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AVIFAUNAL ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR A PROPOSED OVERHEAD POWERLINE POWERLINE FOR THE HYPERION HYBRID FACILITY, NEAR KATHU, NORTHERN CAPE PROVINCE

Prepared for

Hyperion Solar Hybrid (Pty) Ltd.

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EXECUTIVE SUMMARY

Based on the findings of the avifaunal assessment, it is the opinion of the ecologists that from an avifaunal perspective, the proposed development be considered favorably. However, all essential mitigation measures and recommendations presented in this report should be adhered to as to ensure the ecology within the proposed construction areas along with the surrounding zone of influence is protected or adequately rehabilitated, where necessary, in order to minimise the deviations from the Present Ecological State.

Scientific Terrestrial Services (STS) was appointed to conduct an avifaunal assessment as part of the Environmental Impact and Environmental Authorisation (EIA) process for the proposed development of an overhead powerline, near the town of Kathu, Northern Cape Province, henceforth referred to as the "focus area". The focus area consists of a 132kV overhead powerline (OHPL) and an associated 300m corridor. Additional areas within a broader "study area" were also briefly assessed.

The focus area is in the Gamagara Metropolitan Municipality which is an administrative area of the John Taolo Gaetses District Municipality. The focus area is situated approximately 15 km north of the town of Kathu, 11 km northeast of the Sishen Airport, and approximately 5 km northwest of the N14 national route. The location and extent are indicated in Figures 1 and 2.

Specific outcomes required from this report include the following:

- To conduct an avifaunal Species of Conservation Concern (SCC) and determine suitable habitat for these species;
- To identify and consider all sensitive landscapes and possible habitat for such species; and
- To determine the environmental impacts that the proposed development may have on the ecology associated with the focus area, with emphasis on avifauna SCC and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

Results of the Desktop Analysis

- The focus area is located within the Kathu Bushveld which is considered a **Least Concern** ecosystem and is currently **Poorly Protected**. (Mucina & Rutherford, 2006);
- According to the Northern Cape Critical Biodiversity Areas (2016) database, most of the focus area is located within areas categorised as Other Natural Areas. However, the southern portion of the 300 m corridor is located within an Ecological Support Area; and
- The focus area is not located within a 10km radius an Important Bird Area (SAPAD, 2019).

AVIFAUNAL ASSESSMENT

- Habitat integrity is considered to be moderately high. Avifaunal habitat suitable for *Gyps africanus* (White-backed Vulture, CR), *Neotis ludwigii* (Ludwig's Bustard, EN), *Torgos tracheliotos* (Lappet-faced Vulture, EN), *Coracias garrulus* (European Roller, NT), *Falco biarmicus* (Lanner Falcon, VU), *Polemeatus bellicosus* (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle EN), *Cursorius rufus* (Burchell's courser, VU), *Sagittarius serpentarius* (Secretarybird, VU) and *Ardeotis kori* (Kori Bustard, NT) was noted close to the focus area;
- Breeding habitat for *Polemeatus bellicosus* (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle EN), *Cursorius rufus* (Burchell's courser, VU), *Sagittarius serpentarius* (Secretarybird, VU) and *Ardeotis kori* (Kori Bustard, NT) was noted within the study area;
- The largely homogeneous nature of the landscape provides moderately high habitat suitability and habitat availability yet, the monotonous structure limits niche habitats and thus species diversity;
- During the field assessment only *Ardeotis kori* (Kori Bustard, NT) was observed near the focus area, however, a greater sampling effort is likely to identify the presence of more avifaunal SCC;

- The proposed activities will not transform the landscape to an extent that it will no longer be suitable for most avifauna. Minor migrations to adjacent habitat may occur, yet, following construction it is likely that avian diversity will return to baseline levels; and
- The proposed development is thus deemed unlikely to pose a threat to avifaunal SCC in the region if mitigation measures that are set out within this report are adhered to.

AVIFAUNAL IMPACT ASSESSMENT:

The tables below summarise the findings of the impact assessment, indicating the significance of the impact before mitigation takes place and the likely impact if effective management and mitigation takes place. In the consideration of mitigation, it is assumed that a high level of mitigation takes place, but which does not lead to prohibitive costs. From the tables it is evident that prior to mitigation, the impacts on avifaunal SCC are medium-low significance impacts primarily occurring during the construction and operational phases. If effective mitigation takes place, all impacts may be reduced to lower significance impacts.

A summary of the results obtained from the impact assessment for the Pre-Construction phase.

Habitat Unit	Significance (Unmanaged)	Significance (Managed)
PLANNING PHASE		
Impact of Avifaunal Habitat and Diversity		
Kathu Bushveld	**Low**	**Very low**
Impact of Avifaunal SCC		
Kathu Bushveld	**Low**	**Very low**
CONSTRUCTION PHASE		
Impact of Avifaunal Habitat and Diversity		
Kathu Bushveld	**Medium-low**	**Low**
Impact of Avifaunal SCC		
Kathu Bushveld	**Medium-low**	**Low**
OPERATIONAL AND MAINTENANCE PHASE		
Impact of Avifaunal Habitat and Diversity		
Kathu Bushveld	**Medium-low**	**Low**
Impact of Avifaunal SCC		
Kathu Bushveld	**Medium-low**	**Low**

Sensitivity

From an avifaunal ecological perspective, the focus area is considered to be of an intermediate sensitivity, mainly as a result of the natural and unaltered nature of the landscape within the focus area and the intermediate abundance and diversity of birds. Although several SCC likely forage and/or breed here the proposed activities will not alter the landscape to an extent where it will no longer be habitable to these species and with effective mitigation can reduce the potential impacts anticipated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson et al. (2011), Hui and Richardson (2017) and Wilson et al. (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004), and the associated Alien and Invasive Species (A&IS) Regulations, 2014].

Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act;
Bush encroachment	The increase in density of (usually native) woody plants so that the natural equilibrium of the woody plant layer (trees and shrubs) and herbaceous (grass and forb) layer densities is shifted in favour of trees and shrubs.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
IBA (Important Bird and Biodiversity Area)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), Alien and Invasive Species (A&IS) Regulations, 2016.
Least Threatened	Least threatened ecosystems are still largely intact.
RDL (Red Data listed) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.

	Specifically related to fauna: A list of faunal SCC as identified by the Threatened or Protected Species list (2007) is available for the Northern Cape. Additional datasets and sources that were also taken into consideration included: - The National Environmental Management: Biodiversity Act (Act No.10 of 2004) (NEMBA) Threatened or Protected Species (TOPS) list (NEMBA, Notice 389 of 2013); - The International Union for Conservation of Nature (IUCN) Red List of Threatened Species; and - The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland;

LIST OF ACRONYMS

AIP	Alien Invasive Plant
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Area
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment (2011)
NCNCA	Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
NCPSDF	Northern Cape Provincial Spatial Development Framework
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
OHPL	Overhead powerline
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data List
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Area Database
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services CC
TOPS	Threatened or Protected Species
TSP	Threatened Species Programme
VU	Vulnerable

1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a avifaunal assessment as part of the Basic Assessment (BA) process for the proposed development of an overhead powerline to connect the proposed Hyperion Hybrid Facility to the existing Eskom Kalbas substation, near the town of Kathu, Northern Cape Province, henceforth referred to as the "focus area". The focus area consists of a 132kV overhead powerline (OHPL) and an associated 300m corridor. This report includes a desktop screening assessment and faunal and floral ecological assessment as part of the Environmental Impact Assessment (EIA) process.

The focus area is in the Gamagara Metropolitan Municipality which is an administrative area of the John Taolo Gaetses District Municipality. The focus area is situated approximately 15 km north of the town of Kathu, 11 km northeast of the Sishen Airport, and approximately 5 km northwest of the N14 national route. The location and extent are indicated in Figures 1 and 2.

The focus area will consist of the following infrastructure (Figure 3):

- 132kV OHPL; and
- 300 m corridor (the exact location of the overhead powerline (OHPL) was not known at the time of the assessment, therefore a 300m corridor was assessed.

This report, after consideration and the description of the ecological integrity of the focus area, must guide the Environmental Assessment Practitioner (EAP), regulatory authorities and developing proponent, by means of the presentation of results and recommendations, as to the ecological viability of the proposed development activities.

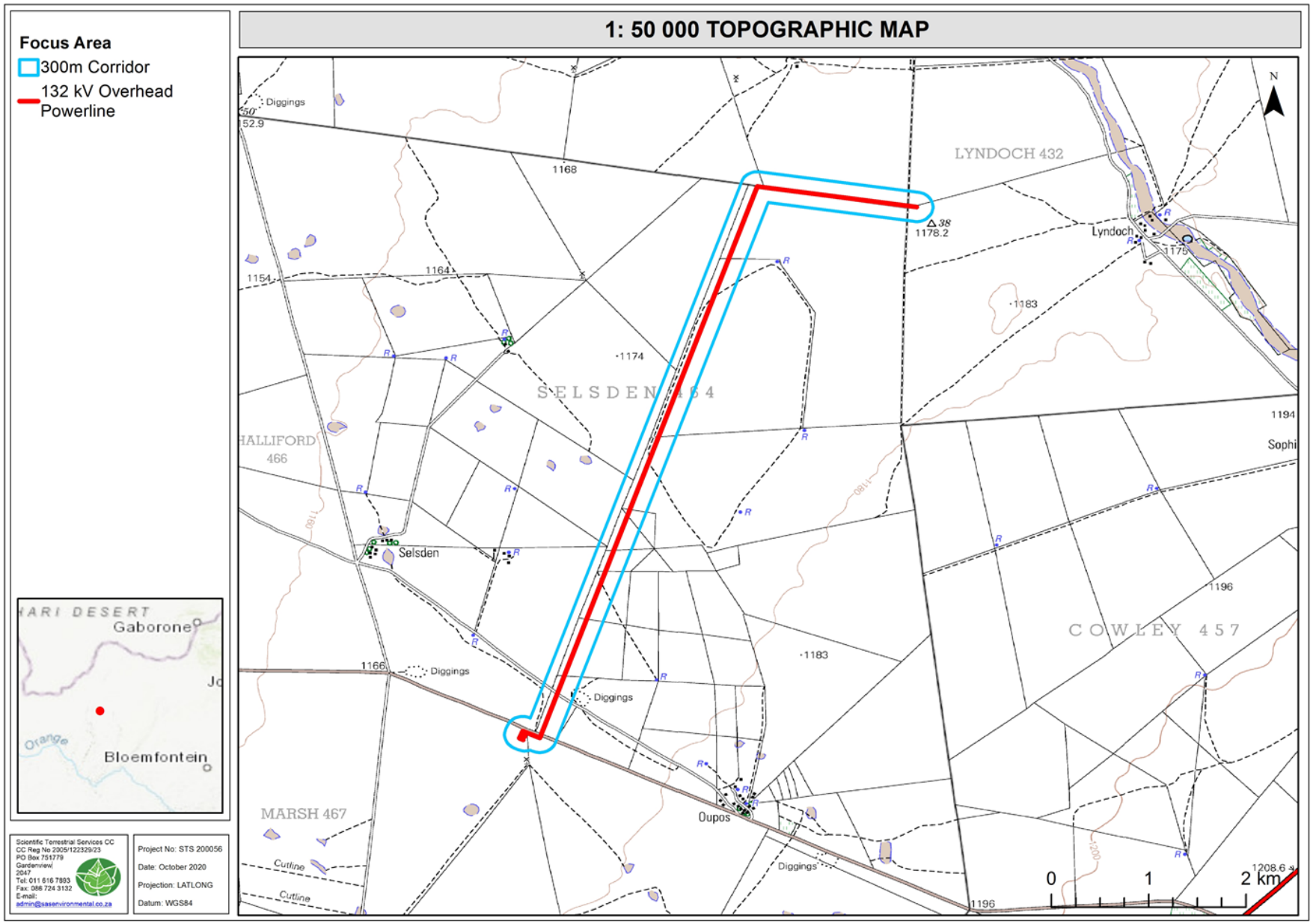

Figure 1: The focus area depicted on a 1:50 000 topographical map in relation to the surrounding area.

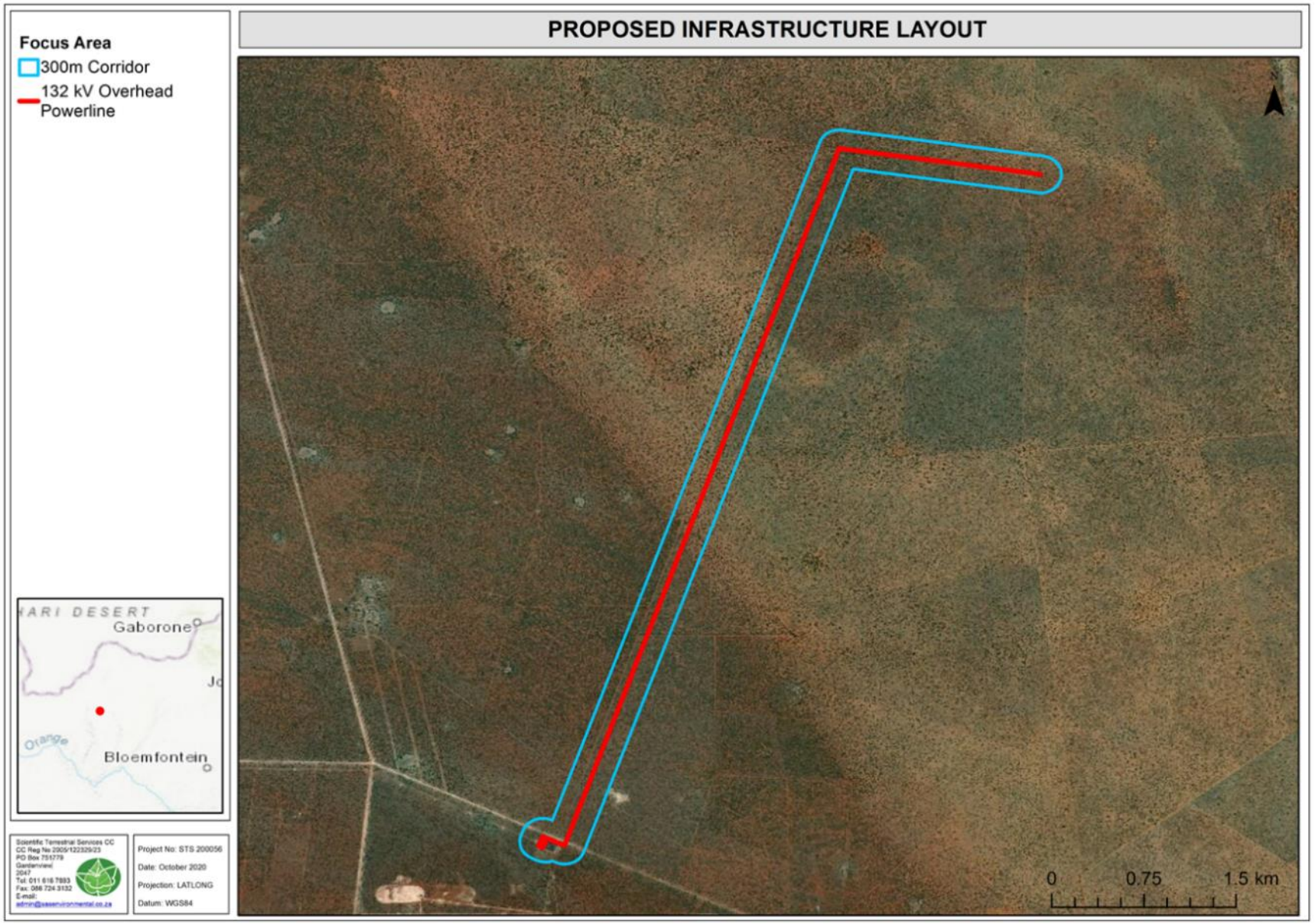

Figure 2: The proposed infrastructure layout within the focus area.

1.2 Project Scope

Specific outcomes in terms of this report are outlined below:

- To conduct an avifaunal Species of Conservation Concern (SCC) assessment and determine potential suitable habitat for SCC to occur within the focus area;
- Determine whether previous occurrence records of the target species have been noted within the broader area (neighbouring QDSs') of interest;
- To identify and consider all sensitive landscapes and possible habitat for such species and possible gatherings of birds, such as at roosts, breeding colonies or waterbodies; and
- To determine the environmental impacts that the proposed development may have on the ecology associated with the focus area, with emphasis on avifauna SCC and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The ecological assessment is confined to the focus area and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important such as seasonality) may have been overlooked due to time constraints. It is, however, expected that most avifaunal communities have been accurately assessed and considered;
- Due to the nature and habits of most avifaunal species and their often wide ranging habits or migration patterns, it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations were compared with literature studies where necessary; and
- The data presented in this report are based on one field assessment, undertaken in October 2020. Therefore, on-site data were significantly augmented with all available desktop data, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the focus area.

1.4 Indemnity and Terms of use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and STS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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2. ASSESSMENT APPROACH

2.1 General Approach

A single field assessment was undertaken from the 26th to the 28th of October 2020, in order to determine the potential presence of SCC and general habitat characteristics within the focus area. A reconnaissance desktop analysis was initially undertaken to determine the general habitat types found throughout the focus area, following this, specific study sites were selected that were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support breeding and foraging habitat for SCC.

A detailed explanation of the method of assessment is provided in Appendix B of this report.

2.2 Sensitivity Mapping

All the ecological features of the focus area were considered and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map should guide the design and layout of the proposed construction and operational activities.

3. RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Focus area

The following table contains data accessed as part of the desktop assessment. It is important to note, that although all data sources used provide useful and often verifiable high quality data, the various databases do not always provide an entirely accurate indication of the focus areas actual biodiversity characteristics.

Table 1: Summary of the terrestrial conservation characteristics for the focus area (Quarter Degree Square (QDS) 2723CA).

<table>
<tr><th colspan="2">CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)</th><th colspan="7">DETAILS OF THE AREA OF INTEREST IN TERMS OF MUCINA & RUTHERFORD (2006, 2018, 2012)</th></tr>
<tr><td colspan="2" rowspan="8">NATIONAL BIODIVERSITY ASSESSMENT (NBA):
Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (act no. 57 of 2003) (NEMPAA), and compared with the biodiversity target for that ecosystem type.
the ecosystem protection level status is assigned using the following criteria:
I. if an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either a or b, it is classified as well protected,
II. when less than 100% of the biodiversity target is met in formal a or b protected areas it is classified it as moderately protected,
III. if less than 50% of the biodiversity target is met, it is classified it as poorly protected, and
IV. if less than 5% it is hardly protected.</td><td>Biome</td><td colspan="5">The focus area is situated within the Savanna Biome.</td></tr>
<tr><td>Bioregion</td><td colspan="5">The focus area is located within the Eastern Kalahari Bushveld Bioregion.</td></tr>
<tr><td>Vegetation Type</td><td colspan="5">The focus area is situated within the Kathu Bushveld.</td></tr>
<tr><td rowspan="3">Climate</td><td colspan="5">Summer and autumn rainfall with very dry winters.</td></tr>
<tr><td>MAP* (mm)</td><td>MAT* (°C)</td><td>MFD* (Days)</td><td>MAPE* (mm)</td><td>MASMS* (%)</td></tr>
<tr><td>300</td><td>18.5</td><td>27</td><td>2 883</td><td>85</td></tr>
<tr><td>Altitude (m)</td><td colspan="5">960 –1 300</td></tr>
<tr><td colspan="2" rowspan="2">NBA (2018):
1) Ecosystem Threat Status
2) Ecosystem Protection Level</td><td rowspan="2">NBA 2018 dataset (Figure 4):
The focus area is located within the Kathu Bushveld which is considered a Least Concern ecosystem and is currently Poorly Protected.</td><td>Distribution</td><td colspan="5">Northern Cape Province: Plains from Kathu and Dibeng in the south, through Hotazel, vicinity of Frylinckspan to the Botswana border roughly between Van Zylsrus and McCarthysrus.</td></tr>
<tr><td>Conservation</td><td colspan="5">Least threatened. Target 16%. None conserved in statutory conservation areas. More than 1% already transformed, including the iron ore mining locality at Sishen, one of the biggest open-cast mines in the world. Erosion is very low.</td></tr>
<tr><td colspan="2" rowspan="2">National Threatened Ecosystems (2011) Figure 4</td><td rowspan="2">The focus area is located within an ecosystem that is currently considered to be Least Concern. Least Concern (LC) ecosystems have not experienced a significant loss of natural habitat or deterioration in condition.

For Environmental Impact Assessments (EIAs), the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA Regulations published under the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA).</td><td>Geology & Soils</td><td colspan="5">Aeolian red sand and surface calcrete, deep (>1.2 m) sandy soils of Hutton and Clovelly soil forms. Land types mainly Ah and Ae, with some Ag.</td></tr>
<tr><td>Vegetation & landscape features</td><td colspan="5">Medium-tall tree layer with Acacia erioloba in places, but mostly open and including Boscia albitrunca as the prominent trees. Shrub layer generally most important with, for example, A. mellifera, Diospyros lycioides and Lycium hirsutum. Grass layer is variable in cover.</td></tr>
<tr><td colspan="2">IBA (2015)</td><td colspan="6">The focus area is not located within a 10km radius an Important Bird Area.</td></tr>
</table>

SAPAD (2019, Q3); SACAD (2019, Q3); NPAES (2009). Figure 5	The South African Protected Areas Database (SAPAD, 2019), the South African Conservation Areas Database (SACAD, 2019), and the National Protected Areas Expansion Strategy (NPAES, 2009) indicates that the **Khathu Forest Nature** is located within a 10km zone from the focus area.

NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) (FIGURE 6)	**NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019)**
According to the Northern Cape Critical Biodiversity Areas (2016) database, most of the focus area is located within areas categorised as Other Natural Areas. However, the southern portion of the 300 m corridor is located within an Ecological Support Area.	The NCPSDF is to function as an innovate strategy that will apply sustainability principles to all forms of land use management throughout the Northern Cape as well as to facilitate practical results, as it relates to the eradication of poverty and inequality and the protection of the integrity of the environment. The focus area is located within the Griqualand West Centre (GWC) of plant endemism (Figure 6). This semi-arid region is broadly described as Savanna, forming part of the Eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby *et al.* 2019). The focus area also falls within the Gamagara corridor. The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.

NATIONAL WEB BASED ENVIRONMNETAL SCREENING TOOL (2020)		
The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. this assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas	Terrestrial Biodiversity Theme	For the terrestrial biodiversity theme, the focus area is considered to have a **very high sensitivity**. The triggered sensitivity features include an Ecological Support Areas (ESA).
	Plant Species Theme	For the plant species theme, the entire focus area is considered to have a **low sensitivity**.
	Animal Species Theme	For the animal species theme, the entire focus area is considered to have a **medium sensitivity**. The triggered sensitivity is due to the presence of *Sagittarius serpentarius* (Secretary bird).

STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)		
Surface Water SWSAS are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. they include transboundary areas that extend into Lesotho and Swaziland. the sub-national water source areas (WSAS) are not nationally strategic as defined in the report but were included to provide a complete coverage.	Name & Criteria	The focus area is **not** within 10 km of a Strategic Water Source Area.

NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SAPAD = South African Protected Areas Database; IBA = Important Bird Area; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).

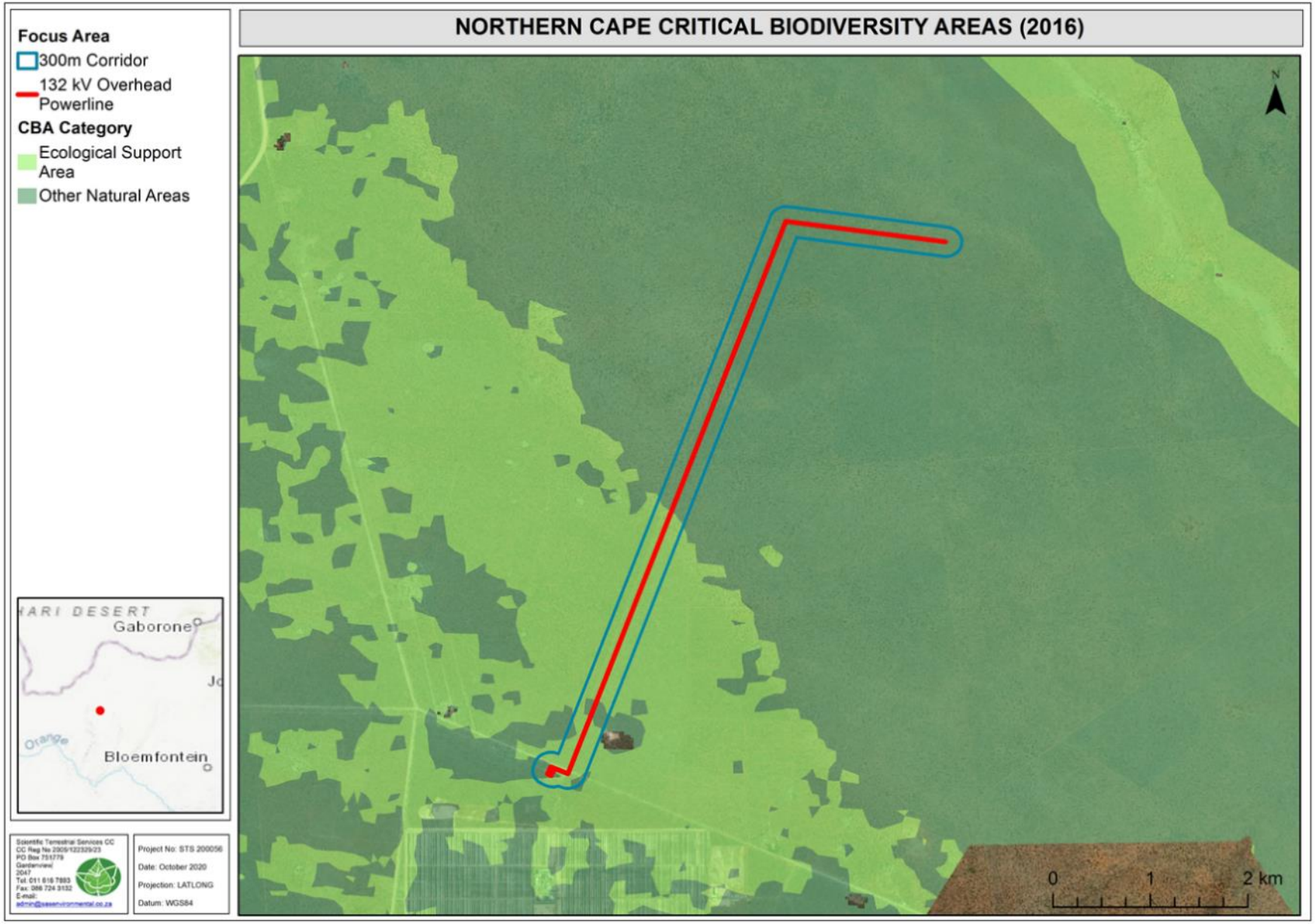


Figure 3: Northern Cape Critical Biodiversity areas associated with the focus area and the associated infrastructure.

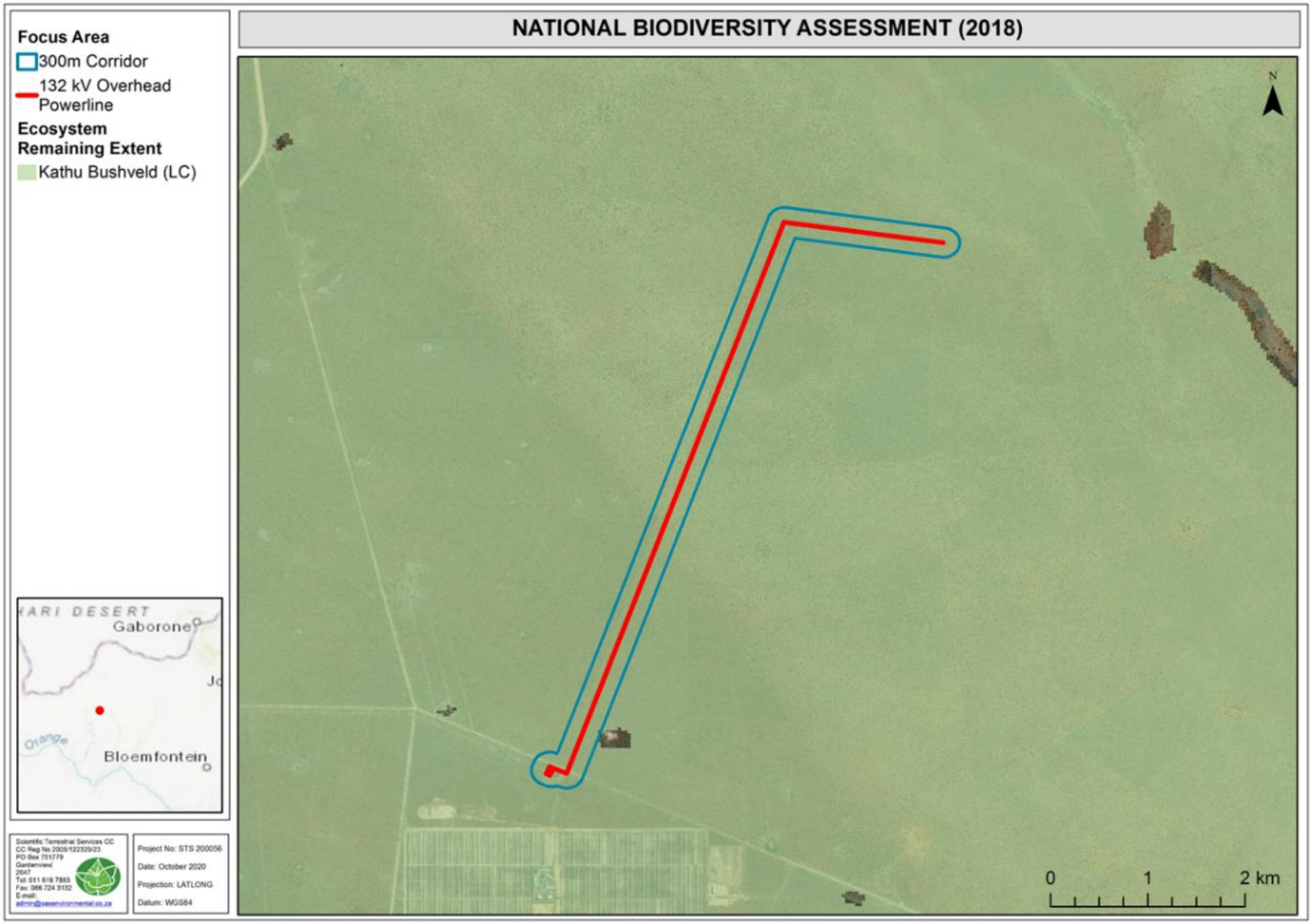


Figure 4: The remaining extent of the Kathu Bushveld, according to the National Biodiversity Assessment (NBA, 2018).

3.2 Important Bird and Biodiversity Areas (IBA)

According to Birdlife South Africa (BLSA), the focus area does not fall within any Important Bird and Biodiversity Areas (IBA). The closest IBA to the focus area is the Spitskop Dam IBA (150km to the south-east).

3.3 Results of Avifaunal SCC Assessment

The following tables of avifaunal SCC shows species with distribution ranges which at some time have overlayed the focus area (Taylor *et al*, 2015). Records from SABAP 2 were obtained to determine if these species were recorded in SABAP2 in the pentads 2730_2300 and 2735_2300 and their relative reporting rate. The table below provides a brief summary of the data.

Table 2: A summary of historic and current data obtained from SABAP2 (2730_2300 and 2735_2300 pentads).

Common Name	Scientific Name	Regional Status (Taylor *et al*, 2015)	Reporting Rate (%)	
			SABAP2 2730_2300 (4 cards)	SABAP2 2735_2300 (22 cards)
Abdim's Stork	*Ciconia abdimii*	NT	-	-
White-backed Vulture	*Gyps africanus*	CR	-	-
Ludwig's Bustard	*Neotis ludwigii*	EN	-	-
Lappet-faced Vulture	*Torgos tracheliotos*	EN	-	-
Black Stork	*Ciconia nigra*	VU	-	-
European Roller	*Coracias garrulus*	NT	-	-
Lanner Falcon	*Falco biarmicus*	VU	-	4.55
Martial Eagle	*Polemeatus bellicosus*	EN	-	-
Tawny Eagle	*Aquila rapax*	EN	-	-
Burchell's courser	*Cursorius rufus*	VU	-	-
Kori Bustard	*Ardeotis kori*	NT	25	-

NA= Not Assessed, NT= Near Threatened, VU= Vulnerable and EN= Endangered and CR=Critically Endangered.

4. AVIFAUNAL ASSESSMENT RESULTS

4.1 Habitat Units

A single habitat unit was identified during the site assessment of the focus area, it is discussed below:

Kathu Bushveld

Overall, the habitat unit within the focus area is typical of the Kathu Bushveld vegetation type as described by Mucina & Rutherford (2006), i.e. the reference state. Mucina and Rutherford (2006) describe the Kathu Bushveld as having an open, medium-tall tree layer in which *Bosica albitrunca* often dominants. The unit has a well-defined shrub layer (e.g. *Diospyros lycioides* and *Senegalia mellifera*), however, the grass layer is somewhat variable. The vegetation unit is considered largely intact as only 2% of the unit has been transformed. Although described as least concern, the vegetation unit has started becoming increasingly fragmented owing to the recent escalation of mining and solar development activities within the area (3 Foxes Biodiversity Solution, March 2019). The biodiversity of the focus area can thus be defined under one broad habitat unit which varies in tree and shrub density from east to west, namely Kathu Bushveld. A depiction of the habitat unit within the focus area is presented in Figure 5 below.

The Kathu Bushveld habitat unit was largely dominated by medium height *Tarchonanthus camphoratus* and *Vachellia haematoxylon.* Other woody species found within the unit included *Vachellia erioloba*, *Senegalia mellifera* and *Ziziphus mucronata*. A well-defined shrub layer existed in the west of the site with uniform homogenous stands of *Senegalia mellifera,* while a more open habitat with tall *Vachellia erioloba* was more dominant in the east. Dominant shrub species included *Asparagus laricinus, Acacia hebeclada* and *Lantana rugosa.* The grass layer is dominated by *Aristida meridionalis, Cynodon dactylon, Eragrostis lehmanniana* and *Aristida congesta* subsp. *congesta*. The unit provides varying structure which is often considered a primary determinant of bird species, as appose to actual floral species diversity. As the unit is largely homogenous few niche habitats or locations of varying structure exist likely reducing the diversity of the avian assemblage within the locality.

Within the Kathu Bushveld habitat unit, suitable habitat exists to support a intermediate diversity of avifaunal species. Overall the condition of the habitat is considered to be good, although there is evidence that the area has experienced some form of degradation especially

as *T. camphoratus,* often an indicator of poor veld condition, is somewhat prolific within the area. Associated degradation is likely the result of mismanagement and the overutilisation of the veld by domestic animals was observed yet, this, in some cases may potentially favour the presence of terrestrial avian SCC which prefer more open habitat.

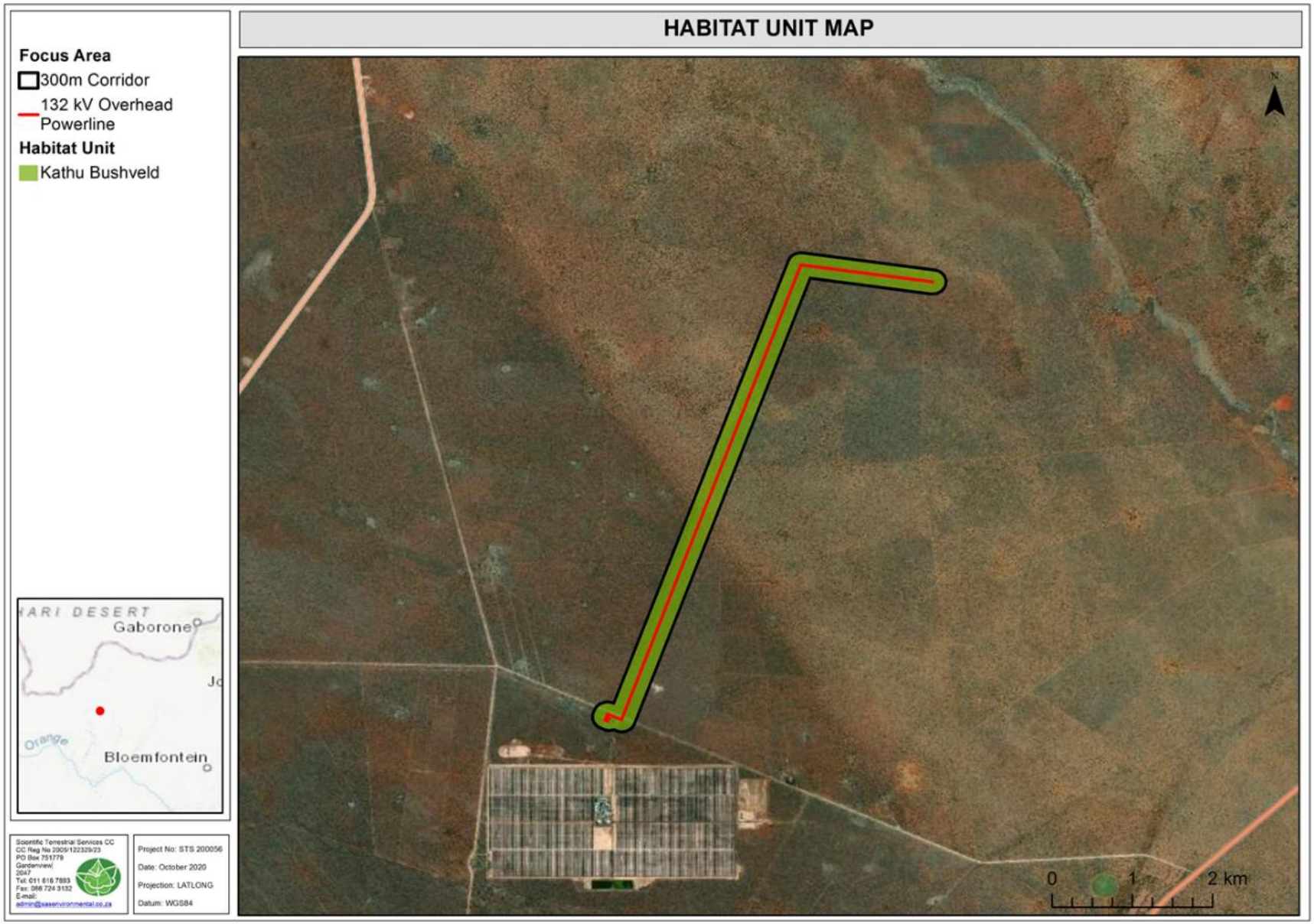


Figure 5: Habitat units encountered within the focus area.

4.2 Results of Avifaunal Field Assessment

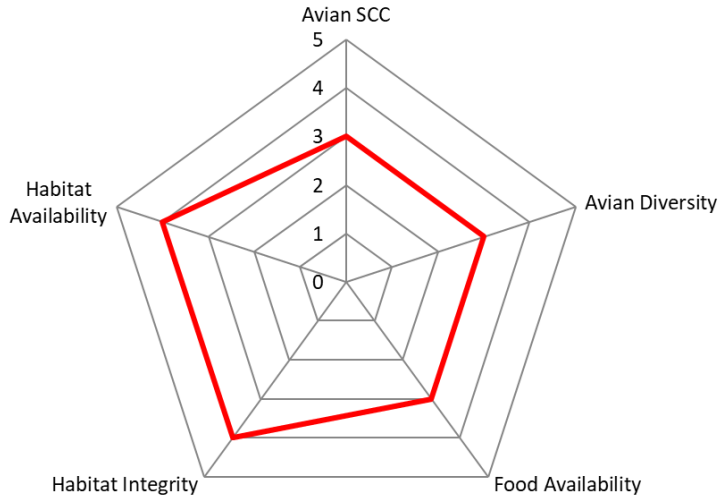
The table below summarises field observations that were made during the site visit in October 2020, with regards to overall avifaunal diversity, food availability, habitat integrity, habitat availability, general comments, business case and conclusion.

Table 3: Summary of results for avifaunal species.

Faunal Class: Avifaunal	Avifaunal Habitat Sensitivity	Intermediate

Notes on photograph:
General habitat of the focus area traversing general habitats from the east (top left and right) of the study area to the west of the focus area (bottom left and right).

Avifaunal Sensitivity Graph:



Habitat photographs:

Faunal SCC/Endemics/TOPS/	No avifaunal species listed as a SCC were encountered during the field assessment within the focus area, however, a large Vulture, almost certainly a pair of *Gyps africanus* (White-backed Vulture, CR) was observed flying to the east of the study area. *Ardeotis kori* (Kori Bustard, NT) have been observed within the study area during previous surveys. The presence of several other SCC within the area is deemed possible, although the focus area will likely only be utilised for foraging as opposed to breeding in most cases. The following SCC are considered likely to utilise the focus area for foraging *Neotis ludwigii* (Ludwig's Bustard, EN), *Torgos tracheliotos* (Lappet-faced Vulture, EN), *Coracias garrulus* (European Roller, NT) and *Falco biarmicus* (Lanner Falcon, VU) at any given point in time. Habitat characteristics indicated that potential breeding habitat for the following species may occur within the focus area: *Polemeatus*

Business Case and Conclusion:

The avifaunal habitat sensitivity for the focus area is considered to be intermediate. Although a large contingent of SCC are considered likely to utilise the focus area for foraging, few are deemed likely to utilise the site for breeding. Most SCC which may inhabit the study area have wide ranges and often respond to favourable environmental conditions (such as locust of quelea outbreaks).

The proposed activities will increase the risk of birds colliding with or being electrocuted by powerlines or when perching or nesting on pylons, which can also be a fire risk.

Potential impacts arising from the proposed activities are unlikely to impact on SCC diversity or abundance as a reduction in suitable habitat will be insignificant within the focus area. Provided that mitigation measures stipulated in this report are adhered to the risk of bird collisions with powerlines is low.

	bellicosus (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle EN), *Cursorius rufus* (Burchell's courser, VU) and *Sagittarius serpentarius* (Secretarybird, VU).	
Avifaunal Diversity	The avifaunal diversity associated with the focus area was intermediate and comprised mainly of common avifaunal. Since habitat structure is often considered the primary determinant of bird assemblages it is anticipated that the largely homogenous structure of the focus area will be mirrored by a relatively narrow assemblage of birds. Species within the focus area include: Cape turtledove (*Streptopelia capicola*), Red-eyed Bulbul (*Pycnonotus nigricans*), Crimson-breasted shrike (*Laniarius astrococcineus*), Karoo Prinia (*Prinia masulosa*), Long-billed crombec (*Sylvietta rufescens*), African Hoopoe (*Upupa africana*), Neddicky (*Cisticola fulvicapillus*), Scaly-feathered Finch (*Sporopipes squamifrons*), Black-chested Prinia (*Prinia flavicans*), Kalahari Scrub-robin (*Erythropygia paena*), Chestnut-vented Tit Babler (*Sylvia subcaeruleum*) and Brown-crowned Tchagra (*Tchagra Australis*). Please refer to Appendix E for the full list of species identified on site.	
Avifaunal Availability	The focus area is considered to have an intermediate amount of forage for avian species. The Kathu Bushveld habitat unit offers sufficient food for the avian assemblage within the focus area and it is unlikely that this is a limiting factor within the natural habitat considering most birds occur naturally in low abundances within this habitat. Forage for granivores and birds that feed on vegetation was abundant in most areas yet will certainly fluctuate throughout the year leading to localized movement and migration. Insect abundances where moderately high providing a rich source of food for most passerines as fruiting vegetation appeared to occur in limited supply. Forage for large perch hunting raptors was noted in lower abundances, however, these species wide ranging habits will cover large areas and it is unlikely food will be a limiting factor for them. The absence of large predators and larger prey species is an important component of vultures habitat and the lack of these fauna within the broader locality reduces the favourability of this habitat for large avian scavengers.	
Habitat Integrity	The focus area is surrounded by natural portions of Kathu Bushveld that has experienced only minor anthropogenic. The only structures which break up the natural Kathu Bushveld are Solar Power Plants to the west and south. The habitat beyond these existing plants is largely intact and likely only disturbed by domestic livestock grazing which has the potential to cause structural changes to herbaceous vegetation. Many of these natural locations are now absent of large herbivores and predators which may play important roles in maintain vegetation structure while reducing the potential for larger scavenging raptors to forage here.	
Habitat Availability	Habitat availability is considered moderately high within the focus area. The Kathu Bushveld offers good habitat for avifaunal species yet the lack in heterogeneity in the landscape reduces the habitat available for specialist birds who have specific niche requirements. The habitat remains of similar floral structure and density throughout, the only noticeable change is the higher density of shrubs in the west while the tree density is higher in the east providing better opportunities for perch hunters and suitable nesting opportunities for many of the larger SCC. The Kathu Bushveld offers suitable habitat similar in structure, which is a primary determinant of bird species assemblages, as such it is not anticipated that a highly diverse assemblage of birds will occur here.	
General comments (Avifauna species/noteworthy records etc.):	During a previous field investigation, *Ardeotis kori* (Kori Bustard, NT) were observed at the north-eastern portion of the study area. Five near-endemic species, namely: Fiscal Flycatcher (*Sigelus silens*), Karoo Thrush (*Turdus smithi*), Fairy Flycatcher (*Stenostira scita*), Black-headed Canary (*Serinus alario*) and Black Harrier (*Circus maurus*) may occur within the study area. Species endemic to the southern Africa which were observed include: *Amadina erythrocephala* (Red-headed Finch), *Malcorus pectoralis* (Rufous-eared Warbler), *Prinia flavicans* (Black-chested Prinia), *Chersomanes albofasciata* (Spike-healed Lark), *Calendulauda africanoides* (Fawn-coloured Lark), *Batis pririt* (Pririt Batis) and *Laniarius astrococcineus* (Crimson-breasted Shrike).	

4.3 Avifaunal SCC Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the focus area. Species listed in Appendix F or other regional listings, whose known distribution ranges and habitat preferences include the focus area were taken into consideration. Only species who are anticipated to have a POC of 60% of higher are listed.

Several SCC listed in Appendix C, *Gyps africanus* (White-backed Vulture, CR), *Neotis ludwigii* (Ludwig's Bustard, EN), *Torgos tracheliotos* (Lappet-faced Vulture, EN), *Coracias garrulus* (European Roller, NT), *Falco biarmicus* (Lanner Falcon, VU), *Polemeatus bellicosus* (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle EN), *Cursorius rufus* (Burchell's courser, VU), *Sagittarius serpentarius* (Secretarybird, VU) and *Ardeotis kori* (Kori Bustard, NT) have distribution ranges which encompass the focus area and most have a POC of 60% or higher.

Due to the habitat unit associated with the focus area the likelihood for avifaunal SCCs occurring within the focus area is deemed to be medium or high. Should the nests of any avifaunal SCC as listed above and in Appendix C of this report, be encountered during the course of the proposed development activities, all operations must be stopped immediately, and an avifaunal specialist must be consulted in order to advise on the best way forward. For mitigation on how to appropriately manage and treat potential SCC present in the focus area refer to Section 5.4.

Table 4: Avifaunal SCC that may occur within the subject property due to suitable habitat. A full list of POC calculations is presented in Appendix B.

Scientific and Common Name	Habitat Description	Red List (Global) Status	Regional Status	POC (%)
AVIFAUNA				
Ardeotis kori (Kori Bustard)	**Range**: In the region in occurs in Angola, Botswana, Zimbabwe, and South Africa, mostly in flat open arid country in grassland, bushveld, thornveld, scrubveld and savanna. Only absent from KwaZulu-Natal.	NT	NT	**100**
	Major habitats: Savanna, Grassland and Desert.			
	Description: Inhabits mostly flat, arid, mostly open country (grassland, bushveld, thornveld, scrubland and savanna).			
	Food:. Omnivorous. Feeds on insects, small reptiles,, birds, mammals and a variety of plant matter.			
	Available habitat with the Subject Property: Entire focus area			
Neotis ludwigii (Ludwig's Bustard, EN),	**Range**: Near endemic to the regions occurring in the more arid regions of South Africa, Namibia and the Southern edge of Angola. Within South Africa the distribution lies more to the south, however, due to the lack of sampling in the region around the focus area it has been included in this list under the precautionary principle.	EN	EN	**50**
	Major habitats: Savanna, shrubland, Grassland, rocky areas (inland cliffs and mountains) and desert.			
	Description: Inhabits mostly flat, semi-arid, open country in the Succulent Karoo, Nama Karoo and Namib.			
	Food:. Insects, small vertebrates and vegetable matter.			
	Available habitat with the Subject Property: Entire focus area			
Cursorius rufus (Burchell's Courser).	**Range**: Near endemic to the regions occurring in South Africa, Namibia and the Southern edge of Angola.	LC	VU	**60**
	Major habitats: Shrubland, grassland inland wetlands and desert.			
	Description: A nomadic species with little known about its movement. Often utilizes open short sward grassland, dry savannas overgrazed or burnt grasslands or pastures, bare or sparsely vegetated sandy or gravelly deserts.			
	Food:. Insects (mainly termites) and occasionally seeds.			
	Available habitat with the Subject Property: Entire focus area (preferring the more open eastern portion)			
Gyps africanus (White-backed Vulture)	**Range**: Widespread south of the Sahel region only avoiding heavily forested areas. In south Africa it is only absent from two of the nine provinces (Western and Eastern Cape). Greatest densities occur along our northern borders with Botswana, Zimbabwe and Mozambique.	CR	CR	**90**
	Major habitats: Favours savanna, shrubland, grassland and desert.			
	Description: The species inhabits woodlands regions within South Africa. For feeding it relies on large mammalian carcasses where it feeds communally. This species has wide ranging habits. The species typically nests in tall trees as appose to cliff-nesting as with most vultures.			
	Food:. Large mammalian carcasses.			
	Available habitat with the Subject Property: Entire focus area (the absence of large mammalian carcasses will reduce the suitability of the location for this species)			
Aquila rapax (Tawny Eagle)	**Range**: This species is widespread throughout sub-Saharan Africa. In South Africa it is largely restricted to protected areas.	VU	EN	**60**
	Major habitats: Forest, savanna, shrubland and grassland.			
	Description: The species favours lightly wooded savanna, thornveld and semi-desert were adults hold territories. Also known to occasionally respond to favourable environmental conditions such as Quelea and Armoured cricket outbreaks.			
	Food:. Scavenging and piracy of prey from other raptors or accipiter's. Also eats invertebrates regularly.			
	Available habitat with the Subject Property: Entire focus area.			
Torgos tracheliotos (Lappet-faced Vulture)	**Range**: Occurs throughout eastern Africa, Southern Africa and within the Sahel region of Africa. Within South Africa the species occurs in the northern reaches of the country.	EN	EN	**60**
	Major habitats: Favours savanna, shrubland, grassland and desert.			
	Description: The species inhabits areas similar to the White-backed Vulture preferring wooded habitat within large Protected Areas. woodlands regions within South Africa.			

Scientific and Common Name	Habitat Description	Red List (Global) Status	Regional Status	POC (%)
	For feeding it relies on large mammalian carcasses, often outcompeting other vultures at carcasses. This species has wide ranging habits. The species typically nests in tall trees as appose to cliff-nesting as with most vultures.			
	Food:. Large mammalian carcasses.			
	Available habitat with the Subject Property: Entire focus area (the absence of large mammalian carcasses will reduce the suitability of the location for this species).			
Coracias garrulus (European Roller)	**Range**: This species has a large range due to its migratory habitats and can be encountered through Africa, only avoiding true desert and dense forest. It occurs throughout Europe, the arabian peninsula to eastern Kazakhstan.	LC	NT	**90**
	Major habitats: Savanna, shrubland, Grassland and Artificial terrestrial habitats.			
	Description: This species is threatened due to the permanent conversion of land to agriculture within its breeding range in Europe. Within our region few threats are known to the species besides drought which alters the movement patterns of the species. This species inhabits woodland and savanna biomes and where it hunts from a prominent perch.			
	Food:. Invertebrates.			
	Available habitat with the Subject Property: Entire focus area.			
Polemeatus bellicosus (Martial Eagle)	**Range**: Sub-saharan Africa, avoids dense forest.	VU	EN	**80**
	Major habitats: Favours savanna and shrubland but occurs in grassland and semi-arid habitats.			
	Description: Adults of this wide ranging hold large territories that are largely restricted to protected areas. More recently a trend has developed showing a westward movement of the species into the Karoo and Kalahari regions where local populations are increasing.			
	Food:. Perch hunter of small to medium sized mammals and reptiles.			
	Available habitat with the Subject Property: Entire focus area.			
Sagittarius serpentarius (Secretarybird)	**Range**: Sub-Saharan Africa where it avoids densely wooded or forested areas.	VU	VU	**60**
	Major habitats: Savanna, Shrubland and grassland.			
	Description: The species is prefers open grassland and scrub with a height lower than 50cm where it stalks its prey on foot. It requires sufficient scattered trees in which to nest. Birds are normally found singly or in pairs.			
	Food:. Has a cosmopolitan diet but appears to prey mostly on snakes. Other prey includes invertebrates, small mammals, birds and their eggs.			
	Available habitat with the Subject Property: Entire focus area but preferring the more open eastern portion of the Kathu Bushveld.			
Falco biarmicus (Lanner Falcon)	**Range**: Southern Europe and the Arabian Peninsula with most of its range within Africa.	LC	VU	**60**
	Major habitats: Forest, Savanna, shrubland, Grassland, Rocky areas (inland cliffs and mountains) and desert. Favours open grassland or woodland near cliffs.			
	Description: Inhabits a wide variety of habitats and may illustrate crepuscular behaviour. Mostly resident with some birds migrating to west Africa.			
	Food:. Birds, small mammals, insects and reptiles.			
	Available habitat with the focus area: Entire focus area.			

If in the event that avifaunal SCC as listed above or in **Appendix F** or the above table of this report are encountered during the proposed activities and may be harmed by the development, an avifaunal specialist must be consulted in order to ascertain the best way forward.

5. SENSITIVITY MAPPING

The figure below conceptually illustrates the areas considered to be of increased ecological sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for avifaunal SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity. The table below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

Table 5: A summary of sensitivity of each habitat unit and implications for development.

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Kathu Bushveld	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	This habitat unit has avoided any large scale alteration and remains in a natural state, only compromised by occasional roads and fencing between properties, and slight overgrazing, as such disturbances to avifauna have been limited and an intermediate abundance and diversity was noted. Although this unit provides good structural diversity the homogenous nature of the broad habitat reduces the potential for smaller niche habitats which would increase diversity. The proposed development is unlikely to result in a permanent decrease in both threatened and non-threatened avifauna. Although the activities will increase the potential for birds, notably large wide ranging species, to collide with the powerlines between the Pylons the proposed mitigation measures should negate this impact

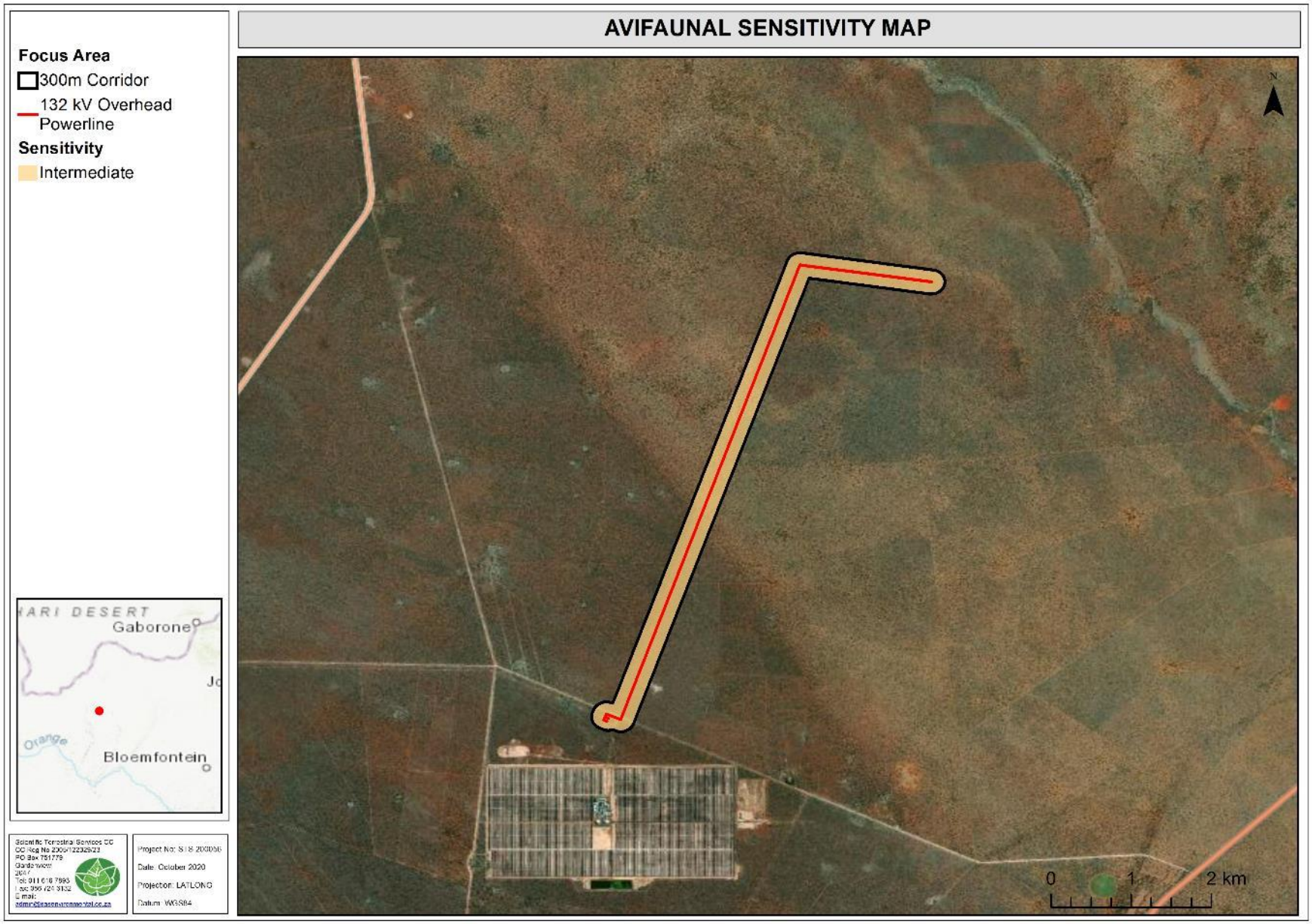


Figure 6: Avifaunal sensitivity map of the focus area.

6. IMPACT ASSESSMENT

The tables below serve to summarise the significance of perceived impacts on the avifaunal SCC associated with the focus area, with each individual impact identified presented in Section 6.1 of this report. A summary of all potential pre-construction, construction and operational impacts is provided in Table 7 below.

The sections below provide the significance of perceived impacts arising from the proposed development for the focus area.

An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 6.1, 6.2 and 6.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 6.4.

Table 6: Aspects and activities register considering avifaunal resources during all phases of development.

ACTIVITIES AND ASPECTS REGISTER
Planning Phase
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities: • Potential failure to have a Rehabilitation Plan and anti-collision measures developed before the commencement of the development of the powerline. - **Impact**: Long-term or permanent degradation and modification of the receiving environment, loss of SCC and fauna habitat.
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities: • Potential failure to obtain the necessary permits for the removal of protected avifaunal species should they be needed resulting in delays to the construction activities. - **Impact**: Long-term or permanent degradation and modification of the receiving environment and displacement or loss of avifaunal SCC.
- Potential inadequate design of electricity pylons and powerlines increasing the possibility of birds being electrocuted by or colliding with infrastructure. - **Impact:** Long-term collision and electrocution risks to SCC species leading to a reduction in SCC diversity.
Construction Phase
- Inadequate layout optimisation, resulting in extensive site clearing and the removal of indigenous vegetation. - **Impact:** Loss of important avifaunal habitat and the potential loss of avifaunal SCC.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of avifaunal habitat and forage. - **Impact:** Loss of sensitive avifaunal habitat and avifaunal species reliant on this specific habitat for survival.
- Proliferation of AIP species that colonise areas of increased disturbances and may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat. - **Impact:** Degradation of favourable avifaunal habitat outside of the direct construction footprint, leading to a decrease in avifaunal diversity at a local scale and loss of land to meet biodiversity targets.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** Loss of avifaunal habitat, diversity and SCC.
- Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase.

ACTIVITIES AND ASPECTS REGISTER
- **Impact:** Potentially leading to permanent transformation of avifaunal habitat and long-term degradation of important avifaunal habitat within the region.
- Additional pressure on avifaunal habitat as a result of an increased human presence associated with the proposed development, contributing to: • Potential hunting/trapping/removal/collection of avifaunal species or potential SCC; and • Increased human activity will lead to the displacement and/or loss of potential avifaunal SCC. - **Impact:** Loss of sensitive avifaunal habitat and the potential loss of avifaunal SCC.
- Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines. - **Impact:** Local loss of avifaunal SCC abundance and diversity.
- Potential failure to concurrently rehabilitate bare or disturbed sites as soon as the construction activities have occurred will potentially result in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for historically recorded avifaunal species. Loss of avifaunal diversity and potential SCC which will disperse into the surrounding area in search of favourable habitat.
Operational and Maintenance Phase
- Ineffective rehabilitation of exposed and impacted areas potentially leading to vegetation succession and a possible reduction of avifaunal diversity and occurrence of potential avifaunal SCC over the long-term. - **Impact:** Permanent loss of avifaunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural avifaunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to avifaunal assemblages.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes being left fragmented, resulting in reduced migration capabilities of avifaunal species, isolation of avifaunal populations and a decrease in avifaunal diversity; • Compacted soils limiting the re-establishment of natural vegetation; and • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of avifaunal habitat, diversity and SCC.
- Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding avifaunal niche habitat, diversity and SCC.
- Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines. - **Impact:** Local loss of avifaunal SCC abundance and diversity.
- Potential overexploitation through the removal and/or collection of important or sensitive avifaunal SCC on the property. - **Impact:** Local loss of avifaunal SCC abundance and diversity.
- Potentially poorly managed edge effects: - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the avifaunal habitat; and - Potential erosion stemming from soil left bare leading to sedimentation of downslope avifaunal habitat. - **Impact:** Loss of avifaunal habitat, diversity and SCC within the direct expansion development footprint of the mine. Loss of surrounding avifaunal diversity and avifaunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.

Table 7 below provides all the impact scores pre- and post-mitigation measures. It Is important to note that if ALL mitigations as stipulated in this report are not implemented, the post mitigation scoring may need to be amended.

The table below highlights the key integrated mitigation measures that are applicable to all the development activities in order to suitably manage and mitigate the ecological impacts on avifauna that are associated with the planning, construction and operation phases of the proposed activities. Provided that all the management and mitigation measures as stipulated

in this report are implemented the overall risk to avifaunal diversity, habitat and faunal SCC can be adequately mitigated and minimised.

The planning phase is essential in ensuring that activities associated with all phases of the project have the lowest possible impact on the receiving environment. In this regard, scoring of the planning phase is considered important, since although it is unlikely to result in an immediate impact, failure to effectively plan, and implement the necessary mitigations, a rehabilitation plan, a Biodiversity Action / Management Plan and obtain the necessary faunal permits as well as design and implement a rescue and relocation plan prior to the onset of ground clearing activities, the impact is likely to be higher during the construction and operational phase.

Table 7: Avifaunal Impact Assessment Results.

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Impact of Avifaunal Habitat and Diversity																
Kathu Bushveld	3	3	2	3	2	**6**	**7**	**42** **Low**	2	3	1	2	2	**5**	**5**	**25** **Very-low**
Impact on Avifaunal SCC																
Kathu Bushveld	3	3	2	3	2	**6**	**7**	**42** **Low**	2	3	1	2	2	**5**	**5**	**25** **Very-low**
CONSTRUCTION PHASE																
Impact of Avifaunal Habitat and Diversity																
Kathu Bushveld	4	3	3	3	2	**7**	**8**	**56** **Medium-low**	3	3	2	2	2	**6**	**6**	**36** **Low**
Impact on Avifaunal SCC																
Kathu Bushveld	4	3	3	3	2	**7**	**8**	**56** **Medium-low**	3	3	2	2	2	**6**	**6**	**36** **Low**
OPERATIONAL AND MAINTENANCE PHASE																
Impact of Avifaunal Habitat and Diversity																
Kathu Bushveld	4	3	3	3	4	**7**	**10**	**70** **Medium-low**	3	3	2	2	4	**6**	**8**	**48** **Low**
Impact on Avifaunal SCC																
Kathu Bushveld	4	3	3	3	4	**7**	**10**	**70** **Medium-low**	3	3	2	2	4	**6**	**8**	**48** **Low**

6.1 Impact discussion

The perceived impact significance of the proposed development (prior to mitigation) on avifaunal habitat, diversity and SCC range from medium high to low. The potential for local or regional impacts are unlikely if recommended mitigation measures as stipulated in Section 6.4 below are adhered to. If effective mitigation takes place at all stages of the proposed project, most of the impacts may be reduced to a lower significance rating (low to very low).

Construction and operational phase impacts to the habitat are expected to be the highest in their severity with impacts that are anticipated to be medium low without mitigation. Impact mitigation is however expected to reduce the severity of these impacts to acceptable levels. Impacts to SCC will be medium low if mitigations measures are ignored during the construction and operational phases. Mitigation, if implemented correctly, will reduce the impact significance to low for SCC.

6.1.1 Impact on avifaunal Diversity and Habitat

The focus area has avoided any form of large-scale landscape transformation (e.g. extensive agriculture or mining activities or earth works) ensuring that a modest assemblage of most avifaunal, with a reduced abundance of large raptors, has been conserved. Very little clearing of vegetation is anticipated for the construction of the pylons and thus little alteration in the local habitat is anticipated. The major impact resulting from the proposed infrastructure is the potential for avifauna (particularly larger birds) to collide with the pylons or be electrocuted on them while perching which may reduce abundances, yet, as little habitat will be transformed diversity is not anticipated to be altered.

Minor impacts from edge effects may occur should proper rehabilitation of the site not be completed which may alter the local environment to a small extent, however these impacts are not anticipated to be high. An increase in vehicle movement during maintenance will increase the likelihood of collisions with avifauna, yet the vehicles are unlikely to be moving fast enough to be a significant risk to avifauna. Avifaunal diversity within the focus area is considered intermediate and is unlikely to be affected as a result of the proposed development. The impact significance of the loss of avifaunal species diversity based on the proposed layout plans for the construction and operational phases is expected to be medium low prior to the implementation of mitigation measures and low should mitigation be implemented thoroughly. The relatively small footprint of the development within the broader habitat should not cause any long-term impacts to the diversity yet the integrity of the focus area may be degraded.

6.1.2 Impact on avifaunal SCC

Ten protected faunal species may either inhabit focus area and utilize it for foraging on a intermittent basis. Several species, including; *Polemeatus bellicosus* (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle EN), *Cursorius rufus* (Burchell's courser, VU), *Sagittarius serpentarius* (Secretarybird, VU) and *Ardeotis kori* (Kori Bustard, NT) may breed within the focus area as suitable habitat is available. Tall trees providing suitable nest locations for *Polemeatus bellicosus* (Martial Eagle, EN) and *Aquila rapax* (Tawny Eagle EN) are available and small mammal signs appeared frequently suggesting sufficient forage resources. The more terrestrial SCCs' *Cursorius rufus* (Burchell's courser, VU) and *Ardeotis kori* (Kori Bustard, NT) do have marginal habitat as the density of shrubs and trees is relatively high for these species. As for the aforementioned species, shrub and tree density may be slightly higher than what is preferred by *Sagittarius serpentarius* (Secretarybird, VU), however, its wide ranging habits will likely bring it into the focus area, a common trend with the larger raptors.

The potential breeding habitat for *Gyps africanus* (White-backed Vulture, CR) and *Torgos tracheliotos* (Lappet-faced Vulture, EN) is available, however, the absence of large carnivores and herbivores limits the foraging potential in the immediate focus area, and although these vultures are capable of travelling vast distances it is likely that they will remain closer to sources of forage where larger protected areas and vast natural landscapes with full faunal compositions are located.

Coracias garrulus (European Roller, NT) does not breed within the region and as such is not likely to be impacted upon by the proposed development. *Falco biarmicus* (Lanner Falcon, VU) is also unlikely to breed within broader locality as no cliffs are available and generally their core breeding range is within the eastern sour grassland. Lastly, habitat for *Neotis ludwigii* (Ludwig's Bustard, EN), is marginal as the species appears to favour more open habitat with a lower density of shrubs and trees where gravel plains occur. However, the limited sampling effort in the region reduces the confidence in this statement.

Local migrations from the development footprint and its direct surroundings will likely occur during the construction phase and will lead to higher competition for resources in adjacent habitats, yet, this will occur over the short term and it is likely that once disturbance frequency is reduced that the diversity within the focus area will return to baseline levels if proper mitigation is implemented.

The impact associated with the loss of habitat for the above-mentioned SCC is of medium-low significance during the construction and operational phases, prior to the implementation of

mitigation measures. With the implementation of mitigation measures, the impact significance of the loss of important species may be reduced to low levels, as mitigation measures will ensure better protection for these species.

6.2 Probable Residual Impacts

Even with extensive mitigation, significant residual impacts on the receiving faunal ecological environment are deemed highly likely. The following points highlight the key latent impacts that have been identified:

- Temporary loss of avifaunal habitat;
- Possible reduction in avifaunal SCC presence in the surrounding habitats through edge effects, collisions and electrocutions;
- Temporary loss of and alteration of avifaunal species diversity;
- Temporary reduction in avifaunal abundance; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of avifaunal habitat, species diversity and avifaunal SCC may be permanent if mitigations are not implemented.

6.3 Cumulative Impacts

Based on the number of avifaunal SCC whose distribution overlay the focus area, it is likely that the location plays a role in supporting SCC populations. As the surrounding landscape has escaped transformation and remains in a good ecological state, the temporary loss of habitat from the proposed activities will be limited it is unlikely to cause any significant impacts on SCC, provided mitigation measures are implemented. Moreover, many of these species which may relocate to more suitable habitat adjacent the development during the construction phase will re-stablish themselves within the project area as very little habitat will be altered or transformed. It is unlikely that any long-term impacts will occur to the highly mobile avifaunal SCC, provided sufficient rehabilitation and post rehabilitation monitoring occurs. Lastly, ineffective control and monitoring of edge effects will result in the spread of AIP species to areas outside of the focus area, which will may alter avifaunal habitat within the pylon locations in the focus areas.

Based on the general landscape and habitat within the focus area the site has the potential to host an intermediate assemblage on avifauna and several potential SCC. Four SCC have possible breeding habitat within the focus area and, as such uncontrolled development within the focus area may result in the loss of breeding habitat for these species.

Table 8: Cumulative impacts associated with the avifaunal habitat, diversity and SCC arising from the proposed development activities

Nature: Impact on avifaunal habitat, species diversity and abundance due to cumulative loss of habitat, increased risk of bird strikes with the overhead lines and tower structures as well as increased electrocution risks.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	The impacts can be mitigated to some degree if mitigation measures are implemented. However, given the presence of the powerline and other associated developments within the area, the long-term impacts associated thereof cannot be fully mitigated.	
Mitigation: ➢ Appropriate anti-collision devices (bird-flappers) must be placed along the OHPL at appropriate intervals so as to deter/ minimise bird strikes with the powerline; ➢ Anti-roosting spikes/ structures must be placed on pylons where birds may perch or attempt to construct nests; ➢ Bird-flappers should be of alternating colours so as to increase visibility, they should also not be of similar colour to the surrounding environment, as this may cause them to blend in an negates their functions; and ➢ Regular monitoring of the OHPL should take place to gather information about the occurrence and frequency of bird strikes/ electrocutions as well as which species are more prone to these. This data must be used to inform and adapt methods to avoid this from happening in the future.		

6.4 Integrated Impact Mitigation

The table below highlights the key integrated mitigation measures that are applicable to the proposed focus area in order to suitably manage and mitigate the ecological impacts that are associated with the proposed development. Provided that all the management and mitigation measures as stipulated in this report are implemented the overall risk associated with the activities may be minimised, although impacts are still considered unavoidable.

Table 9: A summary of the mitigatory requirements for avifaunal resources.

Project phase	*Planning Phase*
Impact Summary	*Loss of avifaunal habitat, species and avifaunal SCC*
Management Measures	***Proposed mitigation and management measures:***
	Avifaunal Habitat and Diversity - At all times, ensure that sound environmental management is in place during the planning phase; - During the site-pegging phase of surface infrastructure, any avifaunal SCC that will be affected by surface infrastructure must be noted and recorded. Should the species (likely its nest) need to be removed the relevant permits must be applied for from the Northern Cape Department of Environment and Nature Conservation (NCDENC) prior to the commencement of construction activities;

	- Minimise loss of indigenous vegetation where possible through refining the final development footprint, optimising the design within focus area while avoiding the removal of large trees where possible; - If avian SCC nests are located, a qualified avifaunal specialist should be consulted to determine the best management options. If nests are known to have nestlings or eggs within, these should be allowed to fledge prior to the nest removal; - Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential collisions or electrocutions, spills and /or leaks; - Prior to the commencement of proposed activities on site an alien vegetation management plan should be compiled for implementation throughout all development phases; - The final development plan should be assessed by a suitably qualified avifaunal specialist in order to ensure sensitive habitats have been avoided as far as feasibly possible, in line with the mitigation hierarchy as advocated by the DEA (2013).
Project phase	*Construction Phase*
Impact Summary	*Loss of avifaunal habitat, species and avifaunal SCC*
Management Measures	***Proposed mitigation and management measures:*** **Development footprint** - The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint. This final footprint area should be reviewed by an avifaunal specialist to ensure no detrimental impacts to avifaunal assemblages occur; - In order to reduce potential avifaunal collisions and electrocutions from the powerlines, large trees should be cut rather than removed to restrict perching areas where collisions may occur, this should occur within 10m/20m of the proposed powerlines; - Any structures which may act as perching sites for birds should be installed with anti-perching spikes; - Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the focus area and may increase avian collisions or electrocutions; - Avifaunal habitat beyond the demarcated area should not be cleared or altered; - Avifaunal monitoring along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities; - Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung. The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the wires. - Construction equipment should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; - No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and avifaunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; and - No hunting/trapping or collecting of avifaunal species is allowed. **Avifaunal SCC** - No collection of avifaunal SCC within the focus area may be allowed by construction personnel; - Edge effect control needs to be implemented to prevent further degradation and potential loss of avifaunal SCC habitat outside of the proposed development footprint; - Should any other avifaunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) be encountered, construction

	should be halted and authorisation to relocate such species must be obtained from NCDENC or the Department of Environmental Affairs (DEA); - Edge effect control needs to be implemented to ensure no further degradation and potential loss of avifaunal SCC outside of the proposed project footprint area; and - A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the focus area in order to ensure that species loss during construction activities is kept to a minimum; and **Fire** - No illicit fires must be allowed during the construction phase of the proposed development. **Rehabilitation** - A rehabilitation plan should be compiled by a suitable specialist. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during, and once construction has been completed as well as ongoing rehabilitation during the operational phase of the project to ensure habitat for avifauna is restored; and - Any natural areas beyond the development footprint, that have been affected by the construction activities, must be rehabilitated using indigenous plant species.
Project phase	*Operational Phase*
Impact Summary	*Loss of avifaunal habitat, species and SCC*
Management Measures	**Development footprint** - All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; and - Continuous monitoring (monthly) should be undertaken and a record of potential bird strikes or collisions should be kept and reported by the ECO during compliance monitoring. **Alien Vegetation** - Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to avifaunal species; and - Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards. **Avifaunal SCC** - No collection of avifaunal SCC within the focus area may be allowed by operational phase personnel unless as part of mortality monitoring activities. **Rehabilitation** - Where bare soils are left exposed as a result of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated.

7. CONCLUSION AND RECOMMENDATIONS

Based on the findings of the avifaunal assessment it is the opinion of the ecologists that from an avifaunal ecological perspective, the proposed development be considered favourably. The major impact anticipated to occur as a result of the project are collisions and electrocutions resulting from the proposed pylons and power lines. It is anticipated that should the proposed mitigation measures be implemented the risk of collisions and electrocutions can be drastically reduced. Although several SCC are known to inhabit the area, no important known nesting, roosting or movement corridors were observed or noted within relevant databases in the focus area and impacts to the priority species are not anticipated to be significant. All essential mitigation measures and recommendations presented in this report should be adhered to as

to ensure the ecology within the proposed project area as well as surrounding zone of influence is protected or adequately rehabilitated in order to minimise deviations from the Present Ecological State.

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APPENDIX A – Legislative Requirements

GDARD REQUIREMENTS FOR BIODIVERSITY ASSESSMENTS

VERSION 3, 2014

Specialists undertaking ornithological studies must be registered as Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Zoology, must be able to demonstrate relevant work experience and must have published on relevant aspects of the biology and/or ecology of birds. The individual must also have recognized expertise pertaining to the species targeted in the survey

- The SOC must determine whether the proposed development site falls within the known or expected distribution of any of the following Red List bird species prioritized by GDARD:- Cape Vulture, Blue Crane, Lesser Kestrel, African Grass-Owl, African Marsh-Harrier, White-backed Night-Heron, White-bellied Korhaan, Martial Eagle, African Finfoot, Lesser Flamingo, Secretarybird, Black Stork, Half-collared Kingfisher and Greater Flamingo.
- The SOC must determine whether suitable habitat occurs on the proposed development site or neighbouring properties for those priority Red List species whose distribution overlaps with the proposed development site.
- Surveys for terrestrial birds must be conducted in summer, but only once the vegetation layer has recovered sufficiently from winter fires to allow for assessment of available habitat.
- Surveys for aquatic birds must be conducted in summer. For species associated with rivers, the assessment must coincide with average flow conditions (i.e. not dry and not in flood) and preferably within the breeding season. For species associated with wetlands, the assessment must follow good summer rains i.e. standing water must be present and the vegetation must have recovered sufficiently from winter fires to allow for assessment of available habitat.
- Where distribution and habitat availability suggest a high probability of one or more priority Red List bird species occurring on site, the SOC must map suitable habitat (see *Sensitivity Mapping rules for Biodiversity Assessments* (spatial rules for birds) and indicate the number of individuals/pairs that could potentially be supported, given that it is unlikely that all birds will be located during a limited survey.

National Environmental Management Act, 1998

The National Environmental Management Act (NEMA; Act 107 of 1998) and the associated Environmental Impact Assessment (EIA) Regulations (GN R982 of 2014) and well as listing notices 1, 2 and 3 (GN R983, R984 and R985 of 2014), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact.

National Environmental Management Biodiversity Act (NEMBA, Act No. 10 of 2004)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.
Furthermore, a person may not carry out a restricted activity involving either:

a) A specimen of a listed threatened or protected species;
b) Specimens of an alien species; or
c) A specimen of a listed invasive species without a permit.

Conservation of Agricultural Resources Act (CARA, Act 43 of 1983)

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of species should take place throughout the construction and operation, phases.

APPENDIX B – Avifaunal Method of Assessment

Avifaunal Assessment Methodology

A reconnaissance 'walk through' on foot was undertaken to determine the general habitat types found throughout the focus area. Special emphasis was placed on areas that may potentially support avifaunal SCC. Sites representative of habitat units or unique niche habitats were then marked and point counts were undertaken in order to identify the occurrence of the avifaunal communities, species and habitat diversities. The presence of any avifaunal inhabitants of the focus area was assessed through direct visual observation or identifying such species through calls, nests and potentially pellets.

It is important to note that avifaunal species have varied breeding patterns and are subject to seasonal fluctuations. As such, it is unlikely that all avifaunal species will have been recorded during the site assessment. However, even though some avifaunal species may not have been identified during the sight assessment, the habitat units and degree of transformation can be used to establish an accurate understanding of avifaunal species most likely associated with the focus area.

Avifaunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each avifaunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The accuracy of the calculation is based on the available knowledge about the species in question. Therefore, it is important that the literature available is also considered during the calculation.
Each factor contributes an equal value to the calculation.

Scoring Guideline				
Habitat availability				
No Habitat	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Food availability				
No food available	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Habitat disturbance				
Very High	**High**	**Moderate**	**Low**	**Very Low**
1	2	3	4	5
Distribution/Range				
Not Recorded		**Historically Recorded**		**Recently Recorded**
1		3		5

[Habitat availability + Food availability + Habitat disturbance + Distribution/Range] / 20 x 100 = POC%

Avifaunal Habitat Sensitivity

The sensitivity of the focus area for avifauna species was determined by calculating the mean of five different parameters which influence avifaunal species and provide an indication of the overall avifaunal ecological integrity, importance and sensitivity of the focus area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Avifaunal SCC:** The confirmed presence or potential for avifaunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for avifaunal species;
- **Food Availability:** The availability of food within the focus area for avifaunal species;
- **Avifaunal Diversity:** The recorded avifaunal diversity compared to a suitable reference condition such as surrounding natural areas or available avifaunal databases; and
- **Habitat Intactness:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the focus area for avifaunal species. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the focus area in relation to avifaunal species. The different classes and land-use objectives are presented in the table below:

Table B1: Avifaunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1> and <2	Low	Optimise development potential.
2> and <3	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
3> and <4	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.
4> and <5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
5	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX C - Impact Assessment Methodology

Ecological Impact Assessment Method

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[1]. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table C1. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary[2].

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

[1] The definition has been aligned with that used in the ISO 14001 Standard.

[2] Some risks/impacts that have low significance will however still require mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table C1: Criteria for assessing significance of impacts

LIKELIHOOD DESCRIPTORS

Probability of impact	**RATING**
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	**RATING**
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	**RATING**
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected <	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected <	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table C2: Significance Rating Matrix.

LIKELIHOOD (Frequency of activity + Frequency of impact)	CONSEQUENCE (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table C3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for all stages of the project cycle including:
  - Pre-construction;
  - Construction; and
  - Operation.
- If applicable, transboundary or global effects were assessed.
- Individuals or groups who may be differentially or disproportionately affected by the project because of their *disadvantaged* or *vulnerable* status were assessed.
- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.

Mitigation measure development

The following points present the key concepts considered in the development of mitigation measures for the proposed development.

- *Mitigation* and *performance improvement measures* and actions that address the risks and impacts[3] are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.
- Desired outcomes are defined, and have been developed in such a way as to be *measurable events with performance indicators, targets and acceptable criteria* that can be tracked over *defined periods*, with estimates of the *resources* (including human resource and training requirements) *and responsibilities for implementation.*

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through to construction and operation.

[3] *Mitigation measures should address both positive and negative impacts*

APPENDIX D – Vegetation Type

Tsakane Clay grassland

Distribution

Gauteng and Mpumalanga Provinces. In patches extending in a narrow band from Soweto to Springs, broadening southwards to Nigel and from there towards Vereeniging, as well as north of the Vaal Dam and between Balfour and Standerton (including Willemsdal). Altitude 1480 – 1680m (Mucina & Rutherford, 2006).

Climate

Tsakane Clay Grassland falls within a strongly-seasonal summer-rainfall region, with very dry winters. MAP 630-720 mm. The overall MAT of 15°C indicates a transition between a cool-temperate and warm-temperate climate. The incidence of frost is frequent, increasing towards the southeast (Mucina & Rutherford, 2006)

Table D1: General climatic information for the Tsakane Clay Grassland (Mucina & Rutherford, 2006).

Bioregion	Vegetation types	Altitude (m)	MAP* (mm)	MAT* (°C)	MAPE* (mm)	MASMS* (%)
Mesic Highveld Grassland	Tsakane Clay Grassland	1480-1680	675	15.0	2118	75

*MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).

Geology and Soils

The most significant rock is the basaltic lava of the Klipriviersberg Group (Ventersdorp supergroup), together with the sedimentary rocks of the Madzaringwe Formation of the Karoo Supergroup. Soils typically of Ba and Bb land types (Mucina & Rutherford, 2006)

Conservation

Endangered. Target 24%. Only 1.5% conserved in statutory reserves (Suikerbosrand, Olifantsvlei, Klipriviersberg, Marievale) and a small portion also in private nature reserves. More than 60% transformed by cultivation, urbanization, mining, dam building and roads. Large portions of Alberton, Springs, Tsakane and part of Soweto (all south and east of Johannesburg) were built in the area of this vegetation unit. Urbanisation is increasing and further expansion of especially the southern suburbs of Johannesburg and the towns of the East Rand (especially the Brakpan District) will bring further pressure on the remaining vegetation. Erosion very low and low across the entire unit (Mucina & Rutherford, 2006)

Dominant Floral Taxa

Flat to slightly undulating plains and low hills. Vegetation is short, dense grassland dominated by a mixture of common Highveld grasses such as Themeda triandra, Heteropogon contortus, Elionurus muticus and a number of Eragrostis species. Most prominent forbs are of the families Asteraceae, Rubiaceae, Malvaceae, Lamiaceae and Fabaceae. Disturbance leads to an increase in the abundance of the grasses Hyparrhenia hirta and Eragrostis chloromelas (Mucina & Rutherford, 2006).

Table D2: Dominant & typical floristic species of *Tsakane Clay Grassland* (Mucina & Rutherford, 2006)

Grass Species	Forb Species	Tree/ Shrub Species
Abildgaardia ovata *Andropogon schirensis* *Brachiara serrata* (d) *Cymbopogon caesius* *Cynodon dactylon* (d) *Cynodon hirsutus* (d) *Digitaria ternata* (d) *Diheteropogon amplectens* *Elionurus muticus* (d) *Eragrostis* chloromelas (d) *Eragrostis patentipilosa* (d) *Eragrostis plana* (d) *Eragrostis racemosa* (d) *Heteropogon contortus* (d) *Hyparrhenia hirta* (d) *Melinis nerviglumis* *Microchloa caffra* (d) *Panicum gilvum* *Setaria nigrirostris* *Setaria sphacelata* (d) *Themeda triandra* (d) *Trachypogon spicatus* (d) *Triraphis andropogonoides*	*Ajuga ophrydis* *Anthospermum australe* *Aspidoglossum ovalifolium* *Eriosema salignum* *Euryops transvaalensis* subsp. *Transvaalensis* *Gerbera viridifolia* *Helichrysum nudifolium* var. *nudifolium* *Helichrysum rugulosum* *Hermannia depressa* *Hypoxis rigidula* var. *pilosissima* *Lotononis macrosepala* *Nidorella hottentotica* *Pentanisia prunelloides* subsp *latifolia* *Peucedanum caffrum* *Selago paniculata* *Senecio coronatus* *Senecio inornatus* *Sonchus nanus* *Striga asiatica* *Thotheca hirsute* *Vernonia oligocephala*	*Anthospermum rigidum* subsp. *pumilum* *Chaetacanthus setiger* *Tephrosia capensis* var. *acutifolia* *Thesium impeditum*

***(d) – Dominant species for the vegetation type**

APPENDIX E – Species Observation List

Table E1: Avifaunal species observed during site visit (to be updated).

Scientific name	Common name	IUCN Red List Status	NCNCA (2009)
Streptopelia capicola	Cape turtledove	LC	Protected species
Amadina erythrocephala	Red-headed Finch	LC	E
Malcorus pectoralis	Rufous-eared Warbler	LC	E
Prinia flavicans	Black-chested Prinia	LC	E
Chersomanes albofasciata	Spike-healed Lark	LC	E
Calendulauda africanoides	Fawn-coloured Lark	LC	E
Corvus alba	Pied Crow	LC	NA
Oena capensis	Namaqua Dove	LC	NA
Emberiza flaviventris	Golden-breasted Bunting	LC	Protected
Passer diffusus	Southern Grey-headed Sparrow	LC	Protected
Merops hirundineus	Swallow-tailed Bee-eater	LC	Protected
Batis pririt	Pririt Batis	LC	E
Merops apiaster	European Bee-eater	LC	Protected
Lamprotornis nitens	Cape Glossy Starling	LC	Protected
Turdoides bicolor	Southern Pied Babbler	LC	Protected
Laniarius atrococcineus	Crimson-breasted Shrike	LC	E
Lanius collaris	Common Fiscal	LC	Protected
Falco rupicolus	Rock Kestrel	NA	Specially protected
Eremomela icteropygialis	Yellow-bellied Eremomela	LC	Protected
Pycnonotus nigricans	Red-eyed Bulbul	LC	NA
Calendulauda africanoides,	Fawn-coloured Lark	LC	Protected
Myrmecocichla formicivora	Ant-eating Chat	LC	Protected
Tchagra australis	Brown-crowned Tchagra	LC	Protected
Cisticola rufilatus	Tinkling Cisticola	LC	Protected
Cisticola fulvicapilla	Neddicky	LC	Protected
Tockus leucomelas	Southern Yellow-billed Hornbill	LC	Protected
Tockus nasutus	Grey Hornbill	LC	Protected
Turdoides bicolor	Southern-pied Babbler	LC	Protected
Rhinopomastus cyanomelas	Common Scimitarbill	LC	Protected
Glaucidium perlatum	Pearl-spotted Owlet	LC	Protected
Ardeotis kori	Kori Bastard	NT	NA
Telophorus zeylonus	Bokmakierie	LC	Protected
Columba guinea	Speckled pigeon	LC	Protected
Uraeginthus granatinus	Violet eared waxbill	LC	Protected
Urocolies indicus	Red-faced Mousebird	LC	NA
Colies	White-backed Mousebird	LC	NA
Ploceus velatus	Southern masked weaver	LC	NA
Laniarius astrococcineus	Crimson-breasted shrike	LC	Protected
Sylvietta rufescens	Long-billed crombec	LC	Protected
Upupa africana	African Hoopoe	LC	Protected
Spilopelia senegalensis	Laughing Dove	LC	Protected

Scientific name	Common name	IUCN Red List Status	NCNCA (2009)
Afrotis afraoides	Northern Black Korhaan	LC	Protected
Sylvia subcaerulea	Chestnut-vented tit-babbler	LC	Protected
Calendulauda sabota	Sabota Lark	LC	Protected
Prinia masulosa	Karoo Prinia	LC	Protected
Emberiza impetuani	Lark-like Bunting	LC	Protected
Tricholaema leucomelas	Acacia Pied Barbet	LC	Protected
Serinus flaviventris	Yellow Canary	LC	Protected
Quelea	Red-billed Quelea	LC	N/A
Plocepasser mahali	White-browed Sparrow-weaver	LC	Protected
Crithagra albogularis	White-throated Canary	LC	Protected
Crithagra atrogularis	Black-throated Canary	LC	Protected
Passer melanurus	Cape Sparrow	LC	NA
Sporopipes squamifrons	Scaly-feathered Weaver	LC	Protected
Saxicola torquata	African Stonechat	LC	Protected
Anthus cinnamomeus	African Pipit	LC	Protected
Sigelus silens	Fiscal Flycatcher	LC	Protected
Erythropygia paena	Kalahari scrub Robin	LC	Protected

LC = Least concerned. NT = Near Threatened, NYBA = Not yet been assessed by the IUCN.

APPENDIX F – Avifaunal SCC

Table F1: TOPS list of faunal species (2015) expected to occur within the Northern Cape.

Scientific Name	Common Name	Threat Status
Neophron percnopterus	Egyptian Vulture	CR
Aquila rapax	Tawny Eagle	EN
Torgos tracheliotos	Lappet-faced Vulture	EN
Gyps africanus	White-backed Vulture	CR
Gyps coprotheres	Cape Vulture	EN
Neotis ludwigii	Ludwig's Bustard	EN
Polemaetus bellicosus	Martial Eagle	EN
Terathopius ecaudatus	Bateleur	EN
Anthropoides paradiseus	Blue Crane	P
Ardeotis kori	Kori Bustard	P

VU = Vulnerable, NT = Near Threatened, LC = Least Concern NYBA = Not Yet Been Assessed = Threatened at a provincial level, Highlighted species may occur within the focus area.

Avifaunal Species for the pentad 2730_2300 and 2735_2300 within the QDS 2723CA.

http://sabap2.birdmap.africa/coverage/pentad/2735_2300

http://sabap2.birdmap.africa/coverage/pentad/2730_2300

APPENDIX G – Declaration and Specialists CV's

1. (a) (i) Details of the specialist who prepared the report

Daryl van der Merwe	MSc Conservation Biology (University of Cape Town)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

1. (A). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Chris Hooton		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	083 342 0639
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	Chris@sasenvgroup.co.za		
Qualifications	BTech Nature Conservation (Tshwane University of Technology National Diploma Nature Conservation (Tshwane University of Technology) Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA) Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs		

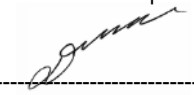
Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Daryl van Der Merwe		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	0780201 0069
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	Daryl@sasenvgroup.co.za		
Qualifications	MSc (Conservation Biology Candidate) (University of Cape Town) BSc (Zoology and Conservation) (University of the Witwatersrand)		

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	082 442 7637
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Daryl van der Merwe, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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



Signature of the Specialist

I, Christopher Hooton, declare that -

- I act as the **independent specialist (reviewer)** 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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.

Specialist Signature

I, Stephen van Staden, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF DARYL VAN DER MERWE

PERSONAL DETAILS

Position in Company	Junior Field Biologist
Joined SAS Environmental Group of Companies	2019

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

EDUCATION

Qualifications

MSc (Conservation Biology Candidate) (University of Cape Town)	2019
BSc (Hons) Plant Science (Ecology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo and Northern Cape

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Faunal Assessments
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
Africa - Zimbabwe, Sierra Leone

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF STEPHN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of IAIA South Africa

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland Assessment short course Rhodes University	2016

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

PROJECT EXPERIENCE (Over 2500 projects executed with varying degrees of involvement)

1 Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2 Linear developments
3 Energy Transmission, telecommunication, pipelines, roads
4 Minerals beneficiation
5 Renewable energy (wind and solar)
6 Commercial development
7 Residential development
8 Agriculture
9 Industrial/chemical

REFERENCES

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