulbispermum* wetlands

7a. *Trisetopsis imberbis - Leersia hexandra* wetlands

7b. *Andropogon appendiculatus - Cyperus longus* wetlands

7c. *Typha capensis - Phragmites australis* wetlands

8. Cropland

9. Infrastructure

10. Disturbed areas

11. Dams

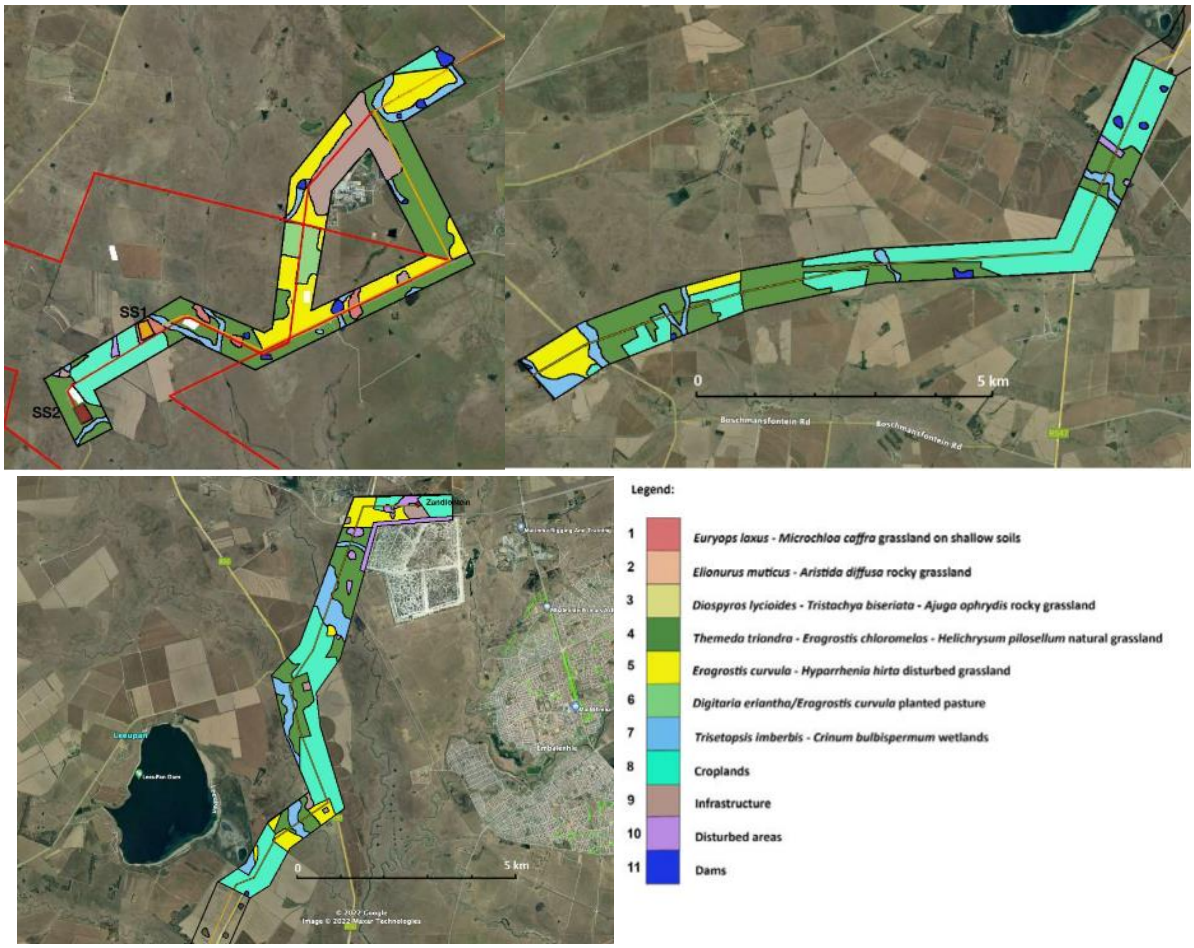


Figure 6-13: Vegetation Map of the Impumelelo Gridline Route

CONSERVATION STATUS OF THE VEGETATION TYPE

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the NEM:BA, lists national vegetation types, and other ecosystems defined in the Act, that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. The Soweto Highveld Grassland is listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

6.2.2 BIODIVERSITY CONSERVATION PLANS

The MBSP (Mpumalanga Parks and Tourism Agency, 2014) classifies the natural vegetation of the province according to the following categories:

- Protected Areas (sub-divided into three categories);
- CBAs (sub-divided into “Irreplaceable” and “Optimal”);
- Other natural areas;
- ESAs (sub-divided into four categories); and
- Modified (sub-divided into Heavily or Moderately modified.

CBAs are areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The definitions for CBAs are (SANBI 2018):

- CBA 1: Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas (SANBI 2018).
- CBA 2: Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.

The CBA map (**Figure 6-14**) indicates CBAs across a large section of the Impumelelo site and along the southern section of the gridline route to Zandfontein. The two proposed on-site substations fall in CBAs. However, most of the habitats on the Impumelelo WEF site and along the gridline route were rated as having a low sensitivity in the current study. Gridline option 2 is slightly longer than option 1, with most of the area between SS1 and SS2 being heavily modified. For most of the route, the options follow the same route. However, where the two routes diverge, option 2 crosses smaller sections of CBA.

Development within CBAs is not encouraged. According to the Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet et al. 2017) permissible land uses in CBAs are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat. Undesirable land uses in terrestrial CBAs are those that cause loss of natural habitat or ecosystem functionality, such as: (i) mining or prospecting; (ii) intensive agriculture (cultivation) or plantation forestry; (iii) residential, commercial or industrial developments; (iv) game-proof fences in CBA corridors; (v) linear infrastructure that disrupts the connectivity of CBA corridors; and (vi) extensive or intensive grazing that results in species diversity being lost through selective or over-grazing (Pool-Stanvliet et al. 2017). An OHPL may thus be regarded as a permissible land-use in a CBA as it does not disrupt the connectivity of the CBA corridor.

An ESA is not essential for meeting biodiversity targets, but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable. It is important that the project should not compromise the functional (natural) state of the ESAs (Pool-Stanvliet et al. 2017). There are some ESA Local corridors demarcated within the Impumelelo gridline route (**Figure 6-14**; MBSP 2014; biodiversityadvisor.sanbi.org) and the gridline traverses some of these ESA local corridors. However, limited habitat loss may be acceptable in an ESA and the gridline would not impact negatively on the ESAs.

Other Natural Areas (ONAs) have not been identified as a priority, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Land use guidelines for Terrestrial ONAs are not required to meet biodiversity targets. Some ONAs were demarcated within the Impumelelo site (**Figure 6-14**; MBSP 2014; biodiversityadvisor.sanbi.org) but gridlines are permissible in ONAs.

Large portions of the site are demarked as either ‘Heavily modified’ or ‘Moderately modified – old lands’, especially in the east (**Figure 6-14**). These MBSP categories, do not have equivalent categories in the SANBI CBA classification system and must be assumed to degraded to such an extent that they cannot qualify as ESAs or ONAs. Wherever possible, the gridlines should be placed in these units.

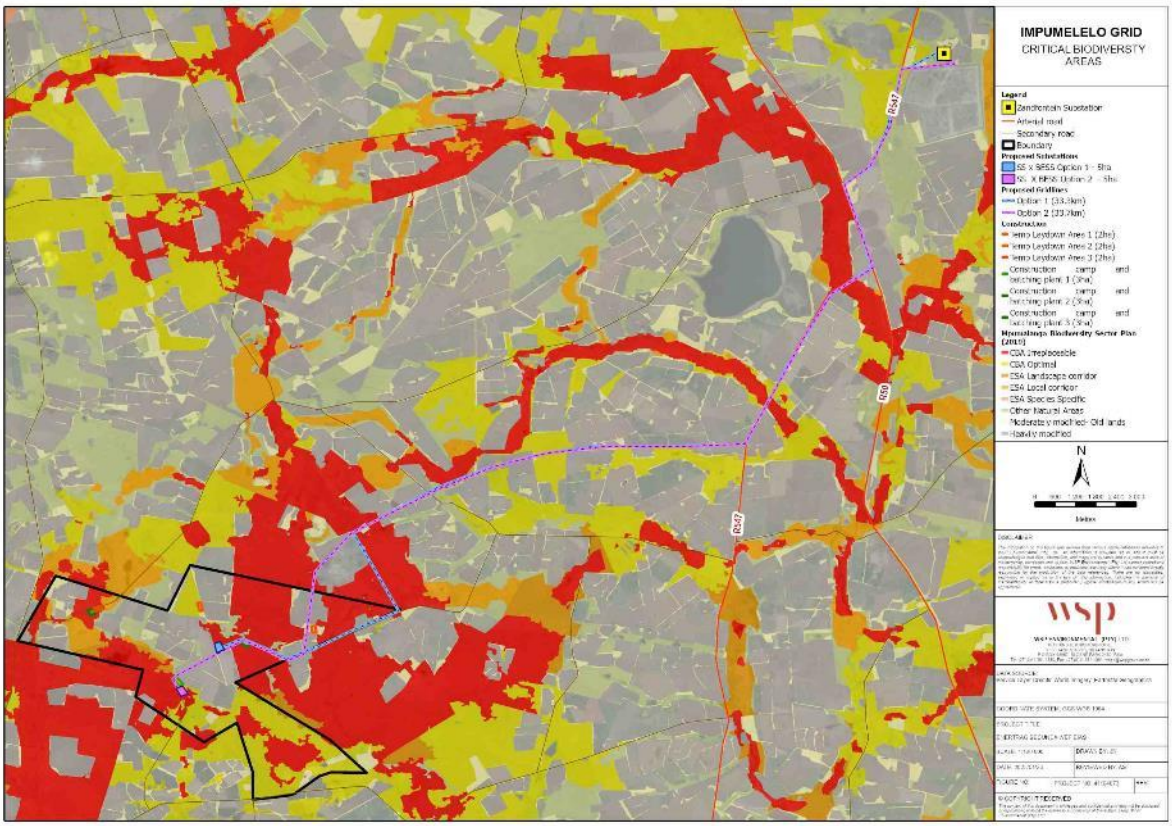


Figure 6-14: Critical Biodiversity Areas (CBAs), Ecological Support Areas (corridors), Other Natural Areas (ONAs), and moderately and heavily modified areas on the Impumelelo site (MBSP 2014; biodiversityadvisor.sanbi.org)

ECOLOGICAL PROCESSES, FUNCTIONING AND DRIVERS

Ecological processes include primary production, decomposition, nutrient cycling and fluxes of nutrients and energy. These processes will be altered by the clearing of the vegetation at the footprint of the gridline infrastructure. However, the impact is expected to be fairly small. Since grasses are wind pollinated, pollination of the grass component should not be unduly affected by the development, although the forbs will depend on pollinators. Roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes, thus migration of ground-dwelling organisms will be hindered locally during construction, but ecological connectivity should not be disrupted during the operational phase. Overall, broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions should be able to continue due to the small footprint of the development. The infrastructure, if properly planned, should not cut off ecological corridors and habitat fragmentation due to the development should not be an issue.

The disturbance caused during construction will inevitably create conditions favourable for invasion by alien species. Since, the level of alien infestation at the site was moderate, an alien invasive plant species monitoring and control programme needs to be initiated to control invasions.

Fire is considered an important driver of vegetation dynamics in the Grassland and Savanna Biomes. Should fire be suppressed on site this could have long-term effects on the vegetation dynamics.

6.2.3 PROPOSED PROTECTED AREAS

The study site is not located in a protected area, in terms of the NEMA:PAA.

According to the National Protected Areas Expansion Strategy 2008 (NPAES2008), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore **outside the NPAES focus area**. A draft National Protected Areas Expansion Strategy was published for public comment in 2018 but is deliberately not available as a spatial dataset. It does, however, reference the Mpumalanga Protected Area Expansion Strategy, in which priority areas are identified in terms of High, Medium and Low priorities. The site is also not earmarked in the 5-year plan of the Mpumalanga PAES (data supplied by M. Lötter, MTPA).

6.2.4 PLANT SPECIES

A list of plant species (the term species is used here in a general sense to denote species, subspecies and varieties) that could be found in the region (quarter degree grids: 2628 DB; 2629 CA; 2629 CB) was downloaded from the South African Biodiversity Institute's website (SANBI: newposa.sanbi.org – accessed November 2021) (Appendix B). The NewPosa data search yielded 147 plant species. During the field surveys, 290 plant species were recorded on the Enertrag sites (Appendix A) and additionally eight species were listed for the region (data supplied by M. Lötter, MTPA). Combined, these sources yielded 396 species for the region of which 30 are protected species according to the MNCA (1998).

SPECIES OF CONSERVATION CONCERN

According to the South African National Biodiversity Institute (SANBI 2020), SCCs include all species that have been assessed according the IUCN Threatened or Red-List Criteria as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), as well as range-restricted species which are not declining and are nationally listed as Rare or Critically Rare. The DD category is split into those that are taxonomically unresolved (DDT) and those where insufficient data (DDD) are available to make a judgement on endangered status.

The Taxonomically Data Deficient (DDT) species were excluded as SCC since taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of extinction risk is not possible.

The SCC species listed for the region are:

- *Argyrolobium campicola* = NT
- *Gladiolus robertsoniae* = NT
- *Habenaria barbertoni* = NT
- *Khadia beswickii* = VU (data supplied by M. Lötter, MTPA)
- *Kniphofia typhoides* = NT (data supplied by M. Lötter, MTPA)
- *Nerine gracilis* = VU (data supplied by M. Lötter, MTPA)
- *Stenostelma umbelluliferum* = NT

The geophyte *Gladiolus robertsoniae* was noted on the Impumelelo WEF site in Habitat 1.

PROTECTED SPECIES

A total of 30 plant species are listed as Schedule 11 Protected plant species in the region according to the MNCA (1998). Most of these species are members of the *Amaryllidaceae* and *Orchidaceae*. Twelve of the 30 protected plant species were recorded during the site survey in December 2021.

The twelve species recorded on all Enertrag sites are:

- *Aloe ecklonis*
- *Gladiolus crassifolius*
- *Aloe transvaalensis*
- *Gladiolus dalenii*
- *Boophone disticha*
- *Gladiolus robertsoniae*
- *Crinum bulbispermum*

- *Haemanthus humilis*
- *Cyrtanthus stenanthus*
- *Haemanthus sp.*
- *Eucomis autumnalis*
- *Huernia hystrix*

Another five species are on the Mpumalanga Red list (Lötter, 2015) although not included in the MNCA (1998) list for Mpumalanga:

- *Drimia angustifolia* = LC
- *Hypoxis hemerocallidea* = LC *
- *Khadia beswickii* = VU
- *Nerine gracilis* = VU
- *Trachyandra erythrorrhiza* = NT

**Species recorded on the Impumelelo site*

TOPS LIST

No species classified as protected within the NEM:BA is listed for the study area and none were found at the Impumelelo site.

CITES APPENDICES

Appendix II of CITES lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Thirteen (13) Appendix II species are listed for the region including mostly (10) species of the Orchidaceae. *Aloe ecklonis, Aloe transvaalensis and Euphorbia clavarioides* are CITES-listed species that were recorded on the Impumelelo site.

PROTECTED TREE SPECIES

No nationally protected tree species is listed for the site (NFA, 2021) and none were recorded during the site visit.

ENDEMIC SPECIES

No endemic species were listed for the Soweto Highveld Grassland Vegetation Type (Mucina & Rutherford, 2006).

ALIEN INVASIVE PLANT SPECIES

An "invasive species" is any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health. Invasive alien plant species are globally considered as one of the greatest threats to biodiversity and ecosystems integrity.

The Alien and Invasive Species (AIS) Regulations and the Alien and Invasive Species (AIS) list were published in 2020 (NEM:BA 2020a & b).

Forty-seven alien plant species were recorded on the three Enertrag sites of which 12 are currently declared alien invasive species and 35 naturalised alien species. Another four naturalised alien species were listed by NewPosa for the region.

6.2.5 TERRESTRIAL FAUNA SPECIES

The site falls within the distribution range of 52 mammal species (http://vmus.adu.org.za)

IUCN THREATENED MAMMAL SPECIES

Three IUCN threatened mammal species were listed for the environs of the Impumelelo site on the website of the Animal Demography Unit, University of Cape Town (**Table 6-12**).

Table 6-12: Mammal species of conservation concern with a likelihood of occurring on site

SCIENTIFIC NAME	COMMON NAME	STATUS
Ourebia ourebi	Oribi	Endangered
Felis nigripes	Black-footed Cat	Vulnerable, protected
Panthera pardus	Leopard	Vulnerable, protected

Seven mammal species were listed for the environs of the Impumelelo site as Near Threatened (a category that is not a threatened category in the IUCN classification but qualifies as SCC (**Table 6-13**).

Table 6-13: Near Threatened Mammal Species at the project site

SCIENTIFIC NAME	COMMON NAME	STATUS
Amblysomus septentrionalis	Highveld Golden mole	Near Threatened
Atelerix frontalis	Southern African hedgehog*	Near Threatened
Leptailurus serval	Serval*	Near Threatened
Otomys auratus	Southern African vlei rat	Near Threatened
Aonyx capensis	African Clawless otter	Near Threatened
Poecilogale albinucha	African Striped weasel	Near Threatened
Crocidura mariquensis	Swamp musk shrew	Near Threatened

*Mammals that were either sighted or confirmed by the landowners.

MPUMALANGA: PROVINCIALLY PROTECTED MAMMAL SPECIES

Six of the 52 mammal species listed in Appendix C are Schedule 2: Protected Game in Mpumalanga. The following mammal species were recorded on the Impumelelo site (**Table 6-14**):

Table 6-14: : Provincially Protected Mammal Species

SCIENTIFIC NAME	COMMON NAME
Raphicerus campestris	Steenbok
Atelerix frontalis	Southern African hedgehog

NATIONALLY THREATENED OR PROTECTED SPECIES: TOPS

According to ToPS legislation (NEMBA), one mammal species is listed as Endangered, one mammal species is listed as Vulnerable and six species are Protected (**Table 6-15**).

Endangered: Indigenous species facing a high risk of extinction in the wild in the medium-term future, although they are not critically endangered.

Table 6-15: ToPS Endangered Species

SCIENTIFIC NAME	COMMON NAME
Ourebia ourebi	Oribi

Vulnerable: Indigenous species facing a high risk of extinction in the wild in the medium-term future, although they are not critically endangered or endangered (**Table 6-16**).

Table 6-16: ToPS Vulnerable Species

SCIENTIFIC NAME	COMMON NAME
Panthera pardus	Leopard

Protected species: Indigenous species of high conservation value or national importance that require national protection (**Table 6-17**).

Table 6-17: ToPS Protected Species

SCIENTIFIC NAME	COMMON NAME
Aonyx capensis	African clawless otter
Ateerix frontalis	Southern African hedgehog*
Connochaetes gnou	Black wildebeest*
Felis nigripes	Black-footed cat
Leptailurus serval	Serval*
Vulpes chama	Cape fox

*Mammals that were either sighted or confirmed by the landowners.

CITES

The following mammal species occurring in the region are CITES listed (**Table 6-18)**.

Table 6-18: CITES Mammal Species

SCIENTIFIC NAME	COMMON NAME	STATUS
Aonyx capensis	African Clawless otter	Appendix II
Leptailurus serval	Serval*	Appendix II
Caracal caracal	Caracal	Appendix II
Panthera pardus	Leopard	Appendix I

*Mammals that were either sighted or confirmed by the landowners.

REPTILES

A total Thirty-two (32) reptile species are listed for the region. The list includes one IUCN threatened (Vulnerable) species, i.e. the Giant Girdled Lizard (*Smaug giganteus*) and one Near-threatened species, i.e. *Chamaesaura aenea* (Coppery Grass Lizard) (**Table 6-19**).

Provincially protected reptile species include 15 Schedule 2 Protected reptiles and 17 Schedule 5 reptiles. The Giant Girdled Lizard (Smaug giganteus) is listed as Endangered according to the ToPS list (NEMBA 2007c). The only reptile that has been recorded on the Impumelelo site is the rinkhals *Hemachatus haemachatus*.

Table 6-19: CITES-listed Reptile Species

SCIENTIFIC NAME	COMMON NAME
Smaug giganteus	Giant Girdled Lizard (Ouvolk)
Cordylus vittifer	Common Girdled Lizard

AMPHIBIANS

Fourteen species were listed for the region and all have an IUCN status of Least Concern. None of the frog species listed for the region has a MNCA or ToPS protected status (MNCA 1998, NEMBA 2007c).

LEPIDOPTERA

Only one of the 62 species of the Lepidoptera listed for the region is IUCN listed as Endangered, i.e. *Chrysoritis aureus* (Golden opal).

The Screening Tool listed Lepidochrysops procera as a sensitive species for the site. However, it was not listed in the ADU website (http://vmus.adu.org.za), the MNCA (1998) provincial species lists or the NEMBA (2007c) ToPS lists. Although *Lepidochrysops procera* has a IUCN status of Least Concern, it is a habitat specialist and is rated as Rare. It is not regarded as sensitive in the National Sensitive Species List of SANBI and is not exploited, collected, traded or utilised in a targeted manner (http://nssl.sanbi.org.za/species/lepidochrysops-procera accessed October 2021).

SCORPIONS

One scorpion species is listed for the 2629C and 2628D locus.

SPIDERS

All baboon spiders are provincially Schedule 7 protected. The listed baboon spider *Harpactira hamiltoni* is a ToPS protected species (NEMBA 2007c).

6.2.6 AVIFAUNA

IMPORTANT BIRD AREAS

The Devon Grasslands IBA (IBA SA130) (Marnewick et al., 2015) is 3.6km west of the southern extent of the Impumelelo Grid Connection's PAOI. The Devon Grassland IBA was established in 2014 for the protection of several threatened grassland/wetland species, several of which regularly occur within the broader area of PAOI.Blue Crane (Globally Vulnerable, Regionally Near Threatened), Greater Flamingo (Globally Least Concern, Regionally Near Threatened), Blue Korhaan (Globally Vulnerable, Regionally Least Concern), African Marsh Harrier (Globally Least Concern, Regionally Endangered), and Secretarybird (Globally Endangered, Regionally Vulnerable). The Devon's Grassland IBA additional serves to protect Black Harrier (Globally Endangered, Regionally Endangered), another powerline sensitive species which irregularly occurs within the broader area of the PAOI.

As of 2015, 250-300 Blue Cranes and 20-25 breeding Secretarybirds were present within the Devon's Grassland IBA. The PAOI shares highly similar habitat conditions with the Devon Grassland IBA, and it is anticipated that some of these Red List species from this IBA will utilize, the grasslands and wetlands within the PAOI, and so would be vulnerable to the potential impacts of the Impumelelo Grid Connection development.

Two additional IBAs occur within 60 km of the PAOI: Blesbokspruit (IBA SA021) (46 km northwest) and Suikerbosrand (IBA SA022) (56 km west). However, it is not envisaged that the proposed grid connection will significantly impact on avifauna in these IBAs due to the distance from the PAOI.

BIRD HABITAT

Whilst much of the distribution and abundance of the bird species in the development areas can be explained by the dominant biomes and vegetation types, it is also important to examine the modifications which have changed the natural landscape, and which may influence the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure.

The following bird habitat classes were identified in the development areas:

GRASSLAND

There are significant tracts of natural undisturbed grassland in the PAOI, particularly in the southern portions as well as tracts of disturbed, overgrazed grassland and fallow fields interspersed throughout the PAOI. The local grassland conditions range from dense stands of relatively high grass to areas of heavily grazed short grass. Several powerline sensitive species, including those of conservation concern, are highly dependent on both disturbed and undisturbed tracts of natural grasslands for breeding, roosting, and foraging. The powerline

sensitive species which could have the potential to use the natural grassland within the PAOI are listed in **Table 6-20.**

Table 6-20: Powerline priority species which may use the natural grasslands in the development area. Red List species are highlighted in red.

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Marsh Harrier	Least Concern	Endangered	Medium
Amur Falcon	Least Concern	Least Concern	High
Black-Chested Snake Eagle	Least Concern	Least Concern	Medium
Black-Headed Heron	Least Concern	Least Concern	High
Black-Winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	High
Blue Korhaan	Near Threatened	Least Concern	High
Cape Crow	Least Concern	Least Concern	High
Common Buzzard	Least Concern	Least Concern	High
Denham's Bustard	Near Threatened	Vulnerable	Medium
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Marsh Owl	Least Concern	Least Concern	High
Northern Black Korhaan	Least Concern	Least Concern	High
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Secretarybird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-Winged Goose	Least Concern	Least Concern	High
Western Barn Owl	Least Concern	Least Concern	Medium
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium
Black Harrier	Endangered	Endangered	Low
Booted Eagle	Least Concern	Least Concern	Low
Brown Snake Eagle	Least Concern	Least Concern	Low
Long-Crested Eagle	Least Concern	Least Concern	Low
Martial Eagle	Endangered	Endangered	Low
Montagu's Harrier	Least Concern	Least Concern	Low
Pallid Harrier	Near Threatened	Near Threatened	Low
Red-Footed Falcon	Vulnerable	Near Threatened	Low
Southern Bald Ibis	Vulnerable	Vulnerable	Low
Wattled Crane	Vulnerable	Critically Endangered	Low
White-Bellied Bustard	Least Concern	Vulnerable	Low
Yellow-Billed Kite	Least Concern	Least Concern	Low

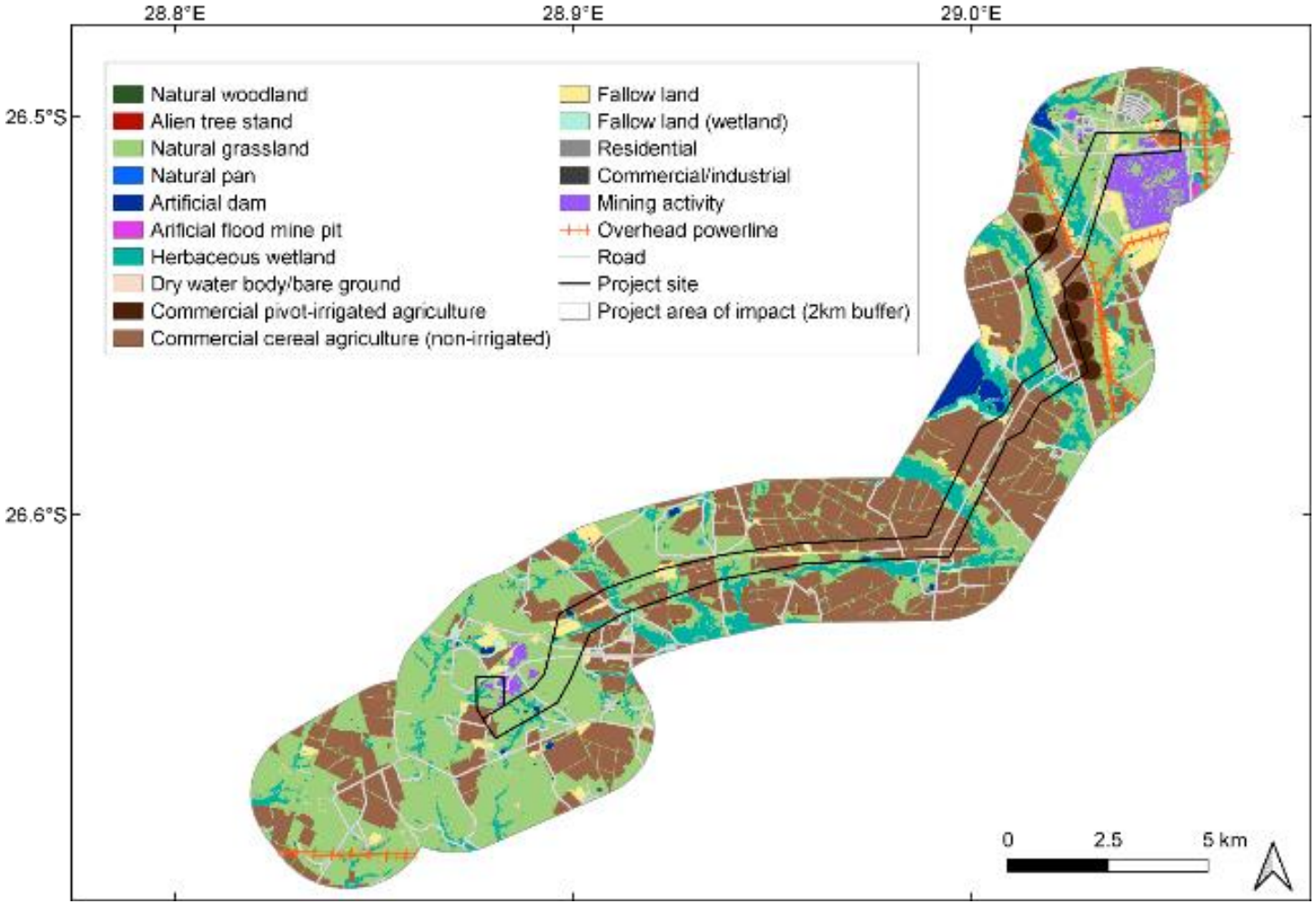


Figure 6-15: Land-cover and land-use within the project area of impact (PAOI, great delineation) and project site (black delineation) according to the 2018 national land-cover surveys (DEA & DALRRD, 2019)

DRAINAGE LINES AND WETLANDS

There are five perennial streams/rivers which drain south- or eastwardly through the PAOI: Watervalrivier, Kaalspruit, Wolwespruit, and an unnamed river, and Grootspruit. The first four of these rivers also intersect the project site. Additionally, there are numerous non-perennial streams within the PAOI. The perennial rivers occasionally flow into small lakes (exposed water bodies) and vleis (reedbed-covered waterbodies). Artificial dams have also been constructed on these drainage-lines, particularly along the non-perennial streams. Associated with these drainage line and riparian waterbodies are herbaceous wetlands comprising extensive reedbed marshlands and riparian grassland, including seasonal floodplains of inundated grassland. Surface rocks are present in some places along the streams. The alluvial soils are mostly deep dark brown to black clayey soils. Riparian wetlands comprising extensive herbaceous reedbed-grassland intergradations provide important foraging, roosting, and breeding opportunities for many power line sensitive species. Additionally, drainage lines provide navigational passageways for many power line sensitive species, and so these landscape features are generally areas of heightened flight activity; certain powerline sensitive species are also ecologically dependent on stream/rivers.

The powerline priority species which could have the potential to use the drainage lines and wetlands in the development are listed in **Table 6-21**.

Table 6-21: Powerline priority species which may use the drainage lines and wetlands in the development area. Red List species are highlighted in red

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Black Duck	Least Concern	Least Concern	Medium
African Darter	Least Concern	Least Concern	High
African Fish Eagle	Least Concern	Least Concern	Medium
African Marsh Harrier	Least Concern	Endangered	Medium
African Sacred Ibis	Least Concern	Least Concern	High
African Spoonbill	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	High
Cape Shoveler	Least Concern	Least Concern	High
Cape Teal	Least Concern	Least Concern	High
Common Moorhen	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Glossy Ibis	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Great Crested Grebe	Least Concern	Least Concern	Medium
Great Egret	Least Concern	Least Concern	Medium
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Intermediate Egret	Least Concern	Least Concern	High
Little Egret	Least Concern	Least Concern	High
Maccoa Duck	Endangered	Near Threatened	High
Marsh Owl	Least Concern	Least Concern	High
Pied Crow	Least Concern	Least Concern	High
Purple Heron	Least Concern	Least Concern	Medium
Red-billed Teal	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
South African Shelduck	Least Concern	Least Concern	High
Southern Pochard	Least Concern	Least Concern	High
Spur-winged Goose	Least Concern	Least Concern	High
Squacco Heron	Least Concern	Least Concern	Medium
White-backed Duck	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
White-faced Whistling Duck	Least Concern	Least Concern	Medium
Yellow-billed Duck	Least Concern	Least Concern	High
African Openbill	Least Concern	Least Concern	Low

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Swamphen	Least Concern	Least Concern	Low
Black Heron	Least Concern	Least Concern	Low
Black-crowned Night Heron	Least Concern	Least Concern	Low
Blue-billed Teal	Least Concern	Least Concern	Low
Fulvous Whistling Duck	Least Concern	Least Concern	Low
Knob-billed Duck	Least Concern	Least Concern	Low
Long-crested Eagle	Least Concern	Least Concern	Low
Southern Bald Ibis	Vulnerable	Vulnerable	Low
Wattled Crane	Vulnerable	Critically Endangered	Low
Yellow-billed Stork	Least Concern	Endangered	Low

DAMS AND PANS

The PAOI includes several natural pans and artificial dams the most prominent of which being Leeupan which partly extends into the west-central portion of the PAIO. These exposed waterbodies provide foraging, roosting, breeding opportunities for several powerline sensitive species. Leeupan, in particular, is an important habitat for several powerline sensitive species of conservation concern, and 179 bird species currently have been observed in or near this waterbody, according to the ebird avifaunal repository (https://ebird.org/hotspot/L6221281). In addition to the artificial dams associated with local drainage lines, the PAOI includes artificial waterpoints (windmills, troughs, reservoirs, etc.). Collectively, these waterbodies are focal points of attraction for many powerline sensitive species (including those not typically associated with dams and pans), as these provide accessible opportunities for drinking water.

The powerline priority species which could have the potential to use the dams and pans in the development are listed in **Table 6-22**.

Table 6-22: Powerline priority species which may use the dams and pans in the development area. Red List species are highlighted in red

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Darter	Least Concern	Least Concern	High
African Fish Eagle	Least Concern	Least Concern	Medium
African Marsh Harrier	Least Concern	Endangered	Medium
African Sacred Ibis	Least Concern	Least Concern	High

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Spoonbill	Least Concern	Least Concern	High
Black-chested Snake Eagle	Least Concern	Least Concern	Medium
Black-necked Grebe	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	High
Cape Shoveler	Least Concern	Least Concern	High
Cape Teal	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Glossy Ibis	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium
Great Crested Grebe	Least Concern	Least Concern	Medium
Great Egret	Least Concern	Least Concern	Medium
Greater Flamingo	Least Concern	Near Threatened	High
Grey Heron	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Intermediate Egret	Least Concern	Least Concern	High
Lanner Falcon	Least Concern	Vulnerable	Medium
Lesser Flamingo	Near Threatened	Near Threatened	Medium
Little Egret	Least Concern	Least Concern	High
Little Grebe	Least Concern	Least Concern	High
Maccoa Duck	Endangered	Near Threatened	High
Pied Crow	Least Concern	Least Concern	High
Purple Heron	Least Concern	Least Concern	Medium

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Red-billed Teal	Least Concern	Least Concern	High
Red-knobbed Coot	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
South African Shelduck	Least Concern	Least Concern	High
Southern Pochard	Least Concern	Least Concern	High
Spur-winged Goose	Least Concern	Least Concern	High
White-backed Duck	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
White-faced Whistling Duck	Least Concern	Least Concern	Medium
Yellow-billed Duck	Least Concern	Least Concern	High
African Openbill	Least Concern	Least Concern	Low
Blue-billed Teal	Least Concern	Least Concern	Low
Fulvous Whistling Duck	Least Concern	Least Concern	Low
Great White Pelican	Least Concern	Vulnerable	Low
Knob-billed Duck	Least Concern	Least Concern	Low
Martial Eagle	Endangered	Endangered	Low
Yellow-billed Stork	Least Concern	Endangered	Low

AGRICULTURAL LANDS

Within the PAOI are extensive areas of non-irrigated commercial cereal agriculture predominately dedicated towards maize production, as well as tracts of pivot-irrigated cropland. Additionally, livestock (cattle) farming is also practiced on lands not dedicated to cereal agriculture, including fallow land. Some fields are lying fallow or are in the process of being re-vegetated by grass. Cereal monocultures generally have far lower bird diversity and abundance compared to the natural grasslands which these replace. However, recently sown and/or ploughed fields can become focal foraging areas for many powerline sensitive species, and fallow lands can fulfil many ecological requirements for such species utilising/dependent upon grasslands.

The powerline priority species which could have the potential to use the agricultural habitats in the development are listed in **Table 6-23.**

Table 6-23: powerline priority species which may use the agricultural habitats in the development area. Red List species are highlighted in Red

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Sacred Ibis	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black-chested Snake Eagle	Least Concern	Least Concern	Medium
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	High
Cape Crow	Least Concern	Least Concern	High
Common Buzzard	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Marsh Owl	Least Concern	Least Concern	High
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Barn Owl	Least Concern	Least Concern	Medium
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Lesser Kestrel	Least Concern	Least Concern	Low
Martial Eagle	Endangered	Endangered	Low
Montagu's Harrier	Least Concern	Least Concern	Low
Pallid Harrier	Near Threatened	Near Threatened	Low
Red-footed Falcon	Vulnerable	Near Threatened	Low
Southern Bald Ibis	Vulnerable	Vulnerable	Low
Yellow-billed Kite	Least Concern	Least Concern	Low

ALIEN TREES

The development area contains few trees (**Figure 6-15**). Most trees are alien species, particularly Eucalyptus, Australian Acacia (Wattle), and Salix (Willow) species. Trees are often planted as wind breaks next to agricultural lands and around homesteads. Some of the drainage lines also have trees growing in them.

The PAOI, being situated in a natural grassland-cereal agriculture mosaic, supports few trees. Minor pockets of natural woodland are present, although more prevalent are alien trees stands – particularly Eucalyptus, Australian Acacia (Wattle), and Salix (Willow) species. These alien trees are often planted as wind breaks next to agricultural lands and artificial dams, as well as around homesteads and residential areas. Some of the drainage lines also have alien trees growing alongside them. In tree-deficient environments, such as those within the PAOI, alien trees can provide roosting and breeding habitat for several powerline sensitive species, especially raptors. The powerline priority species which could have the potential to use the alien trees in the development are listed in **Table 6-24**.

Table 6-24: Powerline priority species which may use the alien trees in development area. Red list species are highlighted in red

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
African Fish Eagle	Least Concern	Least Concern	Medium
African Harrier-Hawk	Least Concern	Least Concern	Medium
African Sacred Ibis	Least Concern	Least Concern	High
African Spoonbill	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black Sparrowhawk	Least Concern	Least Concern	Medium
Black-chested Snake Eagle	Least Concern	Least Concern	Medium

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Cape Crow	Least Concern	Least Concern	High
Common Buzzard	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	High
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Secretary bird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Barn Owl	Least Concern	Least Concern	Medium
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
Booted Eagle	Least Concern	Least Concern	Low

SPECIES NAME	GLOBAL STATUS	REGIONAL STATUS	OCCURRENCE LIKELIHOOD
Brown Snake Eagle	Least Concern	Least Concern	Low
European Honey-buzzard	Least Concern	Least Concern	Low
Lesser Kestrel	Least Concern	Least Concern	Low
Long-crested Eagle	Least Concern	Least Concern	Low
Martial Eagle	Endangered	Endangered	Low
Red-footed Falcon	Vulnerable	Near Threatened	Low
Southern Bald Ibis	Vulnerable	Vulnerable	Low
Yellow-billed Kite	Least Concern	Least Concern	Low

PRIORITY SPECIES

A total of 289 bird species could potentially occur within the broader area where the project site is located Eighty-three (83) of these bird species are classified as powerline sensitive species, of which sixty (60) are considered to regularly occur in the development PAOI, with fifty (50) such species having been recorded during the field surveys.

Eighteen (18) Red Data List species are associated with the broader area. Nine (9) Red List species have a medium-to-high probability of occurring within the PAOI: African Marsh Harrier, Blue Crane, Blue Korhaan, Denham's Bustard, Greater Flamingo, Lanner Falcon, Lesser Flamingo, Maccoa Duck, and The other nine (9) Red List species only have a low occurrence probability within the broader area of the PAOI, and are therefore at lower risk from this development: Black Harrier, Great White Pelican, Martial Eagle, Pallid Harrier, Red-footed Falcon, Southern Bald Ibis, Wattled Crane, White-bellied Bustard, and Yellow-billed Stork.

Table 6-25 lists the possibility of priority species occurring in the study area and the potential long-term impacts.

Table 6-25: Powerline priority species which could occur in the broader area (Global and Regional (South African) Red List status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least concern. Occurrence likelihood: L = Low, M = Medium, H = High)

SPECIES NAME	SCIENTIFIC NAME	GLOBAL STATUS	REGIONAL STATUS	FULL PROTOCOL	AD HOC PROTOCOL	RECORDED DURING MONITORING	GRASSLAND	DRAINAGE LINES AND WETLANDS	DAMS AND PANS	AGRICULTURE	ALIEN TREES	GRID - HABITAT TRANSFORMATION	GRID - DISTURBANCE (BREEDING)	GRID - SUBSTATION ELECTROCUTIONS	GRID – COLLISION HV LINES
African Black Duck	*Anas sparsa*	LC	LC	8.31	0.88			x							X
African Darter	*Anhinga rufa*	LC	LC	17.11	0.75	x		x	x						X
African Fish Eagle	*Haliaeetus vocifer*	LC	LC	5.06	0.75			x	x		x		x	x	
African Harrier-Hawk	*Polyboroides typus*	LC	LC	1.08	0.13	x					x		x	x	
African Marsh Harrier	*Circus ranivorus*	LC	EN	2.17	1.50		x	x	x				x	x	
African Sacred Ibis	*Threskiornis aethiopicus*	LC	LC	38.43	10.53	x		x	x	x	x			x	x
African Spoonbill	*Platalea alba*	LC	LC	31.20	6.39	x		x	x		x				x
Amur Falcon	*Falco amurensis*	LC	LC	16.51	4.76	x	x			x	x			x	
Black Sparrowhawk	*Accipiter melanoleucus*	LC	LC	3.61	0.00	x					x		x	x	
Black-chested Snake Eagle	*Circaetus pectoralis*	LC	LC	1.08	0.50	x	x		x	x	x		x	x	
Black-headed Heron	*Ardea melanocephala*	LC	LC	68.55	21.55	x	x			x	x			x	x
Black-necked Grebe	*Podiceps nigricollis*	LC	LC	20.96	4.76	x			x						x
Black-winged Kite	*Elanus caeruleus*	LC	LC	73.01	26.07	x	x			x	x		x	x	
Blue Crane	*Grus paradisea*	VU	NT	10.72	4.26	x	x	x	x	x		x	x		x
Blue Korhaan	*Eupodotis caerulescens*	NT	LC	27.71	12.41	x	x					x	x		x
Cape Crow	*Corvus capensis*	LC	LC	22.29	10.15	x	x			x	x			x	

SPECIES NAME	SCIENTIFIC NAME	GLOBAL STATUS	REGIONAL STATUS	FULL PROTOCOL	AD HOC PROTOCOL	RECORDED DURING MONITORING	GRASSLAND	DRAINAGE LINES AND WETLANDS	DAMS AND PANS	AGRICULTURE	ALIEN TREES	GRID - HABITAT TRANSFORMATION	GRID - DISTURBANCE (BREEDING)	GRID - SUBSTATION ELECTROCUTIONS	GRID – COLLISION HV LINES
Cape Shoveler	*Spatula smithii*	LC	LC	36.39	8.27	x		x	x						x
Cape Teal	*Anas capensis*	LC	LC	19.76	3.88	x		x	x						x
Common Buzzard	*Buteo buteo*	LC	LC	14.34	3.13		x			x	x			x	
Common Moorhen	*Gallinula chloropus*	LC	LC	14.22	0.75			x							
Denham's Bustard	*Neotis denhami*	NT	VU	0.00	0.00	x	x					x	x		x
Egyptian Goose	*Alopochen aegyptiaca*	LC	LC	80.84	29.07	x	x	x	x	x	x			x	x
Glossy Ibis	*Plegadis falcinellus*	LC	LC	22.89	5.76	x		x	x						x
Goliath Heron	*Ardea goliath*	LC	LC	6.87	2.01	x		x	x						x
Great Crested Grebe	*Podiceps cristatus*	LC	LC	8.92	1.50	x		x	x						x
Great Egret	*Ardea alba*	LC	LC	2.05	1.00	x		x	x						x
Greater Flamingo	*Phoenicopterus roseus*	LC	NT	31.08	9.27	x			x						x
Greater Kestrel	*Falco rupicoloides*	LC	LC	13.37	6.39	x	x				x		x	x	
Grey Heron	*Ardea cinerea*	LC	LC	29.04	7.02	x		x	x		x				x
Hadada Ibis	*Bostrychia hagedash*	LC	LC	85.66	31.08	x	x	x		x	x			x	x
Hamerkop	*Scopus umbretta*	LC	LC	9.76	2.76	x		x	x		x			x	x
Helmeted Guineafowl	*Numida meleagris*	LC	LC	60.96	13.28	x	x			x	x			x	
Intermediate Egret	*Ardea intermedia*	LC	LC	13.61	3.76	x		x	x						x
Jackal Buzzard	*Buteo rufofuscus*	LC	LC	8.92	2.63		x			x	x		x	x	

SPECIES NAME	SCIENTIFIC NAME	GLOBAL STATUS	REGIONAL STATUS	FULL PROTOCOL	AD HOC PROTOCOL	RECORDED DURING MONITORING	GRASSLAND	DRAINAGE LINES AND WETLANDS	DAMS AND PANS	AGRICULTURE	ALIEN TREES	GRID - HABITAT TRANSFORMATION	GRID - DISTURBANCE (BREEDING)	GRID - SUBSTATION ELECTROCUTIONS	GRID – COLLISION HV LINES
Lanner Falcon	*Falco biarmicus*	LC	VU	6.02	2.01	x	x		x	x	x		x	x	
Lesser Flamingo	*Phoeniconaias minor*	NT	NT	10.60	3.26				x						x
Little Egret	*Egretta garzetta*	LC	LC	13.25	1.75	x		x	x						x
Little Grebe	*Tachybaptus ruficollis*	LC	LC	63.37	17.92	x			x						x
Maccoa Duck	*Oxyura maccoa*	EN	NT	10.60	1.00	x		x	x						x
Marsh Owl	*Asio capensis*	LC	LC	12.17	2.88	x	x	x		x		x	x	x	x
Northern Black Korhaan	*Afrotis afraoides*	LC	LC	14.82	5.39	x	x					x	x		x
Pied Crow	*Corvus albus*	LC	LC	17.83	2.63	x	x	x	x	x	x			x	
Purple Heron	*Ardea purpurea*	LC	LC	5.90	1.25	x		x	x						x
Red-billed Teal	*Anas erythrorhyncha*	LC	LC	46.99	10.28	x		x	x						x
Red-knobbed Coot	*Fulica cristata*	LC	LC	81.20	26.32	x			x						x
Reed Cormorant	*Microcarbo africanus*	LC	LC	71.33	19.55	x		x	x						x
Rock Kestrel	*Falco rupicolus*	LC	LC	9.28	7.27	x	x			x	x			x	
Secretarybird	*Sagittarius serpentarius*	EN	VU	7.47	8.15	x	x				x	x	x		x
South African Shelduck	*Tadorna cana*	LC	LC	23.98	5.01	x		x	x						x
Southern Pochard	*Netta erythrophthalma*	LC	LC	25.18	5.51	x		x	x						x
Spotted Eagle-Owl	*Bubo africanus*	LC	LC	4.46	0.25	x	x			x	x		x	x	x
Spur-winged Goose	*Plectropterus gambensis*	LC	LC	27.95	7.02	x	x	x	x	x	x				x

SPECIES NAME	SCIENTIFIC NAME	GLOBAL STATUS	REGIONAL STATUS	FULL PROTOCOL	AD HOC PROTOCOL	RECORDED DURING MONITORING	GRASSLAND	DRAINAGE LINES AND WETLANDS	DAMS AND PANS	AGRICULTURE	ALIEN TREES	GRID - HABITAT TRANSFORMATION	GRID - DISTURBANCE (BREEDING)	GRID - SUBSTATION ELECTROCUTIONS	GRID – COLLISION HV LINES
Squacco Heron	*Ardeola ralloides*	LC	LC	3.25	2.51			x							x
Western Barn Owl	*Tyto alba*	LC	LC	3.61	0.25		x			x	x			x	x
Western Cattle Egret	*Bubulcus ibis*	LC	LC	48.43	13.91	x	x			x	x			x	x
White Stork	*Ciconia ciconia*	LC	LC	2.05	1.13		x			x	x				x
White-backed Duck	*Thalassornis leuconotus*	LC	LC	4.34	0.75	x		x	x						x
White-breasted Cormorant	*Phalacrocorax lucidus*	LC	LC	21.81	5.51	x		x	x		x				x
White-faced Whistling Duck	*Dendrocygna viduata*	LC	LC	10.48	1.75	x		x	x						x
Yellow-billed Duck	*Anas undulata*	LC	LC	67.83	17.67	x		x	x						x
African Openbill	*Anastomus lamelligerus*	LC	LC	0.48	0.25			x	x						x
African Swamphen	*Porphyrio madagascariensis*	LC	LC	1.20	0.00			x							
Black Harrier	*Circus maurus*	EN	EN	0.24	0.63		x						x	x	
Black Heron	*Egretta ardesiaca*	LC	LC	0.00	0.25			x							x
Black-crowned Night Heron	*Nycticorax nycticorax*	LC	LC	1.57	0.00			x							x
Blue-billed Teal	*Spatula hottentota*	LC	LC	0.48	0.25			x	x						x
Booted Eagle	*Hieraaetus pennatus*	LC	LC	0.24	0.00		x				x		x	x	
Brown Snake Eagle	*Circaetus cinereus*	LC	LC	0.24	0.00		x				x		x	x	
European Honey-buzzard	*Pernis apivorus*	LC	LC	0.48	0.00						x			x	
Fulvous Whistling Duck	*Dendrocygna bicolor*	LC	LC	0.24	0.00			x	x						x

SPECIES NAME	SCIENTIFIC NAME	GLOBAL STATUS	REGIONAL STATUS	FULL PROTOCOL	AD HOC PROTOCOL	RECORDED DURING MONITORING	GRASSLAND	DRAINAGE LINES AND WETLANDS	DAMS AND PANS	AGRICULTURE	ALIEN TREES	GRID - HABITAT TRANSFORMATION	GRID - DISTURBANCE (BREEDING)	GRID - SUBSTATION ELECTROCUTIONS	GRID – COLLISION HV LINES
Great White Pelican	*Pelecanus onocrotalus*	LC	VU	0.24	0.00				x						x
Knob-billed Duck	*Sarkidiornis melanotos*	LC	LC	0.96	0.00			x	x						x
Lesser Kestrel	*Falco naumanni*	LC	LC	1.20	0.00					x	x			x	
Long-crested Eagle	*Lophaetus occipitalis*	LC	LC	0.48	0.00		x	x			x		x	x	
Martial Eagle	*Polemaetus bellicosus*	EN	EN	0.48	0.25		x		x	x	x		x	x	
Montagu's Harrier	*Circus pygargus*	LC	LC	1.69	1.00		x			x				x	
Pallid Harrier	*Circus macrourus*	NT	NT	1.20	0.00		x			x				x	
Red-footed Falcon	*Falco vespertinus*	VU	NT	0.36	0.25		x			x	x			x	
Southern Bald Ibis	*Geronticus calvus*	VU	VU	0.24	0.00		x	x		x	x		x	x	x
Wattled Crane	*Grus carunculata*	VU	CR	0.12	0.00		x	x				x	x		x
White-bellied Bustard	*Eupodotis senegalensis*	LC	VU	0.48	0.00		x					x	x		x
Yellow-billed Kite	*Milvus aegyptius*	LC	LC	0.48	0.25		x			x	x			x	
Yellow-billed Stork	*Mycteria ibis*	LC	EN	0.24	0.00			x	x						x

FIELD SURVEYS

A total of 37 powerline priority species were observed during pre-construction monitoring at the proposed Impumelelo WEF.

A total of 50 powerline sensitive species were observed during pre-construction monitoring at the proposed Impumelelo Wind Energy Facility and associated Impumelelo Grid Connection, which also included the grid PAOI . These species could potentially occur anywhere in the PAOI in suitable habitat (**Table 6-26**).

Table 6-26: Powerline priority species observed during preconstruction monitoring at the Impumelelo Grid Connection development area.

SPECIES NAME	SCIENTIFIC NAME
African Darter	*Anhinga rufa*
African Harrier-Hawk	*Polyboroides typus*
African Sacred Ibis	*Threskiornis aethiopicus*
African Spoonbill	*Platalea alba*
Amur Falcon	*Falco amurensis*
Black Sparrowhawk	*Accipiter melanoleucus*
Black-chested Snake Eagle	*Circaetus pectoralis*
Black-headed Heron	*Ardea melanocephala*
Black-necked Grebe	*Podiceps nigricollis*
Black-winged Kite	*Elanus caeruleus*
Blue Crane	*Grus paradisea*
Blue Korhaan	*Eupodotis caerulescens*
Cape Crow	*Corvus capensis*
Cape Shoveler	*Spatula smithii*
Cape Teal	*Anas capensis*
Denham's Bustard	*Neotis denhami*
Egyptian Goose	*Alopochen aegyptiaca*
Glossy Ibis	*Plegadis falcinellus*
Goliath Heron	*Ardea goliath*

SPECIES NAME	SCIENTIFIC NAME
Great Crested Grebe	*Podiceps cristatus*
Great Egret	*Ardea alba*
Greater Flamingo	*Phoenicopterus roseus*
Greater Kestrel	*Falco rupicoloides*
Grey Heron	*Ardea cinerea*
Hadada Ibis	*Bostrychia hagedash*
Hamerkop	*Scopus umbretta*
Helmeted Guineafowl	*Numida meleagris*
Intermediate Egret	*Ardea intermedia*
Lanner Falcon	*Falco biarmicus*
Little Egret	*Egretta garzetta*
Little Grebe	*Tachybaptus ruficollis*
Maccoa Duck	*Oxyura maccoa*
Marsh Owl	*Asio capensis*
Northern Black Korhaan	*Afrotis afraoides*
Pied Crow	*Corvus albus*
Purple Heron	*Ardea purpurea*
Red-billed Teal	*Anas erythrorhyncha*
Red-knobbed Coot	*Fulica cristata*
Reed Cormorant	*Microcarbo africanus*
Rock Kestrel	*Falco rupicolus*
Secretarybird	*Sagittarius serpentarius*

6.3 SOCIAL ENVIRONMENT

6.3.1 LAND USE

According to the South African National Land Cover dataset (Geoterraimage 2020), much of the visual assessment area is classified as “Cultivated Land” interspersed with significant areas of “Grassland”. Small tracts of forested land and numerous water bodies are scattered throughout the study area (**Figure 6-16**).

Commercial agriculture is the dominant activity in the study area, with the main focus being maize cultivation with some limited livestock and game farming. There are multiple farm portions in the study area, resulting in a relatively moderate density of rural settlement with many scattered farmsteads in evidence. Built form in much of the study area comprises farmsteads, ancillary farm buildings and workers’ dwellings, gravel access roads, power and telephone lines and fences.

High levels of human influence are however visible in the north-eastern sector the study area. The town of Embalenhle lies on the north-eastern boundary of the study area while Evander, and the Sasol Secunda Fuel Plant are both just outside the study area. The peri-urban areas associated with the towns extending into the study area are dominated by industrial / mining activity. In addition, the Impumelelo Mine, located in the south-western sector of the study area has resulted in significant transformation in the landscape. These activities have resulted in a significant degree of transformation in the study area. High voltage power lines , contribute further to the overall transformation of the landscape in this area, with 400kV lines traversing the southern and eastern sectors of the study area.

The predominance of cultivated land in conjunction with the remaining natural grassland cover across much of the study area would give the viewer the general impression of a largely rural / pastoral setting. Thus, the proposed Impumelelo powerline development could potentially alter the visual character and contrast with the typical land use and/or pattern and form of human elements present across much of the study area.

In this instance however, high levels of human transformation and visual degradation are evident in the study area where urban/industrial, peri-urban development and mining activity dominate the landscape in the northern half of the study area. In addition, roads, railways and coal conveyors have further degraded the visual character of the study area to some degree, and this factor in conjunction with the presence of an extensive network of high voltage powerlines in the study area will reduce the level of contrast of the proposed development.

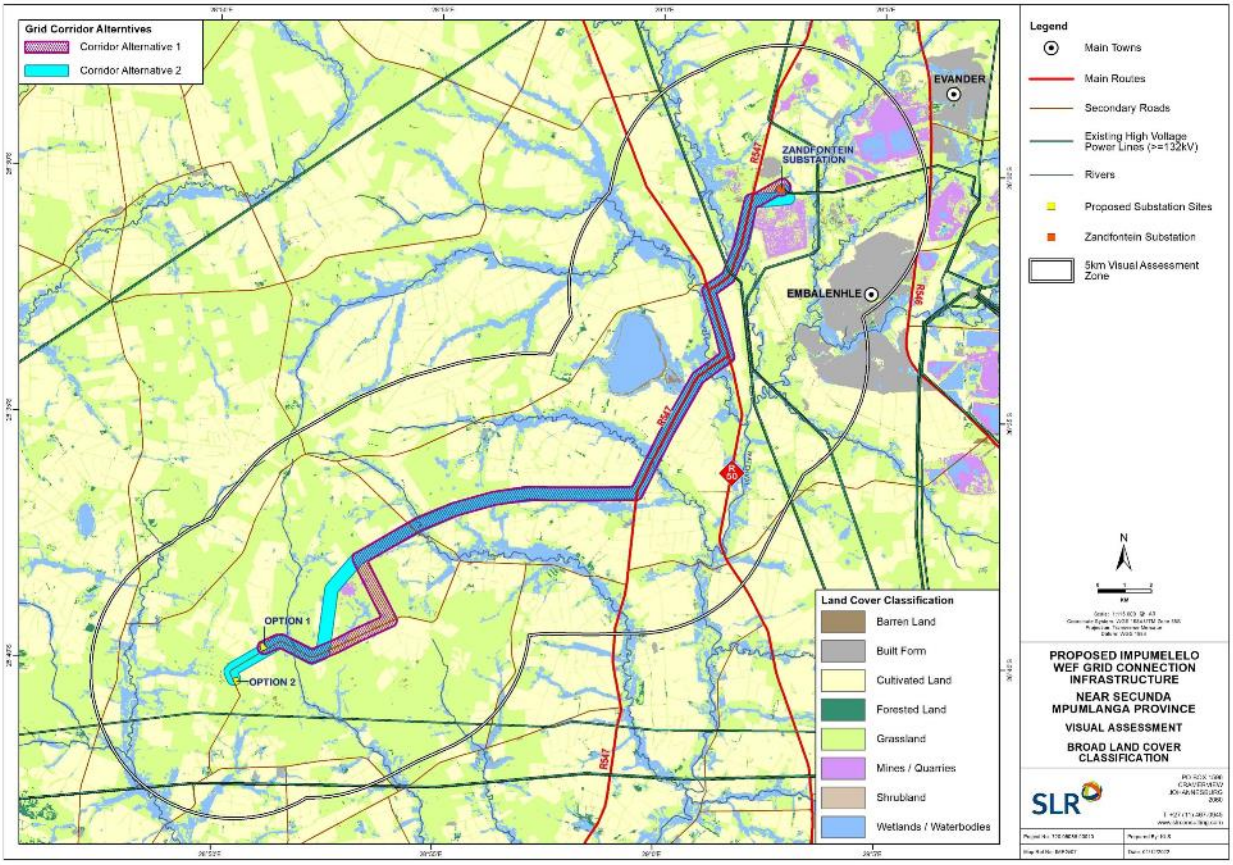


Figure 6-16: Land cover classification of the study area

6.3.2 HERITAGE AND CULTURAL RESOURCES

ARCHAEOLOGY

DESKTOP STUDY

ESA assemblages have been investigated from the Maleoskop Site near Groblersdal, approximately 100 km south of the project area (Esterhuysen & Smith 2007). Other prolific Stone Age sites in Mpumalanga include Bushman Rock Shelter and Heuningneskrans Shelter, located approximately 70 km southeast of the project area (Louw 1969; Plug 1982; Klein 1984). Within the vicinity of the project area, previous impact assessment surveys have shown that MSA and LSA stone tools are widely distributed as scatters across the landscape. Evidence for these periods has been excavated from Bushman Rock Shelter in the Ohrigstad District (Esterhuysen & Smith 2007) and it is known that San communities lived near Lake Chrissie as recently as the 1950s (e.g. Schlebusch et al. 2016).

Dates from Early Iron Age sites indicate that by the beginning of the 5th century CE Bantu-speaking farmers had settled in the Mpumalanga lowveld. Subsequently, farmers continued to move into and between the lowveld and highveld of Mpumalanga. By 1500 CE the escarpment was populated by chiefdoms, including Pedi and Bokoni communities. These chiefdoms would have had trade relations with Ndundza, Swazi and Zulu kingdoms, exchanging salt, cattle and metals as evidenced by the archaeological record (Esterhuysen & Smith 2007; Delius et al. 2012). Iron Age settlements within the surrounding areas include that of Wildebeestfontein near Kinross in the Bethal District. This site consisted of nine middens and several depressions indicating dwellings, with a layout pattern similar to Type V settlements with some possible alteration due to the Difeqane. Another important site is that of Robertsdrift, a Type V settlement at the confluence of the Vaal and Klip rivers outside Standerton. It was discovered after aerial photographs were taken of the area.

Ceramics with comb stamping motifs were identified during excavations (Derricourt & Evers, 1973). Aerial imagery of the present study area has revealed the presence of Iron Age settlements in various areas, both within and outside of the study area. Unfortunately, most of these sites could not be visited due to access not being available.

SITE VISIT

A number of archaeological resources were recorded in the study area during the surveys. Those that are relevant to the powerline corridors are listed in **Table 6-27**. The sites listed here are within 300 m of the centre corridor lines which encompasses slightly more land than the 500 m wide corridors being assessed.

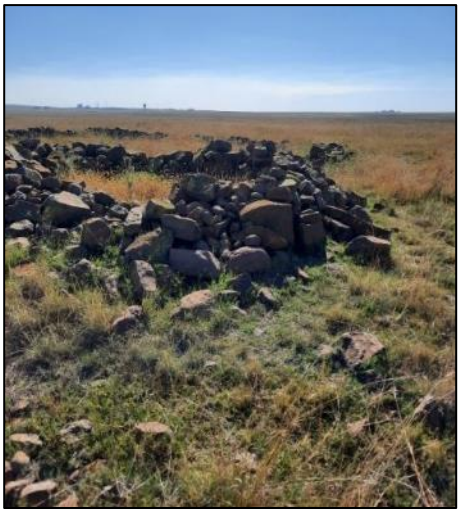
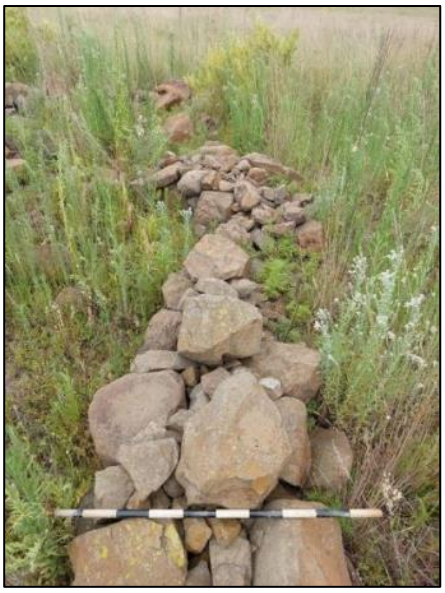
The most significant archaeological sites recorded are large stone-walled Iron Age settlements built on and around hills. These date to the Late Iron Age and follow the Central Cattle Pattern (CCP) (Huffman 2001) settlement layout. These sites were identified from aerial imagery as they stand out clearly on the landscape. Spatially these settlements show close affiliation with Type N settlements (Maggs 1976). Type N settlements date to the 15th to 17th centuries in the Free State, and during this time they spread across the Vaal into the hilly areas around Gauteng (Dreyer 1992). Here it developed into a settlement pattern referred to as Klipriviersberg (Huffman 2007) dating to the 18th and 19th centuries (the sites we identified, including IM011, are thus from this period). These sites are marked by several small stock kraals, and walls separating residential zones and unmarked graves are likely to occur in them. Larger settlements are also more common during this period.

Other stone-walled sites are historical and assumed to be the dwellings and associated structures of white farmers. Most of them likely have their roots in the 19th century but would have fallen into disuse during the 20th century. They are generally of quite low significance because of their poor condition and relatively recent origin. Historical buildings were often purposefully demolished so that the stones could be reused elsewhere on the farms and this may explain the very limited rubble at most of the sites. It is possible that abandoned houses may have been used by farm labourers before their eventual demolition and, as such, the possibility of still-born babies having been buried there must be considered. The chances of this happening are, however, very small and such remains would likely not be found during earthmoving.

Also found were some ruined farm structures which, due to their poor condition and relatively recent age, have low significance

Table 6-27: List of heritage finds recorded during the field survey (note that the SAHRA grading system is not applicable to buildings).

WAYPOINT	LOCATION	NATURE	GRADE	PHOTOGRAPH
IM001	26°39'13.00"S 28°53'55.30"E	Graves	IIIA	

WAYPOINT	LOCATION	NATURE	GRADE	PHOTOGRAPH
IM002	26°39'44.83"S 28°52'05.10"E	Archaeological – stone feature	GPC	
IM004	26°39'43.36"S 28°51'32.52"E	Archaeological – stone features & possible graves	GPC & IIIA	
IM011	26°40'25.71"S 28°50'28.81"E	Archaeological – stone feature	GPB	

WAYPOINT	LOCATION	NATURE	GRADE	PHOTOGRAPH
IM019	26°36'36.35"S 28°58'22.23"E	Building	---	

HISTORICAL ASPECTS AND THE BUILT ENVIRONMENT

DESKTOP STUDY

During the mid-17th century, the Dutch East India Company established a trading post at modern-day Cape Town. Simultaneously, the Portuguese colonised Lourenço Marques (Maputo), Mozambique. As such, the Mpumalanga landscape became a thoroughfare for local and foreign traders. However, the increasing intensity of interaction among indigenous peoples and European merchants led to intensified competition over control of trade routes and accumulating wealth. Consequently, political centralisation led to warfare and population displacement (Derricourt & Evers 1973; Esterhuysen & Smith 2007; Delius *et al.* 2012).

By the 1830s, Dutch-speaking farmers started to migrate from modern-day Cape Town towards the interior regions of South Africa. Dutch-speaking migrants entering the region were confronted with existing tension between local groups due to the ongoing Mfecane, trade conflicts, and pressure from foreign merchants. Motivated to improve their own economic position within the area, more conflict between the Dutch, Sotho-Tswana and Nguni speaking communities started to take place (Giliomee & Mbenga 2007). Ultimately, Dutch-speaking farmers did settle in Mpumalanga and neighbouring provinces.

The discovery of coal, gold and diamonds during the mid-19th century led to a variety of socio-economic changes within South Africa. Since the discovery of mineral wealth, the new wage-economy and migrant labour systems contributed to the demise of traditional homestead economies and social organisation. In addition, competition for resources led to conflict, political upheavals and ultimately warfare (e.g., Crush & Soutter 1999; Delius 2014).

During the 1850s coalfields were already being exploited. Coal served a variety of purposes, as it still does today. From powering steam trains, ships, furnaces for smelting metals, it was also utilised within a domestic context, to heat up space and cook food. Since the discovery of diamonds and gold the industrial demand for coal increased significantly. Lucrative mining continued until the onset of the South African War of 1899 -1902 when the workforce joined the war effort, and, as usual during wartime, railways and infrastructure were destroyed. Following the end of the South African War, activities within the South African Union (formed in 1910) were aimed at stabilising the economy by focusing on agriculture and coal mining. However, post-war socio-economic and political crises, especially after World War I (1914-1918) had a profound economic and political impact on the South African coal industry and mine workers (Giliomee & Mbenga 2007). Due to the relative economic and political stability after World War II (1939-1945), mining towns were established and coal mining continued. Today coal is still an integral part of the South African economy, used for the generation of electricity, synthetic fuels, and petrochemical products (Mathu & Chinomona 2013).

The site itself is an agricultural landscape and, as shown on the historical aerial photography in **Figure 6-17** and modern view in **Figure 6-18**, its overall character has not changed over the last 67 years. A few specific changes are noticeable, however:

- The cultivated lands have changed slightly with some no longer in use and some new or extended ones;
- Some new farmsteads have been added in the area since 1955 (including at last two close to the corridors);
- Some farmsteads have had new structures added;

- The Impumelelo Mine has been developed near the south-western end of the study area and extensive mining infrastructure occurs near Brendan Village in the northeast;
- Various small farm dams have been added to the landscape; and
- The lake in the central part of the study area was far smaller but this is dependent on seasonal rainfall with 2009 imagery showing it even larger than today.

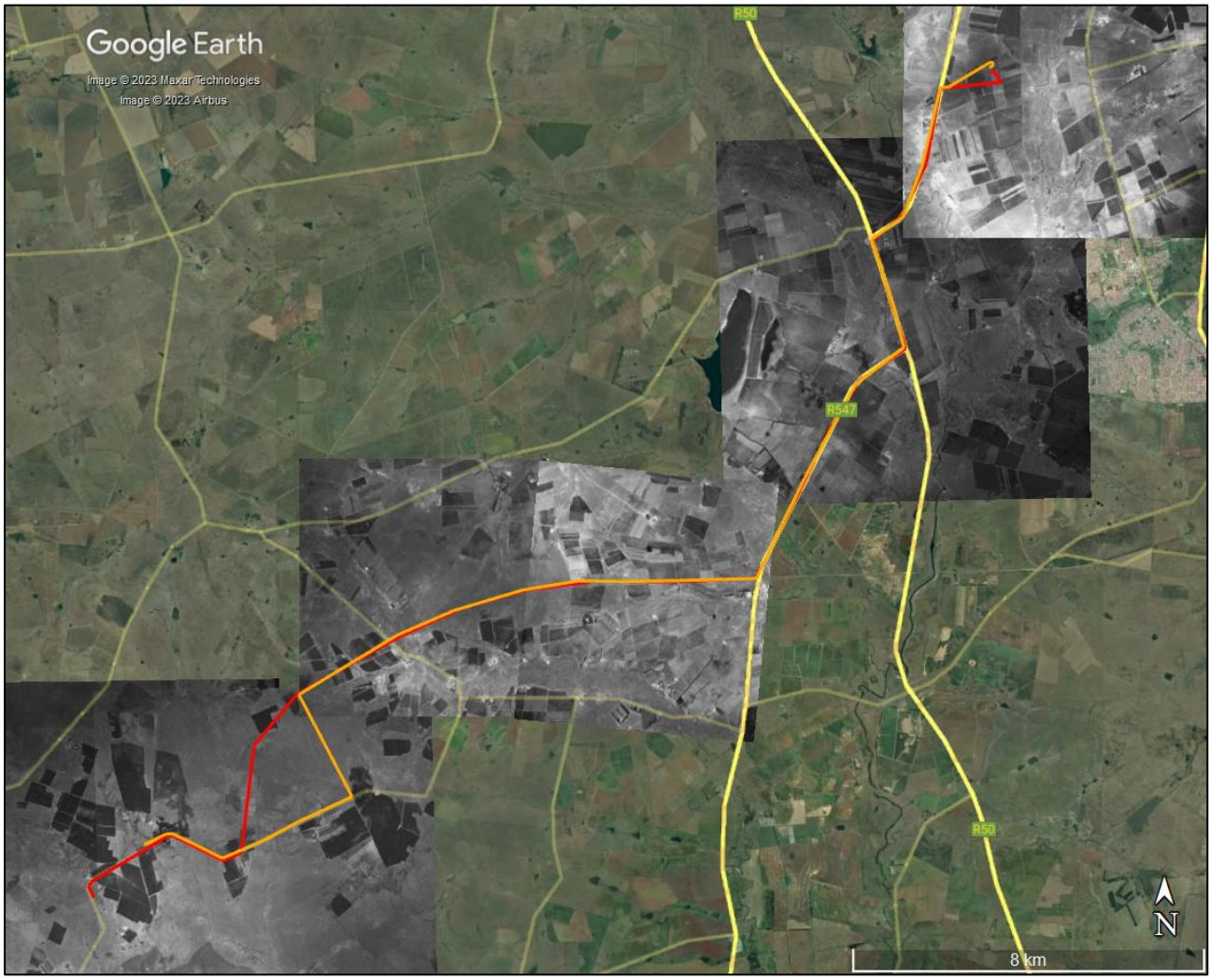


Figure 6-17: Aerial view with 1953 and 1955 images overlaid on Google Earth showing the landscape as a patchwork of arable lands (dark areas) and grassland

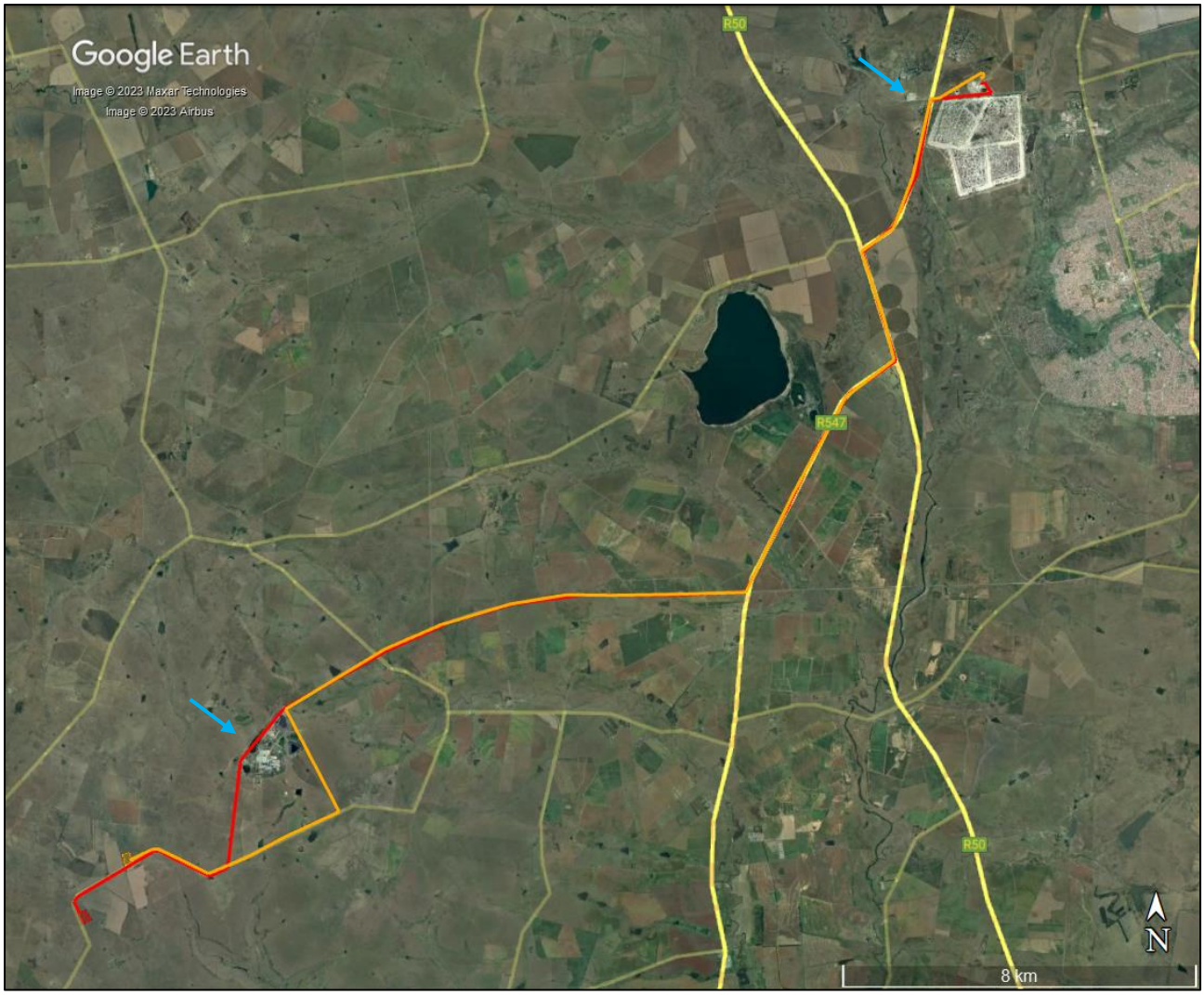


Figure 6-18: Modern aerial view (Google Earth) showing a similar patchwork of arable lands and grassland. Significant additions to the landscape are the mines at either end of the corridors (blue arrows)

SITE VISIT

It is evident from the historical archaeological finds (including those documented in the WEF study) that the agricultural landscape is historical, but many structures in the area (including a number now in ruin) seem to be relatively modern. A number of existing structures are older than 60 years but, because the WEF survey focused on the then-proposed turbine locations and access to the powerline land parcels was not possible, no houses were visited. No buildings, historical or otherwise, will be directly impacted (because they are always avoided by development) but some do lie within the corridor. The vast majority of the atter are modern though (**Figure 6-19**).

Figure 6-19: Aerial views dated 1944 (55_025_01447) and 2021 (Google Earth) showing that the farmstead in this area was absent in 1944

CULTURAL LANDSCAPES AND SCENIC ROUTES

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result".

The historical landscape is an agricultural one characterised by grazing lands (grass) and arable lands (planted with crops). The landscape is extensive and is punctuated by towns and coal mines. It is not a particularly sensitive cultural landscape with most of its development having taken place during the 20th century. Locally, it is compromised by the coal mine located immediately north of the study area. Landscape integrity is better in the southern part of the study area where some hills contribute to the scenic aspect.

The R50 is the main thoroughfare through the general study area. The lack of obvious scenic aspects beyond the rural landscape means that this road cannot be considered a scenic route. The north-eastern end of the proposed corridors is heavily compromised by the large mine dump and associated mining infrastructure at the Middelbult Simunye Mine.

6.3.3 PALAEONTOLOGY

The site lies in the northeastern part of the main Karoo Basin where the basal sediments are exposed. The Karoo sediments unconformably overlie the rocks of the Transvaal Supergroup sequence.

The Karoo Supergroup rocks cover a very large proportion of South Africa. They are bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa. Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin and are known as the Dwyka Group (Johnson et al., 2006).

The SAHRIS Palaeosensitivity Map shows the site to be of mixed sensitivity with at least half the area rated as very high (**Figure 6-20)**. However, areas of moderate and zero sensitivity also occur. Due to the sandy substrate,

generally dense vegetation covering throughout the study area and the fact that much of the routes lie along existing developed servitudes, a desktop palaeontological study was carried out.

Figure 6-20: Extract from the SAHRIS Palaeosensitivity Map showing the corridors (blue and green lines) to be of variably very high (red shading), moderate (green shading) and zero palaeontological sensitivity (grey shading)

The route lies mostly on potentially highly fossiliferous shales of the Vryheid Formation that is considered very highly sensitive for palaeontology so a site visit is required by SAHRA.

The fossils preserved in the Vryheid Formation are plants only and vertebrates are unknown. The plants are those of the Glossopteris flora comprising Glossopteris leaves, fructifications, wood and roots, and other plants such as lycopods, sphenophytes, ferns and early gymnosperms. Although the Vryheid Formation shales and sandstones are potentially fossiliferous, fossils are sporadic and their occurrence is unpredictable. Fossils do not occur in the coal seams as this organic material has been greatly altered by heat and compression to form coal. Soils are weathered products of sediments and so not contain any recognisable fossil material.

Dolerite is an igneous rock and does not preserve fossils and any fossils in close vicinity to the dolerite are usually destroyed by the intrusion.

Part of the route was surveyed by the archaeologist for archaeology, and only within the WEF area. Observations from a distance and from Google Earth show the obvious soils inferred from vegetation cover and crops. The doleritic area and the shales were all covered by soils that have been ploughed for agriculture. Some lands are also lying fallow and they are covered by deep soils and secondary grassland. No rocky outcrops remain (if ever present) in the visited area and no fossils were seen by the archaeologist. Most of the route is

along existing powerline routes, farm borders, coal conveyor belt and farm roads. The rest of the routes lie in recently or previously ploughed fields that would not have fossils because any stones have been removed before ploughing. Rocky outcrops, therefore should be targeted as there might be impressions of fossil plants in the shales of the Vryheid Formation.

The topography is almost flat with a few undulating areas so it was easy to see quite far in the search for rocky outcrops.

The southwestern part of the proposed powerline route where the two alternates pass either north and west of the mine tailings, or east and south of the mine tailings, are all on dolerite so no fossils were expected

6.3.4 VISUAL CHARATER AND SENSITIVITY

VISUAL CHARACTER AND CULTURAL VALUE

The physical and land use-related characteristics of the study area as described above contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural, undisturbed landscape. Visual character is also influenced by the presence of built infrastructure including buildings, roads and other objects such as telephone or electrical infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural or urban which results in a uniqueness, distinctiveness or strong identity.

The predominant land use in the area (maize cultivation) has significantly transformed the natural landscape across much of the study area. In addition, the landscape becomes progressively more transformed towards the north-eastern sector of the study area where the towns of Embalenhle and Evander, as well as mining activities have resulted in a high degree of visual degradation. Further transformation is evident to the south where Impumelelo Mine is located close to the powerline assessment corridors. The more transformed character of the landscape is an important factor in this context, as the introduction of the proposed powerline would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in form. As such, the pastoral landscape and rolling hills in parts of the study area are important features that could increase the visual appeal and visual interest in the area.

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of ‘cultural landscape’ is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002). In this instance, the rural / pastoral landscape represents how the environment has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction.

Considering this, it is important to assess whether the introduction of a powerline and associated infrastructure into the study area would be a degrading factor in the context of the prevailing character of the cultural landscape. Broadly speaking, visual impacts on the cultural landscape in the area around the proposed development would be reduced by the fact that the visual character in much of the area has been significantly transformed and degraded by urban, mining and infrastructural development.

VISUAL ABSORPTION CAPACITY

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

Although the undulating topography in the study area and the areas of cultivation and grassland would reduce the visual absorption capacity, this would be offset considerably by the presence of urban/industrial, mining and infrastructural development in the vicinity of the proposed Impumelelo EGI project.

Visual absorption capacity in the study area is therefore rated as MODERATE.

SENSITIVE VISUAL RECEPTOR LOCATIONS

A sensitive visual receptor location is defined as a location from where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion that alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced will however vary from one receptor to another, depending on the viewer's perception.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.

Preliminary desktop assessment did not identify any formal protected areas or leisure-based tourism activities in the study area for the proposed Impumelelo EGI. The desktop assessment did however identify multiple farmsteads and residences within the study area. While these homesteads and residences could be considered to be receptors, not all of them would be sensitive to the proposed development and given the number of farmsteads, it was not possible to confirm the presence of receptors at all the identified locations. Notwithstanding these limitations, all the identified receptor locations were assessed as part of the VIA as they are still regarded as being potentially sensitive to the visual impacts associated with the proposed development. None of these receptor locations was found to be sensitive.

Although most of the receptor locations are believed to be farmsteads, they are regarded as potentially sensitive visual receptors as the proposed development could potentially alter natural or semi-natural vistas experienced from these locations. At this stage however, local sentiments towards the proposed development are not known.

It was noted that residential areas within the town of Embalenhle are located within the Impumelelo EGI study area. While these could be considered as receptors, they are not considered to be sensitive due to their location within built-up, heavily transformed areas. Residential areas within the town of Evander are outside the study area.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfares in the study area is the R50 Main Road which traverses the north-eastern sector of the study area, linking Standerton to the south with the N17 National Route and Kinross to the North. The section of this road traversing the study area is not however considered part of a designated scenic route, although the route is an important link and is likely to be utilised, to some extent, by tourists en route to other parts of Mpumalanga Province. As a result it is considered to be a potentially sensitive receptor road – i.e., a road being used by motorists who may object to the potential visual intrusion of the proposed new powerline infrastructure.

The R547 Main Road and several other thoroughfares in the study area are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

The potentially sensitive visual receptor locations identified within the study area for the proposed Impumelelo EGI are indicated in **Figure 6-21**.

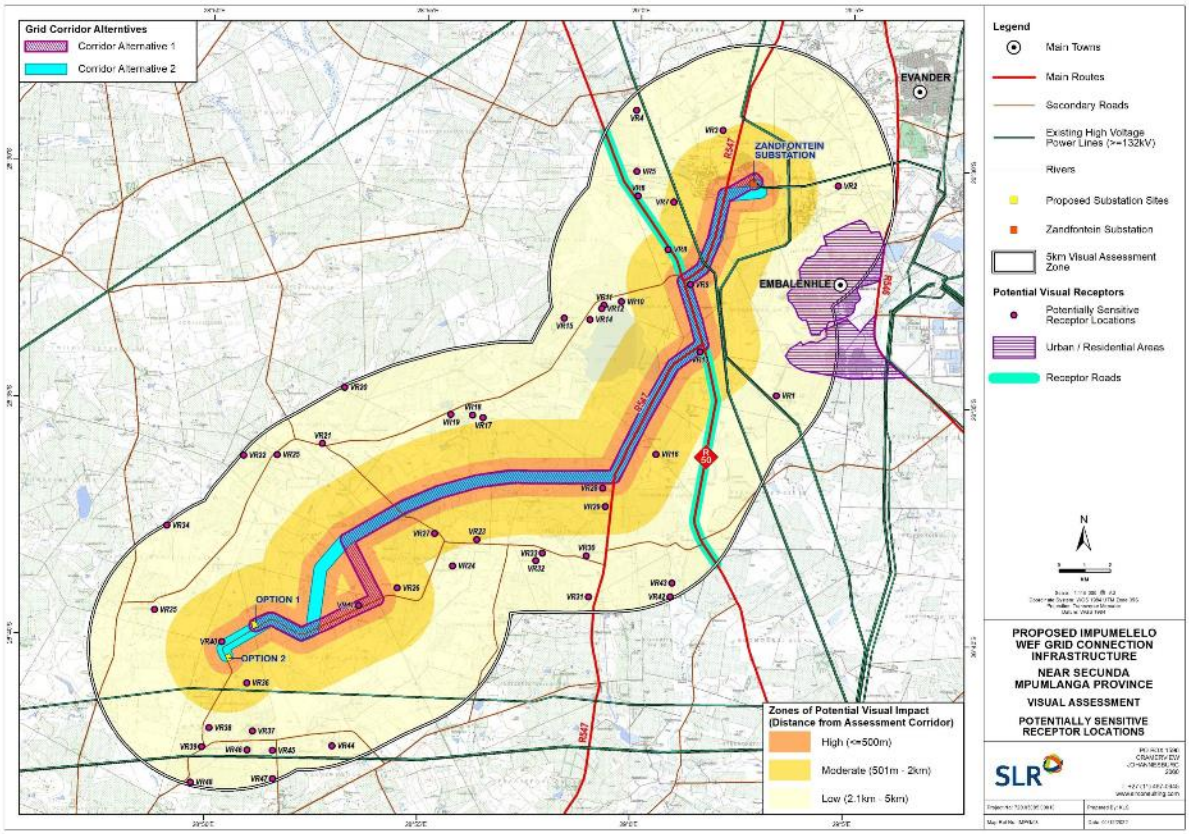


Figure 6-21: Potentially Sensitive Receptor Locations

NIGHT-TIME VISUAL BASELINE

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed development at night.

The towns of Embalenhle and Evander, located to the north-east are the main sources of light within the broader area. The towns, in conjunction with the Sasol Secunda fuel plant to the east of the study area as well as mining activities in the study area are expected to have a significant impact on the night scene in the study area.

Other light sources in the broader area would largely emanate from the many farmsteads dotted across the study area and also from vehicles travelling along the R50 and R547 main roads and local access roads that pass through the site. Overall, the visual character of the night environment within the study area is considered to be moderately 'polluted' and will therefore not be regarded as pristine.

However, power lines and associated towers or pylons are not usually lit up at night and, thus light spill associated with the proposed electrical infrastructure project is only likely to emanate from the proposed substation. Although the lighting required at the substation site would normally be expected to intrude on the nightscape, night time impacts of this lighting will be reduced by the fact the night environment is already moderately polluted. It should also be noted that the EGI project will only be constructed if the proposed Impumelelo WEF is also developed. Light sources for this facility will include operational and security lighting and thus the lighting impacts from the proposed on-site substation would be subsumed by the glare and contrast of the lighting associated with the WEF. As such, the substation alone is not expected to result in significant lighting impacts.

6.3.5 SOCIO-ECONOMIC

ADMINISTRATIVE CONTEXT

The study area falls within the Dipaleseng Municipality (DM) and Govan Mbeki Municipality (GMM) within the Mpumalanga Province, with a small section that traverses the northern section of the Lekwa Municipality (LM). The DM, SM and LM are three of seven Local Municipalities that make up the Gert Sibande District Municipality (GSDM) (**Figure 6-22**). The town of Dipaleseng (Balfour) is the administrative seat of the DM, while Secunda is the set of the GMM. Given that the majority of the alignment falls within the DM and GMM, the focus is on these two areas.

Figure 6-22: Location of Dipaleseng Municipality within the Gert Sibande District Municipality

DEMOGRAPHIC OVERVIEW-DIPALESENG MUNICIPALITY

POPULATION

The population of the DM in 2016 was 45 231 (Community Household Survey 2016). Of this total, 32.7% were under the age of 18, 61% were between 18 and 64, and the remaining 6.2% were 65 and older. The figures or the percentage of the population falling within the economically active age category of 18-64 were higher than the figures for the GSDM and Mpumalanga (57.7% and 56.6% respectively). This is likely to be due to the employment opportunities associated with the mining and manufacturing activities in the DM.

The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates to reduced revenue for local authorities to meet the growing demand for services. The traditional approach is based people younger than 15 or older than 64. The information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e., they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratios for the DM, the GSDM and Mpumalanga in

2016 were 64%, 73.5% and 77% respectively. The lower dependency ratios in the DM reflect the employment and economic opportunities in mining and power sector.

In terms of race groups, Black Africans made up 85.5% of the population on the DM, followed by Whites, 13% and Indian or Asian (1.2%). The main first language spoken in the DM was isizulu, 56.6%, followed by Sesotho (22.7%) and Afrikaans (12.9%).

HOUSEHOLDS AND HOUSE TYPES

The total number of households in the DM in 2016 was 14 880, which constituted less than 10% of the total number of households in the GSDM. Of these 59.8% were formal houses, 25.8% were shacks, and 12.7% were flats in backyards. The figures for the GSDM were 67.2%, 13.4%, 6.7% and 8.3% respectively. While the majority of dwellings in the DM are formal structures there are a high percentage of informal structures which reflects the migration of jobseekers to the area and the pressure this in turn places on housing.

In terms of ownership, 41.9% of the dwellings in the DM were owned and fully paid off, while 5.2% were in the process of being paid off. 18.8% were occupied rent free and 12.2% of the dwellings were rented from private individuals. A relatively large percentage of the properties in the DM (47.1%) were owned and or in the process of being paid off. This reflects a relatively stable and established community.

In terms of household heads, approximately 35.8% of the households in the DM and 39.1% of the households in the GSDM were headed by women. These figures similar to the provincial figure of 39.71%. The high percentage of households headed by women in the DM reflects the likelihood that the men have left the area in search of employment opportunities in Gauteng. This is despite the well-developed mining and energy sector in the DM and around Secunda. Women headed households tend to be more vulnerable.

HOUSEHOLD INCOME

Based on the data from the 2011 Census, 13.2% of the population of the DM had no formal income, 4.4% earned less than R 4 800, 6.9% earned between R 5 000 and R 10 000 per annum, 19.9% between R 10 000 and R 20 000 per annum and 22.8% between R 20 000 and 40 000 per annum (2016). The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 67.2% of the households in the DM and 65.2% in the GSDM live close to or below the poverty line.

The low-income levels in the DM and GSDM reflect the limited formal employment opportunities outside the urban areas. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the DM. This in turn impacts on the ability of the DM to maintain and provide services.

Household income levels are likely to have been impacted by the COVID-19 pandemic. The number of households in the DM and GSDM that live close to or below the poverty line is likely to have increased over the last 18 months. This, coupled with the high dependency ratio, is a major cause of concern for the area.

EMPLOYMENT

The official unemployment rate in the DM in 2016 was 22.3%, while 37.7% were employed, and 35.3% were regarded as not economically active. However, the COVID-19 pandemic is likely to have resulted in an increase in unemployment rates in the DM. Recent figures released by Stats South Africa also indicate that South Africa's unemployment rate is in the region of 36%, the highest formal unemployment rate in the world.

EDUCATION

In terms of education levels, the percentage of the population over 20 years of age in the DM with no schooling was 6.6% in 2016, compared to 10.8% and 11.3% for the GSDM and Mpumalanga Province respectively. The percentage of the population over the age of 20 with matric in the DM (2016) was 30.7%, compared to 34.3% and 36.1% for the GSDM and Mpumalanga. The education levels in the DM are therefore lower than the GSDM and Provincial figures.

MUNICIPAL SERVICES- DIPALESENG MUNICIPALITY

ELECTRICITY

Based on 2016 survey, 84.7% of households in the DM had access to electricity, compared to 90% for the GSDM and 93% for Mpumalanga. 15.3% therefore had not access to electricity compared to 9.6% and 6.8% for the GSDM and Mpumalanga respectively.

ACCESS TO WATER

Based on the 2016 survey information, 86.3% of households in the DM were supplied by a regional or local service provider. This compares to 88.4% and 86.85% for the GSDM and Mpumalanga respectively. Of this total 48.1% had piped water in the yard, and 29.7% had piped water in the house. The relatively high percentage that relied on piped water in their yards reflects the relatively high percentage of shacks (25.8%) in the DM.

SANITATION

76.4% of the households in the DM had access to flush toilets (2016), while 15.8% relied on pit toilets and 1.6% on bucket toilets. The relatively high percentage that relied on pit toilets reflects the relatively high percentage of shacks (25.8%) in the DM.

The figure for flush toilets compares to 65.3% and 42.1% for the GSDM and Mpumalanga respectively. 4.4% of the households in the DM reported that they had no access to formal sanitation, compared to 2.6% and 2.8% for the GSDM and Mpumalanga respectively.

REFUSE COLLECTION

76.4% of the households in the DM had access to regular refuse removal service, while for 13.6% relied on their own dump. The relatively high percentage that relied on their own dump reflects the relatively high percentage of shacks (25.8%) in the DM. The figure for regular service compares to 52.2% for the GSDM.

DEMOGRAPHIC OVERVIEW-GOVAN MBEKI MUNICIPALITY

POPULATION

The population of the GMM in 2016 was 340 091 (Community Household Survey 2016). Of this total, 32.5% were under the age of 18, 63.3% were between 18 and 64, and the remaining 4.2% were 65 and older. The GMM therefore had a high percentage of the population that fall within the economically active group of 18-65. The population of Ward 5 in 2011 was 9 219 (Census 2011). Of this total, 21.5% were under the age of 18, 72.1% were between 18 and 64, and the remaining 6.4% were 65 and older. Ward 5 like the GMM also had a high percentage of the population that fall within the economically active group of 18-65. The figures are higher than the figures for the GSDM and Mpumalanga (57.7% and 56.6% respectively). This is due to the employment opportunities associated with the industrial, mining and manufacturing activities in the MM.

The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates to reduced revenue for local authorities to meet the growing demand for services. The traditional approach is based people younger than 15 or older than 64. The information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e., they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratios for the GMM, the GSDM and Mpumalanga in 2016 were 58%, 73.5% and 77% respectively. The dependency ratio for Ward 5 in 2011 was 38.6%. The lower dependency ratios in the GMM and Ward 5 reflect the employment and economic opportunities in and around Secunda linked to the towns petrochemical and industrial sector.

In terms of race groups, Black Africans made up 85.8% of the population on the GMM, followed by Whites, 12.1% and Coloureds (1.2%). The figures for Ward 5 in 2011 were Whites (72.6%), Black Africans (22.2%), Indian or Asian (2.7%) and Coloureds (2.3%). The main first language spoken in the GMM was isizulu, 60.5%, followed by Siswati, 7.3% and Afrikaans, 6.2%. In Ward 5 Afrikaans (64.6%) followed by English (11.1%) were the main languages spoken.

HOUSEHOLDS AND HOUSE TYPES

The total number of households in the GMM in 2016 was 108 892, which constituted approximately 33% of the total number of households in the GSDM. Of these 63% were formal houses, 20.4% were shacks, and 10.6% were flats in backyards. The figures for the GSDM were 67.2%, 13.4%, 6.7% and 8.3% respectively. While the majority of dwellings in the GMM are formal structures there are a high percentage of informal structures which reflects the migration of jobseekers to the area and the pressure this in turn places on housing. In Ward 5 82.5% of the dwellings were formal houses. There were no reported shacks.

In terms of ownership, 46% of the dwellings in the GMM were owned and fully paid off, while 10.6% were in the process of being paid off. 17.9% of the dwellings were rented from private individuals. In Ward 5, 15.2% were owned and fully paid off, 34.2% were in the process of being paid off, and 35% were rented. A relatively large percentage of the properties in the GMM (56.6%) were owned and or in the process of being paid off. This reflects a relatively stable and established community.

In terms of household heads, approximately 30.8% of the households in the GMM and 39.1% of the households in the GSDM were headed by women. These figures similar to the provincial figure of 39.71%. The figure for Ward 5 in 2011 was substantially lower at 15.5%. The high percentage of households headed by women in the GMM reflects the likelihood that the men have left the area in search of employment opportunities in Gauteng. This is despite the well-developed industrial sector in and around Secunda. Women headed households tend to be more vulnerable.

HOUSEHOLD INCOME

Based on the data from the 2011 Census, 16.6% of the population of the GMM had no formal income, 3.6% earned less than R 4 800, 5.5% earned between R 5 000 and R 10 000 per annum, 12.6% between R 10 000 and R 20 000 per annum and 16.4% between R 20 000 and 40 000 per annum (2016). The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 54.7% of the households in the GMM and 65.2% in the GSDM live close to or below the poverty line. The figure for Ward 5 in 2011 was 16.9%.

The low-income levels in the GMM and GSDM reflect the limited formal employment opportunities outside in the urban areas. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the GMM. This in turn impacts on the ability of the GMM to maintain and provide services.

Household income levels are likely to have been impacted by the COVID-19 pandemic. The number of households in the GMM and GSDM that live close to or below the poverty line is likely to have increased over the last 18 months. This, coupled with the high dependency ratio, is a major cause of concern for the area.

EMPLOYMENT

The official unemployment rate in the GMM in 2016 was 17.2%, while 48.5% were employed, and 31% were regarded as not economically active. The figures for Ward 5 in 2011 were 3.6%, 63.6% and 32.4% respectively. However, the COVID-19 pandemic is likely to have resulted in an increase in unemployment rates in both the GMM and Ward 5. Recent figures released by Stats South Africa also indicate that South Africa's unemployment rate is in the region of 36%, the highest formal unemployment rate in the world.

EDUCATION

In terms of education levels, the percentage of the population over 20 years of age in the GMM and GSDM with no schooling was 6.5% in 2016, compared to 10.8% and 11.3% for the GSDM and Mpumalanga Province respectively. The figure for Ward 5 in 201 was 1.8%. The percentage of the population over the age of 20 with matric in the GMM (2016) and Ward 5 (2011) was 39.4% and 39.2% respectively, compared to 34.3% and 36.1% for the GSDM and Mpumalanga. The education levels in the GMM and Ward 5 are therefore marginally higher than the DM and Provincial figures.

MUNICIPAL SERVICES-GOVAN MBEKI MUNICIPALITY

ELECTRICITY

Based on 2016 survey, 95.1% of households in the GMM had access to electricity, compared to 90% for the GSDM and 93% for Mpumalanga.

ACCESS TO WATER

Based on the 2016 survey information, 96.9% of households in the GMM were supplied by a service provider. This compares to 86.7% and 80.5% for the GSDM and Mpumalanga respectively. The figure for Ward 5 in 2011 was 91.4%.

SANITATION

94.9% of the households in the GMM had access to flush toilets (2016), while 3.4% relied on pit toilets. This compares to 65.3% and 42.1% for the GSDM and Mpumalanga respectively. The figure for Ward 5 in 2011 was 94.5%. Only 0.5% of the households in the GMM reported that they had no access to formal sanitation, compared to 2.6% and 2.8% for the GSDM and Mpumalanga respectively.

REFUSE COLLECTION

72.5% of the households in the GMM had access to regular refuse removal service, while for 13.9% the service was provided, but not on a regular basis. This compares to 52.2% for the GSDM (regular) and 5.2% (irregular). 89% of households in Ward 5 had their waste collected on a regular basis by a service provided.

7 SITE SENSITIVITY VERIFICATION

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 7-1** below. The site verification process is discussed in the section below.

Table 7-1 : Assessment Protocols and Site Sensitivity Verifications

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL	DFFE SCREENING TOOL SENSITIVITY	SPECIALIST SENSITIVITY VERIFICATION
Agricultural Compliance Statement	*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*	High Sensitivity	Low Sensitivity
Terrestrial Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity*	Very High Sensitivity	Medium Sensitivity
Aquatic Biodiversity Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity*	High Sensitivity	High and Low Sensitivity
Plant Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species*	Medium Sensitivity	Low Sensitivity
Animal Species	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*	High Sensitivity	Medium Sensitivity
Avifauna Impact Assessment	*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*	No Sensitivity Identified	High Sensitivity
Archaeological and Cultural Heritage Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	High Sensitivity	Medium to Low Sensitivity
Palaeontology Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Very High Sensitivity	Low Sensitivity

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL	DFFE SCREENING TOOL SENSITIVITY	SPECIALIST SENSITIVITY VERIFICATION
Visual (Landscape) Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	No Sensitivity Identified	Low Sensitivity
Social Impact Assessment	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	No Sensitivity Identified	Low to Medium Sensitivity
Civil Aviation Theme	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	High Sensitivity Identified	Medium Sensitivity
Defence Theme	*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed*	Low Sensitivity Identified	Low Sensitivity

7.1 AGRICULTURAL POTENTIAL

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. All arable land that can support viable crop production, is classified as high (or very high) sensitivity. This is because there is a scarcity of arable production land in South Africa and its conservation for agricultural use is therefore a priority. Land which cannot support viable crop production is much less of a priority to conserve for agricultural use, and is rated as medium or low agricultural sensitivity.

It is important to recognise that the agricultural sensitivity of land, in terms of a particular development, is not only a function of the screening tool sensitivity, but is also a function of the severity of the impact which that development poses to agriculture. This is not recognised in the screening tool classification of sensitivity. So, for example, the sensitivity of an agricultural environment to overhead powerlines is not what the screening tool classifies the sensitivity as, because most agricultural environments have a very low sensitivity to overhead powerlines. This is because powerlines have negligible agricultural impact in most environments, regardless of the agricultural production potential of the land that they cross (see Section 9). Therefore, in the context of the development of overhead powerlines, almost no land can be considered to have high sensitivity for impacts on agricultural resources. For this reason the screening tool sensitivity of the powerline corridor is largely irrelevant. In this assessment, only the footprint of the substation is of relevance.

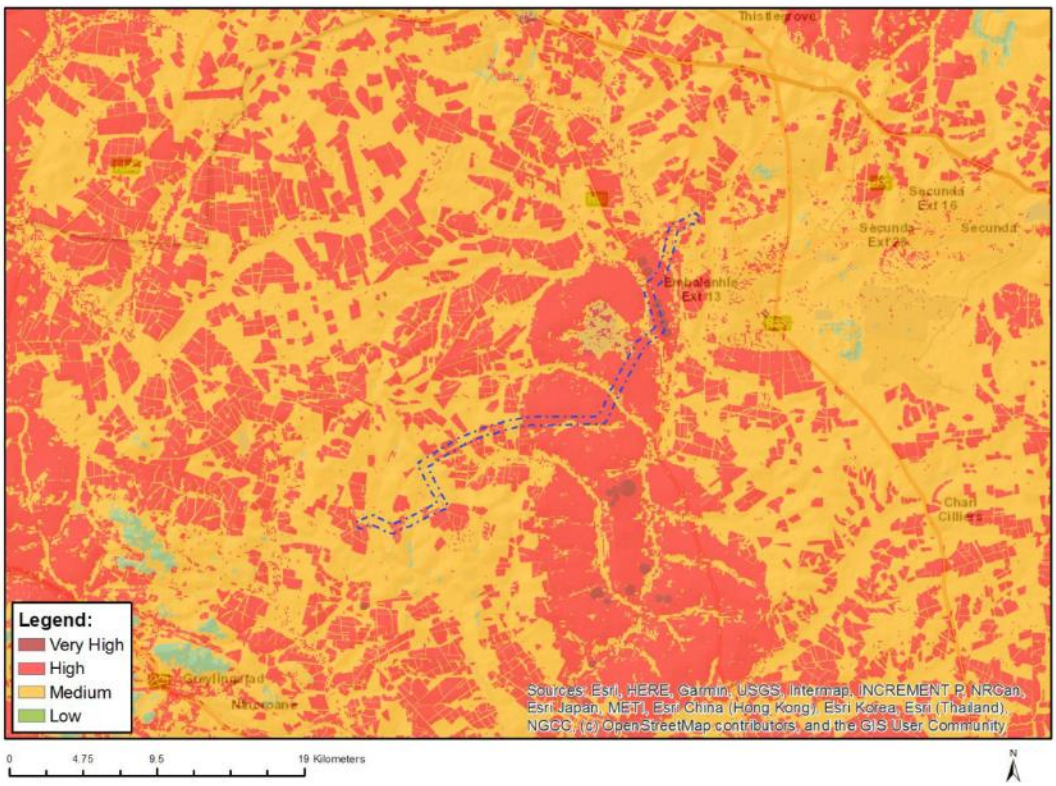
The screening tool classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is used for cropland or not. All cropland is classified as at least high sensitivity, based on the logic that if it is under crop production, it is indeed suitable for it, irrespective of its land capability rating.

The screening tool sensitivity categories in terms of land capability are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The data is generated by GIS modelling. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate and terrain. The higher land capability values (≥8 to 15) are likely to be suitable as arable land for crop production, while lower values are only likely to be suitable as non-arable grazing land.

A map of the proposed powerline and substations alternatives, overlaid on the screening tool sensitivity, is given in **Figure 7-1**, but as noted above, the screening tool sensitivity of the powerline corridor is largely irrelevant to

agricultural impact. The only relevance is that pylons should be located outside of or on the edges of cropland, where possible, so that they minimise interference with crop production.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
High	Old Fields;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Old Fields;Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Pivot Irrigation;Land capability;09. Moderate-High/10. Moderate-High

Figure 7-1 : Map of Agriculture Sensitivity (Source: DFFE Screening Report)

The agricultural sensitivity of the substation footprint is relevant because that land will be permanently removed from agricultural production. The classified land capability of both alternative substation sites is 8, which translates to a medium agricultural sensitivity.

However, at the relevant scale for substation sites, historical land use is actually a more reliable indication of soil cropping potential than land capability. The suitable versus the unsuitable soils have been identified over time through trial and error. In an agricultural environment like the one being assessed, all the suitable soils are

generally cropped, and uncropped soils can therefore fairly reliably be considered to be unsuitable for crop production. Both alternative substation sites were field-verified to be non-cropland.

7.2 TERRESTRIAL BIODIVERSITY

The output of the DFFE Screening Tool for the Terrestrial Biodiversity Theme is illustrated in **Figure 7-2** and indicates that the OHPL falls predominately within an areas classified as Very High Sensitivity due to the presence of areas of CBA 1, CBA 2, ESA, Protect Areas Expansion Strategy and a Vulnerable Ecosystem within the study area.

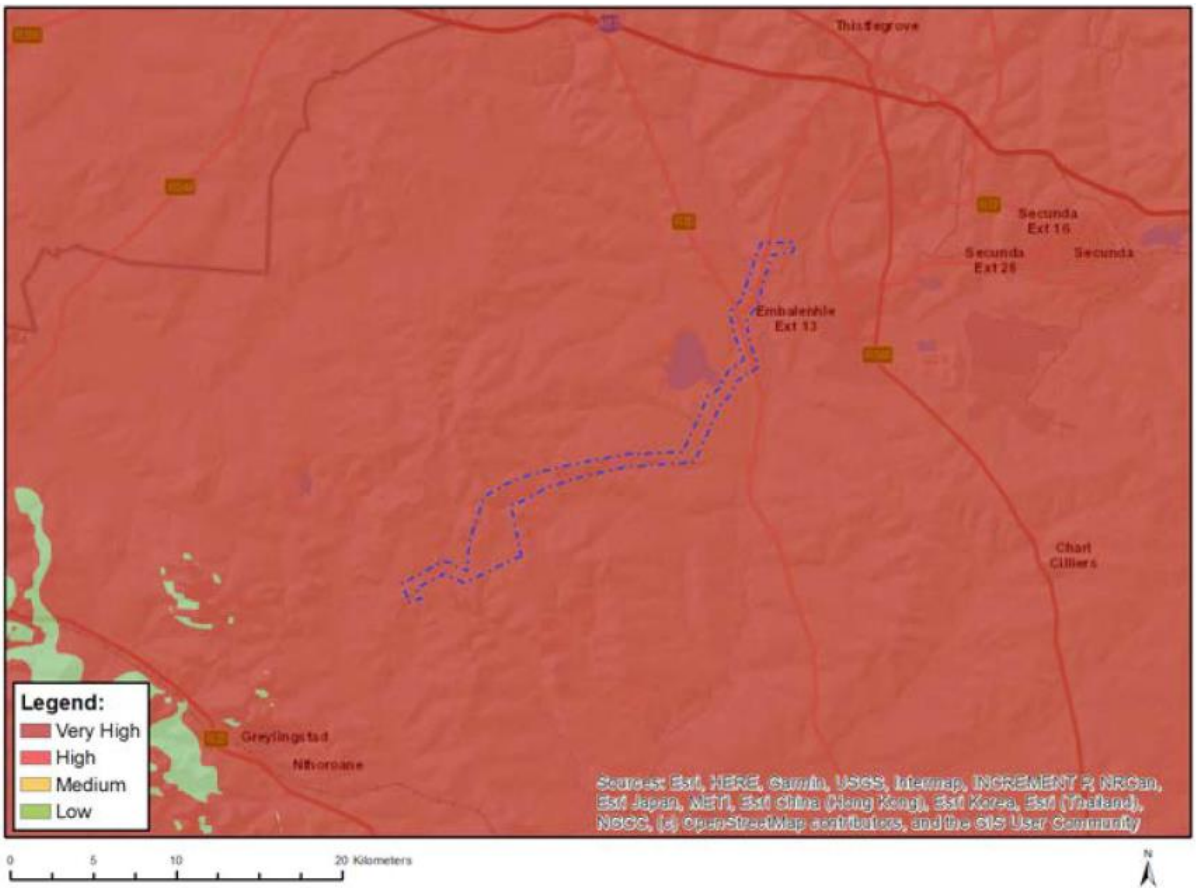


Figure 7-2: Map of Terrestrial Biodiversity Sensitivity (Source: DFFE Screening Report)

This theme considers the presence of protected areas, National Protected Area Expansion Strategy (NPAES), CBAs, ESAs and National Freshwater Ecosystem Priority Areas (NFEPAs).

- The key issue is that certain sections of the gridline routes have been identified as CBAs, especially the sections close to the Impumelelo WEF site. However, our background study indicated that although there are CBAs and ESAs present on site, our sensitivity analysis rated most of these areas as being of low sensitivity except for the wetlands (Habitat 7), which have a high sensitivity.
- The study area is not located in a protected area nor does it fall in an area earmarked for the NPAES (NPAES 2010). It is also not earmarked in the 5-year plan of the Mpumalanga PAES (data supplied by M. Lötter, MTPA).
- Our background study confirms that the Soweto Highveld Grassland vegetation type on site is listed as 'Vulnerable'.
- Sensitivity of Habitat 1 was rated as medium, with substation 1 (SS1) located in such a habitat and its position should be reconsidered. The gridline crosses this habitat on the WEF site but positioning of pylons may avoid the areas.

- Freshwater Ecosystem Priority Areas (FEPAs) or water catchments were not flagged by the screening tool. Based on the site assessment of the vegetation most of the area mapped as upstream river FEPA was rated as having a low or medium sensitivity, with only the drainage lines having a high sensitivity.
- Several Mgumalanga Highveld wetlands are present on site, but these were also not highlighted by the Screening Tool.

Unfortunately, the screening tool on site limits the sensitivity outcome of the Relative Terrestrial Biodiversity Theme to either Very High or Low. This is an issue which should be revisited by DFFE since it does not give a proper representation of the site conditions. Although we agree with the presence of the CBA the entire site does not qualify as CBA, since a large proportion of the site is degraded and under cropland or abandoned cropland. Thus if the same 4-tiered scale were to be applied to this theme, as in the case of the other themes, we would rate it as medium.

Overall, the grassland on shallow soils (rocky sheets) (Habitat 1 – medium sensitivity), grassland of rocky outcrops (Habitat 3) and drainage lines (including dams) (Habitat 7 – high sensitivity) were more sensitive than the other habitats on site. Habitats 6, 8, 9 & 10 are man-made habitats with a low sensitivity rating, e.g. planted pastures, croplands, plantations, wind breaks and diggings.

Substation 1 (SS1) falls in a medium sensitivity area (**Figure 7-3**). The gridline route towards Zandfontein crosses many drainage lines and wetlands (high sensitivity), but positioning of pylons should avoid these areas. Along the watercourses, buffers are applicable to the development. A buffer zone of 32 m is usually applied to drainage lines, but the aquatic specialists may apply wider buffer zones along these habitats. No buffer has been applied in Figure 14, since it is advised to follow the recommendations of the aquatic specialist in this regard.

Apart from the drainage lines and wetlands (Habitat 7), with high sensitivity, the CBAs did not emerge as being highly sensitive in the sensitivity model that was applied. The areas mapped as wetlands were largely incorporated into the CBAs.

Figure 7-3: Sensitivity map of the Impumelelo site. The sensitivity map is additionally provided as a .kmz file. Orange = high sensitivity; Green = medium sensitivity; Blue = low sensitivity. SS1 orange square = Impumelelo on-site substation 1; SS2 red square = substation 2

7.3 AQUATIC BIODIVERSITY

Based on the National Web-Based Environmental Screening tool the majority of the watercourses and aquatic ecosystems surrounding the study site is classified as high in terms of aquatic biodiversity (**Figure 7-4**)

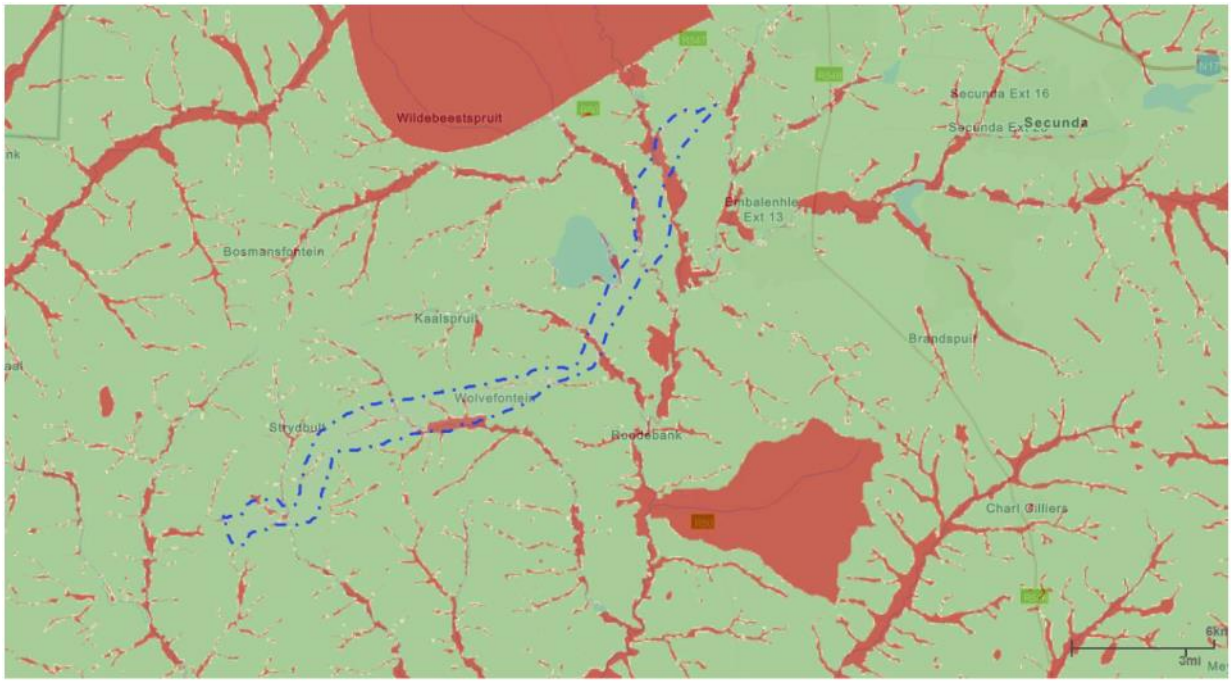


Figure 7-4: Map of Aquatic Biodiversity Sensitivity (Source: DFFE Screening Report)

In terms of the desktop assessment the study site has conservation significance both in terms of national as well as provincial conservation planning. The site verification assessment indicated that the proposed layout encroaches on the wetlands and their associated buffer areas.

The desktop assessment conducted by DWS indicated that the sub quaternary reaches surrounding the study site are largely natural (B) to moderately modified (C). The site verification indicated that the wetlands are moderately (C) to seriously modified (E) whilst the aquatic macroinvertebrates indicated that the aquatic ecosystems are largely (D) to seriously/critically (E/F) modified. Therefore, the wetland and aquatic ecosystems surrounding the study site do not conform to the desktop assessment and are more impacted than expected.

Based on the field assessments, the wetland delineation and buffer indicate that the current layout encroaches on the wetlands as well as their respective buffer areas. Although the wetland and aquatic ecosystems are impacted, they still fulfil important ecosystem services and also form part of national and provincial conservation targets. Ideally a walk down should be done on site once the location of each pylon is available to ensure the footprints remain outside of watercourses as far as possible.

Although the wetland and aquatic ecosystems are impacted, they still fulfil important ecosystem services and also form part of national and provincial conservation targets. It is therefore recommended that the wetlands, aquatic ecosystems and the buffer areas as indicated in **Figure 6-7** and **Figure 6-8** are considered of high sensitivity with the exception of one artificial wetland area scored as low.

7.4 PLANT SPECIES

The DFFE Screening Tool indicates that the site falls within an area with Medium Sensitivity under the Plant Species Theme (**Figure 7-5**) and highlighted four species with an IUCN status of Vulnerable as being of concern, including S*ensitive species 1252, Sensitive species 691, Khadia beswickii and Pachycarpus suaveolens.*

Figure 7-5: Map of Plant Species Sensitivity (Source: DFFE Screening Report)

The field survey and application of a sensitivity model indicated that most of gridline had a low sensitivity. None of the SCC highlighted by the screening tool were recorded on site.

- The Soweto Highveld Grassland is classified as a Vulnerable vegetation type. Along the gridline, large portions of the route have been heavily or moderately modified (compare CBA map, Figure 12) and not prime examples of the Soweto Highveld Grassland. If the development is thus contained within the heavily or moderately modified areas it would not affect the status of the vegetation type since these modified area were already considered as lost for the allocation of a vulnerable status of the vegetation type.
- Sensitive species 691 occurs in damp depressions in shallow soil over rock sheets. Although not found on site, the substation 1 (SS1) is located in Habitat 1.
- The habitats on site do not present suitable habitat for sensitive species 1252 because of a lack of suitable wooded habitat. Moreover, the rocky outcrops on hilly terrain with a sparse woody cover were avoided by the development. This species was not listed for the region on the NewPosa database nor in the MTPA database for the farms in the immediate vicinity of the Impumelelo site.
- Khadia beswickii occurs in rocky habitats on shallow soil (sheetrock) (see Habitat 1), but was not recorded on site. However, the substation 1 (SS1) is located in Habitat 1. Furthermore, the other rocky habitats (Habitats 2 & 3) did not occur along the gridline route.
- The fourth plant species of concern, Pachycarpus suaveolens, prefers grassland, but was not recorded during the site survey. The last collection made was in 1962. Its distribution records show it to be more common northwards from the Secunda sites, e.g. in the Witbank-Carolina area.

7.5 ANIMAL SPECIES

The DFFE Screening Tool indicates that the site has a high sensitivity (**Figure 7-6**).

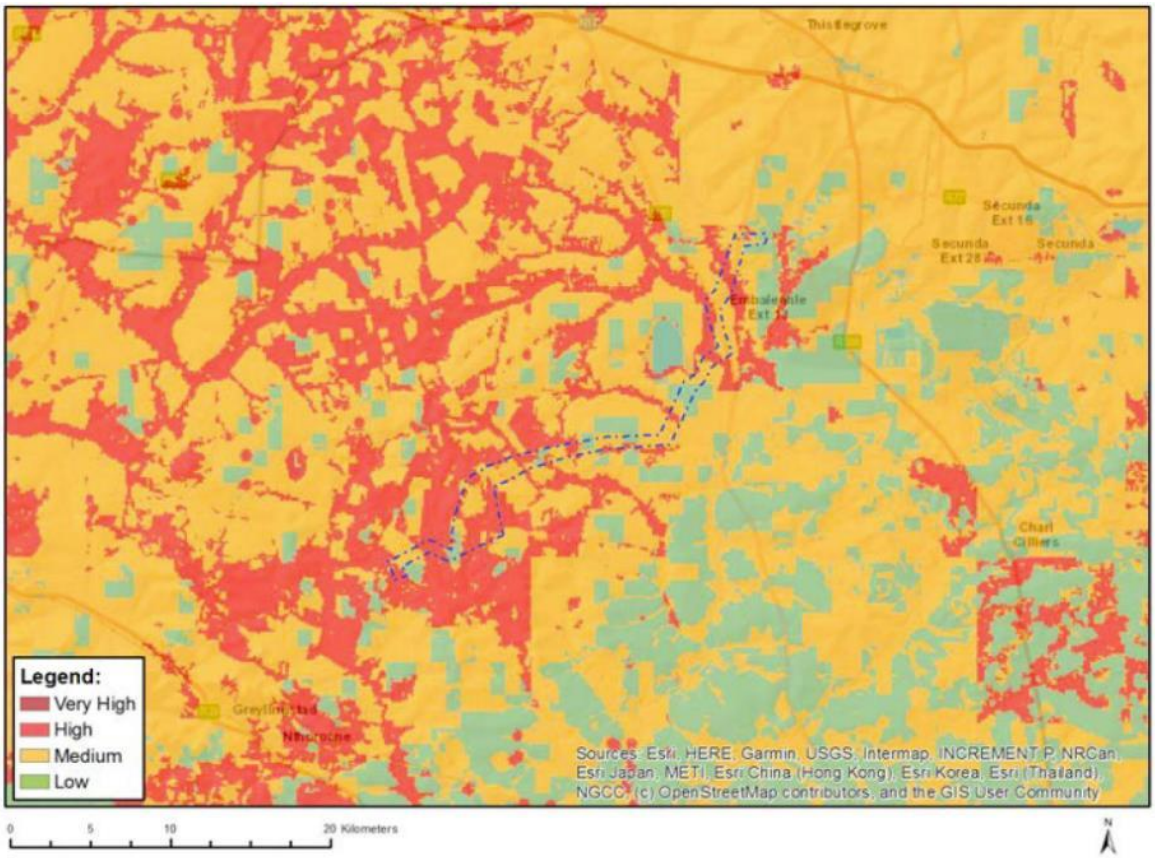


Figure 7-6: Map of Animal Species Sensitivity (Source: DFFE Screening Report)

The screening tool rated the sensitivity of the Animal Species Theme as high and highlighted the following species:

- Aves-*Circus ranivorus*
- Aves-*Hydroprogne caspia*
- Aves-*Eupodotis senegalensis*
- Aves-*Sagittarius serpentarius*
- Aves-*Sagittarius serpentarius*
- Aves-*Eupodotis senegalensis*
- Aves-*Tyto capensis*
- Aves-*Circus ranivorus*
- Aves-*Hydroprogne caspia*
- Insecta-*Lepidochrysops procera*
- Mammalia-*Crocidura maquassiensis*
- Mammalia-*Hydrictis maculicollis*
- Mammalia-*Ourebia ourebi ourebi*

The avifaunal and bat components will be addressed by the avifaunal and bat specialists. The species that were highlighted by the Screening tool, included the mammals *Crocidura maquassiensis, Hydrictis maculicollis, Ourebia ourebi ourebi* and the Invertebrate *Lepidochrysops p*rocera. None of these species were listed in the MTPA database for the farms participating in the proposed Impumelelo WEF development and none were encountered during the site visit. The spotted-necked otter (*Hydrictis maculicollis*) is not listed on the ADU database for the region while the Maquassie musk shrew (*Crocidura maquassiensis*) and *Lepidochrysops procera* are not listed on the ADU database for the region or the MNCA (1998) lists for the Mpumalanga province. The Impumelelo site falls marginally within the distribution range of *Ourebia ourebi ourebi*. None of the animal species listed by the Screening Tool were recorded on site during the survey.

The Maquassie Musk Shrew *Crocidura maquassiensis*: is classified as Vulnerable (Taylor et al. 2016). It depends on wetlands as suitable habitat in savanna and grasslands. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. *Crocidura maquassiensis* has not been reported from Gauteng, Northwest Province or Mpumalanga post-1999 and thus there is a very low probability for it to occur on site.

The Screening Tool listed *Lepidochrysops procera* (Lepidoptera) as a SCC for the site. However, it was not listed in the ADU database, the MNCA (1998) provincial species lists or the NEMBA (2007c) ToPS lists. *Lepidochrysops procera* was not recorded on site and is unlikely to occur there because its host plant (*Ocimum obovatum*) was scarce and only recorded in one location on the Impumelelo WEF site.

- The oribi *Ourebia ourebi* is found in patchy distributions in open and wooded mesic grassland. The Impumeleo site falls marginally within the distribution range of the oribi. Its habitat is largely fragmented due to human socioeconomic activities including agriculture, forestry and mining. It was not recorded during the survey or mentioned by the landowners on site.
- The Maquassie Musk Shrew *Crocidura maquassiensis* was not listed for the region in the ADU mammal species list or the MNCA (1998) lists for the Mpumalanga province. It was not recorded on site during the survey. The Maquassie Musk Shrew depends on wetlands as suitable habitat in savanna and grasslands. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. *Crocidura maquassiensis* has not been reported from Mpumalanga Province post-1999 and thus there is a very low probability for it to occur on site.
- The spotted-necked otter *Hydrictis maculicollis* was not listed for the region in the ADU mammal species list but was included in the MNCA (1998) lists for the Mpumalanga province. It was not recorded on site during the survey. Marginally suitable habitat for the spotted-necked otter is available on site. It occurs widespread, but it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base.
- What the screening tool did not highlight was the possible presence of the giant girdled lizard, a species with a Vulnerable IUCN status. However, the species was not recorded on site nor is it listed in the MTPA database for the farms in the immediate vicinity of the Impumelelo site. Furthermore, according to Bates et al. (2014), the distribution of the giant girdled lizard does not include the Impumelo site.
- The screening did also not highlight the presence of three Near Threatened species, viz. the Southern African hedgehog (*Atelerix frontalis*), serval (*Leptailurus serval*) and Southern African vlei rat (*Otomys auratus*) which have been reported for the Impumelelo site. It is unlikely that the development will affect the Southern African vlei rat, since the vlei habitat should be avoided. During construction the serval will avoid the area, but it could return during the operational phase. Construction workers should be made aware of not harming the Southern African hedgehog, however due to its size most individuals will go unnoticed.
- Overall sensitivity of animal theme (avifaunal and bat components excluded) is thus rated as medium. However, if the suggested mitigation measures are followed the animal SCC should not be negatively affected.

7.6 AVIFAUNA

The PAOI is classified as Low, Medium and High Sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. The high sensitivity classification is linked to the potential occurrence of African Marsh Harrier (Globally Least Concern, Regionally Endangered), Caspian Tern (Globally Least Concern, Regionally Vulnerable), White-bellied Bustard (Globally Least Concern, Regionally Vulnerable), Martial Eagle (Globally Endangered, Regionally Endangered), and Secretarybird (Globally Endangered, Regionally Vulnerable) (Figure 3). Additionally, medium sensitivity classifications are linked to most of the above species, as well as African Grass Owl (Globally Least Concern, Regionally Vulnerable)

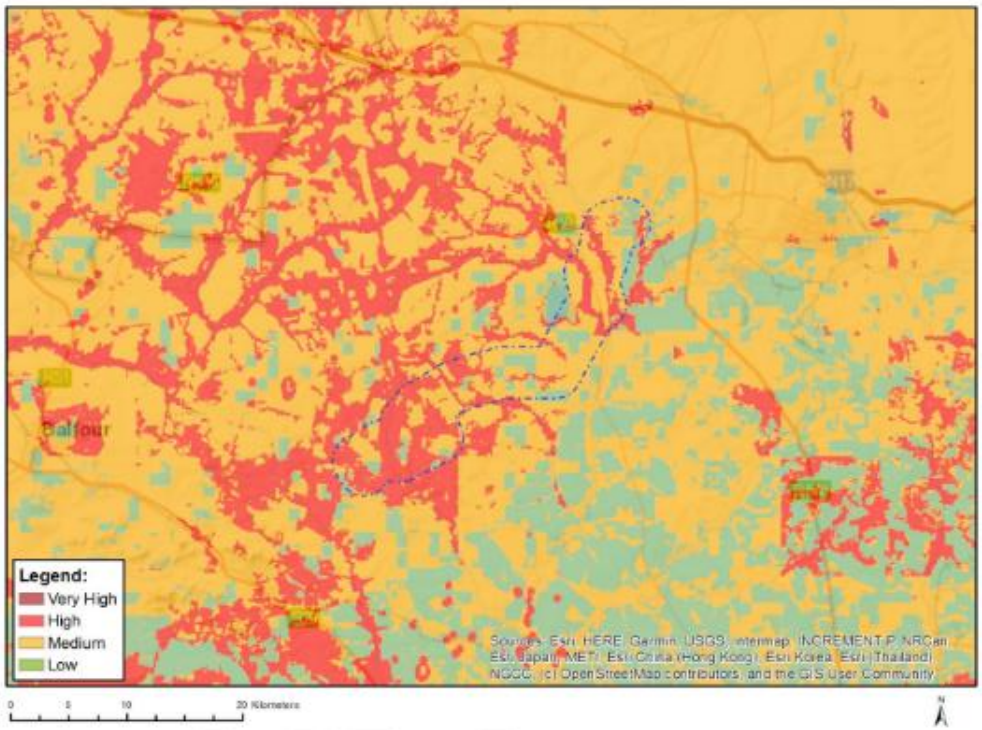
The project site and PAOI contain confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, Vulnerable, Near Threatened, and Data Deficient species.

The occurrence of Secretarybird (Globally Endangered, Regionally Vulnerable) and additional SCC was confirmed in the PAOI during the surveys i.e., Blue Crane (Globally, Vulnerable, Regionally Near Threatened), Denham's Bustard (Globally Near Threatened, Regionally Vulnerable), Blue Korhaan (Globally, Vulnerable,

Regionally Least Concern), Greater Flamingo (Globally Least Concern, Regionally Near Threatened), Lanner Falcon (Globally Least Concern, Regionally Vulnerable), and Maccoa Duck (Globally Endangered, Regionally Near Threatened).

In summary, based on the Site Sensitivity Verification field surveys conducted and subsequent pre-construction monitoring at the WEF, habitat within the PAOI is suitable for Blue Crane, Denham's Bustard, Blue Korhaan, Greater Flamingo, Lanner Falcon, Maccoa Duck, and Secretarybird. Therefore, a classification of High Sensitivity for avifauna for the Terrestrial Animal Species theme is suggested for the PAOI.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Hydroprogne caspia
High	Aves-Eupodotis senegalensis
High	Aves-Polemaetus bellicosus
High	Aves-Sagittarius serpentarius
Low	Subject to confirmation
Medium	Aves-Circus ranivorus
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Hydroprogne caspia
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Tyto capensis

Figure 7-7: Map of Avifauna Species Sensitivity (Source: DFFE Screening Report)

The following specific environmental sensitivities were identified from an avifaunal perspective:

Drainage lines, dams, pans, and associated wetlands. These habitat features are important attractions for many power line sensitive species, particularly waterbirds, including Red List species expected to regularly occur in the development area: African Marsh Harrier, Blue Crane, Greater Flamingo, Lesser Flamingo, Maccoa Duck, and Lanner Falcon. Birds commuting between these areas will be at risk of collision with the earthwire if they must cross over the grid connection. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters, and/or LED bird flappers in specific instances (e.g. Leeupan).

Natural grassland. The natural grassland is vital breeding, roosting and foraging habitat for a variety of powerline sensitive species and will therefore be associated with significant flight activity. These include Red List species expected to regularly occur in the development area: African Marsh Harrier, Blue Crane, Denham's Bustard, Blue Korhaan, Lanner Falcon, and Secretarybird. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters.

Figure 7-8 illustrates the avifaunal sensitivities identified for the OHPL.

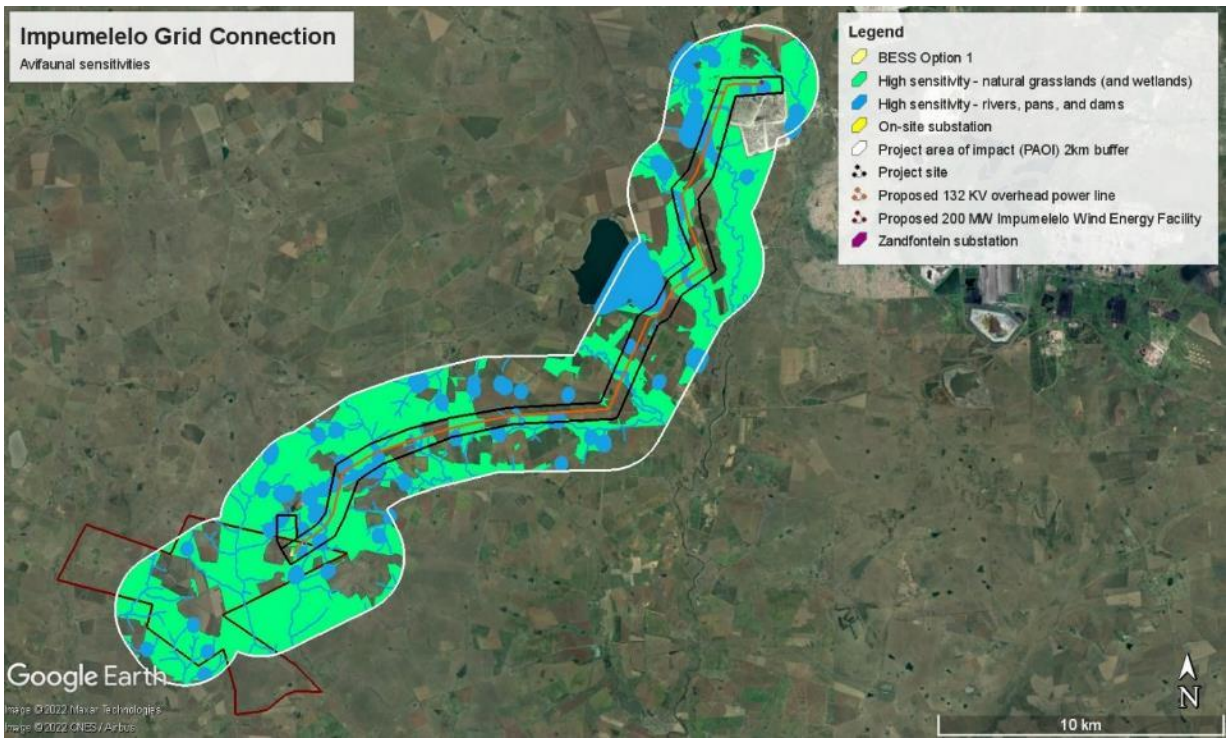


Figure 7-8: Avifaunal sensitivity for the OHPL

7.7 ARCHAEOLOGICAL AND CULTURAL HERITAGE

The output of the DFFE Screening Tool for the Archaeological and Heritage Theme is illustrated in **Figure 7-9** and indicates that the OHPL is situated in an area classified as high sensitivity.

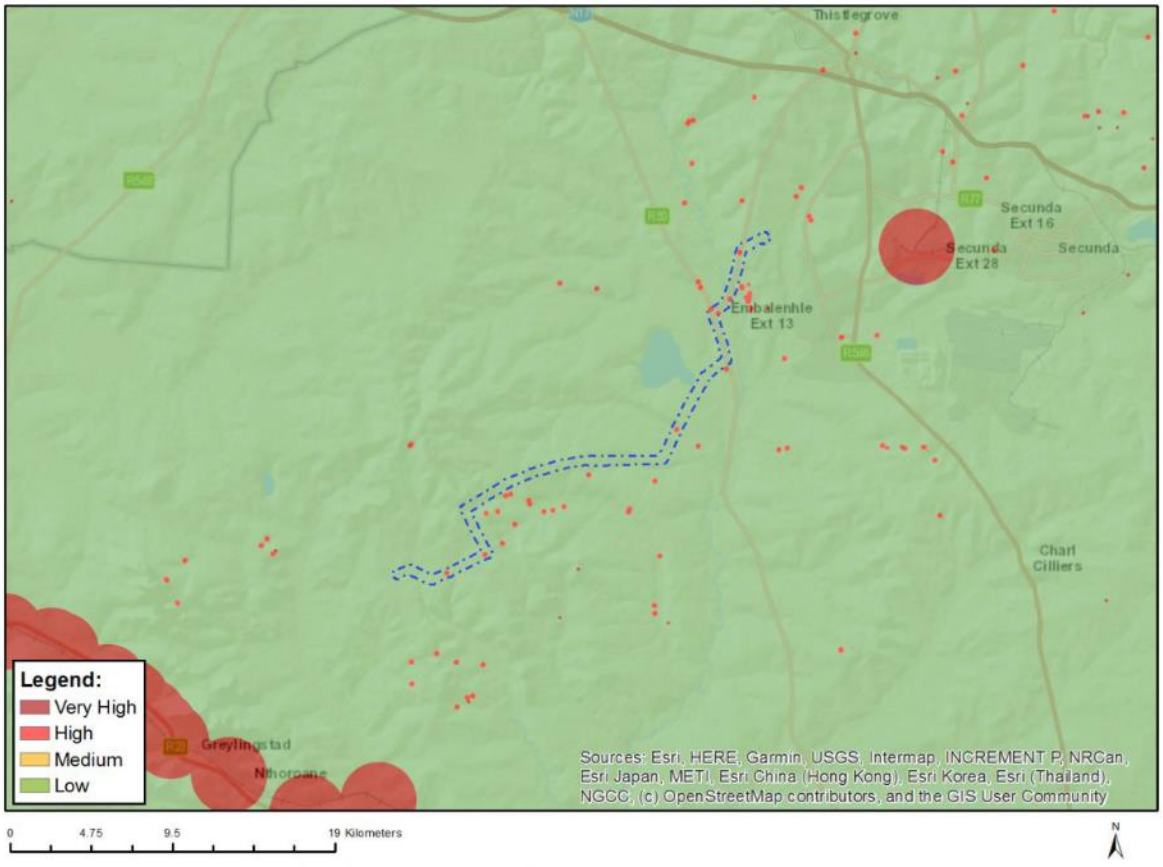


Figure 7-9: Map of Archaeological and Heritage Sensitivity (Source: DFFE Screening Report)

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ‘‘cultural significance’’ means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA.

The archaeological resources are deemed to have low to medium cultural significance at the local level for their scientific value and can be graded GPB or GPC.

Graves are deemed to have high cultural significance at the local level for their social value. They are allocated a grade of IIIA. Possible graves are included here for precautionary reasons.

Built heritage resources are considered up to medium significance at the local level for their architectural, historical and social values.

The cultural landscape is largely an agricultural landscape with medium to low aesthetic value due to the visual intrusion from the nearby coal mines which add an industrial component to parts of the landscape. It is rated as having low cultural significance at the local level.

Figure 7-10 show a grade map with all heritage resources currently known to fall within the corridors. They are indicated with 50 m buffers.

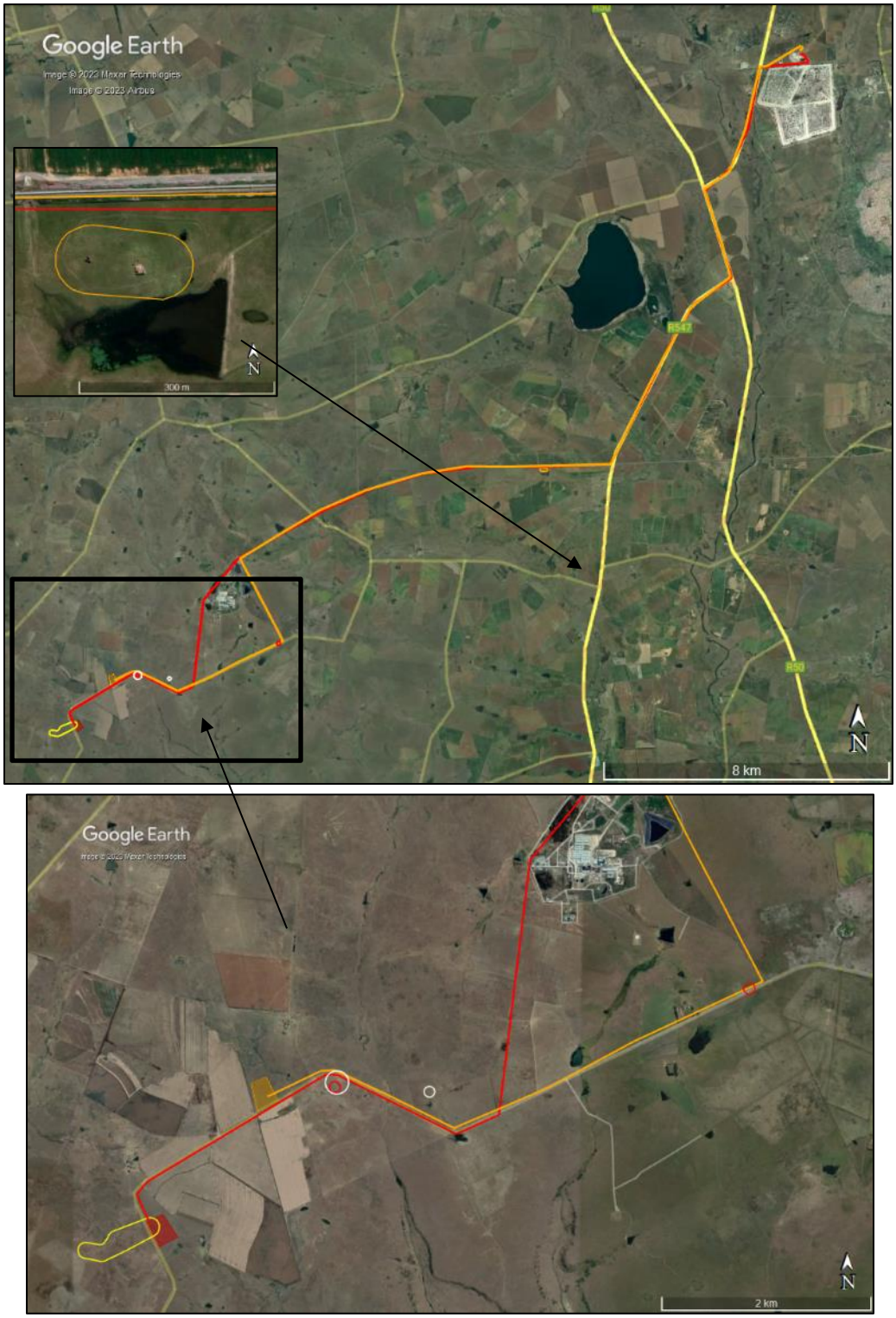


Figure 7-10: Grade map of the study area showing the locations of all sites found. They are coloured as follows: Grade IIIA = red, GPA = light orange, GPB = yellow and GPC = white.

7.8 PALAEONTOLOGY

The output of the DFFE Screening Tool for the Palaeontological Theme is illustrated in **Figure 7-11** and indicates that the OHPL is situated in an area classified as very high sensitivity.

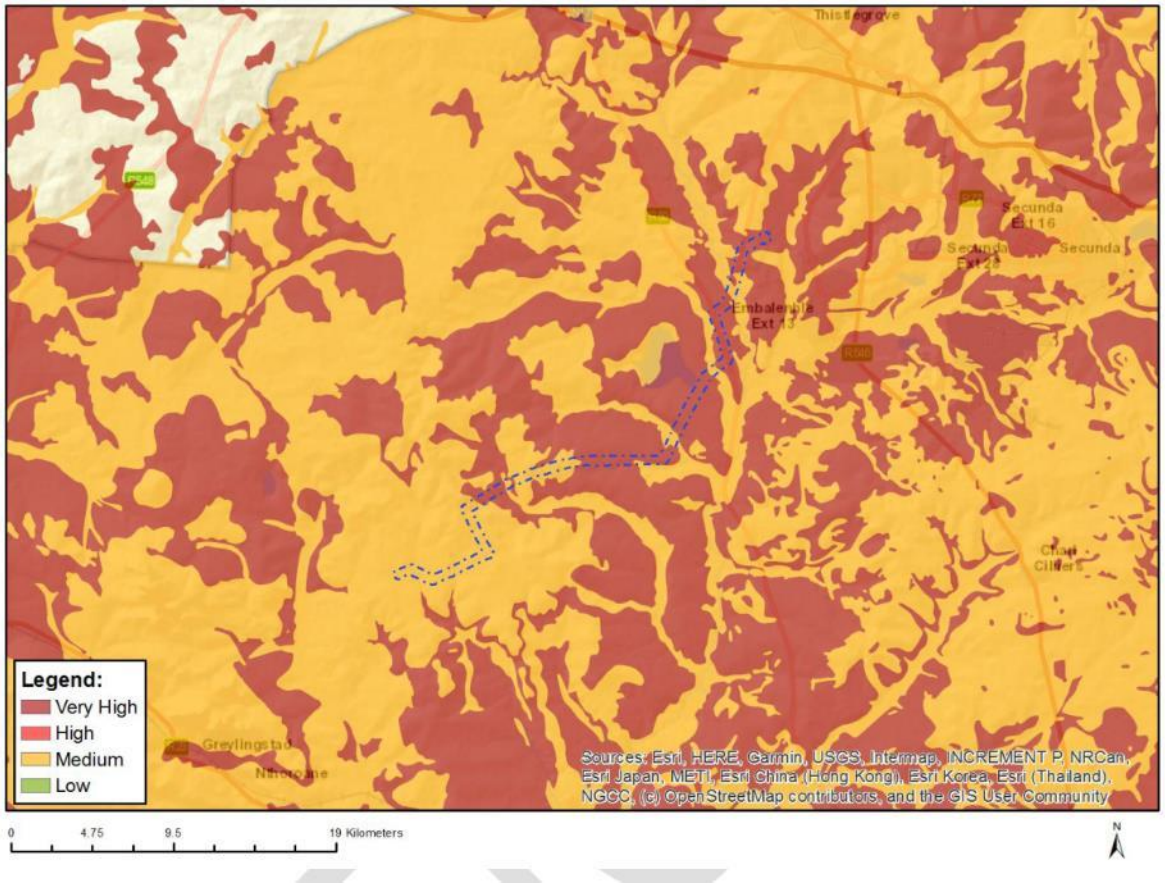


Figure 7-11: Map of Palaeontology Sensitivity (Source: DFFE Screening Report)

The route lies mostly on potentially highly fossiliferous shales of the Vryheid Formation that is considered very highly sensitive for palaeontology so a site visit is required by SAHRA.

The fossils preserved in the Vryheid Formation are plants only and vertebrates are unknown. The plants are those of the Glossopteris flora comprising Glossopteris leaves, fructifications, wood and roots, and other plants such as lycopods, sphenophytes, ferns and early gymnosperms. Although the Vryheid Formation shales and sandstones are potentially fossiliferous, fossils are sporadic and their occurrence is unpredictable. Fossils do not occur in the coal seams as this organic material has been greatly altered by heat and compression to form coal. Soils are weathered products of sediments and so not contain any recognisable fossil material.

Dolerite is an igneous rock and does not preserve fossils and any fossils in close vicinity to the dolerite are usually destroyed by the intrusion. The sensitivity of the palaeontology theme is verified as low.

7.9 VISUAL

The DFFE Screening Tool does not have a sensitivity rating for the Visual Theme.

In assessing visual sensitivity, the proposed development was examined in relation to the Landscape Theme of the National Environmental Screening Tool to determine the relative landscape sensitivity for the development of grid connection infrastructure. The tool does not however identify any landscape sensitivities in respect of the proposed powerline.

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e., topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational or nature-based tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the receiving environment, a matrix has been developed based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 7-2**), the visual sensitivity of the area is broken up into a number of categories, as described below:

- **High** - The introduction of a new development such as a powerline is likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.
- **Moderate** – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
- **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

Table 7-2 outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 7-2: Environmental factors used to define visual sensitivity of the study area

		RATING									
FACTORS	**DESCRIPTION**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pristine / natural / scenic character of the environment	Study area is largely pastoral with some areas of scenic value, although some areas are significantly transformed.										
Presence of sensitive visual receptors	No sensitive receptors have been identified in the study area, although *potentially* sensitive receptors are present.										
Aesthetic sense of place / visual character	Visual character is a typical rural / pastoral landscape, although significantly transformed by urban / industrial development and mining activity.										
Irreplaceability / uniqueness / scarcity value	Few areas of scenic value were found within the study area.										
Cultural or symbolic meaning	Much of the area is a typical rural / pastoral landscape.										
Protected / conservation areas in the study area	No protected or conservation areas were identified in the study area.										
Sites of special interest present in the study area	No sites of special interest were identified in the study area.										
Economic dependency on scenic quality	No tourism/leisure-based facilities were found in the area										
International / regional / local status of the environment	Study area is typical of rural / pastoral landscapes, although significantly transformed by urban / industrial development and mining activity.										

FACTORS	DESCRIPTION	RATING 1	2	3	4	5	6	7	8	9	10
**Scenic quality under threat / at risk of change	Introduction of new powerlines will alter the visual character and sense of place, giving rise to significant cumulative impacts										

**Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low			Moderate				High		
10	20	30	40	50	60	70	80	90	100

Based on the above factors, the total score for the study area is 32, which according to the scale above, would result in the area being rated as having a **LOW** visual sensitivity. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts and is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs and this has been factored into the sensitivity rating above. However, no formal protected areas, leisure-based tourism activities or sensitive receptor locations were identified in the study area.

As part of the visual sensitivity assessment, a screening exercise was undertaken with the aim of indicating any areas that should be precluded from the proposed development footprint. From a visual perspective, these are areas where the establishment of powerlines would result in the greatest probability of visual impacts on any sensitive or potentially sensitive visual receptors.

Using GIS-based visibility analysis, it was possible to determine which sectors of the combined assessment corridor would be visible to the highest numbers of receptors in the study area. This analysis confirmed that areas of higher elevation are visible to greater numbers of potentially sensitive receptors. Hence the visual prominence of a tall structure such as a powerline tower would be exacerbated if located on any ridges or a relatively higher-lying plateaus. It is noted that a small section of the proposed powerline route alignment traverses an area of relatively higher elevation that could be seen as an area of potentially high visual sensitivity. **However, due to the relatively low number of potentially sensitive receptors in the area, the presence of existing powerlines and road infrastructure as well as the fact that the study area as a whole is rated as having a low visual sensitivity, the sensitivity rating of this area would be reduced to "Medium".**

In determining visual sensitivity, consideration must be given to the direct visual impact of the powerlines on any farmsteads or receptors located in, or within 500m of, the combined assessment corridor. Only one (1) receptor was found to be within 500m of the combined assessment corridor, this being VR75 and as such a 500m zone of potential visual sensitivity has been delineated around this farmstead. However, as this receptor is located within the Impumelelo WEF project area, it is assumed that the owner of this property is involved in the development and is unlikely to view the proposed EGI in a negative light. Hence this zone, as shown in **Figure 7-12** is not considered to be a "no go area", but rather should be viewed as a zone of potential visual sensitivity.

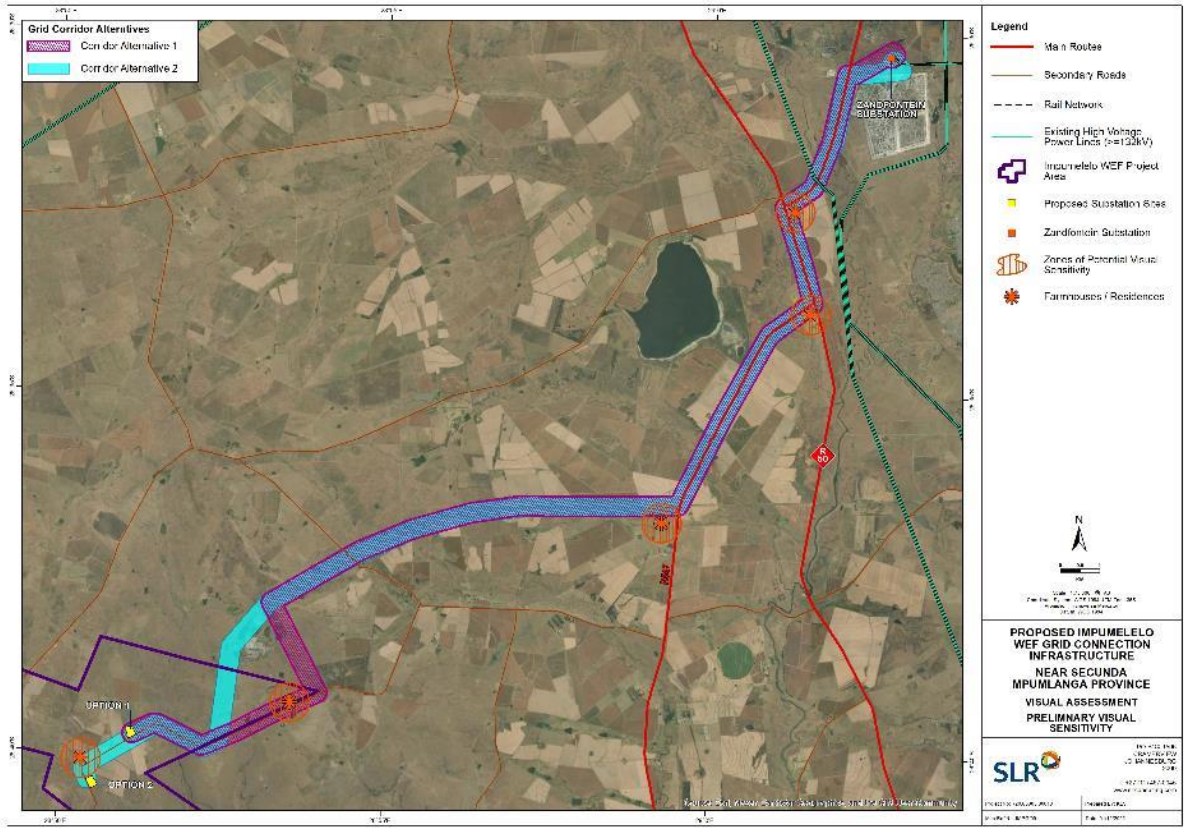


Figure 7-12: Visual Sensitivity on the Impumelelo EGI Assessment Corridor

7.10 SOCIAL

No preliminary socio-economic sensitivities or sensitivity rating was identified or provided based on the DFFE Screening Tool (i.e. a preliminary sensitivity rating was not provided that could then be confirmed or altered based on further assessment).

The findings of the SIA indicate that the significance of the potential negative social impacts for both the construction and operational phase of the proposed 132 kV Impumelelo overhead power line, substation and associated infrastructure are Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. Therefore, it was a low to medium sensitivity rating is applicable.

7.11 CIVIL AVIATION

According to the DFFE Screening Tool Report, civil aviation is regarded as having high sensitivity (**Figure 7-13**).

The proposed development site is located within 5km of an air traffic control or navigation site. Furthermore, the powerline will be built within 13km of the Secunda Airfield. It can be confirmed that the maximum height of the pylons will be 40m.

Due to the fact that only the far northern section of the OHPL is located within close proximity to air traffic control or navigation sites, the verified sensitivity is considered to be medium.

The relevant Authorities have been included on the project stakeholder database. As of the 1st of May 2021, 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.

An Application for the Approval of Obstacles will also be submitted to ATNS and the required permits will be obtained prior to the development of the project. The South African Civil Aviation Authority (SACAA) was included on the project stakeholder database.

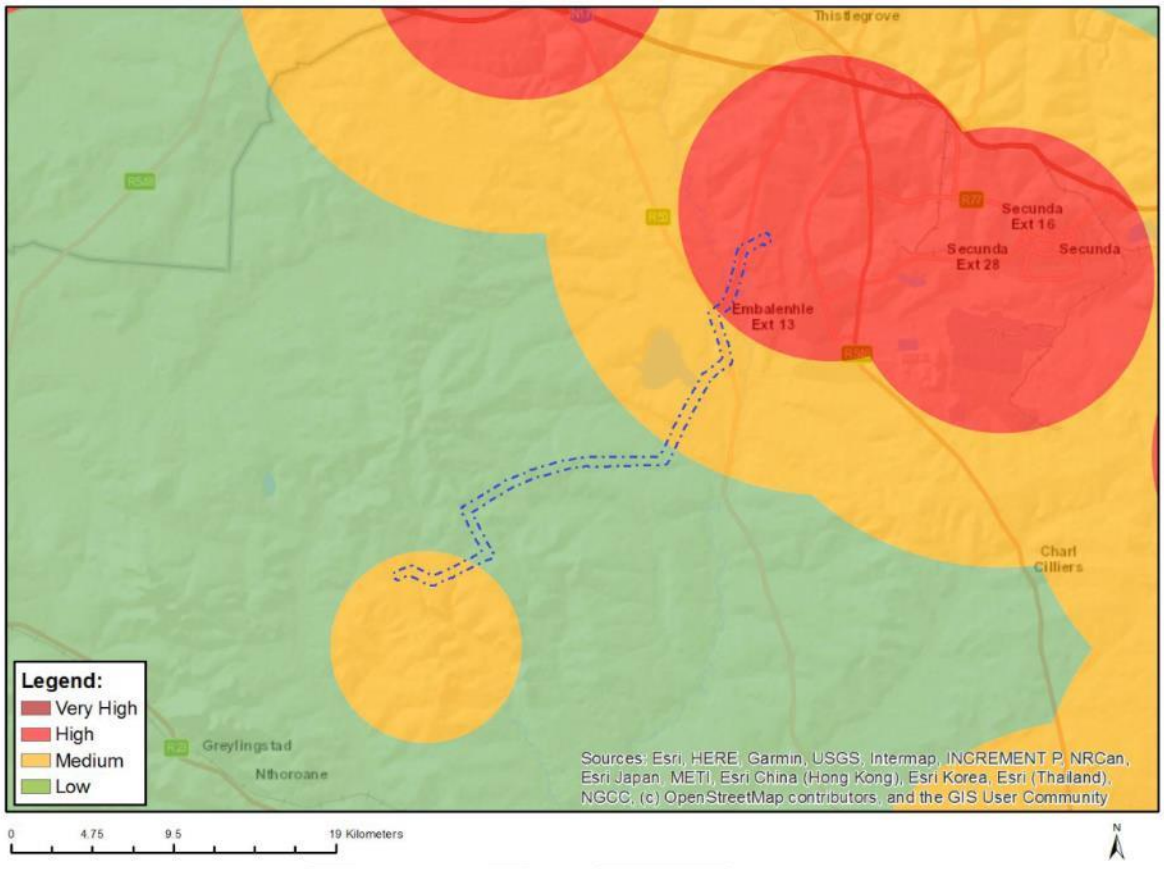


Figure 7-13: Map of Civil Aviation Sensitivity (Source: DFFE Screening Report)

7.12 DEFENCE

According to the DFFE Screening Tool Report, defence is regarded as having low sensitivity (**Figure 7-14**).

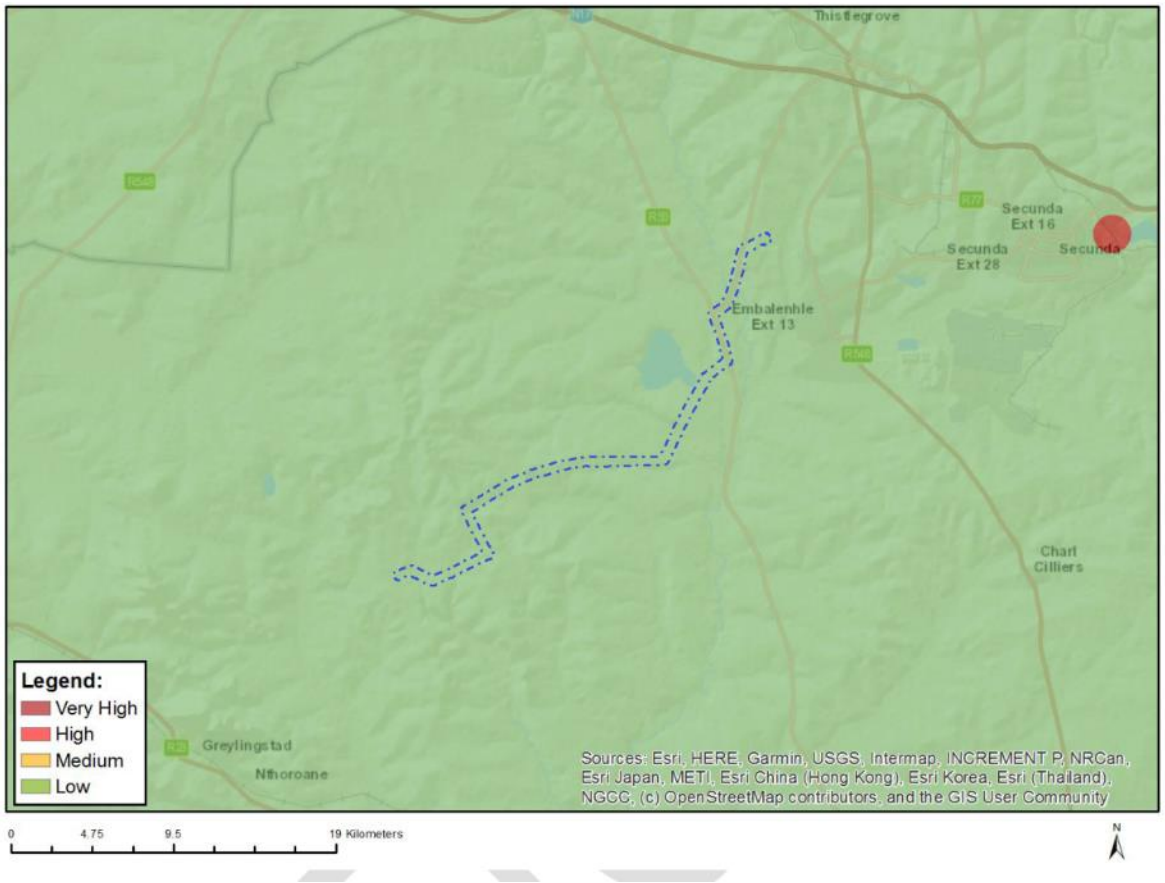


Figure 7-14: Map of Defence Sensitivity (Source: DFFE Screening Report)

7.13 COMBINED SENSITIVITY

The combined environmental sensitivities of the proposed powerline Project footprint are shown in

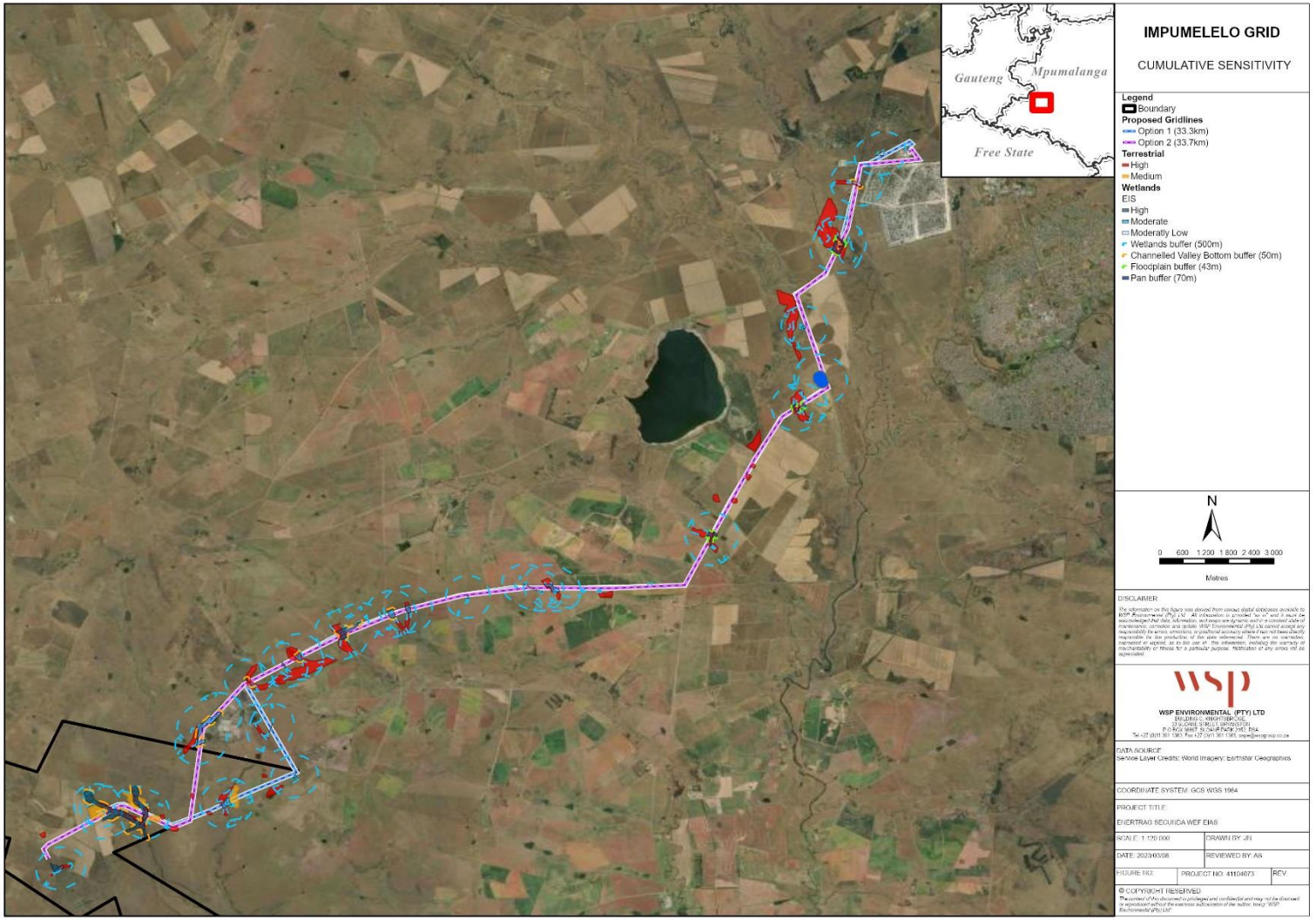


Figure 7-15: Combined Sensitivity Map

8 ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined in **Section 3.5**. The issues identified stem from those aspects presented in **Chapter 6** of this document as well as the Project description provided in **Chapter 4**. The impact assessment is based on the preferred alternative at all Project phases. This section only assesses the preferred option along with the no-go alternative. The impact mitigation hierarchy criteria, as per **Section 3.5.2**, for each mitigation measure are indicated in brackets after each measure indicated.

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.

8.1 AIR QUALITY

8.1.1 CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER

The National Dust Control Regulations (GNR 827) prescribe general measures for the control of dust in both residential and non-residential areas and will be applicable during construction of the OHPL. **Table 8-1** provides the acceptable dust fall rates as prescribed by GNR 827.

Table 8-1: Acceptable dust fall rates (GNR 827)

RESTRICTION AREAS	DUST FALL RATE (D) (mg/m^2/day – 30 DAYS AVERAGE)	PERMITTED FREQUENCY OF EXCEEDING DUST FALL RATE
Residential area	D < 600	Two within a year, not sequential months
Non-residential area	600 < D < 1200	Two within a year, not sequential months

During the construction phase, dust and vehicular emissions (carbon monoxide (CO), hydrocarbons, particulate matter (PM) and nitrogen oxides (NO_x) will be released as a result of vegetation clearing activities, transportation of equipment and materials to site, and the installation thereof, all of which involves the movement of large plant and trucks along unpaved roads and exposing of soils. The emissions will, however, have short-term impacts on the immediate surrounding areas that can be easily mitigated and thus the authorisation of such emissions will not be required. All construction phase air quality impacts will be minimised with the implementation of dust control measures contained within the EMPr (**Appendix G).**

The impact of the construction phase on the generation of dust and particulate matter (PM) is shown in **Table 8-2**.

Table 8-2: Construction Impact on Generation of Dust and PM

Potential Impact / **GENERATION OF DUST AND PM**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	2	3	1	4	**32**	**Moderate**	(-)	High
With Mitigation	1	1	3	1	3	**18**	**Low**	(-)	High

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
GENERATION OF DUST AND PM								
Mitigation and Management Measures	— Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and soil/material stockpiles especially. This includes wetting of exposed soft soil surfaces and not conducting activities during high wind periods which will increase the likelihood of dust being generated; — All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres; — Ensure that all vehicles, machines and equipment are adequately maintained to minimise emissions; — It is recommended that the clearing of vegetation from the site should be selective, be kept to the minimum feasible area, and be undertaken just before construction so as to minimise erosion and dust potential; — All materials transported to, or from, site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. — Enforcing of speed limits. Reducing the dust generated by the listed activities above, putting up signs to enforce speed limit in access roads. — No burning of waste, such as plastic bags, cement bags and litter is permitted; and — All issues/complaints must be recorded in the complaints register.							

8.1.2 OPERATIONAL PHASE

There are no anticipated air quality impacts during the operational phase as maintenance activities will occur as and when required and will be extremely short term.

8.1.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.2 NOISE EMISSIONS

8.2.1 CONSTRUCTION PHASE

Elevated noise levels are likely to be generated by the construction activities (machinery and vehicles) and the workforce. It is important to note that noise impacts (nuisance factor) may vary in the different areas as a result of the surrounding land uses and will be temporary in nature. Due to the temporary and limited nature of the Project activities, coupled with the fact that there are a limited number of noise receptors around the Project area, the impact is regarded as low. The construction impact on noise is indicated in **Table 8-3** below.

Table 8-3: Construction Impact on Noise

Potential Impact: / NOISE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	3	1	4	**28**	**Low**	(-)	High
With Mitigation	2	1	1	1	3	**15**	**Low**	(-)	High
Mitigation and Management Measures	— The equipment must be in maintained in good working order, within service dates, and inspected before use; — Align working times with the substation related operational times; and — Install noise reducing fittings on machinery (if required).								

8.2.2 OPERATIONAL PHASE

There are no anticipated noise impacts during the operational phase as maintenance activities will occur as and when required and will be extremely short-term.

8.2.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.3 SOILS, LAND CAPABILITY AND AGRICULTURAL POTENTIAL

An agricultural impact is a temporary or permanent change to the future production potential of land. The significance of the agricultural impact is directly proportional to the extent of the change in production potential. If a development will not change the future production potential of the land, then there is no agricultural impact.

The proposed overhead powerline has negligible agricultural impact, regardless of its route and design and the agricultural potential of the land it traverse. All agricultural activities can continue completely unhindered underneath the powerline. This is because its direct, permanent, physical footprint that has any potential to interfere with agriculture (pylon bases and servitude track, where it is needed), is insignificantly small and the pylons can mostly be located outside of or on the edges of cropland where they minimise interference with crop production. There will therefore be negligible reduction in future agricultural production potential underneath the powerline. The only potential source of impact of the powerline is minimal disturbance to the land (erosion and topsoil loss) during construction (and decommissioning). This impact can be completely mitigated with standard, generic mitigation measures that are included in the generic DFFE EMPr.

The only impact of this development is therefore the loss of approximately 2 hectares of agricultural land on the site of the substation. The significance of the loss of agricultural land is a direct function of two things, firstly the amount of land that will be lost and secondly, the production potential of the land that will be lost. In this case the amount of land loss is very small and the land is of insufficient land capability for crop production. The significance of the agricultural impact is therefore assessed as very low.

The impact on Agricultural Production Potential lost is outlined in **Table 8-4**.

Table 8-4: Impact on Agricultural Production Potential loss

Potential Impact / Agricultural potential loss	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	3	4	1	**10**	**Very Low**	(-)	High

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Agricultural potential loss									
With Mitigation	2	1	3	4	1	**10**	**Very Low**	(-)	High
Mitigation and Management Measures	— Maintain vegetation and facilitate re-vegetation. — Strip, stockpile and re-spread topsoil.								

8.4 GELOLOGICAL ENVIRONMENT

8.4.1 CONSTRUCTION PHASE

SOIL EROSION

Soil erosion can be as a result of the following:

— 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.

The impacts of the construction phase as a result of soil erosion are outlined in **Table 8-5**.

Table 8-5: Construction Impact on Geology (Soil Erosion)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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.									
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)	High
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— Rehabilitation of affected areas (such as revegetation). — Construction of temporary berms and drainage channels to divert surface water. — Minimize earthworks and fills. — Use existing road network and access tracks. — Correct engineering design and construction of gravel roads and water crossings. — Control stormwater flow.								

OIL SPILILAGE

Oil spillage can lead to the contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources. The impacts of the construction phase as a result of oil spillage are outlined in **Table 8-6**.

Table 8-6 Construction Impact on Geology (Oil Spillage)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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	2	1	1	2	**12**	**Very Low**	(-)	High
Mitigation and Management 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

The disturbance of fauna and flora can lead to the displacement of natural earth material and overlying vegetation leading to erosion.

The impacts of the construction phase as a result of the disturbance of fauna and flora are outlined in **Table 8-7**.

Table 8-7 Construction Impact on Geology (Disturbance of Fauna and Flora)

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

SLOPE STABILITY

Instability can result in damage to the infrastructure. The impacts of the construction phase as a result of slope instability are outlined in **Table 8-8**.

Table 8-8: Construction Impact on Geology (Slope Stability)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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 and Management Measures	— Avoid steep slope areas. — Design cut slopes according to detailed geotechnical analysis.								

SEISMIC ACTIVITY

Seismic activity would result in damage to the infrastructure. The impacts of the construction phase as a result of seismic activity are outlined in **Table 8-9**.

Table 8-9: Construction Impact on Geology (Seismic Activity)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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 and Management Measures	— Design according to expected peak ground acceleration.								

8.4.2 OPERATION PHASE

SOIL EROSION

Soil erosion can be as a result of the following:

- 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.

The impacts of the operation phase as a result of soil erosion are outlined in **Table 8-10**.

Table 8-10: Operation Impact on Geology (Soil Erosion)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Increase in soil and wind erosion due to clearance of structures. — Displacement of soil and damage to vegetation by vehicles									
Without Mitigation	2	1	3	2	2	**16**	**Low**	(-)	High
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	High
Mitigation and Management Measures	— Use existing road network and access tracks. — Use of temporary berms and drainage channels to divert surface water. — Minimize earthworks and demolish footprints. — Rehabilitation of affected areas (such as revegetation). — Reinstate channelized drainage features. — Strip, stockpile and re-spread topsoil								

POTENTIAL OIL SPILILAGE

Oil spillage can lead to the contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources. The impacts of the operation phase as a result of oil spillage are outlined in **Table 8-11** below.

Table 8-11 Operation Impact on Geology (Oil Spillage)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Potential oil spillages from service vehicles and heavy plant									
Without Mitigation	3	2	5	5	3	**45**	**Moderate**	(-)	High

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Potential oil spillages from service vehicles and heavy plant									
With Mitigation	2	1	3	1	1	**7**	**Very Low**	(-)	High
Mitigation and Management Measures	— Vehicle repairs to be undertaken in designated areas.								

8.4.3 DECOMMISSIONING PHASE

SOIL EROSION

Soil erosion can be as a result of the following:

— 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.

The impacts of the decommissioning phase as a result of soil erosion are outlined in **Table 8-12**.

Table 8-12: Decommissioning Impact on Geology (Soil Erosion)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Increase in soil and wind erosion due to clearance of structures. — Displacement of soil and damage to vegetation by vehicles									
Without Mitigation	4	2	3	3	4	**48**	**Moderate**	(-)	High
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— Use existing road network and access tracks. — Use of temporary berms and drainage channels to divert surface water. — Minimize earthworks and demolish footprints. — Rehabilitation of affected areas (such as revegetation). — Reinstate channelized drainage features. — Strip, stockpile and re-spread topsoil								

OIL SPILILAGE

Oil spillage can lead to the contamination of ground and surface water resources from heavy plant leading to quality deterioration of the water resources. The impacts of the decommisioning phase as a result of oil spillage are outlined in **Table 8-13** below.

Table 8-13 Decommissioning Impact on Geology (Oil Spillage)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Potential oil spillages due to clearance of structures.									
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)	High
With Mitigation	2	1	3	1	2	**14**	**Very Low**	(-)	High

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— Potential oil spillages due to clearance of structures.									
Mitigation and Management Measures	— Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection in the form of drip trays. — Frequent checks and conditional monitoring								

DISTURBANCE OF FAUNA AND FLORA

The disturbance of fauna and flora can lead to the displacement of natural earth material and overlying vegetation leading to erosion.

The impacts of the decommissioning phase as a result of the disturbance of fauna and flora are outlined in **Table 8-14**.

Table 8-14 Decommissioning Impact on Geology (Disturbance of Fauna and Flora)

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

SLOPE STABILITY

Instability can result in damage to the infrastructure. The impacts of the construction phase as a result of slope instability are outlined in **Table 8-15**.

Table 8-15: Decommissioning Impact on Geology (Slope Stability)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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 and Management Measures	— Avoid steep slope areas. — Design cut slopes according to detailed geotechnical analysis.								

8.5 GROUNDWATER

8.5.1 CONSTRUCTION PHASE

DETERIORATION IN GROUNDWATER QUALITY

There is a potential to affect the groundwater quality in the area. This is influenced by spills and leaks and the storage of chemicals and fuels. Any contaminants that are not cleaned from the ground will seep into

underground water resources. The impact of construction on change in water quality is shown in **Table 8-16** below.

Table 8-16: Construction Impact on Deterioration in Groundwater Quality

Potential Impact: **DETERIORATION IN GROUNDWATER QUALITY**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	High
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures	— Construction areas should be demarcated, and wetland areas marked as "restricted" in order to prevent the unnecessary impact to and loss of these systems; — Laydown yards, camps and storage areas must be beyond the wetland areas where applicable; — During construction, contractors used for the Project must have spill kits available to ensure that any fuel or oil spills are cleaned-up and disposed of correctly; — A suitable stormwater management plan must be generated for the project to control the movement of water on the substation site; — The stormwater management plan should incorporate "soft" engineering measures as much as possible, limiting the use of artificial materials; — As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site; — All chemicals and toxicants during the construction and operation phase must be stored in bunded areas; — All machinery and equipment should be inspected regularly for faults and possible leaks; these should be serviced off-site; — All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping"; — Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the Project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation); and — Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems.								

8.5.2 OPERATIONAL PHASE

There are no anticipated groundwater quality impacts expected during the operational phase as maintenance activities will occur as and when required and will be extremely short-term.

8.5.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.6 AQUATIC

8.6.1 CONSTRUCTION PHASE

CHANGES IN WATER FLOW REGIME

Changes in flow regime arises from the compaction of soil, the removal of vegetation and surface water redirection. Changes to hydrological function at a landscape level which can arise from changes to flood regimes (i.e. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes). The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary, seasonal, permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.). Changes to base flows i.e. too little/too much water in terms of characteristics and requirements of system). Fragmentation (i.e. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal). The construction impact along with mitigation measures are outlined in **Table 8-17.**

Table 8-17: Construction Impact on water flow regime

Potential Impact Changes in water flow regime	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	4	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Pylons should be placed outside delineated watercourses and their associated buffer zones. — Prevent access of heavy vehicles and machinery in the wetlands or riparian areas — Rehabilitation plans must be submitted and approved for rehabilitation of damage during the construction phase and that plan must be implemented immediately upon completion of construction. — Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access. — Project engineers should compile a method statement, outlining the construction methodologies. The required mitigation measures to limit the impacts on the watercourse and associated buffers should be contained within the method statement. The method statement must be approved by the ECO and be available on site for reference purposes — Only cross watercourses at designated points should this be necessary								

CHANGES IN SEDIMENT ENTERING AND EXITING THE SYSTEM

Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount). Construction and operational activities will result in earthworks and soil disturbance as well as the removal of natural vegetation. This could result in the loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water. Possible sources of the impacts include:

— Earthwork activities during construction

- Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil.
- Disturbance of soil surface
- Disturbance of slopes through creation of roads and tracks adjacent to the watercourse
- Erosion (e.g. gully formation, bank collapse)

Changes in sediment regimes of the aquatic ecosystem and its sub -catchment by for example sand movement, meandering river mouth /estuary, changing flooding or sedimentation patterns. The construction impact along with mitigation measures are outlined in **Table 8-18**.

Table 8-18: Construction Impact on sediment entering and exiting the system

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in sediment entering and exiting the system									
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	Moderate
Mitigation and Management Measures	— Where development is located upslope from wetlands, a temporary fence or demarcation must be erected around No-Go Areas outside the proposed works area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the watercourse. — Where development is located upslope from wetlands, effective stormwater management including sediment barriers should be a priority during both construction and operational phase. This should be monitored as part of the EMP. — Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area. — Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. — Monitoring should be done to ensure that sediment pollution is timeously dressed. — Prevent access of heavy vehicles and machinery in the delineated watercourses — Rehabilitation plans must be submitted and approved for rehabilitation of damage during construction phase and that plan must be implemented immediately upon completion of construction. — Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.								

INTRODUCTION AND SPREAD OF ALIEN VEGETATION

The moving of soil and vegetation resulting in opportunistic invasions after disturbance. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily

colonise and impact on downstream users. The construction impact along with mitigation measures are outlined in **Table 8-19**.

Table 8-19: Construction Impact on the Introduction and spread of alien vegetation

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	3	3	3	3	**36**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— The powerline and substation currently located either within a wetland or within the buffer of a wetland should be moved into nearby impacted areas like agricultural fields — Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. — Undertake an Alien Plant Control Plan which specifies actions and measurable targets — Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area and returning it where possible afterwards. — Long-term monitoring for the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish, as specified in the Alien Vegetation Management Plan. — Rehabilitate or revegetate disturbed areas.								

LOSS AND DISTURBANCE OF WATERCOURSE HABITAT AND FRINGE VEGETATION

Loss and disturbance of watercourse habitat and fringe vegetation due to direct development on the watercourse as well as changes in management, fire regime and habitat fragmentation. The construction impact along with mitigation measures are outlined in **Table 8-20**.

Table 8-20: Construction Impact on the loss and disturbance of watercourse habitat and fringe vegetation

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	5	4	4	**56**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— The Powerline and substation currently located either within a wetland or within the buffer of a wetland should be moved into nearby impacted areas like agricultural fields — Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. — Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed.								

CHANGES IN WATER QUALITY DUE TO POLLUTION

Changes in water quality due to input of foreign materials i.e. due to increased sediment load, contamination by chemical and /or organic effluent, and /or eutrophication. During the construction phase a large amount of waste will be produced including sewerage, domestic waste, wash-water, used oils and grease, diesel or lubricant spills, etc. Waste generally contains pollutants and present a potential risk to the water and surrounding environment if not managed effectively. Oil and diesel spillages may occur during the construction phase which can contaminate surface water. Other potential contaminants (i.e. from chemical toilets, domestic waste, storage facilities, workshop facilities, etc.) can reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act. Changes to the water quality could result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Water quality deterioration often leads to modification of the species composition where sensitive species are lost and organisms tolerant to environmental changes dominate the community structure. The construction impact along with mitigation measures are outlined in **Table 8-21**.

Table 8-21: Construction Impact on water quality

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in sediment entering and exiting the system									
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone. — Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse. — no related impacts may be allowed into the watercourse i.e. water runoff from cleaning of equipment, vehicle access etc. — Maintenance of construction vehicles/equipment should not take place within the watercourse or watercourse buffer. — Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. — Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse. — Develop norms and standards for the treatment of spills such as oil or hydraulic fluid. Ensure that the required equipment is available on hand to contain any spills. — Appoint a reliable contractor for the removal of refuse during the construction phase.								

LOSS OF AQUATIC BIOTA

Aquatic biota can be lost due to the disturbance of the habitat and direct impacts on the watercourse/ rivers/ streams. This can be attributed to Loss and disturbance of biota due to direct development on the watercourse as well as changes in habitat including water quality, the water column, increased sediment, increased alien vegetation fire regime and habitat fragmentation. The construction impact along with mitigation measures are outlined in **Table 8-22**.

Table 8-22: Construction Impact on aquatic biota

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in sediment entering and exiting the system									
Without Mitigation	3	3	3	3	3	36	Moderate	(-)	Moderate
With Mitigation	2	3	3	3	2	22	Low	(-)	
Mitigation and Management Measures	— This impact is not easily mitigated. Further loss in diversity can be minimised by following the mitigation measures mentioned above — The powerline infrastructure currently located either within a wetland or within the buffer of a wetland should be moved outside the watercourse and watercourse buffer								

8.6.2 OPERATIONAL PHASE

CHANGES IN WATER FLOW REGIME

The operation impact along with mitigation measures are outlined in **Table 8-23.**

Table 8-23: Operation Impact on water flow regime

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in water flow regime									
Without Mitigation	3	3	3	4	4	52	Moderate	(-)	Moderate
With Mitigation	2	2	3	4	2	22	Low	(-)	
Mitigation and Management Measures	— The pylon and substation Structure currently located either within a wetland or within the buffer of a wetland should be moved into nearby impacted areas like agricultural fields — Where development activities are located upslope from wetlands, effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP. — Effective culverts should be incorporated into the design of access roads.								

CHANGES IN SEDIMENT ENTERING AND EXITING THE SYSTEM

The operation impact along with mitigation measures are outlined in **Table 8-24**.

Table 8-24: Operation Impact on sediment entering and exiting the system

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in sediment entering and exiting the system									
Without Mitigation	3	2	3	3	3	33	Moderate	(-)	Moderate
With Mitigation	2	2	3	3	2	20	Low	(-)	
Mitigation and Management Measures	— The powerline and substation currently located either within a wetland or within the buffer of a wetland should be moved into nearby impacted areas like agricultural fields								

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
	— Where development is located upslope from wetlands, effective stormwater management including sediment barriers should be a priority during both construction and operational phase. This should be monitored as part of the EMP. — Monitoring should be done to ensure that sediment pollution is timeously dressed								

INTRODUCTION AND SPREAD OF ALIEN VEGETATION

The operation impact along with mitigation measures are outlined in **Table 8-25**.

Table 8-25: Operation Impact on the Introduction and spread of alien vegetation

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish. — Undertake an Alien Plant Control Plan which specifies actions and measurable targets — Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area and returning it where possible afterwards. — Long-term monitoring for the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish, as specified in the Alien Vegetation Management Plan.								

LOSS AND DISTURBANCE OF WATERCOURSE HABITAT AND FRINGE VEGETATION

The operation impact along with mitigation measures are outlined in **Table 8-26**.

Table 8-26: Operation Impact on the loss and disturbance of watercourse habitat and fringe vegetation

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	5	4	4	**56**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	3	**30**	**Low**	(-)	
Mitigation and Management Measures	— Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate								

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	corrective action where invasive species are observed to establish. — Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. — Operational activities should not take place within watercourses or buffer zones, nor should edge effects impact on these areas. — Operational activities should not impact on rehabilitated or naturally vegetated areas							

CHANGES IN WATER QUALITY DUE TO POLLUTION

The operation impact along with mitigation measures are outlined in **Table 8-27**.

Table 8-27: Operation Impact on water quality

Potential Impact Changes in sediment entering and exiting the system	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone. — Maintenance of construction vehicles/equipment should not take place within the watercourse or watercourse buffer. — Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects. — Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse. — Annual independent water quality monitoring should form part of operational procedures in order to identify pollution. — Treatment of pollution identified should be prioritized according to best practice guidelines. — Develop norms and practices for the treatment of spills such as oil or hydraulic fluid. Ensure that the required equipment is available on hand to contain any spills. — Appoint a reliable contractor for the removal of refuse during the operational phase..								

LOSS OF AQUATIC BIOTA

The operation impact along with mitigation measures are outlined in **Table 8-28**.

Table 8-28: Operation Impact on aquatic biota

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Changes in sediment entering and exiting the system									
Without Mitigation	3	2	3	5	3	39	Moderate	(-)	Moderate
With Mitigation	2	2	3	4	2	22	Low	(-)	
Mitigation and Management Measures	— This impact is not easily mitigated. Further loss in diversity can be minimised by following the mitigation measures mentioned above								

8.6.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.7 BIODIVERSITY

8.7.1 CONSTRUCTION PHASE

The main biodiversity impacts associated with construction of the proposed Impumelelo WEF up to 132kV grid connection transmission line include:

THE CLEARING OF NATURAL VEGETATION

Natural vegetation will be cleared for the pylons, new access roads and substations. The removal of indigenous vegetation may cause a loss of individuals of threatened, protected and/or endemic species and will also be accompanied by a loss of faunal habitat. However, no threatened or endemic plant species were found on site and all provincially protected plant species have a Least Concern status. None of the SCC listed by the Screening Tool, were recorded on site..

Since the pylon footprint is relatively small, the loss of prime habitat within the Soweto Highveld Grassland vegetation type will be minimal. Service roads generally have a larger impact on vegetation clearance, however since the roads will have a gravel surface animal movement should still be possible. Beyond the permanent infrastructure footprint, environmental functions and processes should however, not be altered. This impact as well as the associated mitigation measures is outlined in **Table 8-29**.

Table 8-29: Construction Impact on natural vegetation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
The clearing of natural vegetation									
Without Mitigation	3	1	3	4	4	44	Moderate	(-)	Moderate
With Mitigation	3	1	1	3	3	24	Low	(-)	
Mitigation and Management Measures	— Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. The severity of the vegetation clearance can be mitigated if only a service road would be cleared and a vegetative groundlayer would be retained in the rest of the servitude. — Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their								

Potential Impact The clearing of natural vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions. — Ensure that all temporary use areas e.g. laydown areas and construction camp, are located in areas of low sensitivity. — Footprints of the pylons, roads and substation locations should be clearly demarcated. — Watercourses, wetlands, rocky outcrops/sheets should be avoided (Habitats 1 & 7). — Observe buffer zones along drainage lines (see report of aquatic specialist). — All vehicles are to remain on demarcated roads and no driving through the veld should be allowed. — The ECO is to provide supervision on vegetation clearing activities and other activities that may cause damage to the environment, especially when construction commences and most vegetation clearing is taking place. — No plants may be translocated or otherwise uprooted or disturbed without applicable permit and ECO oversight.							

THE LOSS OF THREATENED, PROTECTED & ENDEMIC PLANT SPECIES

The loss of the vegetation for the turbines and crane pads, new access roads, upgrading of existing tracks,

construction site and substation may cause a loss of individuals of threatened, protected or endemic plant species. The site visit did however, not reveal the presence of any plant species with an IUCN threatened status and no endemic species are listed for the Soweto Highveld Grassland. Twelve provincially protected plant species were encountered in the region during the site survey, although all have a Least Concern status, except *Gladiolus robertsoniae* which is Near Threatened. However, *Gladiolus robertsoniae* occurs in Habitat 1, which is not affected by the development and furthermore was not recorded on Impumelelo. As the other protected plant species at the site are not threatened, the loss of a small number of individuals (if any) is not likely to threaten the local or regional populations of these species.

The loss of some individuals of protected species is unlikely to alter the patterns or processes of the natural system, in the sense that environmental functions and processes will temporarily or permanently cease. Nevertheless, permits need to be obtained for the destruction of provincially specially protected or protected species. This impact as well as the associated mitigation measures is outlined in **Table 8-30**.

Table 8-30: Construction Impact on threatened, protected & endemic plant species

Potential Impact The loss of threatened protected & endemic plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	3	4	3	**33**	**Moderate**	(-)	Moderate
With Mitigation	2	1	3	4	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Placement of infrastructure should be done in such a way as to minimise the impact on protected species. — The construction crew should undergo environmental training (induction) to make them aware of the importance of protected species.								

LOSS OF FAUNAL HABITAT

The loss of the vegetation due to turbines and crane pads, new access roads, upgrading of existing tracks, construction site and substation will be accompanied by a loss of faunal habitat.

Although none of the species listed by the screening tool (avifaunal component excluded) were noted on site, several rare species were reported for the region by the landowners. These include the Near Threatened Serval Leptailurus serval, Southern African hedgehog Atelerix frontalis and the Southern African vlei rat Otomys auratus.

The screening report refers to Crocidura maquassiensis (Maquassie musk shrew) as the species of concern. However, there is a very low probability for it to occur on site. The Lepidopteran species is unlikely to occur on site because its host plant was not recorded there. This impact as well as the associated mitigation measures is outlined in **Table 8-31**.

Table 8-31: Construction Impact on faunal habitat

Potential Impact Loss of faunal habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	3	4	3	**33**	**Moderate**	(-)	Moderate
With Mitigation	3	1	1	4	3	**27**	**Low**	(-)	
Mitigation and Management Measures	— Vegetation clearance should be confined to the smallest possible footprint of the development and unnecessary clearance should be avoided. — Construction crew should undergo environmental training (induction) to increase their awareness of environmental concerns. — Speed limits should be set on all roads and strictly adhered to. — Development should avoid water courses, wetlands and rocky outcrops/sheets. — Observe buffer zones along drainage lines.								

DIRECT FAUNAL MORTALITIES DUE TO CONSTRUCTION AND INCREASED TRAFFIC

Faunal mortalities may be caused by construction at the footprint of the infrastructure, construction vehicles or other operational activities and by electrical fences, should they be erected around the construction site and substation. In particular slow-moving species such as tortoises, might be prone to these mortalities. When animals ingest waste material or become ensnared in wires, fatalities might also occur.

Larger more mobile fauna such as antelope and larger predators will most likely move away from areas of high activity during the construction phase. Smaller and less-mobile animals are not as capable of moving away and may seek shelter down burrows and other shelter sites. None of the SCC listed in the screening tool were encountered on site and generally these species occur at a low density and thus it is unlikely that they would be directly encountered by people at the Impumelelo gridline route. This impact as well as the associated mitigation measures is outlined in **Table 8-32.**

Table 8-32: Construction Impact on faunal mortalities due to construction and increased traffic

Potential Impact Direct faunal mortalities due to construction and increased traffic	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	3	3	4	**40**	**Moderate**	(-)	Moderate
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	

Potential Impact Direct faunal mortalities due to construction and increased traffic	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Mitigation and Management Measures	— Construction crew, in particular the drivers, should undergo environmental training to increase their awareness of environmental concerns in order to reduce the number of kills during construction and on roads. The crew should also be made aware of not harming or collecting species such as snakes, tortoises and owls. — Proper waste management procedures should be in place to avoid litter, food or other foreign material from lying around and to remove all waste material from the site. — Speed limits should be set on all roads on site and strictly adhered to. — Personnel should not be allowed to roam into the veld. — Ensure that cabling and electrical infrastructure at the site are buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals. — Any dangerous fauna (e.g. snakes, scorpions) that are encountered during construction should not be handled or molested by construction staff and the ECO (or other suitably qualified person) should be contacted to remove the animals to safety. — Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape. — If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. — Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in Mpumalanga. — Access to the site should be regulated to reduce the opportunities for poaching.							

INCREASED DUST DEPOSITION

Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing. The increased dust levels will however be temporary. This impact as well as the associated mitigation measures is outlined in **Table 8-33**.

Table 8-33: Construction Impact on dust deposition

Potential Impact Increased dust deposition	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)	Moderate
With Mitigation	1	1	3	4	1	**9**	**Very Low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Increased dust deposition									
Mitigation and Management Measures	— Excessive dust can be reduced by spraying water onto the exposed soil surface.								

INCREASED HUMAN ACTIVITY, NOISE AND LIGHT LEVELS

Construction activities will increase human presence, noise and light levels at the site. These activities may affect animal behaviour. However, increased noise and light levels associated with the construction phase are temporary. This impact as well as the associated mitigation measures is outlined in **Table 8-34**.

Table 8-34: Construction Impact on human activity, noise and light levels

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Increased human activity, noise and light levels									
Without Mitigation	4	1	3	2	4	**40**	**Moderate**	(-)	Moderate
With Mitigation	3	1	3	2	3	**27**	**Low**	(-)	
Mitigation and Management Measures	— The SANS standards should be adhered to in terms of noise levels. — No construction should be done at night.								

ESTABLISHMENT OF ALIEN VEGETATION

As a result of the clearance of indigenous vegetation and resulting degradation, alien species might invade the area. Twelve declared alien invasive plant species were recorded on the three Enertrag sites and 35 naturalised species. Another four naturalised alien species were listed by NewPosa for the region.

Six declared invasive species were noted on the Impumelelo site and increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation. Bare areas that are not actively rehabilitated and areas receiving runoff are particularly vulnerable to alien infestation. This impact as well as the associated mitigation measures is outlined in **Table 8-35**.

Table 8-35: Construction Impact on alien vegetation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Establishment of alien vegetation									
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)	Moderate
With Mitigation	1	1	3	4	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Implement a monitoring program for the early detection of alien invasive plant species. — A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts. — Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel.								

Potential Impact Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	— No alien species should be used in rehabilitation or landscaping. — Use only plants and seed collected on-site for revegetation. — Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife. — Material brought onto site e.g. building sand should be regularly checked for the germination of alien species.							

8.7.2 OPERATIONAL PHASE

ESTABLISHMENT OF ALIEN VEGETATION

As a result of the loss of indigenous vegetation and resulting degradation, primarily during the construction phase, alien species might invade the area. Alien invasive species are generally more common in along roads than the adjacent undisturbed farmland. The invasion by alien species will continue unless controlled. Increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may eventually cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation. This impact as well as the associated mitigation measures is outlined in **Table 8-36**.

Table 8-36: Operation Impact on alien vegetation

Potential Impact Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)	Moderate
With Mitigation	1	1	3	4	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Implement a monitoring program for the early detection of alien invasive plant species and a control program to combat declared alien invasive plant species should be employed. — No alien species should be used for landscaping, rehabilitation or any other purpose. — Clearing of alien species should be done on a regular basis.								

8.7.3 DECOMMISSIONING PHASE

FAUNAL MORTALITIES

Faunal mortalities may be caused by vehicles or other decommissioning activities and waste. In particular slow-moving species such as tortoises, might be prone to road mortalities. When animals ingest waste material or become ensnared in it fatalities might also occur. This impact as well as the associated mitigation measures is outlined in **Table 8-37**.

Table 8-37: Decommissioning Impact on faunal mortalities

Potential Impact / Faunal mortalities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)	Moderate
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— Decommissioning crew should undergo environmental training to increase their awareness of environmental concerns. — Speed limits should be adhered to. — Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.								

INCREASED DUST DEPOSITION

Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing the dust covered vegetation. The increased dust levels will be temporary. This impact as well as the associated mitigation measures is outlined in **Table 8-38**.

Table 8-38: Decommissioning Impact on dust deposition

Potential Impact / Increased dust deposition	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	2	3	3	2	**20**	**Low**	(-)	Moderate
With Mitigation	1	1	3	3	1	**8**	**Very Low**	(-)	
Mitigation and Management Measures	— Excessive dust can be reduced by spraying water onto the soil.								

ESTABLISHMENT OF ALIEN VEGETATION

As a result of the decommissioning activities, areas will be disturbed and alien species might invade. Increased vehicle traffic may facilitate the introduction of seeds of alien species. This impact as well as the associated mitigation measures is outlined in **Table 8-39**.

Table 8-39: Decommissioning Impact on alien vegetation

Potential Impact / Establishment of alien vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)	Moderate
With Mitigation	1	1	3	4	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Implement a monitoring program after decommissioning to document vegetation recovery and alien infestation across the site until such time as the rehabilitation is signed off. — A control program to combat declared alien invasive plant species should be employed. — Areas where infrastructure is removed, must be revegetated with indigenous plant species.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Establishment of alien vegetation								
	— No alien species should be used for rehabilitation/revegetation or any other purpose.							

8.8 AVIFAUNA

8.8.1 CONSTRUCTION PHASE

DISPLACEMENT OF PRIORITY AVIFAUNA DUE TO DISTURBANCE ASSOCIATED WITH THE CONSTRUCTION OF THE ONSITE SUBSTATION AND GRID CONNECTION POWER LINE

Apart from direct habitat destruction, the above-mentioned activities also impact on birds through **disturbance**; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities near breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial species and owls are most likely to be affected by displacement due to disturbance in the study area.

The construction impact on priority avifauna due to disturbance during construction of the overhead powerline grid infrastructure is outlined in **Table 8-40**.

Table 8-40: Construction impact on priority avifauna due to disturbance during construction of the overhead powerline grid infrastructure

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Displacement of priority avifauna due to disturbance associated with the construction of the overhead powerline grid infrastructure									
Without Mitigation	4	1	1	2	5	**40**	**Moderate**	(-)	Moderate
With Mitigation	3	1	1	2	4	**28**	**Low**	(-)	
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed. — The authorised alignment must be inspected by an avifaunal specialist by means of a "walk-through" inspection i.e., through a combination of satellite imagery supplemented with in situ inspections by vehicle and where necessary, on foot, once the pole positions have been finalised. The objective would be to demarcate the sections of the powerline that need to be fitted with Bird Flight Diverters. — Once the relevant spans have been identified, Bird Flight Diverters must be fitted according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines).								

Potential Impact Displacement of priority avifauna due to disturbance associated with the construction of the overhead powerline grid infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	— Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. — Vegetation clearance should be limited to what is necessary. — The mitigation measures proposed by the biodiversity specialist must be strictly enforced..							

DISPLACEMENT OF PRIORITY SPECIES DUE TO HABITAT TRANSFORMATION AS A RESULT OF THE CONSTRUCTION OF THE ONSITE SUBSTATION AND GRID CONNECTION POWER LINE

During the construction of power lines, service roads (jeep tracks) and substations, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation
- Construction of the infrastructure (i.e., the on-site substation and overhead power line)
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site
- Removal of vegetation for the proposed on-site substation and overhead power line, stockpiling of topsoil and cleared vegetation
- Excavations for infrastructure

Beyond the increased mortality risks to local bird populations posed by such infrastructure, the resulting habitat loss and fragmentation can degrade adjacent habitats, causing either temporary or permanent displacement of bird species from breeding, roosting, and/or foraging habitats (Fletcher et al., 2018). It remains disputed whether habitat fragmentation is always an environmental detriment (Fahrig et al., 2019), yet the impacts of this landscape change are observable in birds. Lane et al. (2001) noted that Great Bustard flocks in Spain were significantly larger further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard in South Africa generally avoid the immediate proximity of roads within a 500m buffer. Bidwell (2004) found that Blue Cranes in South Africa select nesting sites away from roads.

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

The loss of habitat for powerline sensitive species due to direct habitat transformation associated with the construction of the proposed Impumelelo Grid Connection is likely to be moderate due to the small size of the footprint, but ideally high-quality grassland should be avoided if possible.

The construction impact on priority avifauna d due to habitat change and loss during construction of the overhead powerline grid infrastructure is outlined in **Table 8-41**.

Table 8-41: Construction impact on priority avifauna due to habitat change and loss during construction of the overhead powerline grid infrastructure

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Displacement of priority species due to habitat transformation as a result of the construction of the overhead powerline grid infrastructure									
Without Mitigation	3	1	3	2	4	**36**	**Moderate**	(-)	Moderate
With Mitigation	2	1	1	2	4	**24**	**Low**	(-)	
Mitigation and Management Measures	— Once the relevant spans have been identified, Bird Flight Diverters must be fitted according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). — Once the relevant spans have been identified, Bird Flight Diverters must be fitted according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). — Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. — Vegetation clearance should be limited to what is necessary. — The mitigation measures proposed by the biodiversity specialist must be strictly enforced.								

8.8.2 OPERATIONAL PHASE

ELECTROCUTION OF PRIORITY SPECIES IN SUBSTATIONS

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen, 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed 132kV grid connection, the electrocution risk is envisaged to be negligible because of the clearance distances between the live and earthed components inherent in the design of such powerlines. The 132kV grid connection power line should not pose an electrocution threat to the powerline sensitive species which are likely to occur in the PAOI and immediate surrounding environment.

Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls, and certain species of waterbirds.

The operation impact on mortality of priority avifauna due due to electrocution in substations is outlined in **Table 8-42**.

Table 8-42: Operation impact on mortality of priority avifauna due to electrocution in substations

Potential Impact / Electrocution mortality in the substations	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	2	3	4	4	**56**	**High**	(-)	Moderate
With Mitigation	5	2	3	4	1	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— The hardware within the proposed substation yard is too complex and the risk too low to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded by the maintenance staff once operational, site-specific mitigation (insulation) be applied reactively if need be. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation, although some more common powerline sensitive species might well be present more often and exposed to the electrocution risk								

COLLISION MORTALITY OF PRIORITY SPECIES WITH THE OVERHEAD 132KV POWERLINES IN THE OPERATIONAL PHASE.

Collisions are arguably the biggest threat posed by transmission lines to birds in southern Africa (van Rooyen, 2004). Most heavily impacted upon are bustards, storks, cranes, and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (van Rooyen, 2004). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors described these factors in four main groups – biological, topographical, meteorological, and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes, and bustards usually the most numerous reported victims.

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk. These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles. Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision. Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often. Juvenile birds have often been reported as being more collision-prone than adults.

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g., those that separate feeding and roosting areas, or cross flyways) can be very dangerous. Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing. Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid.

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude or locating them along other features such as tree lines, are both approaches thought to reduce risk. In general, low lines with short span lengths (i.e., the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous. On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause most collisions on power lines with this configuration because

they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires."

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa.

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds, i.e., whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin et al., 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards *Ardeotis kori*, Blue Cranes and White Storks *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas like those of bustards and cranes and are also known to be vulnerable to power line collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins et al., 2010; Martin et al., 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (Alonso & Alonso, 1999; Barrientos et al., 2011; Bernardino et al., 2018; Jenkins et al., 2010; Koops & De Jong, 1982; Sporer et al., 2013), including to some extent for bustards (Barrientos et al., 2012; Hoogstad 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos et al. (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos et al. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin et al., 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three up to 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw et al., 2017).

The operation impact on mortality of priority avifauna due to collisions overhead 132kV powerlines is outlined in **Table 8-43**.

Table 8-43: Operation impact on mortality of priority avifauna due to collisions with the overhead 132kV powerlines

Potential Impact Bird mortality and injury resulting from collisions with the 132kV powerline	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	2	3	4	4	**56**	**High**	(-)	Moderate
With Mitigation	5	2	3	4	2	**28**	**Low**	(-)	
Mitigation and Management Measures	— The hardware within the proposed substation yard is too complex and the risk too low to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded by the maintenance staff once operational, site-specific mitigation (insulation) be applied reactively if need be. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation, although some more common powerline sensitive species might well be present more often and exposed to the electrocution risk								

8.8.3 DECOMMISSIONING PHASE

DISPLACEMENT OF PRIORITY AVIFAUNA DUE TO DISTURBANCE ASSOCIATED WITH DECOMMISSIONING OF THE ONSITE SUBSTATION AND GRID CONNECTION POWER LINE

The decommissioning impact on mortality of priority avifauna due to collisions with the medium voltage overhead lines is outlined in **Table 8-44.**

Table 8-44: Decommissioning impact on priority avifauna due decommissioning of the onsite substation and grid connection power line

Potential Impact Displacement of priority avifauna due to disturbance associated with the dismantling of the 132kV grid infrastructure.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	1	1	2	5	**40**	**Moderate**	(-)	Moderate
With Mitigation	3	1	1	2	4	**28**	**Low**	(-)	
Mitigation and Management Measures	— Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum..								

8.9 VISUAL AND LANDSCAPE

8.9.1 CONSTRUCTION PHASE

Large construction vehicles, equipment and construction material stockpiles will alter the natural character of the study area and expose visual receptors to impacts associated with construction. Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.

Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.

Surface clearance for cable trenches, access roads, laydown areas and other on-site infrastructure may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Potential visual pollution could also result from littering on the construction site.

The construction visual impact as well as mitigation measures are indicated in **Table 8-45**.

Table 8-45: Construction Impact on the visual receptors of the Impumelelo EGI Project

Potential Impact **Visual impact due to construction**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of mitigation**
Without Mitigation	3	2	3	2	2	**30**	**Low**	(-)	
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	Moderate

Mitigation and Management Measures	— Carefully plan to minimise the construction period and avoid construction delays.
	— Where possible restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
	— Position storage/stockpile areas in unobtrusive positions in the landscape, where possible.
	— Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
	— Vegetation clearing should take place in a phased manner.
	— Make use of existing gravel access roads where possible.
	— Limit the number of vehicles and trucks travelling to and from the construction site, where possible.
	— Ensure that suitable dust suppression techniques are implemented:
	  — on all access roads;
	  — in all areas where vegetation clearing has taken place;
	  — on all soil stockpiles.
	— Maintain a neat construction site by removing litter, rubble and waste materials regularly.								

8.9.2 OPERATIONAL PHASE

The proposed power line and substation could alter the visual character of the surrounding area and expose sensitive visual receptor locations to visual impacts. The proposed development will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts.

Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. The night time visual environment will be altered as a result of operational and security lighting at the proposed substation. The impact assessment for the above-mentioned impacts is outlined in **Table 8-46**.

Table 8-46: Operational Impact on the visual receptors of the Impumelelo EGI Project

Potential Impact Visual impact of wind turbines and associated infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	3	3	4	2	**24**	**Low**	(-)	Moderate
With Mitigation	2	3	3	4	2	**24**	**Low**	(-)	
Mitigation and Management Measures	— Where possible, limit the number of maintenance vehicles using access roads. — Ensure that dust suppression techniques are implemented on all gravel access roads. — As far as possible, limit the amount of security and operational lighting present on the substation site whilst adhering to safety standards. — Light fittings for security at night should reflect the light toward the ground and prevent light spill. — Lighting fixtures should make use of minimum lumen or wattage whilst adhering to safety standards. — Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. — If possible, make use of motion detectors on security lighting. — The buildings on the substation site should not be illuminated at night unless required to adhere to safety standards and should be painted in natural tones that fit with the surrounding environment. — Non-reflective surfaces should be used where possible.								

8.9.3 DECOMMISSIONING PHASE

Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts. Decommissioning activities may be perceived as an unwelcome visual intrusion. Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would expose bare soil resulting in visual scarring of the landscape and increasing the level of visual contrast with the surrounding environment. Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.

The impact assessment for the above-mentioned decommissioning impacts is outlined in **Table 8-47**.

Table 8-47: Decommissioning Impact on the visual receptors

Potential Impact Visual impact due to decommissioning	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	2	**30**	**Low**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— All infrastructure that is not required for post-decommissioning use should be removed. — Carefully plan to minimize the decommissioning period and avoid delays. — Maintain a neat decommissioning site by removing rubble and waste materials regularly. — Position storage / stockpile areas in unobtrusive positions in the landscape, where possible.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Visual impact due to decommissioning								
	— Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. — All cleared areas should be rehabilitated as soon as possible.							

8.10 HERITAGE AND CULTURAL RESOURCES

8.10.1 CONSTRUCTION PHASE

IMPACTS TO ARCHAEOLOGICAL RESOURCES – ALTERNATIVE 1

Direct impacts to archaeological resources would occur during the construction phase when grubbing and construction commence. No culturally significant archaeological sites are expected to be impacted by the proposed project. The impact significance thus calculates to very low negative (Table 8-48). Mitigation would entail surveying the final alignment to determine whether any archaeological sites requiring mitigation might still occur. Any parts of the route running through arable lands do not need to be examined. Once construction is underway any further sites discovered during construction should be protected and reported. With mitigation, the significance remains very low negative.

There are no fatal flaws in terms of construction phase impacts to archaeology.

Table 8-48: Construction Impact on the Archaeological Resources (Alternative 1)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Damage to or destruction of archaeological resources (Alt 1)									
Without Mitigation	1	1	5	5	1	**12**	**Very Low**	(-)	Moderate
With Mitigation	1	1	5	5	1	**12**	**Very Low**	(-)	
Mitigation and Management Measures	— Pre-construction survey, micro-siting of infrastructure, make recommendations for mitigation. — Reporting chance finds as early as possible, protect in situ and stop work in immediate area.								

IMPACTS TO GRAVES – ALTERNATIVE 1

One graveyard lies within the corridor, as does a potential grave. Because of the very high cultural significance of graves the magnitude of impacts to graves is rated high. Because most of the layout remains unsurveyed there is still a chance of impacts occurring elsewhere as well. The resulting impact significance is moderate negative (Table 8-49) Mitigation will entail avoiding all graves and potential graves and reporting any chance finds of unmarked graves during construction. A farm-style fence with a pedestrian access gate should also be erected around the IMP001 graveyard. A pre-construction survey should also be undertaken to determine whether any graves are visible in the final footprint. With mitigation the significance would reduce to very low negative.

Impacts to graves would be considered a fatal flaw but if all graves and possible graves are avoided then there are no fatal flaws in terms of construction phase impacts to graves.

Table 8-49: Construction Impact on Graves (Alternative 1)

Potential Impact Damage to or destruction of graves (Alt 1)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	3	5	5	3	54	Moderate	(-)	Moderate
With Mitigation	1	3	5	5	1	14	Very Low	(-)	
Mitigation and Management Measures	— Pre-construction survey, micro-siting of infrastructure, make recommendations for mitigation. — Reporting chance finds as early as possible, protect in situ and stop work in immediate area.								

IMPACTS TO THE CULTURAL LANDSCAPE – ALTERNATIVE 1

The local landscape is already compromised by the nearby coal mines, and powerlines are not highly visible over long distances. As such, the intrusion into this landscape of the construction equipment and powerlines is considered to be of low magnitude. Due to the certainty of an impact occurring, the significance calculates to moderate negative (Table 8-50). Minimising the construction duration, minimising landscape disturbance in general and ensuring rehabilitation of areas not needed during operation will result in a reduction in the significance to low negative. There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

Table 8-50: Construction Impact on the Cultural Landscape (Alternative 1)

Potential Impact Visual intrusion into and change of character of the cultural landscape (Alt 1)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	3	3	2	5	45	Moderate	(-)	Moderate
With Mitigation	1	3	3	2	3	27	Low	(-)	
Mitigation and Management Measures	— Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.								

IMPACTS TO ARCHAEOLOGICAL RESOURCES – ALTERNATIVE 2

Direct impacts to archaeological resources would occur during the construction phase when grubbing and construction commence. The most significant site in the project area is an Iron Age site in the Alternative 2 substation footprint. This means that there is a high likelihood of impacts and the resulting impact significance is high negative (Table 8-51). Mitigation would entail avoiding the site and surveying the final alignment to determine whether any further archaeological sites requiring mitigation might still occur. The risk of graves in these settlements must be remembered, although archaeological deposits tend to be uncommon. Any parts of the route running through arable lands do not need to be examined. Once construction is underway any further sites discovered during construction should be protected and reported. With mitigation, the significance reduces to very low negative. There are no fatal flaws in terms of construction phase impacts to archaeology.

Table 8-51: Construction Impact on the Archaeological resources (Alternative 2)

Potential Impact Archaeological Resources (Alt 2)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	2	30	Low	(-)	Moderate
With Mitigation	2	2	3	2	2	18	Low	(-)	
Mitigation and Management Measures	— Pre-construction survey, micro-siting of infrastructure, make recommendations for mitigation.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Archaeological Resources (Alt 2)									
	— Reporting chance finds as early as possible, protect in situ and stop work in immediate area.								

IMPACTS TO GRAVES – ALTERNATIVE 2

Only one possible grave has been recorded in the Alternative 2 corridor. Because of the very high cultural significance of graves the magnitude of impacts to graves is rated high but the chances of an impact occurring are low. Because most of the layout remains unsurveyed there is still a chance of impacts occurring elsewhere as well. The resulting impact significance is low negative (Table 8-52). Mitigation will entail avoiding all graves and potential graves and reporting any chance finds of unmarked graves during construction. A pre-construction survey should also be undertaken to determine whether any graves are visible in the final footprint. With mitigation the significance would reduce to very low negative.

Impacts to graves would be considered a fatal flaw but if all graves and possible graves are avoided then there are no fatal flaws in terms of construction phase impacts to graves.

Table 8-52: Construction Impact on Graves (Alternative 2)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Graves (Alt 2)									
Without Mitigation	3	2	3	2	2	**30**	**Low**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— Pre-construction survey, micro-siting of infrastructure, make recommendations for mitigation. — Reporting chance finds as early as possible, protect in situ and stop work in immediate area.								

IMPACTS TO THE CULTURAL LANDSCAPE – ALTERNATIVE 2

The local landscape is already compromised by the nearby coal mines, and powerlines are not highly visible over long distances. As such, the intrusion into this landscape of the construction equipment and powerlines is considered to be of low magnitude. Due to the certainty of an impact occurring, the significance calculates to moderate negative (Table 8-53). Minimising the construction duration, minimising landscape disturbance in general and ensuring rehabilitation of areas not needed during operation will result in a reduction in the significance to low negative. There are no fatal flaws in terms of construction phase impacts to the cultural landscape

Table 8-53: Construction Impact on the Cultural Landscape (Alternative 2)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cultural Landscape (Alt 2)									
Without Mitigation	3	2	3	2	2	**30**	**Low**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.								

8.10.2 OPERATIONAL PHASE

As before, the local landscape is already compromised by the nearby coal mines. As such, the intrusion into this landscape of the powerline and substation is considered to be of only low magnitude. Due to the certainty of an impact occurring, the significance calculates to moderate negative (Table 8-54). There are no specific mitigation measures that can be applied during operation other than the best practice measure of ensuring that all maintenance work occurs within designated areas. Post-mitigation significance would remain at the moderate negative level. There are no fatal flaws in terms of operation phase impacts to the cultural landscape.

Table 8-54: Operational Impact on the Cultural Landscape (Alternative &2)

Potential Impact Visual intrusion into and change of character of the cultural landscape (Alt 1&2)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	3	3	4	5	55	Moderate	(-)	Moderate
With Mitigation	1	3	3	4	3	33	Moderate	(-)	
Mitigation and Management Measures	— Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.								

8.10.3 DECOMMISSIONING PHASE

Decommissioning impacts are essentially the same as those in the construction phase. The significance calculates to moderate negative (Table 8-55). Minimising the decommissioning duration and ensuring full rehabilitation post-closure will not change the rating which remains moderate negative. There are no fatal flaws in terms of decommissioning phase impacts to the cultural landscape.

Table 8-55: Decommissioning Impact on the Cultural Landscape (Alternative 1)

Potential Impact Visual intrusion into and change of character of the cultural landscape (Alt 1&2)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	3	3	2	5	45	Moderate	(-)	Moderate
With Mitigation	1	3	3	2	3	27	Low	(-)	
Mitigation and Management Measures	— Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.								

8.11 PALAEONTOLOGY

8.11.1 CONSTRUCTION PHASE

There are no-go areas because the fossils, if present, can be removed ad curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material. Only the construction phase could have any impact on the palaeontology because this is when the ground will be excavated and any fossils, if present, would be removed.

The impact significance for the construction impacts on palaeontology are outlined in Table 8-48. There are no fatal flaws in terms of construction phase impacts to palaeontology.

Table 8-56: Construction Impact on Palaeontology

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Damage to or destruction of archaeological resources (Alt 1)									
Without Mitigation	2	1	3	5	3	**36**	**Moderate**	(-)	Moderate
With Mitigation	1	1	1	2	1	**5**	**Very Low**	(+)	
Mitigation and Management Measures	— The impact on the palaeontological heritage can be reduced greatly by a palaeontologist conducting a pre-construction site visit to look for fossils and removing any scientifically important fossils with the relevant SAHRA permit.								

8.11.2 OPERATIONAL PHASE

The operational phase will not impact the palaeontology.

8.11.3 DECOMMISSIONING PHASE

The operational phase will not impact the palaeontology.

8.12 SOCIAL

8.12.1 CONSTRUCTION PHASE

CREATION OF LOCAL EMPLOYMENT, TRAINING, AND BUSINESS OPPORTUNITIES

The construction phase is expected to extend over a period of approximately 12 months and create in the region of 50 employment opportunities. Approximately 80% of the jobs will be low-skilled, 15% semi-skilled and 5% skilled. Most of the low and semi-skilled employment opportunities would benefit community members from local towns in the area. A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area.

The capital expenditure will create opportunities for local engineering and construction companies. Implementing the enhancement measures listed below can enhance these opportunities. The local service sector will also benefit from the construction phase. These benefits will be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers. However, given the relatively small scale of the project and short duration of the construction phase these benefits will be limited. The construction impact of employment, training and business creation opportunities is outlined in **Table 8-57.**

Table 8-57: Construction Impact of employment, skills development, and business creation opportunities

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Creation of employment and business opportunities									
Without Mitigation	2	2	N/A	2	3	**18**	**Low**	(+)	Easy
With Mitigation	4	2	N/A	2	4	**32**	**Moderate**	(+)	
Mitigation and Management Measures	**Employment** — Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase.								

Potential Impact Creation of employment and business opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	— Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. — Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. — Before the construction phase commences the proponent should meet with representatives from the MM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. — The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. — The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** — The proponent should liaise with the DM with regards the establishment of 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.) prior to 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							

IMPACT OF CONSTRUCTION WORKERS ON LOCAL COMMUNITIES

The presence of construction workers can pose a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of girlfriends and/or wives to construction workers.
- An increase in teenage and unwanted pregnancies.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.

Given the relatively small number of construction workers, namely ~ 50, the potential impact on the local community is likely to be negligible. The construction impact on local communities due to construction workers in the area is outlined in **Table 8-58**.

Table 8-58: Construction Impact of the presence of construction workers in the area on local communities

Potential Impact Impacts on family structures and social networks associated with the presence of construction workers	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	2	3	2	2	**18**	**Low**	(-)	Moderate
With Mitigation	1	1	3	2	2	**14**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. — Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. — The proponent should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. — The proponent and contractor should develop a Code of Conduct (CoC) for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The CoC should be signed by the proponent and the contractors before the contractors move onto site. The CoC should form part of the CHSSP. — The proponent and the contractor should implement an HIV/AIDS, COVID-19 and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP. — The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site. — The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end. — No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.								

RISK TO SAFETY, LIVESTOCK, AND FARM INFRASTRUCTURE

The presence of and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers on and in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open. The presence of construction workers on the site also increases the exposure to local farming operations to the outside world, which, in turn, increases the potential risk of stock theft.

The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction workers on the site during the construction phase. The mitigation measures to address these risks are outlined below. The construction impact if risk to safety, livestock, and damage to farm infrastructure is outlined in **Table 8-59**.

Table 8-59: Construction Impact of risk to safety, livestock and damage to farm infrastructure

Potential Impact Risk to safety, livestock and damage to farm infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	3	**16**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. — All farm gates must be closed after passing through. — Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. — The proponent should establish a MC and CoC for workers (see above). — The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). — The proponent should implement a Grievance Mechanism that provides local farmers with an effective and efficient mechanism to address issues related to report issues related to damage to farm infrastructure, stock theft and poaching etc. — The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. — Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. — Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the CoC. All dismissals must be in accordance with South African labour legislation. — It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site								

NUISANCE IMPACTS ASSOCIATED WITH CONSTRUCTION RELATED ACTIVITIES

Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage to local roads. Given the relatively small number of construction workers and the short construction period the traffic related impacts are likely to be limited. The impacts will be largely local and can be effectively minimised and mitigated. The assessment of the nuisance impacts associated with construction related activities is outlined in **Table 8-60.**

Table 8-60: Construction Impact of noise, dust and safety

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust and safety impacts associated with movement of construction related activities and movement of traffic to and from the site									
Without Mitigation	2	2	1	2	3	**21**	**Low**	(-)	Easy
With Mitigation	2	1	1	2	2	**12**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — Timing of construction activities should be planned to avoid / minimise impact on key farming activities, including planting and harvesting operations. — The proponent should establish a MC to monitor the construction phase and the implementation of the recommended mitigation measures. The MC should be established before the construction phase commences, and should include key stakeholders, including representatives from local farmers and the contractor(s). The MF should also address issues associated with damage to roads and other construction related impacts. — Ongoing communication with land owners and road users during construction period. This should be outlined in the SEP. — The proponent should implement a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. — Implementation of a road maintenance programme throughout the construction phase to ensure that the affected roads maintained in a good condition and repaired once the construction phase is completed. — Repair of all affected road portions at the end of construction period where required. — Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers. — All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits								

INCREASED RISK OF VELD FIRE

The presence on and movement of construction workers on and off the site and construction related activities such as welding etc., increases the risk of veld fires which pose a risk to livestock, farm infrastructure and crops. The loss of grazing also poses a threat to local livelihoods that are dependent on livestock farming. The risk of veld fires is higher during the dry, windy winter months of May through to November. The construction impact of veld fires to livestock, farm infrastructure and grazing is outlined in **Table 8-61**.

Table 8-61: Construction Impact of risk posed by veld fires

Potential Impact Loss of livestock and grazing and damage to farm infrastructure associated with increased incidence of grass fires	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. — Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. — Smoking on site should be confined to designated areas. — Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. — Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle. — Contractor should provide fire-fighting training to selected construction staff. As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities. — No construction staff, with the exception of security staff, to be accommodated on site overnight.								

IMPACTS ASSOCIATED WITH LOSS OF FARMLAND

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition, the landowner will be compensated for the loss of land.

Based on the findings of the SIA cropped areas on 25 properties are affected by the assessment corridor. In all instances, liminal portions of properties would be affected, and in almost all instances the areas affected are associated with existing corridors. As such the footprint losses are likely to be minimal, but may impact on fence lines, farm roads and irrigation infrastructure (6 properties along R50). Landowners indicated that the costs associated with repairing and or moving infrastructure should be covered by the developer.

The affected landowners also indicated that an alignment within the assessment corridor located to the south of the coal conveyor line and west of the R50 would be preferable for the shared section of the Alternative 1 and 2. The owners of the WEF-site properties did not raise concerns regarding the potential impact on cropping areas on Mahemsfontein 544/RE, 544/7, 544/8 (van Jaarsveld) and 543/5 (Klopper pers. com.).. The construction impact on farmlands is outlined in **Table 8-62**.

Table 8-62: Construction Impact on farmlands

Potential Impact / Impact on productive farmland	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	
Mitigation and Management Measures	— An alignment within the assessment corridor located to the south of the coal conveyor line and west of the R50 for the shared section of the Alternative 1 and 2 should be investigated. — The loss of high-quality agricultural land should be avoided and or minimised by careful micro-siting of the final layout of the proposed transmission line. — The costs associated with repairing and or moving infrastructure affected by the transmission line should be covered by the developer. — The recommendations of the agricultural / soil assessment should be implemented. — Affected landowners should be consulted about the timing of construction related activities in advance. — The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised. — An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase. — All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. — The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up by the Environmental Consultants appointed to manage the EIA. — The implementation of the Rehabilitation Programme should be monitored by the ECO.								

8.12.2 OPERATIONAL PHASE

PROVIDE ENERGY INFRASTRUCTURE TO SUPPORT THE USE OF RENEWABLE

The proposed power line is essential for the operation of the Impumelelo WEF. The aim of the project is to generate renewable energy for nearby mining and industrial operations. The proposed project, including the grid infrastructure, will therefore create opportunities to improve energy security in South Africa by generating alternative energy sources and reduce the carbon footprint associated with current energy generation.

South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. The Minister of Mineral Resources and Energy, Gwede Mantashe, indicated in February 2023 that the cost of load shedding was

estimated at R1 billion a day . The South African Reserve Bank indicated in February 2023 that stage 3 and stage 6 loadshedding cost the South African economy between R204 million and R899 million a day.

A survey of 3 984 small business owners in 2019 found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period .. The operational impact of the development of infrastructure to generate renewable energy to produce green hydrogen and ammonia is outlined in **Table 8-63**.

Table 8-63: Operational Impact of development of infrastructure to improve energy security and support the renewable sector

Potential Impact Generate renewable energy to produce green hydrogen and ammonia	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	4	N/A	4	4	**44**	**Moderate**	(-)	Easy
With Mitigation	3	4	N/A	4	5	**55**	**Moderate**	(+)	
Mitigation and Management Measures	— Maximise the number of employment opportunities for local community members, where feasible. — Implement training and skills development programs for members from the local community. — Maximise opportunities for local content and procurement.								

CREATION OF EMPLOYMENT AND BUSINESS OPPORTUNITIES

The potential employment, skills development and business-related opportunities associated with the power line and substation will be limited and confined to periodic maintenance and repairs. The potential socio-economic benefits are therefore likely to be limited. There is limited opportunity to enhance the potential opportunities. The operational impact of employment, skills development and business creation opportunities is outlined in **Table 8-64**.

Table 8-64: Operational Impact of employment, skills development and business opportunities

Potential Impact Creation of employment, skills development and business opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	N/A	4	4	**28**	**Low**	(+)	Easy
With Mitigation	2	1	N/A	4	4	**28**	**Low**	(+)	
Mitigation and Management Measures	**Employment** — Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the operational phase. — Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. — Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. — Before the construction phase commences the proponent should meet with representatives from the MM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. — The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the								

Potential Impact Creation of employment, skills development and business opportunities	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. — The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** — The proponent should liaise with the MM with regards the establishment of 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.) prior to 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							

GENERATE INCOME FOR AFFECTED LANDOWNERS

The proponent will enter into a lease/servitude agreement with the affected landowners for the use of the land for the establishment of the proposed transmission line and preferred substation. The additional income would assist to reduce the risks to their livelihoods posed by climate change and fluctuating market prices for livestock, crops, and farming inputs, such as fuel, feed etc. The additional income would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy. The operational impact of benefits associated with income generated for affected farmers is outlined in **Table 8-65**.

Table 8-65: Operational Impact of benefits associated with income generated for affected farmers

Potential Impact Generation of additional income for affected farmers	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	N/A	4	3	**21**	**Low**	(+)	Easy
With Mitigation	3	2	N/A	4	5	**45**	**Moderate**	(+)	
Mitigation and Management Measures	— Implement agreements with affected landowners.								

VISUAL IMPACT AND IMPACT ON SENSE OF PLACE

The proposed transmission line and associated substations has the potential to impact on the areas existing rural sense of place. However, the potential impact on the areas sense of place is likely to be limited given the location of the alignment within an area that has been impacted by existing transmission lines, coal mining and associated mining dumps and coal conveyor belt and the Secunda industrial complex. This was confirmed during the site visit. None of the affected landowners or adjacent owners interviewed raised concerns regarding the potential impact on the areas sense of place. The visual impact and impact on sense of place associated with the proposed facility and associated infrastructure is outlined in **Table 8-66**.

Table 8-66: Visual impact and impact on sense of place during the operational phase

Potential Impact Visual impact and impact on the areas rural sense of place	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	1	4	3	**33**	**Moderate**	(-)	Easy
With Mitigation	2	2	1	4	3	**27**	**Low**	(-)	
Mitigation and Management Measures	— Recommendations of the VIA should be implemented.								

IMPACT ON LAND USES AND FARMING OPERATIONS

The concerns related to the potential impact on land uses and farming operations are confined to the southwestern sections of Alternative 1 and 2 associated with connecting to the on-site substations. Based on the findings of the SIA the key sensitive land use affected by the grid infrastructure are the game farming activities on the Holgatsfontein Game Farm (Holgatsfontein 535/6). Two accommodation facilities are located on Holgatsfontein Game Farm, with a chalet located 400 m from the Mahemsfontein Road, just outside the assessment corridor. The owner's key concern is not related to impact on sense of place, potential restrictions on game farming and hunting activities. Hunting activities along the section of the farm located along the Mahemsfontein Road is already affected by safety related restrictions. The owner, Mr Botha, indicated that Alternative 2 would be the preferred option. However, Alternative 1 may be acceptable if steps were taken to avoid / minimise footprint impacts (Botha, pers. comm).

The owner of Platkop 543/4 indicated that Alternative 2 was not acceptable as the north-south section traverse his property and would result in fragmentation and increased security risks (Klopper – pers. comm). The relevant portion of Platkop 543/4 is used for grazing. The property forms part of the WEF site. The operational impact on farming operations is outlined in **Table 8-67**.

Table 8-67: Operational impact on Land Uses And Farming Operations

Potential Impact Land Uses And Farming Operations	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	Easy
With Mitigation	2	2	3	2	3	**27**	**Low**	(-)	
Mitigation and Management Measures	— Proponent should liaise with owner of Holgatsfontein 535/6 (Mr Botha) to identify a suitable alignment for Alternative 1 within the assessment corridor. — Affected property owners should be notified in advance of the timing and duration of maintenance activities. — Property owners should be compensated for damage to farm property and or loss of livestock or game. — Movement of traffic and maintenance related activities should be strictly contained within designated areas associated with transmission lines and substations								

IMPACT ON FARMING OPERATIONS DURING MAINTENANCE

The presence on and movement of maintenance workers on and off the site poses a potential risk to farming operations. Farm fence and gates may be damaged and stock losses may also result from gates being left open. The presence of maintenance workers on the site also increases the exposure of their farming operations and livestock to the outside world, which, in turn, increased the potential risk of stock theft and crime.

The key issues raised are linked to the construction phase but are also valid for the maintenance phase. These include:

- Impact of maintenance related activities and movement of maintenance vehicles on the cropped areas and the veld.
- Farm gates left open by maintenance contractors.
- Damage to farm fences. The damage to farm fences poses the same risks to farming operations as leaving farm gates open.
- Lack of awareness amongst contractors of the impacts that their activities can have on farming operations.

Based on experience with maintenance of the existing Eskom power lines this is an issue that will need to be addressed. The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by ensuring the maintenance teams take care to ensure that gates are kept closed and affected property owners are kept informed about timing of maintenance operations. Mitigation measures to address these risks are outlined below. The operational impact on farming operations is outlined in **Table 8-67**.

Table 8-68: Operational impact on farming operations and damage to farm infrastructure

Potential Impact farming operations and damage to farm infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)	Easy
With Mitigation	2	2	3	2	3	**27**	**Low**	(-)	
Mitigation and Management Measures	— Affected property owners should be notified in advance of the timing and duration of maintenance activities. — Maintenance teams must ensure that all farm gates must be closed after passing through. — Property owners should be compensated for damage to farm property and or loss of livestock or game associated maintenance related activities. — Movement of traffic and maintenance related activities should be strictly contained within designated areas associated with transmission lines and substations. — Strict traffic speed limits must be enforced on the farm. — No maintenance workers should be allowed to stay over-night on the affected properties								

8.13 NO-GO ALTERNATIVE

The no-go alternative is essentially the option of not developing powerlines or substations in this area in which case none of the negative and positive impacts described above will come into effect.

The no-go alternative considers impacts that will occur to the project area in the absence of the proposed development. The extent to which the development (insignificant impact) and the no-go alternative will impact the current land use is more or less equal.

The no-go alternative will result in the current status quo being maintained at the proposed development site as far as all the specialist studies concerned. The 'no-go' option would eliminate any additional impact on the ecological integrity of the proposed 132kV grid infrastructure development site, as far as avifauna is concerned.

There are no agricultural impacts of the no-go alternative, but the agricultural impacts of the development are low, and so there is not a big difference between the agricultural impacts of the proposed development and those of the no-go option. The no-go option would prevent the associated renewable energy facility, which cannot operate without a grid connection, from contributing positive agricultural impacts to the farm as well as contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.

If the ‘no-go’ option is implemented, there would be no development. The area would thus retain its visual character and sense of place and no visual impacts would be experienced by any locally occurring receptors. Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.

Should the ‘no-go’ alternative be considered, there would be no impact on the existing environmental baseline and no benefits to the local economy and affected communities. The alternative also bears the opportunity cost of missed socio-economic benefits to the local community that would otherwise realise from establishing the farms which form part of the project sites. The option of not developing also entails that the bid to provide renewable/clean energy to the national grid and contribute to meeting the country’s energy demands will be forfeited.

9 CUMULATIVE IMPACT ASSESSMENT

Although the objective of the NEMA Basic Assessment process is to undertake an impact and risk assessment process, inclusive of cumulative impacts, which is essential to assessing and managing the environmental and social impacts of projects, it may be insufficient for identifying and managing the incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process "*will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence*" including "*master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant*."

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC GPH).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC's Performance Standards specify that "*Risks and impacts will be analysed in the context of the project's area of influence. This area of influence encompasses…areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.*" (IFC 2006).

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed OHPL and substation. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Therefore, a number of renewable energy developments within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved and others now operational). It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

These existing surrounding projects of varying approval status include:

- Potential cumulative impacts identified are summarised below:The authorised Tutuka 65.9 MW Solar Photovoltaic (PV) Energy Facility and its associated infrastructure (Ref: 14/12/16/3/3/2/754) located 46km south-east of the site;

- The proposed Mukondeleli WEF to be located east of the site;
- The proposed Vhuvhili Solar Energy Facility (NEAS No. MPP/EIA/0001063/2022) located approximately 34km north-east of the site;
- The authorised Grootvlei 75 MW Solar (PV) electricity installation (Ref: 12/12/20/2060) located 27km southwest of the site; and
- The lapsed 75MW PV power plant on Portion 17 of the Farm Rusplaas No.1388 and Portions 2 & 3 of the Farm Heartsease No 420, Free State Province (Ref: 14/12/16/3/3/2/315) located 23km southwest of the site

9.1 AGRICULTURE CUMULATIVE IMPACTS

The potential cumulative agricultural impact of importance is a regional loss of future agricultural production potential. The defining question for assessing the cumulative agricultural impact is this:

> *What level of loss of future agricultural production potential is acceptable in the area, and will the loss associated with the proposed development, when considered in the context of all past, present or reasonably foreseeable future impacts, cause that level in the area to be exceeded*?

There are a number of non-agricultural developments that are leading to loss of agricultural production potential in the area. However, because this grid connection itself leads to a very small loss of production potential, its cumulative impact is low. It therefore does not make sense to conduct a more formal assessment of the development's cumulative impacts as per DFFE requirements for cumulative impacts. Many times more electricity grid infrastructure than currently exists, or is currently proposed, can be accommodated before acceptable levels of change in terms of loss of production potential are exceeded. In reality the landscape in this environment could be covered with powerlines and agricultural production potential would be minimally affected.

Due to the considerations discussed above, the cumulative impact of loss of future agricultural production potential can confidently be assessed as being low and therefore having an acceptable impact on the area. In terms of cumulative impact, the proposed development is therefore acceptable and it is therefore recommended that it be approved.

9.2 GEOTECNICAL CUMULATIVE IMPACTS

SOIL EROSION

The anticipated cumulative impacts due to soil erosion are outlined in **Table 9-1**.

Table 9-1: Cumulative Impact due to soil erosion

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	Confidence
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
Mitigation and Management Measures	— Use existing road network and access tracks.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
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.								
	— Use of temporary berms and drainage channels to divert surface water. — Minimize earthworks and demolish footprints. — Rehabilitation of affected areas (such as revegetation). — Reinstate channelized drainage features. — Strip, stockpile and re-spread topsoil							

POTENTIAL OIL SPILILAGE

The anticipated cumulative impacts due to potential oil spillages are outlined in **Table 9-2**.

Table 9-2 Cumulative Impact due to potential oil spillages

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
— 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 and Management 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

The anticipated cumulative impacts due to disturbance of fauna and flora are outlined in **Table 9-3**.

Table 9-3 Cumulative Impact due to disturbance of fauna and flora

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

SLOPE STABILITY

The anticipated cumulative impacts due to slope stability are outlined in **Table 9-4**.

Table 9-4: Cumulative Impact due to slope stability

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

SEISMIC ACTIVITY

The anticipated cumulative impacts due to seismic activity are outlined in **Table 9-5**.

Table 9-5: Cumulative Impact due to seismic activity

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

9.3 AQUATIC CUMULATIVE IMPACTS

In terms of drainage the Grootspruit, Ouhoutspruit watercourses, their tributaries which surround the gridline all ultimately drain into the Vaal River which is a very important and strategic water source of South Africa, and all care should be taken to protect the Vaal River from further pollution and other impacts.

Cumulative impacts are assessed by adding anticipated impacts from this proposed development to existing and proposed developments with similar impacts in a 55 km radius.

At a landscape level it is imperative that the GRIDLINE design is kept out of the wetlands as well as associated buffer area, as this will ensure that there is a degree of connectivity at a landscape level as the watercourses and tributaries of the Ouhoutspruit and Grootspruit also provide corridors for movement for fauna and insects.

During the construction phase it is likely that vegetative cover as well as disturbance of soil will increase the prevalence of erosion and subsequently the amount of sediment present in the catchment. It is also foreseen that during the construction phase the disturbance caused can increase the spread of alien invasive plant species. It is expected that during the operational phase the impact on hydrological regime will be higher due to the cumulative impacts of the GRIDLINE, SEF, grid solutions and supporting infrastructure.

In terms of aquatic biodiversity, the major cumulative impact is thought to be an increase in concentrated flows due to increase in runoff.

9.4 BIODIVERSITY CUMULATIVE IMPACTS

VEGETATION LOSS AND HABITAT DESTRUCTION

Vegetation loss, habitat destruction and possibly loss of SCC, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Secondary vegetation will develop at sites where the vegetation was cleared or the soil compacted. The species composition may change and alien species might invade. Vegetation loss will also constitute the loss of animal habitat. It should however be noted that in the case of wind energy facilities

vegetation loss due to habitat destruction is far more contained than in the case of solar facilities. The contribution by the Impumelelo gridline site to the cumulative impact will be small (**Table 9-6**).

Table 9-6: Cumulative Impact on vegetation loss and habitat destruction

Potential Impact Vegetation loss and habitat destruction	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	3	3	4	3	**45**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— All projects should adhere to the site-specific recommendations of the ecologists to ensure that impacts are mitigated where possible. — Placement of infrastructure should be done in such a way that no SCC are affected and CBAs avoided. — Location of the pylons in the most environmentally responsible manner is — Maintain a vegetation ground layer along the roads in the servitude.								

COMPROMISING INTEGRITY OF CBA, ESA AND NPAES

According to the mapping of CBAs in Mpumalanga, some sections of the gridline are located/partially located within CBAs in the current layout. Development within CBAs is not encouraged as such development may result in biodiversity loss and therefore compromise the integrity of the CBA. Although there are currently only two projects within 50 km from the Impumelelo site, this could in future change and the integrity of the CBAs could be compromised and consequently the biodiversity target for the ecosystem could be affected. The development does not affect a NPAES (2010) and is not earmarked for expansion in the Mpumalanga PAES within a 5-year span. The contribution of the Impumelelo gridline to this cumulative impact will be small. .

It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs (**Table 9-7**).

Table 9-7: Cumulative Impact on CBA, ESA and NPAES

Potential Impact Compromising integrity of CBA, ESA and NPAES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	3	3	4	3		**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	2		**Low**	(-)	
Mitigation and Management Measures	— Placement of infrastructure should strive to avoid CBAs. — Minimise the development footprint as far as possible. — Maintain a vegetation ground layer in the gridline servitude. — Stringent construction-phase monitoring of activities at the site to ensure that mitigation measures are adhered to and that the overall ecological impact of the development is maintained at a low level. — Align roads and other infrastructure so that transformation within the CBAs is minimised. — The use of structures which may inhibit movement of fauna, e.g. mesh or electric fencing should be avoided, where feasible.								

REDUCED ABILITY TO MEET CONSERVATION OBLIGATIONS & TARGETS

The loss of unprotected vegetation types on a cumulative basis from the area may impact the countries' ability to meet its conservation targets. Very few statutorily conserved areas occur in the Vulnerable Soweto Highveld Grassland and almost half of it has been transformed mostly by cultivation, plantations, mining and urbanisation. It has a conservation target of 24% and was classified as Not Protected (0.6%) in the 2018National Biodiversity Assessment (Skowno et al. 2018). The layout of the Impumelelo WEF should be amended to fall within the heavily and moderately transformed areas wherever possible. These transformed areas have already been included in the transformed % for the vegetation type and will thus not affect its conservation status. However, the Impumelelo site is not located in a protected area nor does it fall within a protected area expansion strategy and thus will not have an impact on the expansion of Protected Areas (**Table 9-8**).

Table 9-8: Cumulative Impact on meeting conservation obligations and targets

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Reduced ability to meet conservation obligations & targets									
Without Mitigation	5	3	3	4	3	**45**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— Avoid highly sensitive habitats and CBAs.. — Minimise the development footprint as far as possible.								

LOSS OF LANDSCAPE CONNECTIVITY AND DISRUPTION OF BROAD-SCALE ECOLOGICAL PROCESSES

The gridline could pose a minimal threat to the connectivity of the landscape. For fauna the disruption would depend largely on whether a ground layer of vegetation will be maintained in the servitude or not. Subterranean species that have to emerge from the soil to cross roads will be affected. The severity of these impacts for subterranean species is likely to be relatively low as the roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes.

If a ground layer of vegetation is maintained beneath the gridline, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of population (**Table 9-9**).

Table 9-9: Cumulative Impact on landscape connectivity and disruption of broad-scale ecological processes

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of landscape connectivity and disruption of broad-scale ecological processes									
Without Mitigation	3	3	3	4	2	**26**	**Low**	(-)	Moderate
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— Minimising the development footprint wherever possible. — Revegetation of all cleared and bare areas created by the facility with local plant species. — Fences and other structures which impede faunal movement should be avoided. — Roads should not have steep curbs.								

9.5 AVIFAUNA CUMULATIVE IMPACTS

According to the official database of DFFE and other documents in the public domain, there are currently at least five planned wind- and solar energy facilities within a 55 km radius of the proposed development.

Associated with each of these developments, is the infrastructure needed for connection to the national grid. The area within a 55 km radius of the project site includes approximately 3352 km of already-constructed overhead, high-voltage power lines (**Figure 9-1**). For this assessment, however, the total length can be reduced to a functional length approximately 1785 km, given that multiple parallel power lines arguably present the same impact as a single power line transect over the distance of parallel transmission. This overall reticular length can be further broken down into: ~494 km of 88 kV lines (functionally ~350 km), ~754 km of 132 kV lines (functionally ~506 km), ~541 km of 275 kV lines (functionally ~169 km), ~1333 km of 400 kV lines (functionally ~773 km), and 230 km of 765 kV lines (functionally ~200 km) (**Figure 9-1**).

The proposed 132 KV Impumelelo Grid Connection will be at most 34 km, representing 1.0 % of the total length of all existing regional overhead power lines, or a functional contribution of 1.9 %. When considering only existing 132 kV power lines, this contribution becomes 4.5 % to the overall length, and 6.5 % to the functional length. The Impumelelo Grid Connection therefore represents a comparably small contribution to the existing overhead grid system. However, this grid connection likely represents a larger proportion of new grid infrastructure associated with regional renewable energy projects. Although the length of the pending grid infrastructure could not be procured, we estimate the contribution to be ~20-30% (depending on the number of approved projects, and length of the associated grid infrastructure). By extension, the pending grid infrastructure collectively contribute towards ~6-10 % of the functional length of regional overhead power lines.

These length contributions, though comparably low, increase the density of regional power lines. The Impumelelo Grid Connection alone will increase the density of overall overhead power lines from 227 m/km2 to 229 m/km2, and the density of 132 kV lines from 51 m/km2 to 53 m/km2. When considering new grid connection infrastructure from related regional projects (assuming all proposed projects are approved and the associated grid connection infrastructure are of similar length), the estimated future density of overhead powerlines may be up 238 m/km2 overall and 62 m/km2 of 132 kV powerlines. Heightened density of power lines increases collision risks to priority avifauna, compounding the impacts of electrocution risk, collisions with wind turbines/other renewable energy facilities, as well as the displacement associated with construction and decommission of these renewable energy projects.

The Impumelelo Grid Connection therefore represents a comparatively low contribution towards the total length of high voltage power lines within a 55km radius. However, this project will increase the density of planned and existing high voltage lines within a 55 km radius, and this cumulative effect represents a potentially moderate impact risk to priority avifauna, by compounding the collision risks imposed regional renewable energy projects onto powerline sensitive species..

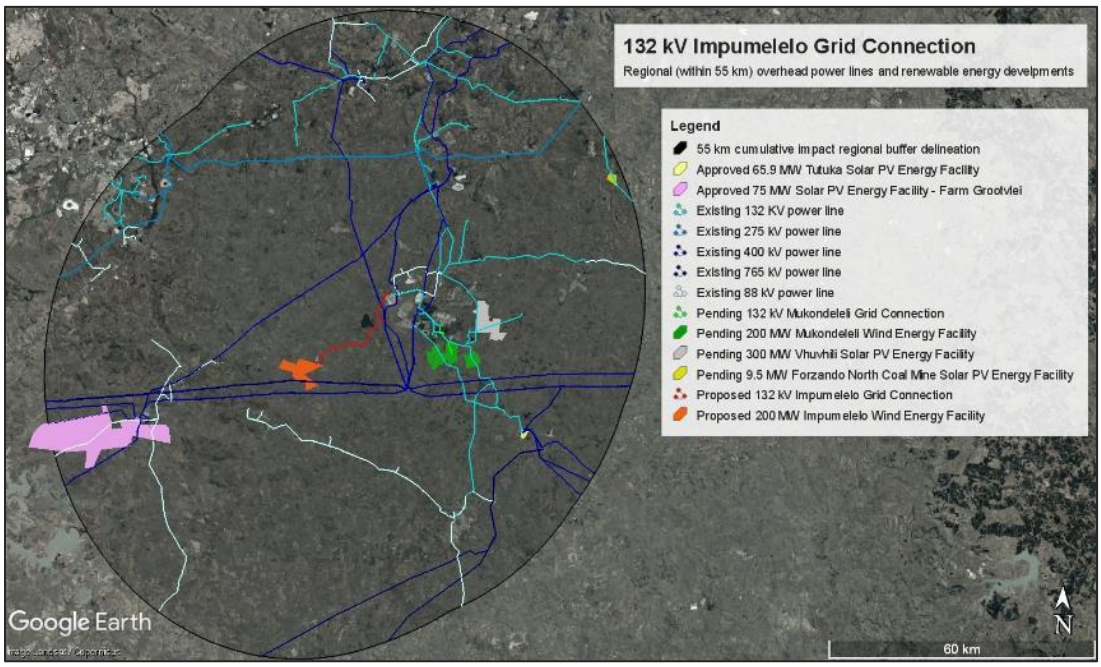


Figure 9-1: Existing overhead high voltage power lines and proposed renewable energy projects within 55 km of the proposed Impumelelo Grid Connection (source: DFFE Database 2022 & Cabanga Environmental)

9.6 VISUAL CUMULATIVE IMPACTS

Although it is important to assess the visual impacts of the proposed Impumelelo EGI specifically, it is equally important to assess the cumulative visual impact that could materialise as a result of this development. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include:

- existing mining / quarrying activities,
- existing industrial development including the Sasol Secunda synthetic fuel plant; and
- other existing / proposed renewable energy facilities within a 30km radius.

Existing mining / quarrying and industrial development have already resulted in large scale visual impacts, especially to the north of the Impumelelo EGI study area. These developments have significantly altered the sense of place and visual character in the broader region.

Renewable energy facilities have the potential to cause large-scale visual impacts, and although the level of transformation already present in the landscape will reduce the contrast and overall visual impact of the new development, the incremental change in the landscape will be increased and the visual impacts on surrounding visual receptors would be exacerbated. The South African Renewable Energy EIA Application Database from DFFE (REEA_OR_2022_Q2) records only one approved renewable project within 30kms of the Impumelelo EGI project area, this being a Solar Photovoltaic (PV) facility located at the Tutuka Power Station. This project is however some 23 km south-east of the Impumelelo EGI project area, and it is not anticipated that this development will result in any significant cumulative impacts affecting the landscape or the visual receptors within the visual assessment zone for the Impumelelo EGI.

However, it is known that the Impumelelo EGI project forms part of a larger Renewable Energy cluster of projects proposed in the greater Secunda area. This complex, including wind (Impumelelo and Impumelelo WEFs) and solar facilities (Vhuvhili SEF) as well as associated grid connection infrastructure, will affect a large portion of the study area.

From a visual perspective, the concentration of renewable energy facilities in close proximity to existing mining and industrial development as proposed will further change the visual character of the area on the periphery of the Secunda / EMbalenhle urban areas and alter the inherent sense of place, extending an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommended mitigation measures. In addition, it is possible that these developments in close proximity to each other could be seen as one large Renewable Energy Facility (REF) rather than several separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape.

The cumulative visual and landscape impact and associated mitigation measures are outlined in **Table 9-10**.

Table 9-10: Cumulative Impact on the visual landscape

Potential Impact / **Visual impacts**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of mitigation**
Without Mitigation	4	3	3	5	4	**64**	**High**	(-)	Moderate
With Mitigation	4	3	3	4	4	**56**	**Moderate**	(-)	
Mitigation and Management Measures	— Carefully plan to minimise the construction period and avoid construction delays. — Position laydown areas and related storage/stockpile areas in unobtrusive positions in the landscape, where possible. — Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. — Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter.								

Potential Impact / Visual impacts	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
	— As far as possible, limit the number of maintenance vehicles which are allowed to access the facility. — Ensure that dust suppression techniques are implemented on all gravel access roads. — As far as possible, limit the amount of security and operational lighting present on site whilst adhering to relevant safety standards. — Light fittings for security at night should reflect the light toward the ground and prevent light spill. — Lighting fixtures should make use of minimum lumen or wattage whilst adhering to relevant safety standards. — Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. — If possible, make use of motion detectors on security lighting.							

9.7 HERITAGE CUMULATIVE LANDSCAPES

Various other projects are proposed in the wider area and might impact upon heritage resources. Cumulative impacts would occur through the construction, operation and decommissioning of many projects in the same general area. The projects considered in the assessment of cumulative impacts are listed in Table 8. In terms of archaeology, Iron Age settlements are large and quite widespread which means that there is a fair chance of impacts (most notably from the Impumelelo WEF). Mitigation (as proposed for the various projects) would bring the significance down from high negative to low negative (Table 8). Graves are generally unlikely to be impacted but are present widely in the landscape and one potential grave in the present project is at risk of impacts. Furthermore, graves can be present within the Iron Age settlements. Mitigation would reduce the impact significance from high negative to very low negative. Cumulative impacts to the landscape are likely to be moderate negative before mitigation for all three phases. With mitigation these are likely to reduce to low negative for the construction and decommissioning phases but remain moderate negative for the operation phase.

IMPACTS TO ARCHAEOLOGICAL RESOURCES

The cumulative impacts as well as the mitigation measures are outlined in **Table 9-11**.

Table 9-11: Cumulative Impact on archaeological resources

Potential Impact / Damage to or destruction of archaeological resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	3	5	5	5	80	High	(-)	High
With Mitigation	1	3	5	5	2	28	Low	(-)	

IMPACTS TO GRAVES

The cumulative impacts as well as the mitigation measures are outlined in **Table 9-12.**

Table 9-12: Cumulative Impact on graves

Potential Impact / Damage to or destruction of graves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	5	3	5	5	4	72	High	(-)	High

Potential Impact Damage to or destruction of graves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
With Mitigation	1	3	5	5	1	**14**	**Very Low**	(-)	

IMPACTS TO THE CULTURAL LANDSCAPE

The cumulative impacts as well as the mitigation measures are outlined in **Table 9-13**.

Table 9-13: Cumulative Impact on cultural landscapes

Potential Impact Visual intrusion into and change of character of the cultural landscape	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	3	3	2	5	**45**	**Moderate**	(-)	High
With Mitigation	1	3	3	2	3	**27**	**Low**	(-)	

9.8 PALAEONTOLOGY

As far as the palaeontology is concerned, there are no cumulative impacts because each site is unique and may or may not have fossils. Fossil bones may be scattered over the landscape but their distribution is erratic and unpredictable. If a bone-bed or plant outcrop occurs this would an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to add any impact on this project.

9.9 SOCIAL CUMULATIVE IMPACTS

SENSE OF PLACE

The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues raised in these guidelines as to what defines a cumulative impact are also regarded as pertinent to transmission lines. The relevant issues identified by Scottish Natural Heritage study include:

- Combined visibility (whether two or more transmission lines) will be visible from one location).
- Sequential visibility (e.g. the effect of seeing two or more two or more transmission lines) along a single journey, e.g. road or walking trail).
- The visual compatibility of different two or more transmission lines in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The areas sense of place has been impacted by existing transmission lines, mining operations and the Secunda industrial complex. The potential for cumulative impacts associated with combined visibility (whether two or more power lines will be visible from one location) and sequential visibility (e.g., the effect of seeing two or more power lines along a single journey, e.g., road or walking) does therefore exist. However, the cumulative impact on the areas sense of place is likely to be low. In this regard the areas sense of place has been impacted by existing transmission lines, mining operations and the Secunda industrial complex. None of the landowners interviewed raised concerns regarding the potential visual impact on the areas sense of place

The cumulative impact on the sense of place and the landscape is outlined in **Table 9-14.**

Table 9-14: Cumulative Impact on sense of place and the landscape

Potential Impact Visual impacts associated with the establishment of more than one REF and the potential impact on the area's rural sense of place and character of the landscape.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Overall impact of the proposed project considered in isolation	2	2	1	4	3	**27**	**Low**	(-)	Moderate
Cumulative impact of the project and other projects in the area	2	2	1	4	4	**40**	**Moderate**	(-)	
Mitigation and Management Measures	— Recommendations of the VIA and SIA should be implemented.								

10 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 BA are the result of comprehensive assessments. These assessments were based on issues identified through the BA process and public participation undertaken to date. The BAR will be 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 BAR will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

10.1 SPECIALIST CONCLUSIONS

10.1.1 AGRICULTURAL ASSESSMENT

The conclusion of this assessment is that the proposed development will have low agricultural impact and will therefore be acceptable in terms of its impact on the agricultural production capability of the site. The only impact of this development is the loss of approximately 2 hectares of agricultural land on the site of the substation. This is assessed as being of low significance because the amount of land loss is very small and the production potential of the land is limited to being unsuitable for crop production and only suitable as grazing land.

The powerline itself has insignificant agricultural impact because all agricultural activities that are viable in this environment, can continue completely unhindered underneath the powerline and there will therefore be negligible loss of agricultural production potential underneath it.

The only potential source of impact from the powerline is minimal disturbance to the land (erosion and topsoil loss) during construction (and decommissioning). This impact can be completely mitigated with standard, generic mitigation measures that are included in the DFFE Generic EMPr.

From an agricultural impact point of view, it is recommended that the development be approved.

Because of the insignificant agricultural impact of the powerline, there can be no material difference between the agricultural impacts of any of the alternative powerline routes. All proposed route alternatives are considered equally acceptable in terms of agricultural impact. In terms of the substation site, both alternatives are considered equally acceptable in terms of agricultural impact.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is only subject to the condition that the pylon locations minimize agricultural impacts by being located, wherever possible, outside of or on the edges of cropland so that they interfere minimally with crop

production. Pylon locations should be assessed and approved by an agricultural specialist during the final micro-siting walk-through exercise that occurs after Environmental Authorisation and prior to construction. A desktop assessment of the pylon positions using satellite imagery will be adequate for this purpose.

10.1.2 GEOTECHNICAL ASSESSMENT

The completed desktop assessment of the geotechnical conditions at the proposed development site and grid servitude of the Impumelelo 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 significantly to "negative very low".

A geotechnical site investigation must be undertaken to provide detailed geotechnical information for the design of the proposed structures and roads.

The proposed development should, from a geotechnical impact perspective, be authorized. There is no preferred grid servitude option with respect to the geotechnical impact assessment. The most significant geotechnical condition that will affect the development is the expected hard excavation conditions where shallow rock is present.

Minimal slope stability issues are expected as slope areas are minimal. Access roads can be developed as gravel road with suitable wearing-course to protect the subgrade likely being obtained from local weathered dolerite rock deposits

10.1.3 AQUATIC ASSESSMENT

The study area comprises of two powerline and substation options. Option 1 (including Substation Option 1) and Option 2 (including Substation Option 2) follows the same route from the same Zandfontein Substation towards the Sasol Impomolelo Mine where the route diverges around the mine respectively. Substation Option 1 is located closer to the Sasol mine compared to Substation Option 2. Thus Option 1 approximately 33.3 Km while Option 2 is approximately 33.7 km. It should be noted that both the powerline options follows existing roads, conveyer belts and other previously built powerlines for the majority of the route, this greatly reduces potential impacts due to access roads and previously vegetation clearing. Both route options cross a similar amount of wetlands although the substation of option 2 encroaches on a small seepage wetland and is thus not a suitable location. Furthermore, a wetland does fall within 100 m (and thus within the DWS 500 m regulated areas) from substation option 1 although option 1 follow an existing gravel road for a longer distance compared to option 2. Based on these findings Option 1 is the preferred option although ideally the substation should ideally be reconsidered to be moved possibly across the road in an existing agricultural land, thereby reducing potential impacts. The following wetlands were recorded within the powerline corridor and the substation corridor areas::

- 1 Depressional Pan Wetland;
- 1 Seepage Wetland;
- 3 Floodplain Wetlands;
- 9 Channelled Valley Bottom Wetlan; and
- 11 Unchannelled Valley Bottom Wetlands.

The main rivers associated with these wetlands include: Ouhoutspruit-, Wolwespruit-, Kaalspruit-, Xspruit- and Watervalspruit Rivers. These all drain southward into the Watervalspruit River before flowing into the important Vaal River.

Buffer zones were calculated for the wetlands following Macfarlane *et al.*, (2015):

- Floodplain Wetlands - 43 m;
- Channelled Valley Bottom Wetlands – 50 m;
- Depressional Pan – 70 m;
- Unchannelled Valley Bottom Wetlands – 42 m; and
- Seepage Wetland – 21 m.

The majority of the proposed route is located directly adjacent to roads and the impact will thus be limited in extent. However, a walk down is suggested once the final position of the pylons is known to ensure they are not placed within watercourse of watercourse buffer zones.

10.1.4 TERRESTRIAL ECOLOGY ASSESSMENT

Provided the positioning of gridline infrastructure takes sensitive habitats, i.e. drainage lines and wetlands and CBAs into consideration, the resulting low sensitivity rating and low impact significance for many of the habitats means the project could go ahead, provided all mitigation measures and management actions proposed to conserve protected fauna and flora on the site, are taken into consideration. We thus recommend authorisation of the project provided all mitigation measures are implemented.

A brief summary of the most important considerations is provided below:

- Vegetation and flora:
  - Vegetation types: The Soweto Highveld Grassland vegetation type is listed as "Vulnerable" and consequently the gridline infrastructure should give preference to the habitats on site where past disturbance has occurred e.g. disturbed areas, cultivated cropland or abandoned cropland (old lands). • Screening Tool: The species that were highlighted by the Screening tool were not encountered on site.
  - Threatened plant species: No IUCN threatened or red-listed plant species were encountered during the field survey.
  - Near Threatened Species: *Gladiolus robertsoniae* was recorded in Habitat 1. Substation 1 (SS1) falls in Habitat 1 (medium sensitivity) and should be relocated if possible.
  - Screening Tool: None of the plant species highlighted by the Screening Tool were encountered on site
  - Protected plant species: No ToPS species or protected tree species were recorded on site. A number of Mpumalanga protected species were recorded on site, but none with a threatened IUCN status.
  - CITES: Two CITES listed species occur on the Impumelelo WEF site, i.e. *Aloe transvaalensis* and *Euphorbia clavarioides*.
  - Habitats: Three of the five habitats along the gridline had a low sensitivity rating with one habitats rated as of medium sensitivity, i.e. Habitat 1 (rocky sheets). The wetland habitat (Habitat 7) had a high sensitivity.
  - Overall sensitivity of plant theme based on the status of the habitats (plant communities): Rated as low provided some infrastructure is repositioned to habitats of low sensitivity, CBAs and highly sensitive habitats are avoided. The Soweto Highveld Grassland has a 'Vulnerable' threat status and to minimise the impact on the vegetation a ground cover should be maintained in the servitude along the gridline.
- Fauna (avifaunal and bat components excluded):
  - Screening Tool: The species that were highlighted by the Screening tool, included *Crocidura maquassiensis, Hydrictis maculicollis, Ourebia ourebi ourebi* and *Lepidochrysops procera*. None of these species were listed in the MTPA database for the farms participating in the proposed Impumelelo WEF development and none were encountered during the site visit. The Maquassie musk shrew *Crocidura maquassiensis* and *Lepidochrysops procera* are also not listed on the ADU database for the region. The Impumelelo site falls marginally within the distribution range of *Ourebia ourebi ourebi*, however it was not encountered during the site visit and also not reported as present by the landowners.
  - Threatened animal species: The giant girdled lizard (Smaug giganteus), a reptile with a Vulnerable IUCN status, has been noted on Impumelelo according to one of the landowners. As a precautionary measure, it is recommended that a survey should be done for this reptile once the proposed final layout has been established. This species was however not highlighted by the Screening Tool.
  - Near Threatened species: Three Near Threatened mammal species are reported for the region, according to the landowners in the vicinity of the gridline, i.e. the serval (*Leptailurus serval*), Southern African hedgehog (*Atelerix frontalis*) and Southern African vlei rat *Otomys auratus*. None of these species were however highlighted by the Screening Tool.
  - Overall sensitivity of animal theme (avifaunal and bat components excluded): This is rated as medium. If the suggested mitigation measures are followed the animal SCC should not be negatively affected.
- Conservation:

- Protected Areas: The study area is not located in a protected area.
- National Protected Areas Expansion Strategy (NPAES): The development will not interfere with the protected areas expansion strategy according to the NPAES spatial data of 2010 and it is also not earmarked in the 5-year plan of the Mpumalanga PAES (data supplied by M. Lötter, MTPA).
- CBAs: Both the on-site substations are located partially or fully in CBAs and should be repositioned even though the habitat of substation 1 (SS1) had a medium sensitivity and substation 2 (SS2) had a low sensitivity in our current assessment (Figure 14). Large sections of the power line route have been delineated as CBAs. Pylon positions can largely be selected to avoid drainage lines. It should however be noted that the mapping of CBAs in the region is not always secure. For example, almost the entire Impumelelo mine has been mapped as part of a CBA1 (irreplaceable). Such gross inaccuracies leaves a question mark over the entire CBA mapping effort.
- ESAs: ESA Local corridors occur within the boundary of the Impumelelo gridline site. The gridline option 1 does not cross any ESAs, but the alternative route traverse ESAs. However, these areas had a low sensitivity rating in the current assessment and the gridline should not further degrade the landscape functionality.
- FEPA: Although the entire site is classified as an upstream management area, the site assessment of the vegetation and the application of a sensitivity model rated most of the river FEPA area as being of low to medium sensitivity, with only the drainage lines having a high sensitivity.
- Mpumalanga Highveld wetlands: Channelled valley-bottom wetlands, floodplain wetlands, seeps and dams were distinguished on site. These wetlands were largely incorporated into the delineation of the CBAs (refer to aquatic specialist report for wetlands)

- Ecological processes, function and drivers:
  - Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.
  - The disturbance caused by the construction of the infrastructure will inevitably create conditions favourable for invasion by alien species and thus a programme for the early detection as well as control of alien invasive plant species must be implemented.
  - Fire is an important driver of vegetation dynamics in the Grassland Biome and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire, although regular mowing could affect seed set.
- Significance of environmental impacts:
  - Overall the significance of the environmental impacts was rated as very low to low.
  - Since the development footprint is expected to be relatively small, the loss of habitat within the Soweto Highveld Grassland vegetation type will be fairly small. However, our impact assessment was based on the assumptions (i) only a service track would be cleared and a vegetative groundlayer would be retained beneath the rest of the servitude; and (ii) where the vegetation was destroyed at the pylon sites during construction, that it will be rehabilitated and allowed to recover.
  - From an ecological point of view, large portions of the site have been heavily modified (compare CBA map) and are no longer prime examples of the Soweto Highveld Grassland. If the development is thus primarily contained within the heavily or moderately modified areas it would not affect the status of the vegetation type since these modified area were already considered as lost for the allocation of a vulnerable status of the vegetation type.
  - Habitat 7 was rated as highly sensitive Habitat 1 was rated as medium sensitive in the current assessment. Optional substation 1 (SS1) is located in a medium sensitive habitat
  - Most of the habitats traversed by the proposed gridline were rated as having a low sensitivity.
  - None of the species highlighted by the screening tool were encountered on site, thus the impact on populations of threatened or protected species will be negligible if all mitigation measures are applied. Although not mentioned by the screening tool, the giant girdled lizard has been reported by one of the landowners. As a precautionary measure once the footprint has been amended to take all specialist assessments into consideration, a survey of the footprint could be undertaken to establish the presence/absence of the species.

- Depending on the type of fencing to be erected at some of the infrastructure, the gridline infrastructure will contribute minimally to obstruction of animal movement.

10.1.5 AVIFAUNA ASSESSMENT

The proposed Impumelelo Grid Connection could have a **high** to **moderate** impact on avifauna which, in most instances, could be reduced to **low** through appropriate mitigation, although some moderate residual impacts will still be present after mitigation.

No fatal flaws were discovered during the onsite investigations. The proposed Grid Connection development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

10.1.6 VISUAL ASSESSMENT

A visual study was conducted to assess the magnitude and significance of the potential visual impacts associated with the development of the proposed Impumelelo EGI near Secunda in Mpumalanga Province. The VIA has demonstrated that the study area has a somewhat mixed visual character, transitioning from the heavily transformed urban / peri-urban landscape associated with the EMbalenhle and Secunda urban areas and the Sasol Secunda fuel plant in the north and the town of Charl Cilliers in the south to a more rural / pastoral character across the remainder of the study area. Hence, although EGI development would alter the visual character and contrast with this rural / pastoral character, the location of the proposed EGI in relatively close proximity to these transformed areas as well as the associated extensive powerline network will significantly reduce the level of contrast.

A broad-scale assessment of visual sensitivity, based on the physical characteristics of the study area, economic activities and land use that predominates, determined that the area would have a low visual sensitivity. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. No formal protected areas, leisure-based tourism activities or sensitive receptor locations were identified in the study area, thus confirming the low level of visual sensitivity.

The desktop assessment did however identify multiple farmsteads and residences within the study area that could be considered to be receptors, although not all of them would be sensitive to the proposed development. These farmsteads are however regarded as potentially sensitive visual receptors as elements of the proposed development could potentially alter natural or semi-natural vistas experienced from these locations. At this stage however, local sentiments towards the proposed development are not known.

A total of forty-five (45) receptors were identified within 5 kms of the Impumelelo EGI combined assessment corridor, three (3) of which are outside the viewshed for the EGI. None of the remaining receptors are considered sensitive.

Only one (1) potentially sensitive receptor (VR40) is expected to experience high levels of visual impact. This receptor, along with VR35, VR36 and VR41, is located within the Impumelelo WEF project area and as such the respective land-owners are not expected to perceive the proposed development in a negative light

Thirty (30) receptor locations are expected to experience moderate levels of impact as a result of the Impumelelo EGI development, while the remaining fourteen (14) would only experience low levels of visual impact.

Although the R50 Main Road could be considered a potentially sensitive receptor road, the likely visual impacts of the proposed development on motorists utilising this route would be reduced by the level of transformation and landscape degradation visible from the road and also by the presence of high voltage powerlines adjacent to the road. Visual impacts affecting the R50 are rated therefore rated as LOW.

A preliminary assessment of overall impacts revealed that impacts (post mitigation) associated with the proposed Impumelelo EGI are of LOW significance during construction, operation and decommissioning phases, with a number of mitigation measures available.

Considering the presence of existing mining and industrial activity and proposals for other renewable energy facilities in the broader area, the introduction of new EGI in the area will result in further change in the visual character of the area and alteration of the inherent sense of place, extending an increasingly industrial character

into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommended mitigation measures. In light of this, cumulative impacts have been rated as MODERATE.

A comparative assessment of route alternatives was undertaken in order to determine which of the alternatives would be preferred from a visual perspective. No fatal flaws were identified in respect of either of the site alternatives and both alternatives were found to be Favourable from a visual perspective.

10.1.7 HERITAGE ASSESSMENT

Heritage resources were generally uncommon in the corridor and most of those found should be easily avoided. The exception is the Iron Age settlement that falls partly within the Alternative 2 Substation footprint (**Figure 10-1**). Two other potential concerns exist. One is a very low significance archaeological site that has a potential grave associated with it (**Figure 10-2**) but this should be easily avoided. The Other is a graveyard that lies right in the centre of the corridor, adjacent to a road **(Figure 10-3**). While it is best to avoid this site with a 50 m buffer, it is acknowledged that an alignment close to the public road is likely to be most feasible. As such, the powerlines may span over the 50 m buffer area but no pylon should be built within 30 m of the graveyard. It is also preferred that the powerlines do not span directly over the graveyard. With so little of the layout surveyed there is also a chance that more graves may come to light. A pre-construction survey will be very important to minimise potential impacts. Much of the overall corridors lies within ploughed lands and these are considered as being of very low sensitivity. Only sections of the final alignment located out of the ploughed lands need to receive a pre-construction survey.

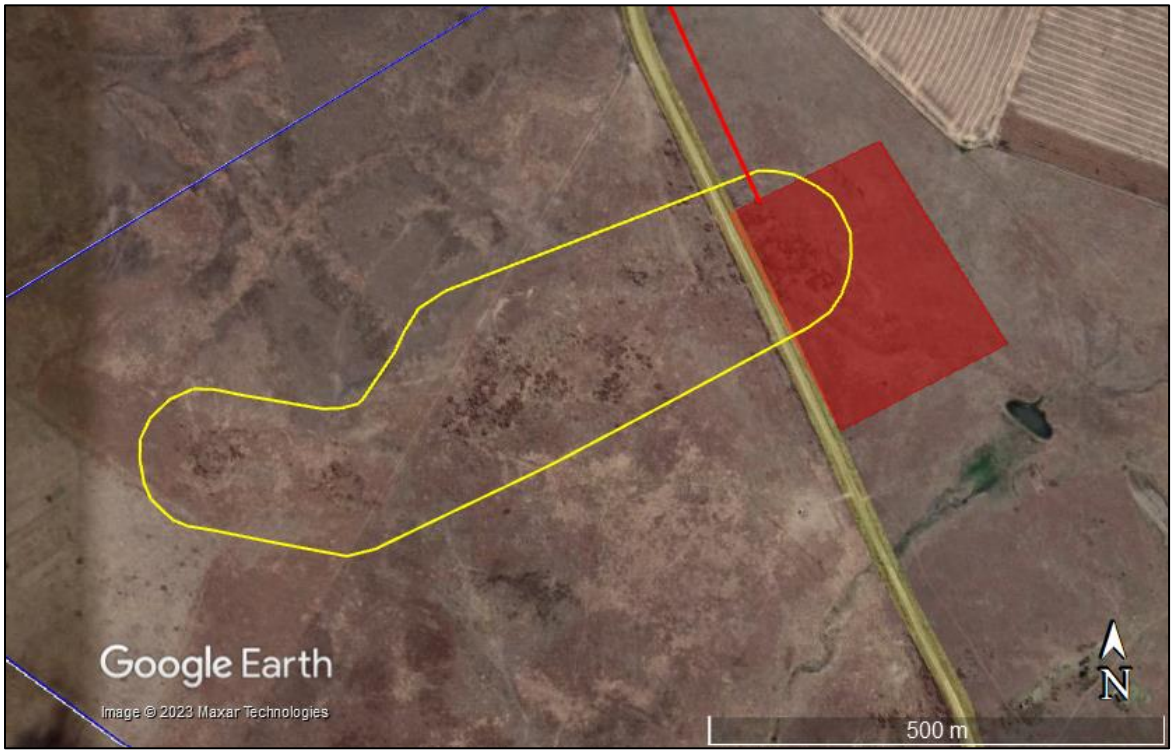


Figure 10-1: Aerial view of the vicinity of the Alternative 2 substation (red polygon) and the Iron Age settlement (yellow polygon, including buffer).

Should Alternative 2 be used, then an alternative configuration of the substation area to avoid this site will be required. Although not of high cultural significance, mitigation could be extensive due to the nature of the site and it (and its 50 m buffer as mapped in this report) is best avoided.

The expected impacts for the two alternatives vary with Alternative 1 likely to result in more significant impacts to graves along the powerline route and Alternative 2 likely to result in more significant impacts to archaeology at the substation. In sum, the Alternative 1 substation location and Alternative 2 powerline route are preferred

from a heritage point of view, but ultimately either alternative could be used with the successful application of mitigation measures.

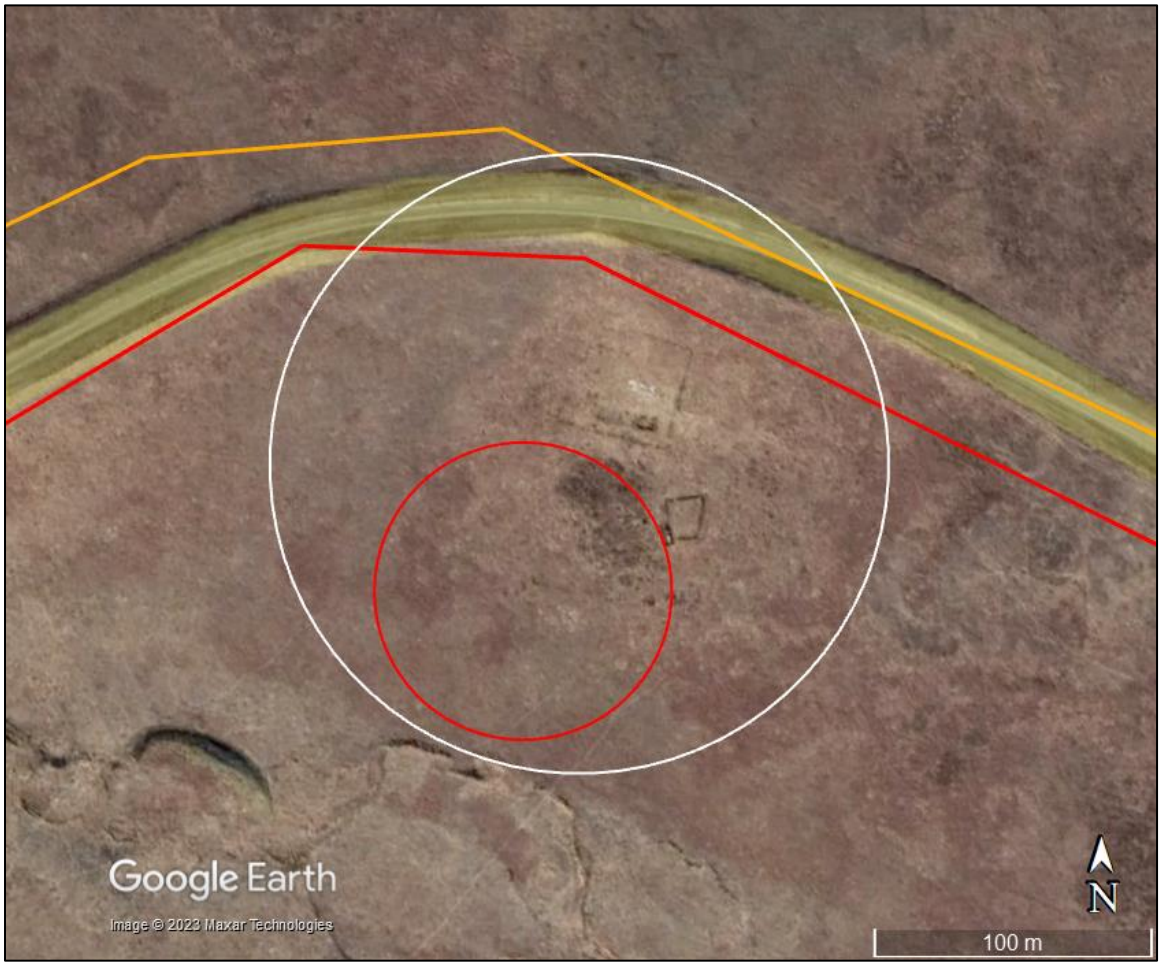


Figure 10-2: Aerial view of the area just east of the Alternative 1 substation showing the very low significance archaeological site (white circle, including buffer) and possible grave (red circle, including buffer).

Figure 10-3: Aerial view of the graveyard in the Alternative 2 corridor showing it to be very close to the corridor centre line.

Most of the two corridors is, or is likely to be, of low sensitivity. Micro-siting of infrastructure during the final EMPr approval stage will likely account for all potential impacts, although further micrositing may still be needed after the pre-construction survey. The main concerns for this project are the graveyard in the Alternative 1 corridor and the Iron Age settlement in the Alternative 2 substation footprint. It is the opinion of the heritage consultant that the proposed Impumelelo grid connection may be authorised in full with Alternative 2 being slightly preferred and on condition that layout changes are made to account for the archaeological site in the Alternative 2 substation footprint should that alternative be used.

10.1.8 PALAEONTOLOGY 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 sands and soils of the Quaternary. There is a very small chance that fossils may occur in the shales below ground of the early Permian Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the contractor, environmental officer or other responsible person once excavations for foundations and infrastructure have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, therefore as far as the palaeontology is concerned the project should be authorised. There is no preferred route and there is no no-go area.

10.1.9 SOCIAL ASSESSMENT

The benefits associated with the proposed Impumelelo WEF which include the generation for renewable energy for the mining and industrial sector are dependent upon being able to connect the Impumelelo WEF to these sectors via the establishment of grid connection infrastructure.

The findings of the SIA indicate that the significance of the potential negative social impacts for both the construction and operational phase of the proposed 132 kV Impumelelo overhead power line, substation and associated infrastructure are Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The establishment of proposed 132 kV Impumelelo overhead power line and associated infrastructure is therefore supported by the findings of the SIA.

10.2 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed powerline is provided in **Table 10-1** below.

Table 10-1: Impact Summary

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
Air Quality	Generation of Dust and PM	Construction	**Moderate**	**(-)**	**Low**	**(-)**
Noise	Noise Emissions	Construction	**Low**	**(-)**	**Low**	**(-)**
Soils, Land Capability and Agricultural Potential	Agricultural Production Potential	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
Geological	Soil Erosion	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Oil Spillage	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Disturbance of fauna and flora	Construction	**Low**	**(-)**	**Very Low**	**(-)**
	Slope Stability	Construction	**Low**	**(-)**	**Very Low**	**(-)**
	Seismic Activity	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
	Soil Erosion	Operation	**Low**	**(-)**	**Very Low**	**(-)**
	Oil Spillage	Operation	**Moderate**	**(-)**	**Very Low**	**(-)**
	Soil Erosion	Decommissioning	**Moderate**	**(-)**	**Very Low**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Oil Spillage	Decommissioning	**Moderate**	(-)	**Very Low**	(-)
	Disturbance of fauna and flora	Decommissioning	**Low**	(-)	**Very Low**	(-)
	Slope Stability	Decommissioning	**Low**	(-)	**Very Low**	(-)
Groundwater	Deterioration of Groundwater Quality	Construction	**Moderate**	(-)	**Low**	(-)
Aquatic	Changes in Water Flow Regime	Construction	**Moderate**	(-)	**Low**	(-)
	Changes In Sediment Entering And Exiting The System	Construction	**Moderate**	(-)	**Low**	(-)
	Introduction and spread of alien vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	loss and disturbance of watercourse habitat and fringe vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	Changes in water quality due to pollution	Construction	**Moderate**	(-)	**Low**	(-)
	Loss of Aquatic Biota	Construction	**Moderate**	(-)	**Low**	(-)
	Changes in Water Flow Regime	Operation	**Moderate**	(-)	**Low**	(-)
	Changes in sediment entering and exiting the system	Operation	**Moderate**	(-)	**Low**	(-)
	Introduction and spread of alien vegetation	Operation	**Moderate**	(-)	**Low**	(-)
	loss and disturbance of watercourse habitat and fringe vegetation	Operation	**Moderate**	(-)	**Low**	(-)
	Changes in water quality due to pollution	Operation	**Moderate**	(-)	**Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Loss of Aquatic Biota	Operation	**Moderate**	(-)	**Low**	(-)
Biodiversity	Clearing Natural Vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	The Loss Of Threatened, Protected & Endemic Plant Species	Construction	**Moderate**	(-)	**Low**	(-)
	Loss Of Faunal Habitat	Construction	**Moderate**	(-)	**Low**	(-)
	Direct Faunal Mortalities Due To Construction And Increased Traffic	Construction	**Moderate**	(-)	**Low**	(-)
	Increased Dust Deposition	Construction	**Low**	(-)	**Very Low**	(-)
	Increased Human Activity, Noise And Light Levels	Construction	**Moderate**	(-)	**Low**	(-)
	Establishment Of Alien Vegetation	Construction	**Moderate**	(-)	**Low**	(-)
	Establishment Of Alien Vegetation	Operation	**Low**	(-)	**Very Low**	(-)
	Faunal Mortalities	Decommissioning	**Very Low**	(-)	**Very Low**	(-)
	Increased Dust Deposition	Decommissioning	**Low**	(-)	**Very Low**	(-)
	Establishment Of Alien Vegetation	Decommissioning	**Low**	(-)	**Very Low**	(-)
Avifauna	Displacement due to disturbance associated with the construction	Construction	**Moderate**	(-)	**Low**	(-)
	Displacement due to habitat transformation associated with the construction	Construction	**Moderate**	(-)	**Low**	(-)
	Mortality of priority species due to collisions	Operation	**High**	(-)	**Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Electrocution of priority species on the on-site substation infrastructure	Operation	**High**	**(-)**	**Low**	**(-)**
	Displacement of priority species due to disturbance associated with decommissioning of the on-site substation and 132kV overhead power line	Decommissioning	**Moderate**	**(-)**	**Low**	**(-)**
Visual	Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure	Construction	**Low**	**(-)**	**Low**	**(-)**
	Potential visual impact on sensitive visual receptors located during the operational phase	Operation	**Low**	**(-)**	**Low**	**(-)**
	Potential visual impact on sensitive visual receptors located during the decommissioning phase	Decommissioning	**Low**	**(-)**	**Low**	**(-)**
Heritage	Impacts to Archaeological resources (Alt 1)	Construction	**Very Low**	**(-)**	**Very Low**	**(-)**
	Impacts to Archaeological resources (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to Graves (Alt 1)	Construction	**Moderate**	**(-)**	**Very Low**	**(-)**
	Impacts to Graves (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape (Alt 1)	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape (Alt 2)	Construction	**Low**	**(-)**	**Low**	**(-)**
	Impacts to the Cultural Landscape	Operation	**Moderate**	**(-)**	**Moderate**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Impacts to the Cultural Landscape	Decommissioning	**Moderate**	**(-)**	**Low**	**(-)**
Palaeontology	Impacts on palaeontological resources	Construction	**Moderate**	**(-)**	**Very Low**	**(+)**
Socio-economic	Creation of employment and business opportunities during the construction phase	Construction	**Low**	**(+)**	**Moderate**	**(+)**
	Potential impacts of Construction Workers On Local Communities	Construction	**Low**	**(-)**	**Low**	**(-)**
	Potential risk to safety, livestock and damage to farm infrastructure associated with the presence of construction workers on site	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Potential noise, dust and safety impacts associated with movement of construction related activities and movement of traffic to and from the site	Construction	**Low**	**(-)**	**Low**	**(-)**
	Potential impact of increased risk of veld fire	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Potential impacts associated with the loss of farm land	Construction	**Moderate**	**(-)**	**Low**	**(-)**
	Development of infrastructure to improve energy security and support the renewable sector	Operation	**Moderate**	**(-)**	**Moderate**	**(+)**
	Creation Of Employment And Business Opportunities	Operation	**Low**	**(+)**	**Low**	**(+)**
	Generate Income For Affected Landowners	Operation	**Low**	**(+)**	**Moderate**	**(+)**
	Visual Impact And Impact On Sense Of Place	Operation	**Moderate**	**(-)**	**Low**	**(-)**

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Land Uses And Farming Operations	Operation	**Moderate**	**(-)**	**Low**	**(-)**
	Impact On Farming Operations During Maintenance	Operation	**Moderate**	**(-)**	**Low**	**(-)**

10.3 ALTERNATIVES ASSESSMENT

Table 10-2 outlines the alternative preferences resulting from the various specialist studies.

Table 10-2: Specialist Alternative Preferences

SPECIALIST STUDY	COMMENT	PREFERENCE
Agriculture and Soils	Because of the insignificant agricultural impact of the powerline, there can be no material difference between the agricultural impacts of any of the alternative powerline routes. All proposed route alternatives are considered equally acceptable in terms of agricultural impact. In terms of the substation site, both alternatives are considered equally acceptable in terms of agricultural impact	***Powerline:*** – No preference ***Substations:*** – No preference
Geotechnical	The two grid servitude options do not have differing geotechnical conditions and as such the one assessment applies to both options. This also results in there being no preferred options between Option 1 and Option 2 with respect to the geotechnical impact assessment. Both alternatives are favourable.	***Powerline:*** – No preference ***Substations:*** – No preference
Freshwater	Gridline Alternative 1 (Preferred): The proposed powerline will be approximately ~33 km and will connect to the Impumelelo GRIDLINE to the Zandfontein Substation via the onsite substation located on portion 5/543 of Farm Platkop (preferred substation – Option 1). This alternative spans over existing road and farm boundaries. The preferred pylon and powerline will be 132 kV Intermediate Self-Supporting single circuit or double circuit. The powerline will have a 500m (250m on either side of center line) assessment corridor to allow or micro-siting. Gridline Alternative 2: The proposed powerline will be approximately ~34 km and will connect to the Impumelelo GRIDLINE to the Zandfontein Substation via the onsite substation located on portion 0/544 of Farm Mahemsfontein. This alternative spans across the GRIDLINE around the Carmona Substation thereafter following the existing road and farm boundaries.	***Powerline:*** – No Preference ***Substation:*** – Option 1

SPECIALIST STUDY	COMMENT	PREFERENCE
	The preferred pylon and powerline will be 132 kV Intermediate Self-Supporting single circuit or double circuit. The powerline will have a 500m (250m on either side of center line) assessment corridor to allow for micro-siting.	
Biodiversity	There is no preferred option regarding the gridline route. Large sections of the power line routes, especially in the south, have been delineated as CBAs. Both the on-site substations are located partially or fully in CBAs and should be repositioned even though the habitat of substation 1 (SS1) had a medium sensitivity and substation 2 (SS2) had a low sensitivity in our current assessment	***Powerline:*** — Option 1 ***Substation:*** — Option 2
Avifauna	There is no material difference between the avifaunal impacts of any substation alternative or OHPL route alternatives	***Powerline:*** — No preference ***Substation:*** — No preference
Visual	A comparative assessment of route alternatives was undertaken in order to determine which of the alternatives would be preferred from a visual perspective. No fatal flaws were identified in respect of either of the site alternatives and both alternatives were found to be Favourable from a visual perspective.	***Powerline:*** — No preference ***Substation:*** — No preference
Heritage	It is recommended that the proposed Impumelelo grid connection be authorised with either alternative, although Alternative 2 is marginally preferred	***Powerline:*** — Option 2 ***Substation:*** — No preference
Socio-economic	Based on the findings of the SIA, Alternative 1 is the preferred Alternative. Proponent should liaise with owner of Holgatsfontein 535/6 (Mr Botha) to identify a suitable alignment for Alternative 1 within the assessment corridor. An alignment within the assessment corridor located to the south of the coal conveyor line and west of the R50 for the shared section of the Alternative 1 and 2 should be investigated.	***Powerline:*** — Option 1 ***Substation:*** — No Preference

Based on the table above, it can be concluded that the OHPL Alignment Option 1 and the onsite substation Option 1 can be considered preferred.

The preferred route and proposed onsite substations are illustrated in **Figure 10-4** and the co-ordinates are included in **Table 10-3**.

Table 10-3: Co-ordinates of the preferred route and associated infrastructure

POINT	CO-ORDINATES	
OHPL Option 1 (Preferred)		
Start	029° 02' 41.65425960" E	26° 30' 17.52291720" S
1	029° 02' 45.01785480" E	26° 30' 15.09085080" S

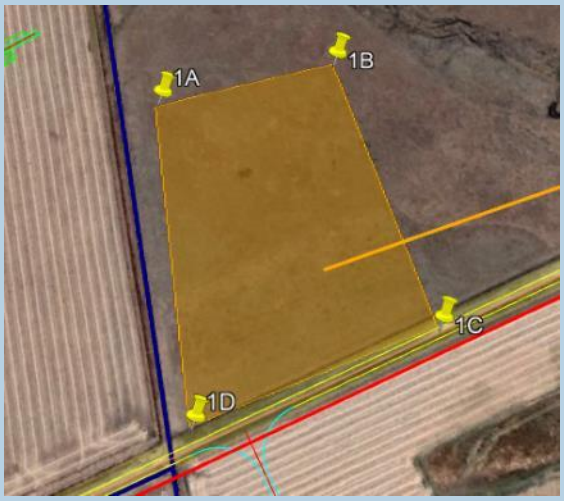
POINT	CO-ORDINATES	
2	029° 02' 42.86016960" E	26° 30' 12.95731800" S
3	029° 02' 07.99231920" E	26° 30' 31.68164160" S
4	029° 02' 01.01356440" E	26° 30' 32.27142960" S
5	029° 01' 47.02735560" E	26° 31' 28.71467040" S
6	029° 01' 31.18888200" E	26° 32' 06.37495440" S
7	029° 01' 05.29572720" E	26° 32' 23.07176160" S
8	029° 01' 22.98662400" E	26° 33' 11.04416640" S
9	029° 01' 31.96424280" E	26° 33' 42.30678600" S
10	029° 00' 52.50463920" E	26° 34' 09.12281880" S
11	028° 59' 31.10848080" E	26° 36' 31.39841520" S
12	028° 57' 05.27640480" E	26° 36' 33.19539840" S
13	028° 56' 19.01889240" E	26° 36' 39.92953680" S
14	028° 55' 23.03872320" E	26° 36' 54.88315920" S
15	028° 54' 37.13172480" E	26° 37' 12.68153400" S
16	028° 53' 16.38232440" E	26° 37' 56.11422720" S
17	028° 53' 59.83001520" E	26° 39' 10.80152640" S
18	028° 52' 13.59053400" E	26° 39' 55.89081000" S
19	028° 51' 32.25719520" E	26° 39' 37.93635360" S
End	028° 51' 09.31781880" E	26° 39' 46.11756600" S
Impumelelo Substation - Option 1 (Preferred)		
		
1A	28°51'3.65"E	26°39'41.79"S
1B	28°51'8.98"E	26°39'40.13"S
1C	28°51'12.98"E	26°39'47.54"S
1D	28°51'5.89"E	26°39'50.84"S

Figure 10-4: Preferred Impumelelo OHPL Alignment

10.4 RECOMMENDATIONS

The following key aspects are recommended to be included as conditions of authorisation:

- The layouts submitted in the Final BAR are not finalised. The final layouts are to be submitted to the MDARDLEA for approval prior to construction;
- The site-specific EMPr submitted in the Final BAR is to be approved.. The EMPr is to be updated to include the final layout map once finalised and approved by MDARDLEA.
- The EMPr and BAR mitigation measures must be adhered to;
- Recommendations for the layout as provided by the relevant specialists must be implemented as far as possible;
- 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 Mpumalanga Natura Conservation Act (No. 10 of 1998) must be obtained before commencement; and
- Where required, water use authorisation under NWA is to be obtained from the DWS prior to construction.
- It is recommended that the footprint of each pylon be assessed with a walk down when available to give input into placing where possible outside of watercourses and watercourse buffer zones.
- A flora and fauna search and rescue should be undertaken before any vegetation clearing
- The habitats that are designated as having an elevated sensitivity should be avoided as far as is technically possible.

- It is recommended that monitoring in terms of wetland PES as well as biomonitoring be conducted to consider the cumulative impacts of the proposed Vhuvhili SEF, Impumelelo WEF (subject to separate applications) as well as the gridline solution. Monitoring should be conducted in both the construction and operational phases of the project.
- It is imperative that an AIS plant management plan be developed, prior to the construction phase. Clearing and/treatment of these species occurs prior to any construction activities which will curb the spread of AIS plants due to the disturbance events caused by construction.
- Implement a monitoring program for the early detection of alien invasive plant species.
- Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on species and habitats of conservation concern.
- Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation.
- Avoid or minimise impacts that could potentially affect animal behaviour.
- Trenches should not be left open for long periods of time. Trenches should regularly be inspected for the presence of trapped animals.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site.
- Speed limits should be strictly adhered to.
- Dust control measures should be implemented.
- Permits have to be obtained for the removal of Mpumalanga protected species
- Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.
- The authorised alignment must be inspected by an avifaunal specialist by means of a “walk-through” inspection i.e., through a combination of satellite imagery supplemented with in situ inspections by vehicle and where necessary, on foot, once the pole positions have been finalised. The objective would be to demarcate the sections of the powerline that need to be fitted with Bird Flight Diverters.
- Once the relevant spans have been identified, Bird Flight Diverters must be fitted according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung;
- The only micro-siting aspect that requires checking is that all pylons have been located outside of or on the edges of cropland where possible, so that they minimise interference with crop production. This can only be checked during the final micro-siting walk-through exercise that occurs after Environmental Authorisation and prior to construction.
- The Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development;
- If Alternative 1 is used then no pylons may be placed within 30 m of the IM001 graveyard falling within the corridor;
- The powerlines may span over the IM001 graveyard buffer but should preferably not pass over the site itself;
- The potential grave at IM004 should be avoided;
- A pre-construction survey needs to be undertaken on all unploughed sections of the final layout;
- No stones may be removed from any archaeological site; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
- All proposed mitigation measures includes in this BA Report and in the site specific and generic EMPRs (**Appendix G**) must be implemented in order to reduce possible impacts to an acceptable level.

10.5 CONCLUSION AND AUTHORISATION OPINION

The overall objective of the BA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed Project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for MDARDLEA to make an informed decision for the environmental authorisation being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the site specific and generic EMPRs (**Appendix G**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the environmental aspects is expected to be low. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires “where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised” must be included in the BA Report.

The EA is required for a period of 10 years from the date of issuance of the EA to the end of the construction period (including rehabilitation), when the proposed activities applied for are completed. This is a reasonable period as it allows Impumelelo WEF to conduct its internal processes which can only begin after issuance of the EA, when the proposed route is confirmed.

11 WAY FORWARD

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 BA 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. This report will be subjected to a public review period in line with NEMA EIA Regulations, 2014 as amended. Outcomes of all comments received from the public review period will be recorded and responded to in the Final BAR. Based on the environmental description, specialist surveys as well as the stakeholder engagement undertaken to date, a detailed impact assessment was undertaken and, where relevant, the necessary management measures have been recommended.

In summary, the BA process assessed both biophysical and socio-economic environments and identified appropriate management and mitigation measures. The biophysical impact assessment revealed that there are no moderate or major environmental fatal flaws and no significant negative impacts associated with the proposed Project should mitigation and management measures be implemented. In addition, it should be noted that there are positive (albeit limited) socio-economic impacts associated with the Project.

The Draft BAR (this report) will be made available for public review from **23 March 2023** and **25 April 2023**. All issues and comments are to be submitted to WSP to the contact provided below. All comments received will be incorporated in the Comments and Response Report (CRR) which will be attached as an appendix to the Final BAR.

The Draft BAR will be submitted to the competent authorities. It is the opinion of WSP that the information contained in this document is sufficient for the MDARDLEA to make an informed decision for the EA being applied for in respect of this Project.