PROPOSED 132kV NAOS GRID CONNECTION TO MERCURY SUBSTATION IN FREE STATE PROVINCE

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DOCUMENT CONTROL

Project title	Specialist Avifaunal Assessment for Proposed 132kV Naos Powerline Grid Connection to Mercury Substation in Free State Province
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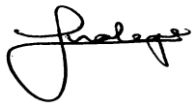
Primary author	Mokgatla Molepo (MSc. Zoology) *Pr. Nat. Sci*. (009509) 
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SPECIALIST INFORMATION AND LEGAL REQUIREMENTS

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6):

The details of -	
○ the specialist who prepared the report; and	Page 10
○ the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 10-11
A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 12
An indication of the scope of, and the purpose for which, the report was prepared;	Page 9
○ An indication of the quality and age of base data used for the specialist report;	Page 26
○ A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Page 37
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Page 35
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Page 35
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Page 17
An identification of any areas to be avoided, including buffers;	Page 20
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Page 20
A description of any assumptions made and any uncertainties or gaps in knowledge;	Page 9
A description of the findings and potential implications of such findings on the impact of the proposed activity, or activities;	Page 24
Any mitigation measures for inclusion in the EMPr;	Page 24-28
Any conditions for inclusion in the environmental authorisation;	Page 30
Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Page 30
A reasoned opinion-	Page 29
○ whether the proposed activity, activities or portions thereof should be authorised;	Page 29
○ regarding the acceptability of the proposed activity or activities; and	Page 29
○ if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Page 29

A description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
Any other information requested by the competent authority.	Not applicable
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

EXECUTIVE SUMMARY

Project background

In South Africa birds are faced with two major problems when it comes to electricity structures. Those are electrocution and collision.

MORA Ecological Services (Pty) Ltd was appointed by SOLA Group to conduct an avifaunal impact assessment for the proposed 132 kV Transmission line. There is a proposed Naos Solar PV Project, which will have a grid connection line from the three solar facilities to the nearest Eskom Mercury substation. The site is approximately 24 km north of the town of Viljoenskroon and is located in Ward No. 22 of the Moqhaka Local Municipality, in the Fezile Dabi District Municipality, Free State province. The local municipality coordinates are 27º12' 55.69" South and 26°58' 51.56" East. The proposed powerline is accessible via the existing R59, R501 and S643 roads.

No no-go areas are applicable to the project site from an avifaunal perspective. Should the proposed activity not proceed, due to other specialist studies, the site will remain unchanged and will continue to be used for agricultural purposes.

Currently there are six alternative/options for the overhead lines with the following lengths; Alternative 1A – up to 8km, Alternative 1B (technically preferred) – up to 8km, Alternative 1C up to 8km, Alternative 2 – up to 7km, Alternative 3 up to 7km, and Alternative 4 up to 7.5km.

Avifaunal community

More than 500 bird species are known to occur in the Free State province. Birds of greatest potential relevance and importance with regard to possible impacts of the proposed powerline and associated infrastructure are likely to be local populations of endemic passerines, resident or migrant large bodied raptors, waterbirds and other terrestrial birds. The overall avifaunal species occurring at the proposed development site are dominantly represented by chats, swifts, pipits, kites, martins, wagtails, lapwings, herons and cisticolas. One bird species of priority, the Black-winged Kite *Elanus caeruleus* was encountered during the powerline surveys.

Impacts and mitigations for Naos 132kV Powerline.

<u>Loss of priority avian species from important habitats</u>

Rated Negative medium impact (environmental significance = 42) but can be reduced to Negative low impact (environmental significance = 16) with effective implementation and ongoing monitoring of required mitigations as specified;

<u>Loss of resident avifauna through increased disturbance</u>

Rated Negative medium impact (environmental significance = 36) but can be reduced to Negative low impact (environmental significance = 16) with effective implementation and ongoing monitoring of required mitigations as specified;

Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats.

Rated Negative medium impact (environmental significance = 45) but can be reduced to Negative low impact (environmental significance = 20) with effective implementation and ongoing monitoring of required mitigations as specified;

Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity.

Rated Negative medium impact (environmental significance = 36) but can be reduced to Negative low impact (environmental significance = 18) with effective implementation and ongoing monitoring of required mitigations as specified;

Cumulative impacts of the above.

The cumulative and residual impacts should be prioritised. With the effective implementation and ongoing monitoring of required mitigations as specified, all potential impacts for the 132 kV powerline will remain on Negative low impact environmental significance.

Impact statement

Despite some residual and cumulative impacts, there is no objection for the proposed 132kV powerline from an avifaunal perspective. However, Option 2, 3 and 4 are the most recommended due to few water crossings and lengths. Overall, the avifaunal sensitivity of the study area was regarded as Low-Medium around majority of the habitats. With the exception of the water crossings. With proper mitigations as recommended in this report, impacts can be reduced to Low.

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TERMS OF REFERENCE

MORA Ecological Services (Pty) Ltd was requested by SOLA Group to conduct a specialist avifaunal assessment towards their pursuit of obtaining the requisite environmental authorisations for the proposed Naos 132kV powerline. The critical objective of this specialist avifaunal assessment is to determine the bird species community and the potential impacts the proposed powerline may have on avifauna species. The following tasks were undertaken by MORA Ecological Services (Pty) Ltd to achieve the assessment objective:

- Site visits to identify the avian habitats associated with the proposed powerline;
- Field data collection to define the current avifauna community within the development site and the identification of Red Data and/or endemic species which could potentially be affected by the proposed powerline and associated infrastructure;
- Integration of the site data collected (species counts) and the Southern African Bird Atlas Project 2 avian atlases to develop a comprehensive avifaunal database likely to be present within the development footprint;
- Identify potential negative impacts on the avifaunal diversity and species composition at the site of the proposed powerline and assess the significance of these impacts;
- To provide recommendations and mitigation measures for the potential impacts in order to avert or lower their significance on the avifaunal diversity and species composition.

The survey was conducted throughout all identified habitats using various methods i.e. walked transects, vehicle drive transects, powerline inspection and the fixed point survey.

ASSUMPTIONS, LIMITATIONS, UNCERTAINITIES AND GAP ANALYSIS

- The findings, results, observations, conclusions and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the potential impacts on terrestrial environment.
- It was assumed that a two season survey with a total of five days of fieldwork would be near sufficient for assessing available habitats for birds of conservation concern.
- MORA Ecological Services (Pty) Ltd relied on Environamics, as the EAP, to supply correct information on the site locality and extent, as well as project details which were assumed to be correct.
- It was assumed that the information contained in existing databases, reports and publications is correct.
- MORA reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

SPECIALIST DETAILS, CURRICULUM VITAE AND DECLARTION

The surveys and assessment were undertaken by Mokgatla Jerry Molepo, a competent avifaunal specialist and Director of MORA Ecological Services (Pty) Ltd.

Curriculum vitae

EDUCATION:

- MSc Zoology, Nelson Mandela University (Percy FitzPatrick Institute of African Ornithology Centre of Excellence)

Research Project Topic: Foraging behaviour and thermal physiology in Cape Sugarbirds: sex-specific responses to temperature.

- BSc Honours in Zoology, University of Limpopo

Research Project Topic: Morphometrics and plumage variation in the South African Fiscal flycatcher *Sigelus silens* Shaw 1809.

- BSc Botany & Zoology, University of Venda
- Grade 12, Marobathota High School

CERTIFICATES:

- SASS5 Aquatic Biomonitoring, GroundTruth
- Hydropedology and Wetland Functioning, Terra Soil Science & Water Business Academy
- Section 21 (c) & (i) Water Use Authorisation Training, Department of Water and Sanitation
- Basic Project Management, Hudisa Business School

PROFESSIONAL MEMBERSHIP:

- South African Council for Natural Scientific Professions (SACNASP) – Professionally registered as Professional Natural Scientist. **Registration number:** 009509
- British Ecological Society (BES). **Membership number**: 1010709
- Zoological Society of Southern Africa (ZSSA). **Membership number**: 691

WORK EXPERIENCE:

- MORA Ecological Services (Pty) Ltd: April 2018 – Current, I am an Environmental Specialist, and my duties include; (i) Conducting Biodiversity, Aquatic Impact Assessments, Rehabilitation (ii) Compilation of specialist reports.
- Arcus Consulting: May - November 2017, I was a subcontracted avifaunal surveyor for the proposed Highlands Wind Energy Farm, Somerset East, Eastern Cape.
- Centre for African Conservation Ecology (ACE), Nelson Mandela University: 2015 - 2016, I was a field guide/ environmental educator. Responsibilities: taking school learners on trial walks inside the Nelson Mandela University Nature Reserve.
- South African National Biodiversity Institute (SANBI): May – December 2014, I was a Zoological Systematics Technician. Responsibilities: (i) Insect identification and curation, and (ii) compiling

the animal checklist of South Africa, (iii) Sourcing wildlife crime reports on endangered animals and plants for Barcode of Wildlife Project, (iv) Monitoring the bird population in the Botanical Garden.

- Department of Zoology, University of Venda: 2009 – 2013, I was a Research Assistant under Dr. T.C Munyai who was conducting a long-term research project which monitored the effects of climate change on biota and processes influencing ecosystem functioning and species diversity patterns.
- Percy FitzPatrick Institute of African Ornithology: March – April 2014, I was a Research Assistant under Dr. Rita Covas' Sociable Weaver Research Project. This is a long-term study which looks at the reproductive success of Sociable weavers at Benfontein Nature Reserve in Kimberley.

Key experience in specialist projects

Year	Project	Location:	Role(s)
2022	Avifaunal Impact Assessment for the proposed 132kV for Musina-Makhado Special Economic Zone North Site	Musina, Limpopo	Avifaunal Specialist/Ornithologist
2022	Avifaunal Impact Assessment for the proposed Khauta PV Solar including 44kV and 132kV Powerline	Welkom, Free State	Avifaunal Specialist/Ornithologist
2022	Preconstruction Avifaunal Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline	Lichtenburg, North West	Avifaunal Specialist/Ornithologist
2022	Preconstruction Botanical Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline	Lichtenburg, North West	Ecologist
2022	Biodiversity Assessment, Land Capability and Veld Condition Assessment for PPC Cement SA Slurry	Slurry, North West	Ecologist
2021	Avifaunal Impact Assessment for the proposed Upington-Aries 2x 400kV	Upington, Northern Cape	Avifaunal Specialist/Ornithologist
2021	Habitat Assessment Post Rehabilitation for PPC Cement SA Dwaalboom Factory	Dwaalboom, Limpopo	Ecologist
2021	Habitat Assessment Post Rehabilitation for Gibson Bay Wind Energy Farm	Humansdorp, Eastern Cape	Ecologist
2021	Wetland Rehabilitation for the sewer pipeline construction in Daveyton	Ekurhuleni East College Campus, Daveyton, Gauteng	Wetland Ecologist
2021	12 Months Wetland Rehabilitation Supervision for Ekangala Ext F Waterborne Sanitation Project	City of Tshwane Metropolitan Municipality, Ekangala, Gauteng	Aquatic Ecologist

DECLARATION BY THE SPECIALIST

I, Mokgatla Jerry Molepo , declare that:

• I act as the independent specialist in this application;

• I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

• I declare that there are no circumstances that may compromise my objectivity in performing such work;

• I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

• I will comply with the Act, Regulations and all other applicable legislation;

• I have no, and will not engage in, conflicting interests in the undertaking of the activity;

• I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

• all the particulars furnished by me in this form are true and correct; and

• I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

MORA Ecological Services (Pty) Ltd

Name of Company

18/01/2023

Date

INTRODUCTION

Proposed Development

Electricity supply is an essential service for South Africa's society and economy. In South Africa birds are faced with several problems when it comes to electricity structures. Those are electrocution and collision.

When it comes to interaction of birds with powerlines, birds are categorised as follows:

- Streamers
- Collision
- Electrocution
- Insulator Pollution
- Nesting

Electrocution: Birds perching on towers/conducting cables are killed if they cause short circuits.

Collision: In flight, birds can collide into the powerlines because powerlines are difficult to perceive as obstacles.

The risk of collisions in majority of the birds is increased by body size and limited manoeuvrability (Alonso & Alonso. 1999).

MORA Ecological Services (Pty) Ltd was appointed by SOLA Group to conduct an avifaunal specialist assessment and Environamics (hereafter referred to as the EAP) to undertake a full Scoping and Environmental Impact Assessment for the proposed 132 kV Powerline. The proposed powerline is located approximately 24 km north of the town of Viljoenskroon. The site is located in Ward No. 22 of the Moqhaka Local Municipality, in the Fezile Dabi District Municipality, Free State province. The local municipality coordinates are 27º12' 55.69" South and 26°58' 51.56" East.

SITE DESCRIPTION

Figure 1 shows the exact extent of the proposed 132kV Naos powerline. All proposed lines will run through farm lands and municipal roads. There are currently six options for the 132kV route, and they are as follow:

Power Line Option 1A – up to 8km

Power Line Option 1B (technically preferred) – up to 8km

Power Line Option 1C – up to 8km

Power Line Option 2 – up to 7km

Power Line Option 3 – up to 7km

Power Line Option 4 – up to 7.5km.

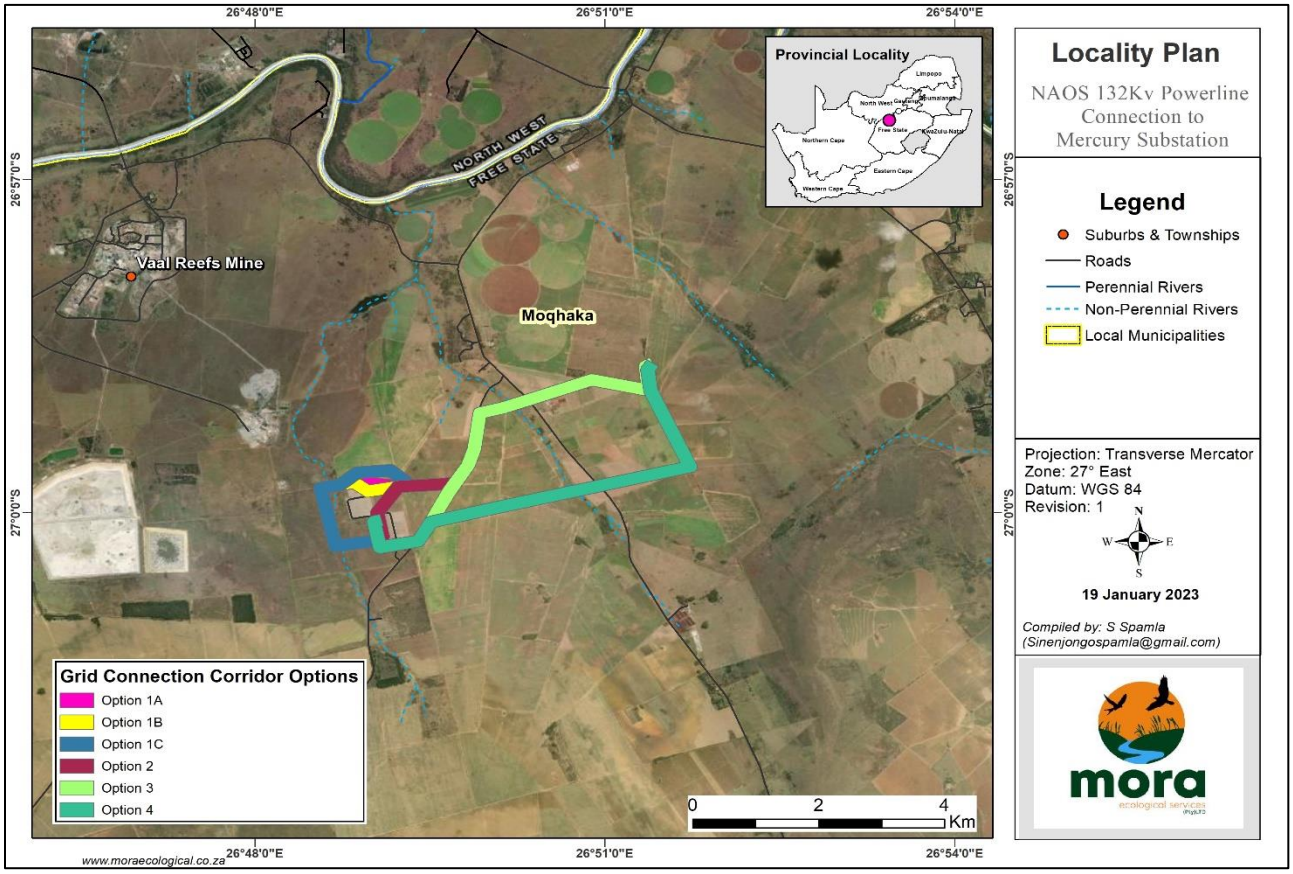

Figure 1. Locality map of the proposed development area.

Vegetation

The geographic region of the proposed Naos powerline falls on the Grassland biome (Figure 2). The broad ecological of the Fezile Dabi District Municipality is represented by grassland ecosystems with seven vegetation types. The original vegetation is classified as Vaal-vet Sandy Grassland, forming part of the Dry Highveld Grassland Broad Vegetation Unit. The Dry Highveld Grassland Bioregion has a total area of 117 753 km^2 and approximately 32 717 km^2 (31.51%) of it already transformed (Carbutt et al., 2011). Mucina and Rutherford (2006) noted the bioregion to be dominated by semi-arid sweetveld that is drought-

adapted and shows a significant amount of reproduction from seed. Plants in the Dry Highveld Grassland persist vegetatively from year to year and new plants establish after droughts from dormant seeds. Hence, most of the geographic area has been transformed for agricultural activities.

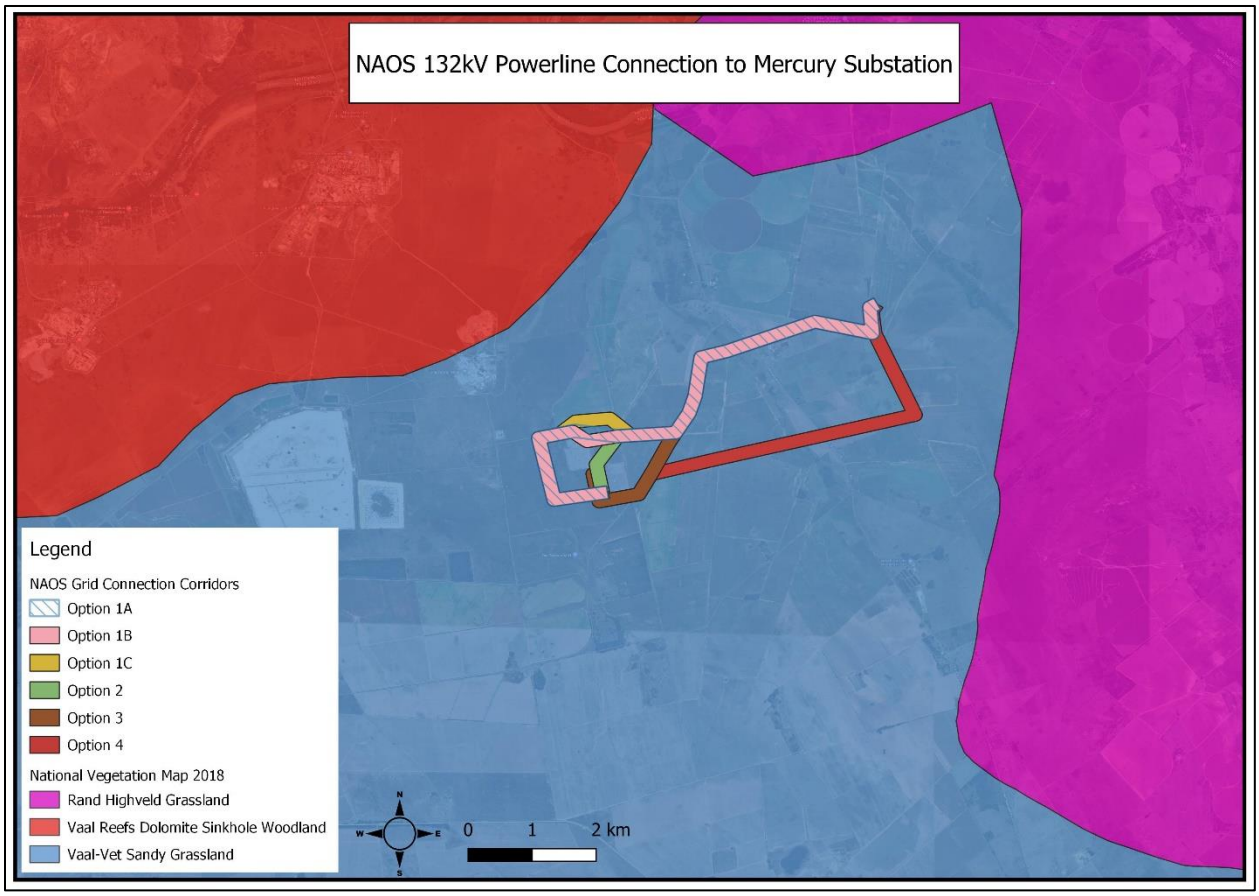

Figure 2. Vegetation map relative to the proposed powerline.

Geology

The Vaal River forms the northern boundary of the project area, flowing from east to west. The geology of the region is made up of dolomite, stromatolitic, interbedded chert, minor carbonaceous shale, limestone and quartzite o the Malmani Subgroup. The topography of the region is classified as plains and pans and no hills or outcrops are known to exist in the vicinity of the project area as shown in the photograph (Figure 3) below.

Figure 3. Photograph of the assessment area taken during field surveys.

Climate

The proposed development area is characterized by cold and frosty winters, with low and highly variable summer rainfalls. Rainfall is strongly seasonal, resulting to a low mean annual precipitation ranging between 400 to 500 mm. The highly variable summer rainfalls are evident on the drier parts of the region, i.e. towards the eastern region of the Dry Highveld Grassland. The area is therefore a semi-arid ecosystem.

Land-use

A majority of the Moqhaka Local Municipality is leased by local farmers and is used for agriculture (i.e. grazing and crop production). The area is particularly important for growing maize and is a rangeland for sheep and cattle. A smaller percentage of the area is notably important for gold mining activities, which all together improve the socio-economic state of the Moqhaka Local Municipality.

LEGAL FRAMEWORK RELATING TO AVIFAUNA AND PROPOSED DEVELOPMENT

International law and conventions

The importance of sustainable development and the protection of environmental resources have globally become a driving factor in the construction of new legislation governing industrial practices and their impact on the environment. South Africa has signed and ratified a number of global treaties, protocols and conventions, agreeing to implement the policies, which endorse sustainable development and promote a positive environmental legacy for future generations. A considerable international convention to which South Africa is in agreement with in signatory is namely the Convention on Biological Diversity (CBD). The CBD is notably the key international convention for sustainable development. The CBD has three main objectives which lead and encourage a sustainable future. These are:

- The conservation of biological diversity;
- The sustainable use of its components; and
- The fair and equitable sharing of the benefits from the use of genetic resources.

Although the convention does not include specific recommendations or guidelines pertaining to birds and powerline infrastructure interactions and impacts, it does make provisions for sustaining and restoring biodiversity. The convention covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business and culture.

South African Constitution

The foundation of South Africans Environmental law is set in the Constitution of the Republic of South Africa (1996), specifically “Chapter 2- The Bill of Rights: section 24”. This has allowed for the rapid development of environmentally based legislations which guard, enforce and guide all parties to maintain the human rights granted in the Constitution. These rights include:

- The right to an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management Act (NEMA)

The National Environmental Management Act (NEMA), Act 107 of 1998 is the fundamental environmental legislation which aims to strengthen the rights granted in the South African Constitution. The NEMA Act is the foundation of environmental law in South Africa and has set the framework for additional legislation to build on. The Act establishes principles for decision-making on environmental matters, as well as providing motive for institutions which promote cooperative governance, and which can coordinate environmental

action plans. Section 2(4) specifies that sustainable development requires the consideration of all relevant factors. In the regard to biodiversity and South Africa's ecological integrity, development should not result in the disturbance of ecosystems and loss of biological diversity, if not possible, these effects must be minimised and remedied. A low-risk, cautious approach should always be applied, considering limits of current knowledge concerning consequences and actions. Always anticipate possible negative impacts on the environment and people's environmental rights, identified impacts should be prevented and where they cannot be altogether prevented, are minimised and mitigated. Outlined NEMA principles with regard to biodiversity are to:

- Prevent pollution and ecological degradation.
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management of Biodiversity Act (NEMBA)

The National Environmental Management of Biodiversity Act (NEMBA) Act 10 of 2004 was designed to provide a management and conservation outline for biological diversity, as drafted under the NEMA. NEMBA focuses on the management and conservation of biodiversity, with its relevant components, which includes the use of indigenous biological resources in a sustainable manner, the fair and equitable sharing of benefits arising from bio-prospecting, cooperative governance in biodiversity management and conservation within the structures of NEMA. The Act, in protecting biodiversity, deals with the protection of threatened ecosystems and species, the control of alien invasive species, genetically modified organisms and regulates bio-prospecting. As with NEMA, NEMBA incorporates and gives effect to international agreements relating to biodiversity. The Act gives the Minister of Environmental Affairs, Forestry and Fisheries the power to categorise any process or activity in a listed ecosystem, as a threatening process, thereafter, be regarded as an activity contemplated in Section 24(2) (b) of NEMA which states that: Specified activities may not be commenced without prior authorisation from the Minister or MEC and specify such activities. NEMBA is the most prominent statute containing provisions directly aimed at the conservation of birds with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). The NEMBA Regulations on Threatened or Protected Species (TOPS, 2007) lists all of the species (including avian) that are threatened with extinction and therefore, nationally protected under an approach to sustainable use and development. Periodically, Red Data books are published, and the data used to update these lists of protected species.

Norms, Guidelines and Standards

BirdLife South Africa compiled the Best Practice Guidelines on Birds and Solar Energy to guide the assessment and monitoring of the impact of solar generating facilities on birds in South Africa. This guideline has been followed as far as possible in the compilation of this report.

BASELINE DESCRIPTION OF THE AVIFAUNAL COMMUNITY

SABAP2 data

The Second South African Bird Atlas Project 2 (SABAP2), a continuous initiative of the Animal Demography Unit of the University of Cape Town, was consulted or data collected for the pentads in which the site is situated. SABAP2 is the second bird atlas project that was initiated in July 2007. SABAP2 was designed to run indefinitely with the aim to create valuable long-term dataset for southern Africa. The objective of the SABAP2 project is to accurately provide specified information on bird distributions, taken over a period of years. The proposed powerline is located in three pentads (Figure 4). One pentad occupies approximately 7,700 Ha. The pentad covers greater avian diversity and comprises priority habitats (waterbodies), which will substantially increase the species counts. These species counts should not be expected for the development site.

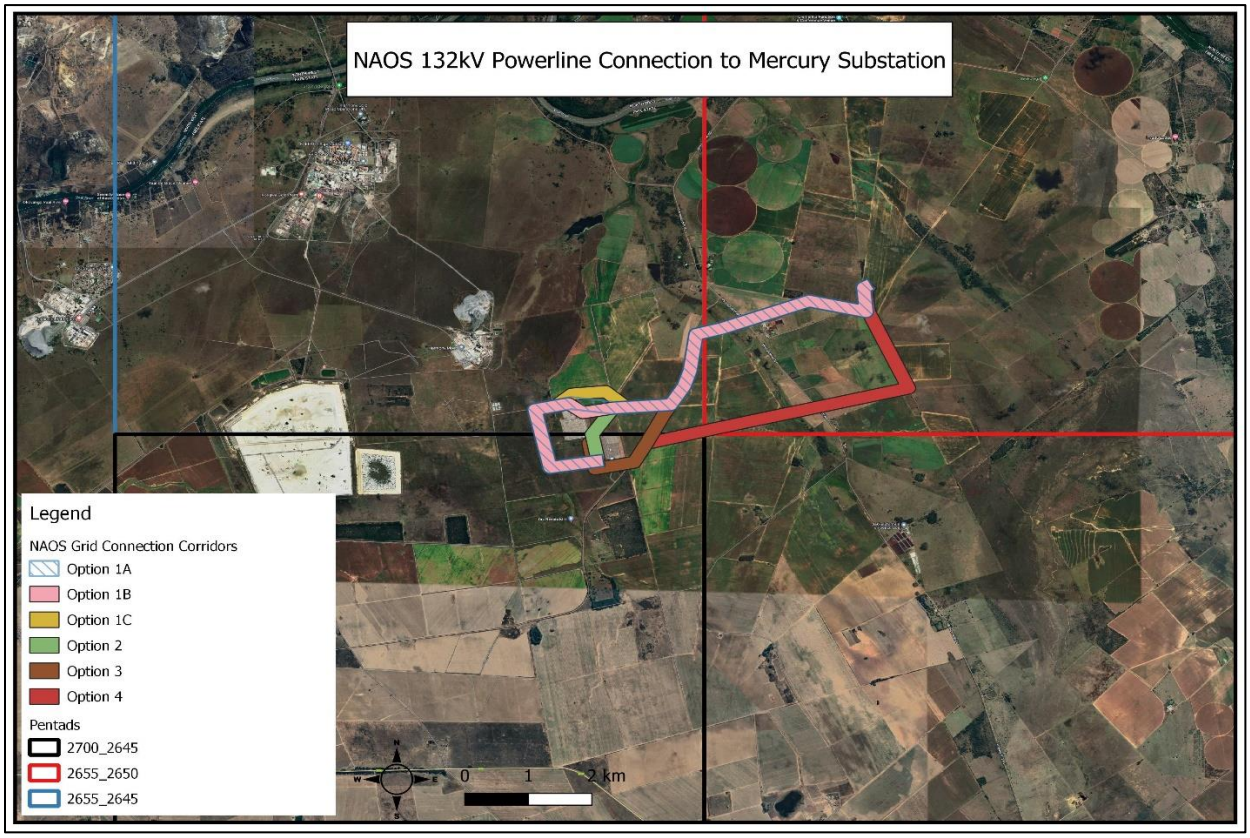

Figure 4. Location and extent of SABAP2 pentads relative to the proposed powerline.

According to the SABAP2 species list, it is estimated that a total of 856 bird species occur in the broader area of the proposed powerline development. However, very few species were recorded during the surveys. There are many long-distance migrant species that will only be recorded during early to mid-summer and also some regional migrants and nomadic species that are more likely to occur in winter.

General species description

The overall avifaunal species occurring along the proposed powerline routes are dominantly represented by pigeons, doves, geese, and guineafowls. One bird species of priority, the Black-winged Kite was encountered during the transect surveys. The Black-winged Kite was encountered once, where it was seen perched on an existing powerline near the Mercury substation.

Species of conservation importance

Nine (9) categories are used by the International Union for Conservation of Nature (IUCN) in distinguishing the conservation status of species across all taxa (IUCN, 2001). Figure 5 is a diagram showing the structure of the 9 categories and Table 3 gives a summary of the 9 categories which were all considered for this study. The categories are important for classifying species at high risk of global extinction to further inform specialist recommendations. The assessment of Red Data status follows Taylor (2015) and the ESKOM Red Data Book of Birds of South Africa, Lesotho and Swaziland.

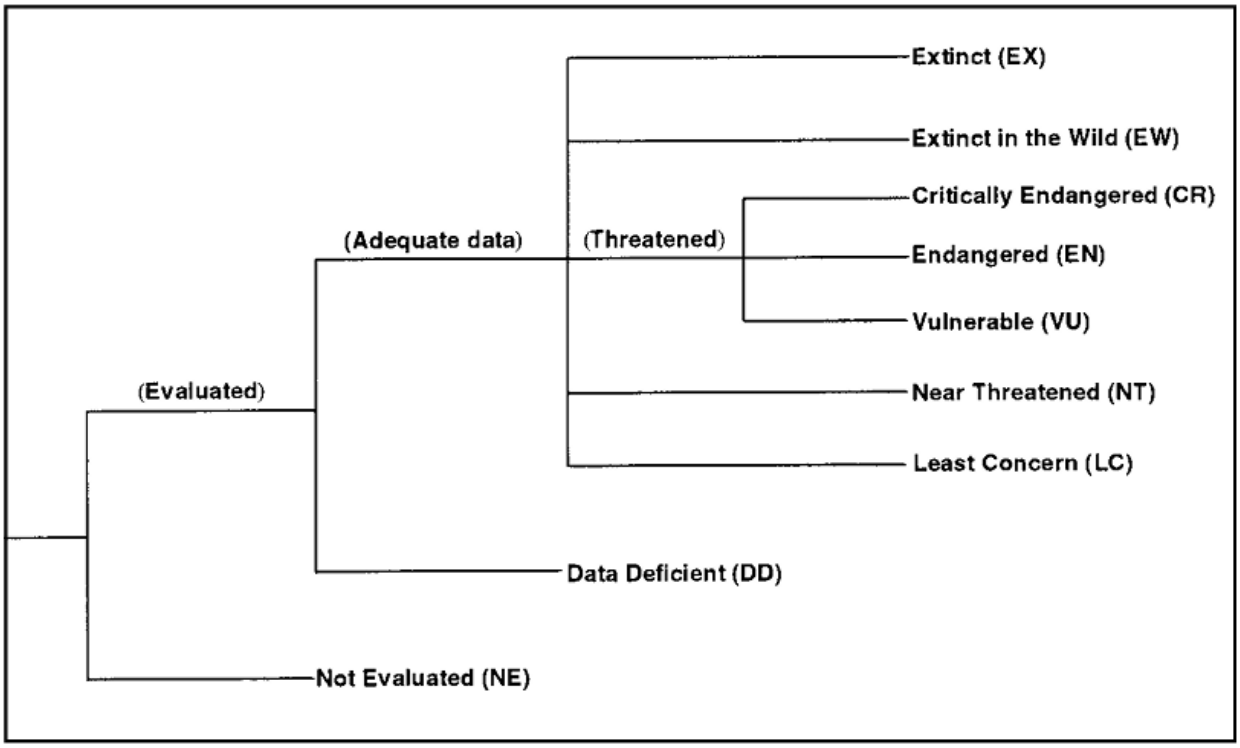

Figure 5. A representation of the relationships between the 9 categories (IUCN, 2001).

Table 3. IUCN red-list conservation criteria

Extinct	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild	A taxon is extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered	A taxon is critically endangered when the best available evidence indicates that it meets any of the criteria for critically endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered	A taxon is endangered when the best available evidence indicates that it meets any of the criteria for endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable	A taxon is vulnerable when the best available evidence indicates that it meets any of the criteria for vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened	A taxon is near threatened when it has been evaluated against the criteria but does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern	A taxon is least concern when it has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category.
Data Deficient	A taxon is data deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
Not Evaluated	A taxon is not evaluated when it is has not yet been evaluated against the criteria.

Of the 24 listed avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads, only one species is classified as Red Data Species.

Endemic species

South Africa has a rich diversity of nationally and regionally endemic species that are found nowhere else on earth and, therefore, warrant consideration for assessment of sensitivity to potential developments. No endemic species were recorded during the powerline surveys.

METHODS

Methodology

Prior to conducting field assessments, a comprehensive literature review of available published and unpublished literature pertaining to bird interactions with solar plants, substations and power lines was undertaken. The aim of the desktop study was to summarise various issues involved specifically for the proposed 132kV powerline and associated infrastructure near Viljoenskroon, Free State Province. Additionally, a list of previously recorded birds was obtained from Southern African Bird Atlas Project 2 (SABAP 2), and Google Earth was also used to determine potential habitats for birds. The field methodology was thereafter conducted for assessing the impact of the proposed development on the extant avifaunal population. All habitat types were covered during assessments, and all attempts were made to ensure a representative spread of sampling localities and survey effort that reflected overall habitat composition.

Resident avifaunal population assessment

In determining the *in situ* local avifauna and avian habitats present on the proposed development area, site visits were from the 17th to 19th of March 2022 and 19th to 21st June 2022. The survey was conducted by two senior fieldworkers, and the survey time was from 06h00 am until 18h00 pm with categorised sessions. Birds were observed using 8 x 42 Bushnell binoculars and photographic records were taken where possible. Data collection methods included the following:

- Vehicle drive surveys: Vehicle surveys were predominantly done along the farm dirt roads and as well as the service road of the existing power line infrastructure.
- Walked-transects: Walking a fixed-length transect within a given time and recording all bird species seen or heard within a specified transect width.

All data was recorded on BasicAirData GPS logger and BirdLasser.

RESULTS OF AVIFAUNAL POPULATION ASSESSMENT

From the survey, a total of 26 bird species were observed along the proposed powerline routes. Out of the 24 species, only one was identified as a priority species, which is the Black-winged Kite. The primary threat to the Kite is the loss or transformation of habitat within the Grassland Biome. Secondary threats, amongst many other, include collisions with powerlines and poisoning by agrochemicals (Taylor, 2015). Additionally, there were medium to large sized species that may be prone to collision. These species include Egyptian Goose and Spur-winged Goose.

Although the area is located less than a kilometre from the Vaal River, one would expect a high diversity of bird species within the site.

IMPACT ASSESSMENT RATINGS

The methodology for assessing the impact ratings was supplied by Environamics as the EAP for the proposed 132kV powerline. The methodology is included as Appendix A: Method of Environmental Assessment at the end of this report. The rating rankings for assessing impacts significance are as shown in Table 6 below. The findings of the impact assessment ratings are shown in the tables below. Table 7 is the impacts matrix used for scoring environmental significance and Table 8 is a summary of impacts ratings for the proposed 132kV powerline using Appendix A.

Table 6. Impact rating scoring used for the avifaunal impact assessment at the proposed 132kV powerline.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".

74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

An impact assessment of all potential pre-construction, construction, operational and maintenance phase impacts associated with the activities pertaining to the proposed infrastructure developments are provided in Table 7.

Table 7. Avifaunal impact ratings for the proposed NAOS powerline and associated infrastructure.

Construction Phase	**Overhead Lines**	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of priority avian species from important habitats	Minimise the construction footprint wherever possible. All vegetation not required to be removed should be protected against damage.
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	1
Total SP:	42	16
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of resident avifauna through increased disturbance	Minimise the construction footprint wherever possible. All vegetation not required to be removed should be protected against damage.
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	2	1
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact

POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats	Use designated roads to access the site. Minimise the construction footprint and reserve indigenous vegetation wherever possible. Rehabilitate area with indigenous flora.
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
Operation Phase	**Overhead Lines**	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats	Existing roads must be used where possible during maintenance.
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of resident avifauna through increased disturbance	Roosting areas and nests should not be disturbed without consulting an avifaunal specialist. Existing roads must be used where possible during maintenance.
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2

Reversibility:	2	1
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Collisions with overhead lines and electrocution risks leading to injury or loss of avian life which decreases avian diversity	Ensure overhead lines are marked with bird flight diverters along collision risk areas. Conduct quarterly fatality monitoring assessments
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	3	2
Probability:	3	2
Total SP:	36	18
Significance rating:	Negative medium impact	Negative low impact
Decommissioning Phase	**Overhead Lines**	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats	Have a biodiversity protocol and rehabilitation plan that will be implemented following the decommissioning phase
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of resident avifauna through increased disturbance	Have a biodiversity protocol and rehabilitation plan that will be implemented following the decommissioning phase
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	2	1
Cumulative Effect:	2	1

Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact

Table 8. Summary of avifaunal impact ratings for the proposed Naos 132kV powerline.

	Average impact rating	Significance class	Average mitigated impact	Significance class
Avifaunal impacts of the 132kV powerline and associated infrastructure	40.64	Negative medium impact	18.00	Negative low impact

MITIGATION REQUIREMENTS

Loss of priority avian species from important habitats

The area has been identified as 'Low Avian Sensitivity' by DFFE's screening tool. One priority species, the Black-winged Kite, was recorded confirmed for the wider three SABAP2 pentads. The construction footprint must be minimised and indigenous vegetation should be conserved. Construction should be outside breeding season (summer).

Loss of resident avifauna through increased disturbance

The resident avifaunal community has a moderately low diversity. However, a biodiversity protocol and rehabilitation plan that will be implemented following the decommissioning phase should be in place.

Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats.

Designated roads must be used to access the proposed development powerline route. The construction footprint must be minimised, and indigenous vegetation should be conserved as much as possible. Constructing during breeding seasons (summer) must be avoided and construction should run for a shortest possible timeframe. Pollution should be controlled, and the area should preferably be rehabilitated using indigenous vegetation.

Collisions with overhead lines and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity.

To avoid the impacts associated with collisions, Bird Flight Diverters should be installed on selected sections of the powerlines (i.e., Where it crosses drainage lines, waterbodies).

Implementing these mitigations should reduce the significance by 50% and results in acceptable Low (L) impact ratings.

In summary, the majority of the mitigations listed in Table 7 above for the Naos 132kV powerline involve minimising impact footprints during construction, installation of bird flight diverters, limiting site access beyond direct disturbance zones, reducing noise pollution, constructing in winter (to avoid the breeding season), and using designated roads as much as possible. Implementing these mitigations reduces the significance by 44% which results in acceptable Negative low impact ratings.

NO-GO AREAS, BUFFERS AND ALTERNATIVES

No no-go areas are applicable to the project site from an avifaunal perspective. Should the proposed activity not proceed, due to other specialist studies, the site will remain unchanged and will continue to be used for agricultural purposes.

There are currently six powerline alternatives, and due to the risks observed on site, Option 2,3 and 4 are the most preferred. Half of Option 3 will be located on an existing public road, which implies that there will be less disturbance. More than 50% of Option 4 will run parallel to an existing Eskom line towards the substation. This will also reduce impacts. Both Option 3 and 4 will also have single river crossings (Figure 5).

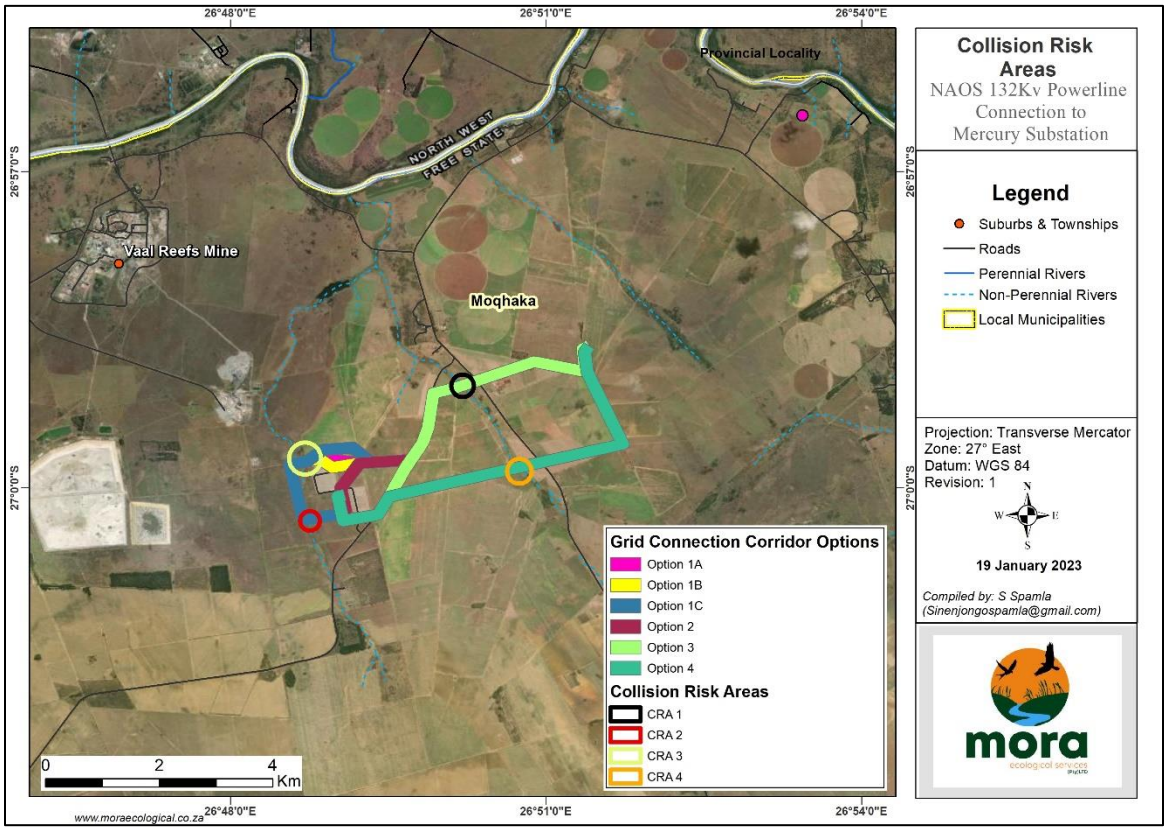

Figure 5. Location of collision risk areas along the proposed powerline routes.

CONCLUSION AND RECOMMENDATIONS

The proposed 132kV powerline will be located in an area of low avian sensitivity. However, the powerline will have several river crossings, which is of great concern. Assessments for the present waterbodies were conducted where only species of Least Concern were encountered. As a result, from an avifaunal perspective, there is no objection to the development of the proposed powerline development and associated infrastructure, provided to the recommended mitigation measures are strictly followed. The overall impacts (including cumulative) for the project are considered to be low and will not cause detrimental impacts to the avifauna species located within the development area.

Specific conditions recommended for the EA from an avifaunal perspective.

1. Implement mitigation controls during the construction phase as specified in the mitigation requirements. Monitor and report on their effectiveness.
2. Implement mitigation controls during the operational phase as specified in the mitigation. Monitor and report on their effectiveness.
3. Monitoring of implementation of mitigation controls, along with reporting, should be undertaken at least quarterly throughout the construction phase, and bi-annually during the operational phase. Monitoring, at the minimum, should consist of a quarterly monitoring of the powerline route for evidence of bird collisions;
4. As much of the natural habitat as possible should be conserved during construction and operation to lessen the operational impacts and to reduce the irreversibility of impacts.

5. Effective restoration of the natural habitats that were intact before the development should be implemented and reported on after decommissioning.

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APPENDICES

Appendix A: Method of Environmental Assessment

1.1 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 6.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.1.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 9. The rating system

NATURE		
Include a brief description of the impact of the environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).

3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		

This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.

51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

Appendix B: Photographs of sampled habitat types

Figure 12. Walk transect along the proposed powerline route.

Figure 13. Agricultural lands where walked and drive transects were conducted.

Appendix C: Species composition of encountered avifaunal community during assessments and photographs of selected bird species from the site.

Common name	Seen/Heard	Latitude	Longitude	Count
Spur-winged Goose	Seen	-26.981006	26.833962	30
Egyptian Goose	Seen	-26.981012	26.833955	50
Yellow-billed Duck	Seen	-26.981012	26.833955	5
Red-billed Teal	Seen	-26.981012	26.833955	2
Hadeda Ibis	Seen	-26.981012	26.833955	10
South African Shelduck	Seen	-26.981012	26.833955	8
Blacksmith Lapwing	Seen	-26.981012	26.833955	2
Cape Turtle Dove	Seen	-26.981005	26.833958	1
African Pipit	Seen	-26.981358	26.833523	1
Speckled Pigeon	Seen	-26.982815	26.832695	30
Red-capped Lark	Seen	-26.983672	26.832321	2
Wattled Starling	Seen	-26.984618	26.831977	50
Red-capped Lark	Seen	-26.987029	26.831477	5
Ant-eating Chat	Seen	-26.98742	26.831416	1
Cape Turtle Dove	Seen	-26.989658	26.831116	80
Speckled Pigeon	Seen	-26.993779	26.829579	100
Laughing Dove	Seen	-26.994736	26.82887	150
Orange River Francolin	Seen	-26.996215	26.827846	2
Black-winged Kite	Seen	-26.996748	26.827486	1
Pied Crow	Seen	-26.996948	26.827353	20
Helmeted Guineafowl	Seen	-27.00089	26.825027	30
Scaly-feathered Finch	Seen	-27.001898	26.824424	20
Cape Sparrow	Seen	-27.003547	26.82349	4
Grey-backed Cisticola	Heard	-27.003942	26.823251	1
Cape Weaver	Seen	-27.004901	26.822656	19
Hadeda Ibis	Seen	-27.005747	26.821938	2

Top: Flock of Spur-winged Goose at a river crossing. Bottom: Pied Crows on an existing powerline.

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