



SCIENTIFIC TERRESTRIAL SERVICES

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**BIODIVERSITY ASSESSMENT AS PART OF THE
ENVIRONMENTAL ASSESSMENT AND AUTHORISATION
PROCESS FOR A PROPOSED OVERHEAD POWERLINE
(OHPL) FOR THE HYPERION HYBRID FACILITY, NEAR
KATHU, NORTHERN CAPE PROVINCE**

Prepared for

Hyperion Solar Hybrid (Pty) Ltd.

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (STS) was appointed to conduct a biodiversity assessment as part of the Basic Assessment (BA) process for the proposed development of an overhead powerline (OHPL) 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 OHPL and an associated 300 m corridor. This report includes a desktop screening assessment and faunal and floral ecological assessment as part of the Environmental Impact Assessment (EIA) process.

During the field assessment, one habitat unit was identified within the focus area, namely the Kathu Bushveld. Within the Kathu Bushveld habitat unit, suitable habitat exists to support an array of floral and faunal species. Overall, the condition of the habitat is good, although there is evidence that the area has experienced some form of degradation. Indigenous plant species dominated the focus area, and only one alien invasive plant (AIP) species was identified at the time of assessment, namely *Prosopis glandulosa* (Glandular Mesquite, Not Listed), indicating the very low level of alien plant impacts within the focus area.

During the field assessment no floral SCC (i.e. Red Data Listed plants), as defined in Section 52(2) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were observed within the focus area. However, three protected trees, namely *Boscia albitrunca*, *Vachellia erioloba* and *V. haematoxylon*, as defined under The National Forest Act, 1998 (Act No. 84 of 1998, amended 2001) (NFA) were recorded within focus area. Furthermore, several species of provincial importance were present in this habitat unit, i.e. those listed in Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), namely *Aloe grandidentata*, *Boscia albitrunca*, *Gymnosporia buxifolia*, *Euphorbia duseimata*, *Jamesbrittenia atropurpurea* and *Ruschia calcarea*. Permits from Department of Environment and Nature Conservation (DENC) should be obtained to remove, cut, or destroy the before-mentioned protected species before any vegetation clearing may take place. Permits provided by the Department of Environment, Forestry and Fisheries (DEFF) will be required should any of the protected species be removed, destroyed, or relocated. If a walkdown of the focus area is conducted prior to the commencement of construction activities, and these species are rescued and relocated (if encountered), the anticipated impact on their populations will be minimal.

The focus area provides suitable habitat to support several faunal SCC. Potential faunal SCC are unlikely to permanently reside within the focus area, as many require large areas to forage and survive. However, smaller Arachnid SCC such as *Opisthophthalmus carinatus* (Robust Burrowing Scorpion), *O. wahlbergii* (Kalahari Burrower) and *Pterinochilus spp* (Golden-brown baboon spiders) may occur within the footprint areas and as such will be at increased risk from the associated development activities. Any faunal SCC located within the focus area will likely require provincial and possibly national permits to relocate them prior to the commencement of construction activities.

Following the ecological assessment of the biodiversity within the focus area, the impacts associated with the proposed development activities were determined. The impacts on the floral and faunal habitat, diversity and SCC are considered to range from medium-low to low significance impacts prior to the implementation of mitigation measures. With mitigation fully implemented all impacts can be reduced to low to very-low significance impacts. No significant impacts on the biodiversity associated with the focus area are anticipated for the proposed development.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.



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LIST OF ACRONYMS

BA	Basic Assessment
BGIS	Biodiversity Geographic Information Systems
BODATSA	Botanical Database of Southern Africa
CARA	Conservation of Agricultural Resources Act, 1983 [Act No. 43 of 1983]
CBA	Critical Biodiversity Areas
CR	Critically Endangered
CR PE	Critically Endangered, Possibly Extinct
DDD	Data Deficient - Insufficient Information
DDT	Data Deficient - Taxonomically Problematic
DEFF	Department of Environment, Forestry and Fisheries
DENC	Department of Environment and Nature Conservation
EAP	Environmental Assessment Practitioner
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Areas
EW	Extinct in the Wild
EX	Extinct
GIS	Geographic Information System
GPS	Global Positioning System
GWC	Griqualand West Centre
IBAs	Important Bird and Biodiversity Areas
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature
LC	Least Concern
MAP	Mean annual precipitation
MAPE	Mean annual potential evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean annual temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NCNCA	Northern Cape Nature Conservation Act, 2009 [Act No. 9 of 2009]
NCPSDF	Northern Cape Provincial Spatial Development Framework
NE	Not Evaluated
NEMA	National Environmental Management Act, 1998 [Act No. 107 of 1998]
NEMBA	National Environmental Management: Biodiversity Act, 2004 [Act No. 10 of 2004]
NEMPAA	National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]
NFA	National Forest Act, 1998 [Act No. 84 of 1998, as amended in October 2011]
NPAES	National Protected Areas Expansion Strategy
NPAES	National Protected Areas Expansion Strategy
OHPL	overhead powerline
OHPL	Overhead Powerline
PES	Present Ecological State
POC	Probability of Occurrence
PRE	National Herbarium in Pretoria
QDS	Quarter Degree Square
RE	Regionally Extinct
SABAP2	South African Bird Atlas Project
SACAD	South African Conservation Areas Database, Quarter 4
SANBI	South African National Biodiversity Institute's
SAPAD	South African Protected Areas Database, Quarter 4
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
SWSAs	Strategic Water Source Area
TOPS	Threatened or Protected Species



VU	Vulnerable
WSAs	Water Source Areas
WUA	Water Use Authorisation

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&I) Regulations, 2014].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
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.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
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.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
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.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g. species are still native if they increase their range as a result of watered gardens, but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
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.
Species of Conservation Concern (SCC)	<p>The term SCC in the context of this report refers to all SANBI RDL (Red Data Listed) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project. These are species and subspecies that are important for South Africa's conservation decision-making processes.</p> <p>Resources considered as part of the SCC assessment included the below list:</p> <ul style="list-style-type: none"> - The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEMBA) Threatened or Protected Species (TOPS) list (NEMBA, Notice 389 of 2013); - Specially Protected and Protected Species: The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), provides a list of Specially Protected Species (Schedule 1) [Section 49(1) of the NCNCA] and Protected Species (Schedule 2) [Section 50(1) of the NCNCA] for the Northern Cape Province; - Nationally Protected Trees: The National Forest Act, 1998 (act 10 of 1998), as amended in September 2011 (NFA), affords protection to a list of tree species; - The Botanical Database of Southern Africa (BODATSA) to obtain plant names and floristic details (http://posa.sanbi.org/); and - 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; - The Atlas and Red List of the Reptiles of South Africa, Lesotho, and Swaziland.



1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a biodiversity assessment as part of the Basic Assessment (BA) process for the proposed development of an overhead powerline (OHPL) 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 OHPL and an associated 300 m 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 Gaetse 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 OHPL was not finalised 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.



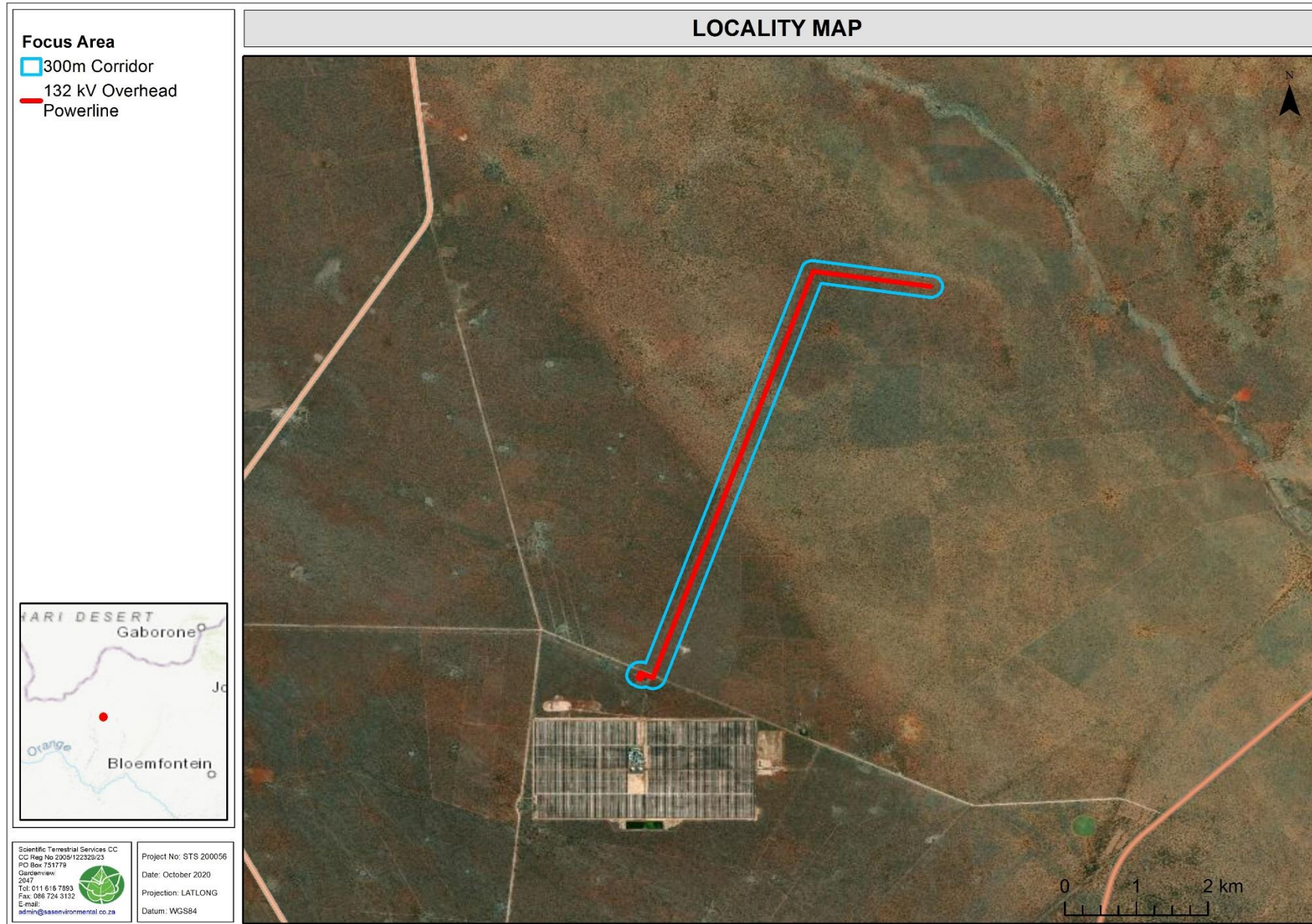


Figure 1: Digital Satellite image depicting the location of the focus area in relation to surrounding areas.



1.2 Project Scope

Specific outcomes in terms of this report are outlined below:

- To define the Present Ecological State (PES) of the terrestrial ecological resources associated with the focus area;
- To determine and describe habitats, communities and ecological state of the focus area;
- To conduct a faunal and floral Species of Conservation Concern (SCC) assessment, including potential for such species to occur within the focus area;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands, and any other ecologically important features, if present; and
- To determine the environmental impacts that the construction of the proposed development might have on the terrestrial ecology associated with the focus area, as well as potential impacts on the ecology due to activities related to the proposed development and to develop mitigation and management measures 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 immediate surrounding area and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment. Access was not granted for the remaining extent of the Farm 464 (west of the proposed powerline) and, as such the focus area could only be “ground-truthed” within Portion 1 of Farm 464 and Portion 1 of Farm 431 (OHPL & access road), as well as the remainder of Farm 465 (OHPL / Kalbas substation) ;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral and faunal communities have been accurately assessed and considered;
- Due to the often secretive nature and habits of most faunal taxa and the time (season) of the assessment, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the focus area may have been missed during the assessment; and



- The data presented in this report are based on a site visit, undertaken during October 2020. A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was 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 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996¹;
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- Government Notice R598 Alien and Invasive Species Regulations as published in the Government Gazette 37885 dated 1 August 2014 as it relates to the National Environmental Management Biodiversity Act, 1998 (Act No.107 of 1998);
- Government Notice 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 October 2018 as it relates to the National Forest Act, 1998 (Act No. 84 of 1998);
- The National Forest Act, 1998 (Act No. 84 of 1998, as amended in October 2011) (NFA);
- The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA); and
- The Northern Cape Provincial Spatial Development Framework (NCPSDF) as developed 2011 to meet the requirements of the Northern Cape Planning and Development Act, 1998 (Act No.7 of 1998) and the Municipal Systems Act, 2000 (Act No. 32 of 2000).

The details of each of the above, as they pertain to this study, are provided in Appendix A of this report.

¹ Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 1996'. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers



2. ASSESSMENT APPROACH

2.1 General Approach

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the focus area and does not include the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps. Relevant databases and documentation that were considered during the assessment of the focus area included ²:

- The National Protected Areas Expansion Strategy (NPAES) focus areas for Protected Area Expansion, 2009 (Formally and Informally Protected Areas):
- South African Conservation Areas Database, Quarter 4 (SACAD, 2019);
- The South African Protected Areas Database, Quarter 4 (SAPAD, 2019);
- Northern Cape Critical Biodiversity Areas (2016);
- Mucina and Rutherford, 2012 and 2018:
 - Biomes, Bioregions and Vegetation Type(s);
- The National Threatened Ecosystems (2011);
- The National Biodiversity Assessment (NBA, 2018);
- Important Bird and Biodiversity Areas (IBAs) (2015), in conjunction with the South African Bird Atlas Project (SABAP2); and
- The International Union for Conservation of Nature (IUCN).

The field assessment took place during October 2020 to determine the ecological status of the focus area and to “ground-truth” the results of the desktop assessment. Results of the field assessment is presented in Sections 4 and 5.

2.2 Sensitivity Mapping

All the ecological features of the focus area were considered, and sensitive areas were delineated with the use of a Global Positioning System (GPS). In addition, identified locations of SCC and SANBI protected species were also marked by means of GPS. A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps.

² Datasets obtained from:

- SANBI BGIS (2019). The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: <http://bgis.sanbi.org> as retrieved in 2019; and
- Department of Environmental Affairs (DEA) Environmental Geographical Information Systems (E-GIS) website. URL: <https://egis.environment.gov.za/>



3. RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Focus area based on national and provincial databases

The following section contains data accessed as part of the desktop assessment and are presented as a “dashboard” report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation are provided.



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

CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)		DETAILS OF THE AREA OF INTEREST IN TERMS OF MUCINA & RUTHERFORD (2006, 2018, 2012)				
<p>NBA (2018):</p> <p>1) Ecosystem Threat Status</p> <p>2) Ecosystem Protection Level</p>	<p>NBA 2018 dataset (Figure 3): The focus area is located within the Kathu Bushveld which is considered a Least Concern ecosystem and is currently Poorly Protected.</p> <p>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.</p> <p>The ecosystem protection level status is assigned using the following criteria:</p> <ul style="list-style-type: none"> 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. 	Biome	The focus area is situated within the Savanna Biome .			
		Bioregion	The focus area is located within the Eastern Kalahari Bushveld Bioregion .			
		Vegetation Type	The focus area is situated within the Kathu Bushveld .			
		Climate	Summer and autumn rainfall with very dry winters.			
			MAP* (mm)	MAT* (°C)	MFD* (Days)	MAPE* (mm)
			300	18.5	27	2 883
		Altitude (m)	960 –1 300			
		Distribution	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.			
		Conservation	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.			
National Threatened Ecosystems³ (2011) Figure 4	The focus area is located within an ecosystem that is currently considered to be Least Concern . Least Concern ecosystems have not experienced a significant loss of natural habitat or deterioration in condition.	Geology & Soils	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.			
IBA (2015)	The focus area is not located within 10 km of an Important Bird and Biodiversity Area.					

³ 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 2014, as amended published under the National Environmental Management Act, 1998 (Act No. 107 of 1998). However, the updated 2018 ecosystem threat status have been considered in the assessment of impact significance in EIAs.



<p>SAPAD (2019, Q3); SACAD (2019, Q3); NPAES (2009). Figure 4</p>	<p>The South African Protected Areas Database (SAPAD, 2019)⁴, indicate that the Khathu Forest Nature Reserve is located within 10 km from the focus area.</p> <p>The South African Conservation Areas Database (SACAD, 2019)⁵ and the National Protected Areas Expansion Strategy (NPAES, 2009) does not indicate any additional protected areas or conservation areas within 10 km of the focus area.</p>	<p>VEGETATION & LANDSCAPE FEATURES</p>	<p>Medium-tall tree layer with <i>Vachellia erioloba</i> in places, but mostly open and including <i>Boscia albitrunca</i> as the prominent trees. Shrub layer generally most important with, for example, <i>Senegalia mellifera</i>, <i>Diospyros lycioides</i> and <i>Lycium hirsutum</i>. Grass layer is variable in cover.</p>
<p>NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) (FIGURE 5 AND 6)</p>		<p>NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019) (FIGURE 7 & 8)</p>	
<p>The Northern Cape CBA map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) which, together with protected areas, are important for the persistence of a viable representative sample of ecosystems and species, as well as the long-term ecological functioning of the landscape as a whole.</p> <p>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, a fairly large section of the southern portion of the 300 m corridor is located within an Ecological Support Area.</p> <p>The Northern Cape Critical Biodiversity Areas (2016) database also includes the “reasons” layer, which is based on the planning units used in the spatial analysis, and provides a list of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target (CBA Map Reason Metadata).</p> <p>According to this Northern Cape Critical Biodiversity Areas Reasons layer, the triggering biodiversity and ecological features include the below:</p> <ul style="list-style-type: none"> - Kathu Bushveld - Conservation Areas - All natural wetlands and all rivers - Landscape Structural Elements. 		<p>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.</p> <p>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 <i>et al.</i> 2019).</p> <p>The focus area also falls within the Gamagara Corridor (figure 7). 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.</p>	

⁴ **SAPAD (2019):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

⁵ **SACAD (2019):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.



NATIONAL WEB BASED ENVIRONMENTAL 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	
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 <i>Sagittarius serpentarius</i> (Secretary bird).
Plant species theme	For the plant species theme, the entire focus area is considered to have a low sensitivity.
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).
STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)	
Surface Water Strategic Water Source Area (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 and Biodiversity 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).



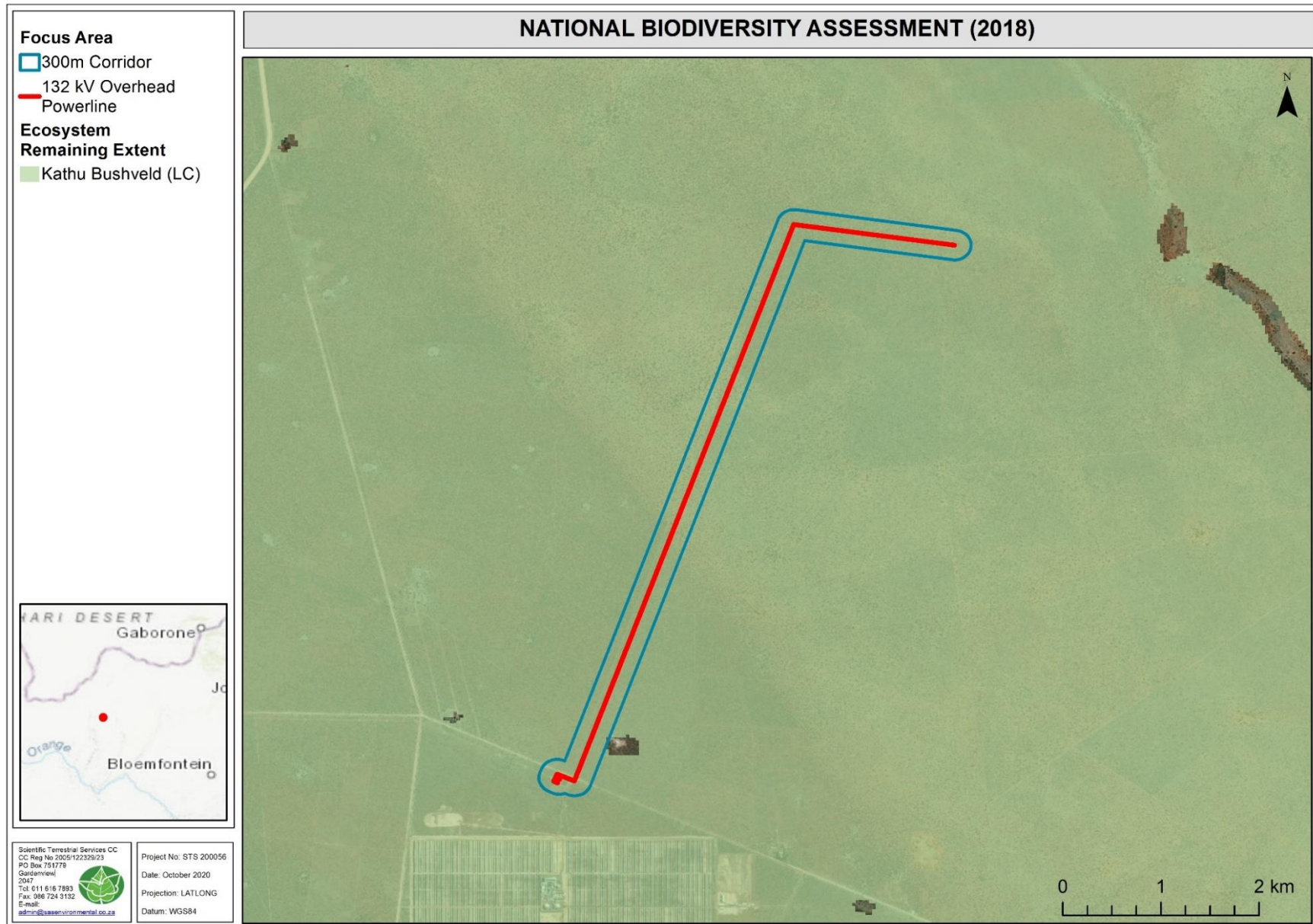


Figure 3: The remaining extent of the Kathu Bushveld, according to the National Biodiversity Assessment (NBA, 2018).



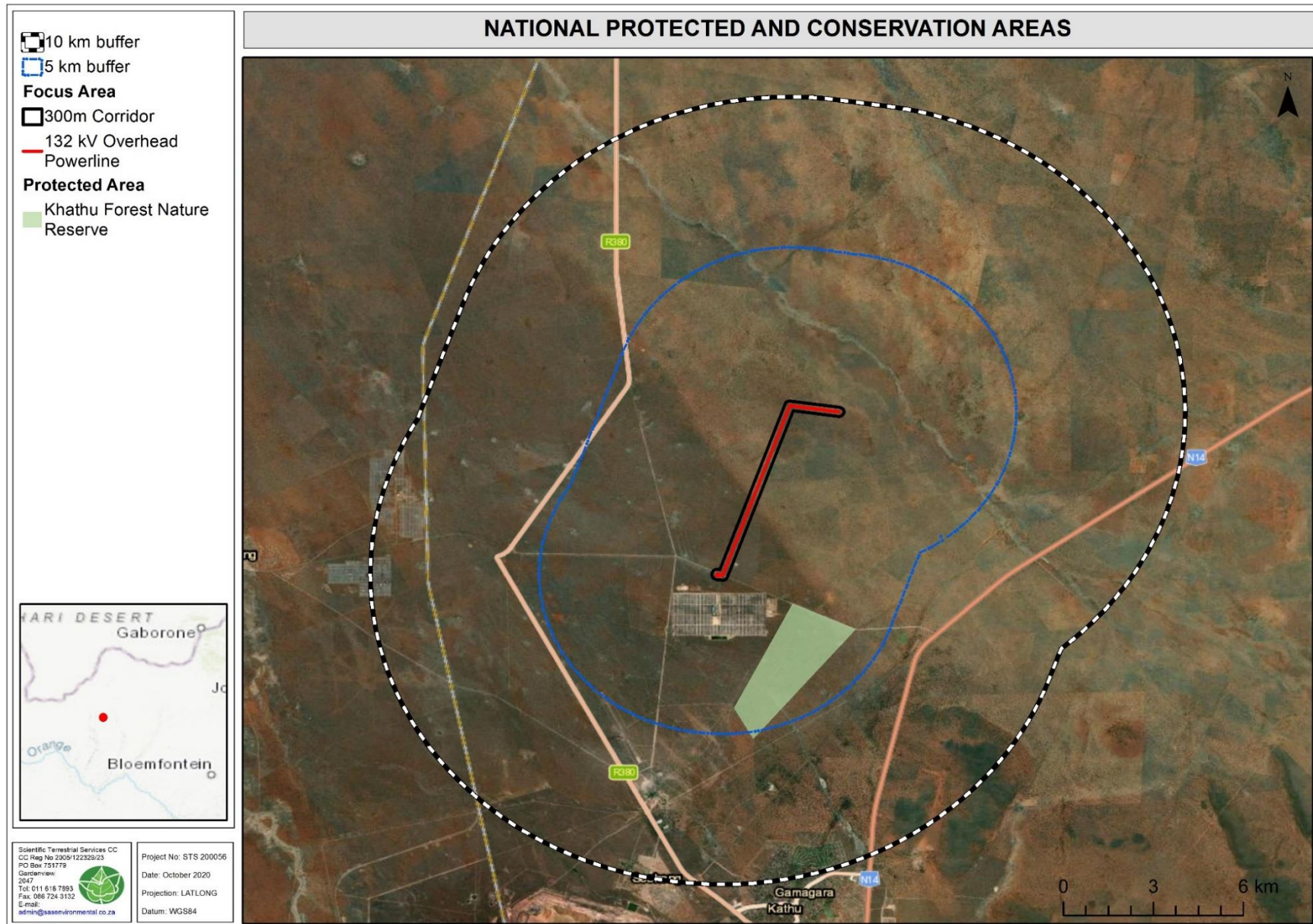


Figure 4: Protected areas within a 5 km and 10 km radius of the focus area, according to SAPAD (Q4, 2019).



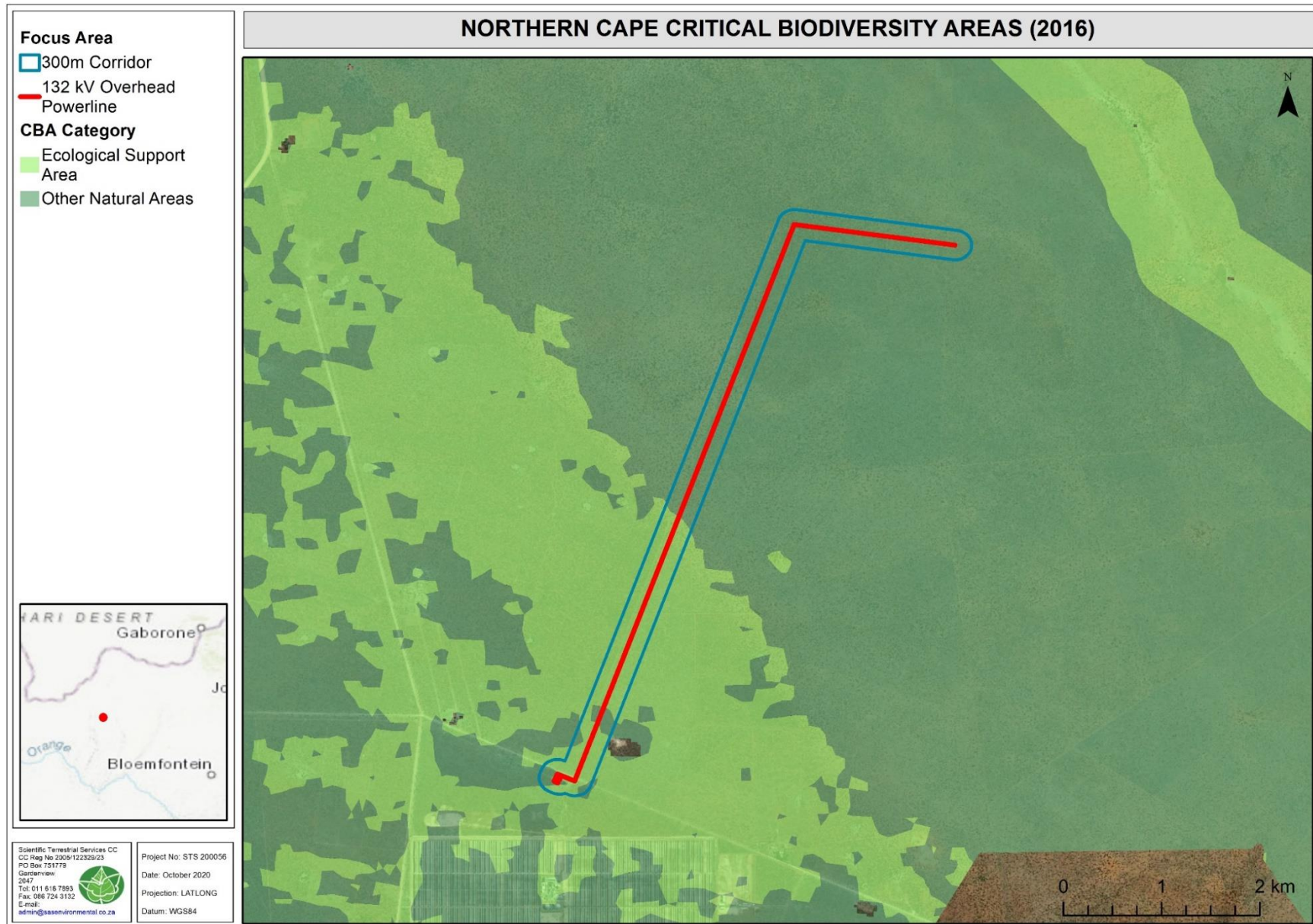


Figure 5: Northern Cape Critical Biodiversity areas associated with the focus area and the associated infrastructure.



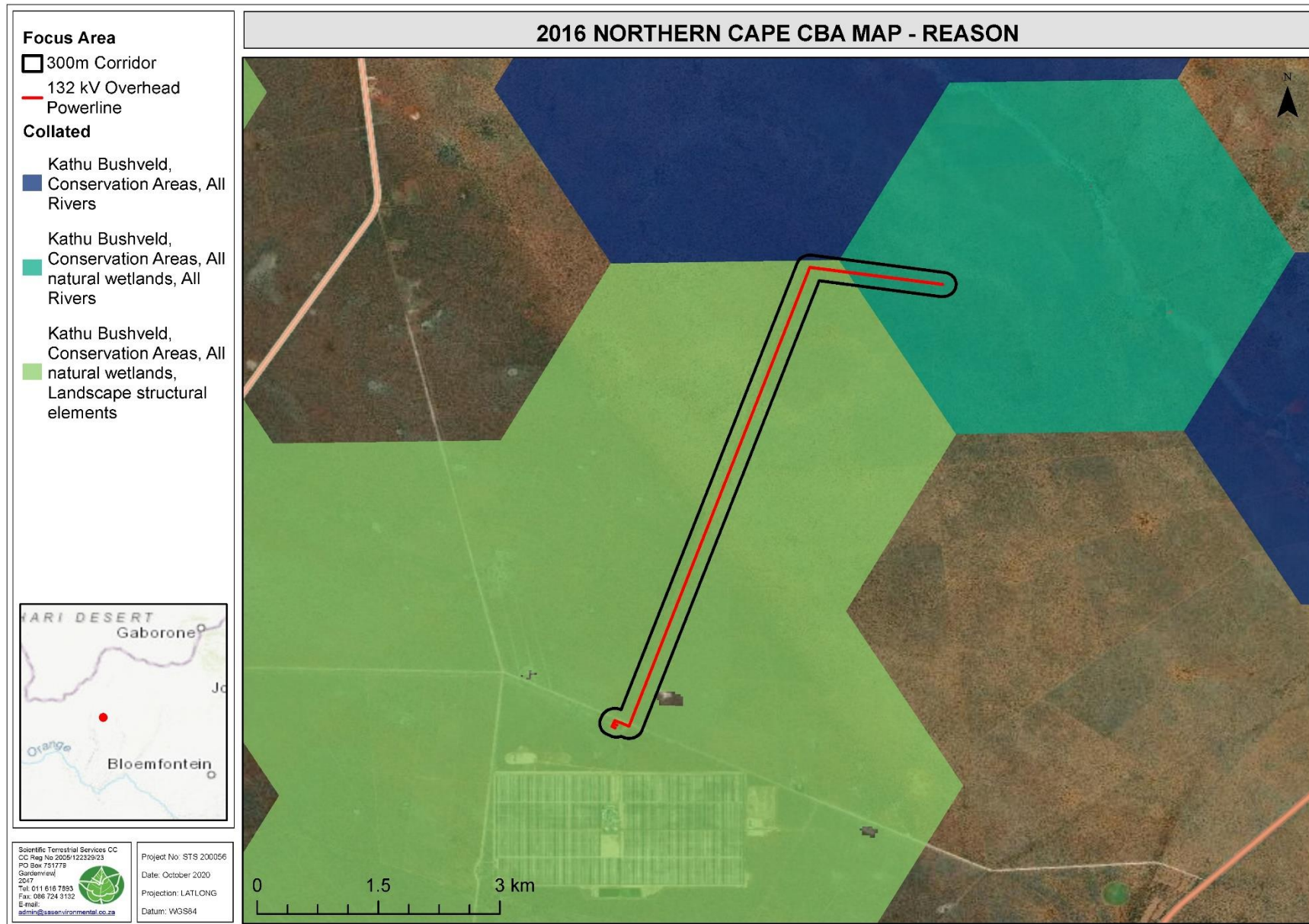


Figure 6: List of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target for the focus area (2016 Northern Cape CBA Reasons layer).



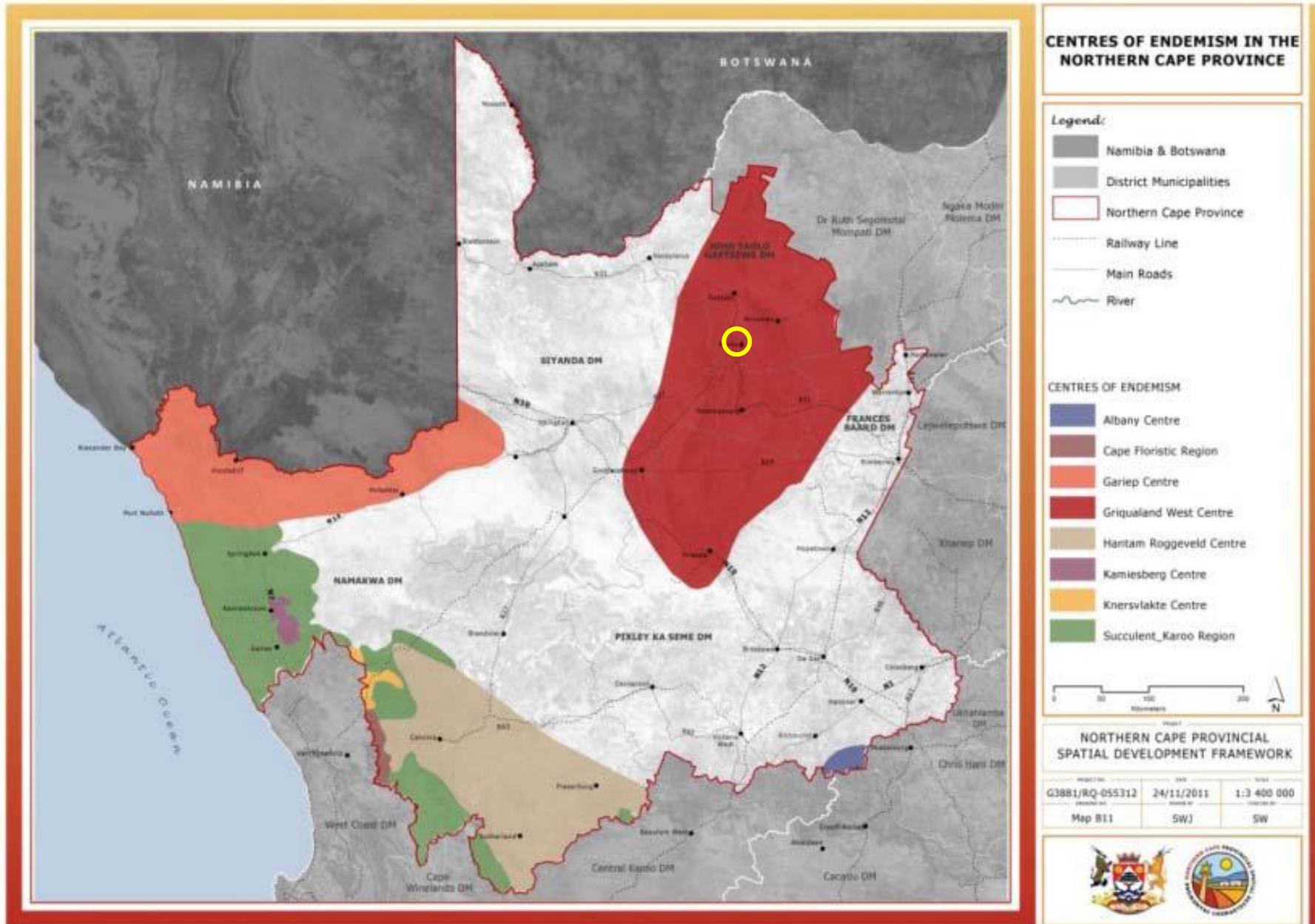


Figure 7: Centers of endemism of the Northern Cape Province: the focus area indicated by the yellow circle (NPSDF, 2012).



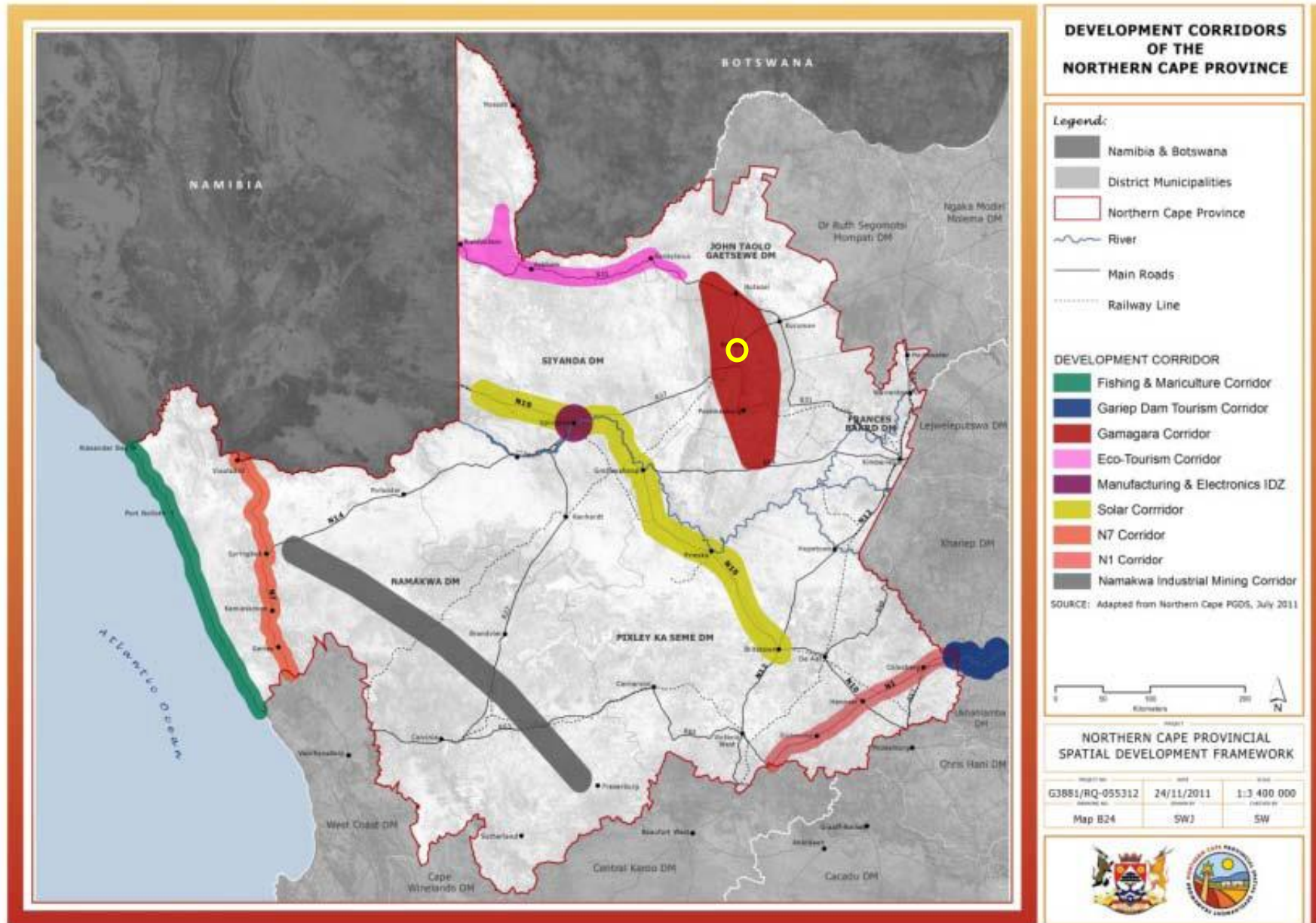


Figure 8: Development corridors of the Northern Cape Province: the focus area is indicated by the yellow circle (NPSDF, 2012).



4. RESULTS OF THE FLORAL ASSESSMENT

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 *Boscia albitrunca* often dominants. The unit has a well-defined shrub layer (e.g. *Diospyros lycioides* and *Senegalia mellifera* subsp. *detinens*), however, the grass layer is somewhat variable. 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, namely Kathu Bushveld. A depiction of the habitat unit within the focus area is presented in Figure 9 below.

The Kathu Bushveld habitat unit was largely dominated by *Grewia flava*, *Rhigozum trichotomum*, *Senegalia mellifera* subsp. *detinens*, *Tarchonanthus camphoratus*, *Vachellia erioloba* and *Vachellia haematoxylon* (more northern sections). Other woody species found within the unit included *Boscia albitrunca*, *Gymnosporia buxifolia*, *Terminalia sericea* and *Ziziphus mucronata*. Although well-defined, the density of the shrub layer was low. Dominant shrub species included *Asparagus larycinus*, *Vachellia hebeclada* subsp. *hebeclada* and *Lantana rugosa*. The grass layer is dominated by *Aristida meridionalis*, *Cynodon dactylon*, *Eragrostis lehmanniana* and *Aristida congesta* subsp. *congesta*.

Within the Kathu Bushveld habitat unit, suitable habitat exists to support an array of floral and faunal 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 *Rhigozum trichotomum*, *Senegalia mellifera* subsp. *detinens* and *Tarchonanthus camphoratus*, often indicators of poor veld condition, are somewhat prolific within the area.



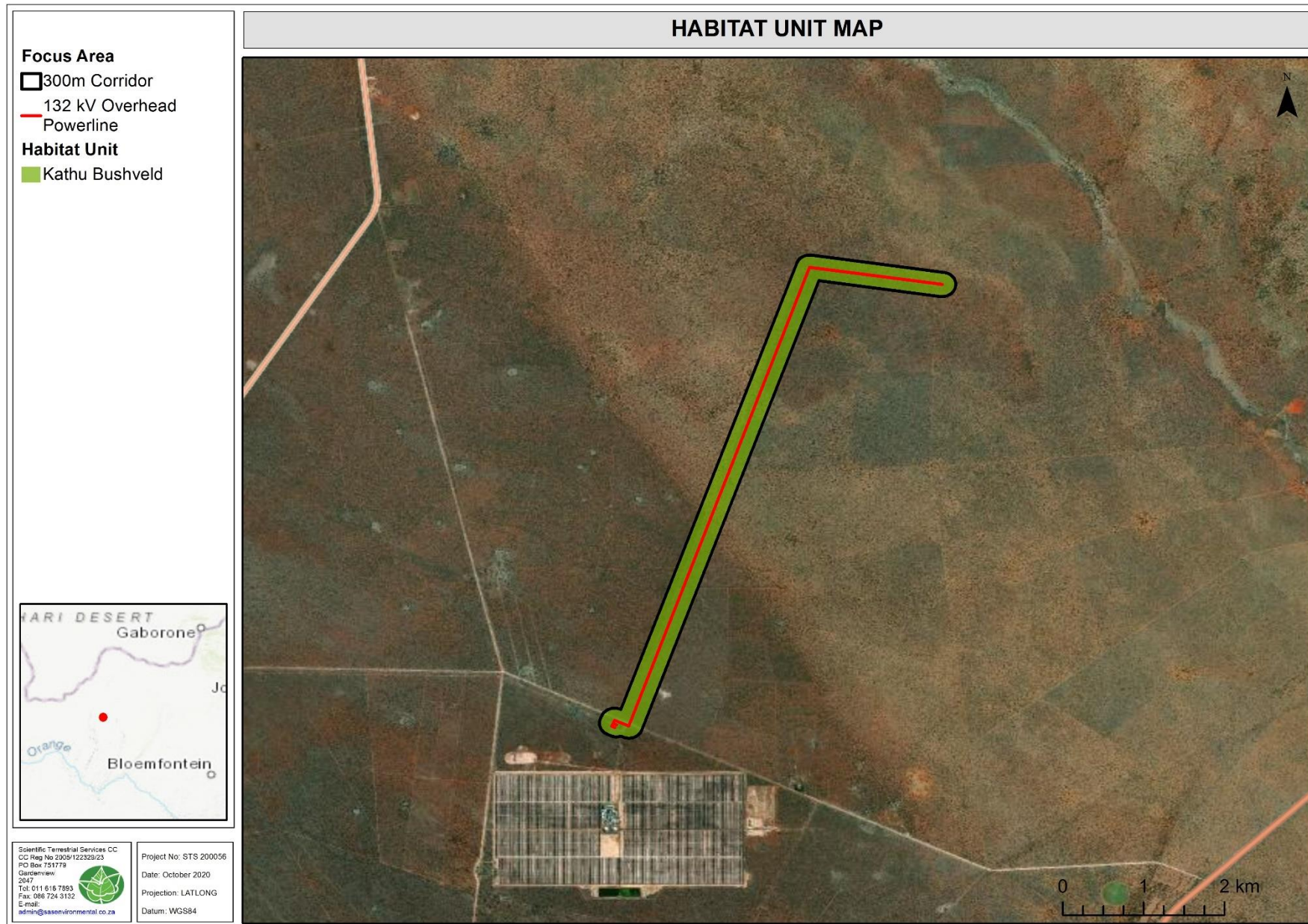

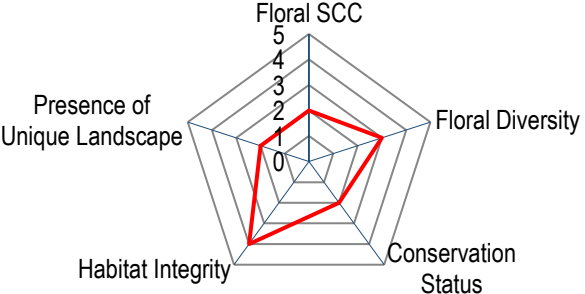




Figure 9: Habitat units encountered within the focus area.



Table 2: Summary of results of the floral assessment.

Kathu Bushveld Habitat and Sensitivity	Intermediate Sensitivity
	
Selected examples of flora recorded within the Kathu Bushveld Habitat Unit	
	
<p>Forbs from left to right: <i>Aptosimum elongatum</i>, <i>Glossochilus burchellii</i>, <i>Jamesbrittenia atropurpurea</i>, <i>Requienia sphaerosperma</i>, <i>Ruschia calcarea</i>, <i>Senna italica</i> subsp. <i>arachoides</i></p>	
	
<p>Woody species from left to right: <i>Boscia albitrunca</i>, <i>Crotalaria spartioides</i>, <i>Ehretia rigida</i>, <i>Vachellia haematoxylon</i>, <i>Vachellia hebeclada</i> subsp. <i>hebeclada</i>, <i>Vachellia erioloba</i></p>	



SCC Discussion

No nationally threatened SCC (i.e. Red Data Listed plants), as defined in NEMBA Section 56, were recorded during the site assessment. However, the NFA protected tree species, *Boscia albitrunca*, *Vachellia erioloba*, and *Vachellia haematoxylon* were observed within this habitat unit. Permits will have to be obtained from Department of Environment, Forestry and Fisheries (DEFF) for the individuals of *Boscia albitrunca*, *V. erioloba*, and *V. haematoxylon* that will have to be removed for construction to proceed. These trees occur fairly abundantly throughout the habitat unit.

Furthermore, several species of provincial importance were present in this habitat unit, i.e. those listed in Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), namely *Aloe grandidentata*, *Boscia albitrunca*, *Gymnosporia buxifolia*, *Euphorbia duseimata*, *Jamesbrittenia atropurpurea* and *Ruschia calcarea*. Permits from Department of Environment and Nature Conservation (DENC) should be obtained to remove, cut, or destroy the before-mentioned protected species before any vegetation clearing may take place.

Before the commencement of any development activities within the focus area, a walk-through should be conducted to ensure this species is not present. If its presence within the focus area is confirmed, permits will have to be obtained from DEFF for the individuals that will have to be removed for construction to proceed.

Ecological Discussion

From a floral perspective, the Kathu Bushveld habitat unit has experienced a small degree of degradation - more within the southern section than within the northern section. Despite this, the habitat unit still provides a good representation of the reference vegetation type. Indigenous plant species dominated the focus area, and only one alien invasive plant (AIP) species was identified at the time of assessment, namely *Prosopis glandulosa* (Glandular Mesquite, Not Listed in the NEMBA Alien and Invasive Species List of 2020), indicating the very low level of alien plant impacts within the focus area. In particular, the focus area was largely dominated by *Tarchonanthus camphoratus* and *V. haematoxylon* in the northern sections, with the southern section dominated by *Grewia flava*, *Rhigozum trichotomum*, *Senegalia mellifera* subsp. *detinens*, *V. erioloba* was dominant / common throughout. The dominance of *Rhigozum trichotomum*, *Senegalia mellifera* subsp. *detinens* and *TarchonanthusT. Camphoratus*, all typical bush encroachers, is an indication of a poorer veld condition, further indicating that the focus area has experienced small amounts of degradation and likely overgrazing.

The focus area supported a wide array of indigenous species and overall diversity was moderately high. Common woody species found throughout the focus area included *Grewia flava*, *Ziziphus mucronata*, *Searsia ciliata*, and *Diospyros lycioides* subsp. *lycioides*. In terms of the graminoid layer, the focus area was largely dominated by *Schmidtia pappophoroides*, *Cynodon dactylon*, *Eragrostis lehmanniana* and *Aristida congesta* subsp. *congesta*. The shrub layer was less diverse, and the density and diversity of shrubs was fairly lower than anticipated but included species such as *Asparagus laricinus*, *Asparagus retrofractus*, *Blepharis cf. marginata*, *Cadaba aphylla*, *Crotalaria spartioides*, *Elephantorrhiza elephantina*, *Gymnosporia buxifolia*, *Lasiosiphon polycephalus*, *Leucas capensis* and *Pteronia glauca*. Several forbs were also identified and included *Dicoma schinzii*, *Aptosimum elongatum*, *Boophone disticha*, *Gazania krebsiana*, *Glossochilus burchellii*, *Helichrysum argyrosphaerum*, *Hermannia comosa*, *Hermannia tomentosa*, *Hirpicium echinus*, *Jamesbrittenia atropurpurea*, *Requienia sphaerosperma*, *Sansevieria cf. aethiopica* and *Vahlia capensis*.

Although there is existing infrastructure to the south of the focus area, no edge effects are observed as a result of the proximity of the focus area to this existing infrastructure, and the associated pressures resulting from the presence of human processes. Instead, of greater significance is the pressures from grazing, which is both from wildlife and domestic animals and has resulted in altered ecological drivers, e.g. overgrazing in the south resulting in more degraded vegetation and reduced floral diversity. The overall, relatively low levels of edge effects allows for the ongoing natural functioning of the habitat unit, as evident by the intact vegetation layers (e.g. the intact woody layer) and the moderately high diversity of floral species within the unit.

Parts of the focus area are located within Ecological Support Areas (ESAs). These areas are required to be maintained in an ecologically functional state to support Critical Biodiversity Areas (CBAs) and/or Protected Areas. The remaining areas of the focus area were in other natural areas, which consist of natural or semi-natural areas that are not required to meet biodiversity targets or support natural ecological processes. The proposed development is likely to impact on the habitat present and negatively affect suitable habitat for species, especially that of the NFA listed tree species *B. albitrunca*, *V. erioloba*, and *V. haematoxylon*. However, given the nature of the proposed development, habitat corridors are not anticipated to be greatly affected, and therefore the dispersal ability of such species within the focus area are not anticipated to be of great concern.



Business Case and Conclusion:

The overall sensitivity of the habitat unit is of **intermediate sensitivity**. This habitat unit must be preserved and as far as possible, the proposed development must aim to enhance biodiversity of the habitat unit and surrounds while optimizing development potential.

The proposed OHPL has the potential to result in the loss of habitat for a diversity of floral species and could impact on SCC numbers within the focus area. If the OHPL is placed along existing farm roads, it will limit the need for a new powerline reserve and can reduce impacts on floral communities. Vegetation clearing should be kept to areas where infrastructure will be erected and should aim to maintain vegetation in between these structures. During development activities, all mitigation measures are to be strictly enforced to ensure that the surrounding environment is not impacted upon through edge effects or careless veld clearing and dumping activities.

Important considerations:

- Although only one AIP was found on site, it should be noted that AIP species favour disturbed habitat and can easily proliferate in such conditions, thus increasing the chance of the proliferation thereof within the focus area and surrounding habitat. As such, it is recommended that throughout the project phases, monitoring for AIP species is implemented to ensure that, in the case of AIP species establishment, they do not spread to adjacent areas where they do not yet occur. Similarly, disturbances should be kept to a minimal to avoid an increase in indigenous bush encroaching;
- The proposed development is likely to impact on several NFA protected trees, namely *Boscia albitrunca*, *Vachellia erioloba*, and *Vachellia haematoxylon*. Permits will have to be obtained from DEFF if any individuals of these species will be removed during construction activities. Several provincially protected floral also occur within the proposed footprint of the OHPL, for which permits from DENC is required before these species can be removed or harmed. It is recommended that once the layout/ development plans for the proposed focus area have been finalised, a walk down of the area must be conducted to ascertain the exact presence and numbers of protected plant species. Where possible, species that will be impacted should be relocated; and
- According to the Northern Cape Critical Biodiversity (2016) database, the focus area is located within an ESA, an area which supports the ecological functioning of protected areas or critical biodiversity areas or provides important ecological infrastructure. Given the small amounts of degradation, and thus fairly intact habitat of the habitat unit, mitigation measure must be implemented to ensure the value of these areas are not greatly affected.



4.1 Floral Species of Conservation Concern Assessment

Threatened/protected species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is a threatened species. Furthermore, SCC are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare and Declining.

An assessment considering the presence of any plant species of concern, as well as suitable habitat to support any such species was undertaken. The SANBI PRECIS RDL plants database was consulted for the Quarter Degree Square (QDS) 2723CA to obtain historical floral SCC observations. The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), the 2015 TOPS list of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), as was the Protected tree species listed within Section 15 (1) of the National Forest Act (1998, as amended in October 2011), were taken into consideration (see **Appendix F** for a full list of potential SCC within the focus area).

No threatened SCC (i.e. Red Data Listed plants), in terms of Section 56 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were recorded during the site assessment. This includes the species listed on the NEMBA TOPS list for the Northern Cape. Within the Kathu Bushveld there is, however, suitable habitat to support RDL and TOPS listed species with a medium or high Potential of Occurrence (POC), namely:

- *Barleria media* (POC = Medium, Status = Vulnerable)
- *Cleome conrathii* (POC = Medium, Status = Near Threatened)
- *Harpagophytum procumbens* (POC = High, Status = TOPS Protected)
- *Sceletium tortuosum* (POC = Medium, Status = TOPS Protected)

The focus area was associated with a high abundance of tree species protected under the NFA. The Camel Thorn, *Vachellia erioloba*, was recorded throughout the focus area (mostly mature individuals) but was more abundant within the *Vachellia haematoxylon*-dominated Kathu Bushveld where soils were deeper. The Gray Camel Thorn, *Vachellia haematoxylon*, was only recorded within the *Vachellia haematoxylon*-dominated Kathu Bushveld in high abundances (mixture of mature individuals and seedlings). The Shephard Tree, *Boscia albitrunca*, was recorded within the southern section of the Kathu Bushveld in high abundances, but rarely included large / mature specimens.



Several species of provincial importance were present in this habitat unit, i.e. those listed in Schedule 2 of the NCNCA, namely *Aloe grandidentata*, *Boscia albitrunca*, *Gymnosporia buxifolia*, *Euphorbia duseimata*, *Jamesbrittenia atropurpurea* and *Ruschia calcarea*. Due to the availability of suitable habitat, several additional Schedule 2 species are likely occurring within this habitat unit and are listed below:

- *Trianthes parvifolia* (Status = LC, POC = High)
- *Mestoklema arboriforme* (Status = LC, POC = Medium)
- *Plinthus karooicus* (Status = LC, POC = Medium)
- *Nerine laticoma* (Status = LC, POC = High)
- *Raphionacme velutina* (Status = LC, POC = High)
- *Microlooma armatum* (Status = LC, POC = Medium)
- *Piarranthus decipiens* (Status = LC, POC = Medium)
- *Cynanchum viminale* (Status = LC, POC = High)
- *Brachystelma circinatum* (Status = LC, POC = Medium)
- *Gomphocarpus fruticosus* (Status = LC, POC = High)
- *Gomphocarpus tomentosus* (Status = LC, POC = Medium)
- *Kalanchoe rotundifolia* (Status = LC, POC = Medium)
- *Euphorbia mauritanica* (Status = LC, POC = Medium)
- *Euphorbia crassipes* (Status = LC, POC = Medium)
- *Euphorbia inaequilatera* (Status = LC, POC = High)
- *Babiana bainesii* (Status = LC, POC = Medium)
- *Gladiolus permeabilis* (Status = LC, POC = Medium)
- *Moraea pallida* (Status = LC, POC = Medium)
- *Lapeirousia littoralis* (Status = LC, POC = Medium)
- *Oxalis depressa* (Status = LC, POC = High)
- *Oxalis lawsonii* (Status = LC, POC = High)
- *Jamesbrittenia aurantiaca* (Status = LC, POC = Medium)

Permits from Department of Environment and Nature Conservation (DENC) and the Department of Environment, Forestry and Fisheries (DEFF) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.



4.2 Alien and Invasive Plant Species

During the floral assessment, only one alien and invasive floral species was identified within the focus area and is listed in the table below.

Table 3: Dominant alien vegetation species identified during the field assessment.

Species	Common name	Area of Origin	NEMBA listing	Growth form
<i>Prosopis glandulosa</i>	Honey Mesquite	North America	Not Listed	Tree

From the table above, it is clear that the focus area has remained largely unaffected by alien plant species. The very low alien plant diversity is most likely attributed to i) the aridity of the region, with very limited habitat for the proliferation of alien plant species, and ii) the area being in a location that is fairly unutilised by human activity. Despite this, there is an increased risk that further alien plant proliferation may occur during developmental activities. As such, in accordance with the NEMBA Alien and Invasive Species Regulations (2014), all listed alien invasive plant species need to be controlled and removed during operational and rehabilitation activities. Ongoing maintenance activities conducted within the proposed development area must include the ongoing control of alien plant species.



5. RESULTS OF THE FAUNAL ASSESSMENT

5.1 *Habitat Description*

Kathu Thornveld

The Kathu Thornveld habitat unit within the focus area provides intermediary levels of habitat for faunal species whilst it appears that in the past that the habitat unit has been subjected to some form of disturbance (refer to Section 4.1).

The Kathu Thornveld is associated with the more arid regions of South Africa, and as such only faunal species well adapted to these dry and sometimes harsh conditions can survive. The habitat within the focus area varied in terms of structure and is characteristic of the vegetation type as described in Mucina and Rutherford (2006). The vegetation within the focus area comprises of a characteristic herbaceous layer, dominated by short to medium-high shrubs and interspersed with larger woody species. This vegetation structure provides varying degrees of habitat for all classes of faunal species, from fossorial and ground-dwelling species to those that tend to be more arboreal. As mentioned, species living in these arid environments must be well adapted to surviving long periods of time without water. The focus area does not traverse any surface water areas and as such, does not pose a threat to these scattered yet important features.

Further discussions are presented in the dashboards below pertaining to the various faunal species classes, the habitat suitability for faunal species, food and water resources as drivers of faunal abundance as well as Species of Conservation Concern (SCC) that may occur within the focus area, including those species included in the NEMBA Threatened or Protected Species listings, 2015 (TOPS) and the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA).



5.2 Mammals

Table 4: Field assessment results pertaining to mammal species within the focus area.

<p>Faunal Class: Mammal</p>	<p>Mammal Habitat Sensitivity</p>	<p>Intermediate</p>		
<p>Notes on photograph: Top: <i>Hystrix africaeaustralis</i> (Porcupine) (left), <i>Phacochoerus africanus</i> (Warthog) (Right); Middle: <i>Elephantulus intufi</i> (Bushveld Sengi) (Left), <i>Oryx gazella</i> (Gemsbok) (Right). Bottom: <i>Tragelaphus strepsiceros</i> (Kudu) (Right), <i>Sylvicapra grimmia</i> (Common Duiker) (Right).</p>				
<p>Mammal Sensitivity Graph:</p>				
<p>Faunal SCC/ Endemics/ TOPS</p>	<p>No mammal SCC were recorded during the site assessment undertaken. The majority of mammal SCC in these arid regions are often secretive and not often seen, as such signs such as scat, spoor and in the case of some species burrows were searched. Habitat conditions indicate that several SCC may utilise the focus area, either permanently or during foraging forays. These species include: <i>Otocyon megalotis</i> (Bat-eared Fox, TOPS), <i>Felis nigripes</i> (Black-footed Cat, VU), <i>Smutsia temminckii</i> (Ground Pangolin, VU), <i>Orycteropus afer</i> (Aardvark, TOPS listed), <i>Atelerix frontalis</i> (South African Hedgehog, VU), <i>Poecilogale albinuch</i> (African Striped Weasel, Specially Protected), <i>Ictonyx striatus</i> (Striped Polecat, Specially Protected), <i>Vulpus chama</i> (Cape Fox, Specially Protected and TOPS).</p> <p><i>Parahyaena brunnea</i> (Brown Hyaena, NT) and <i>Panthera pardus</i> (Leopard, VU) must be mentioned, although it is considered very unlikely that either of these species will occur within the focus area. These species are often highly persecuted by local landowners which will likely preclude them from the focus area.</p>			



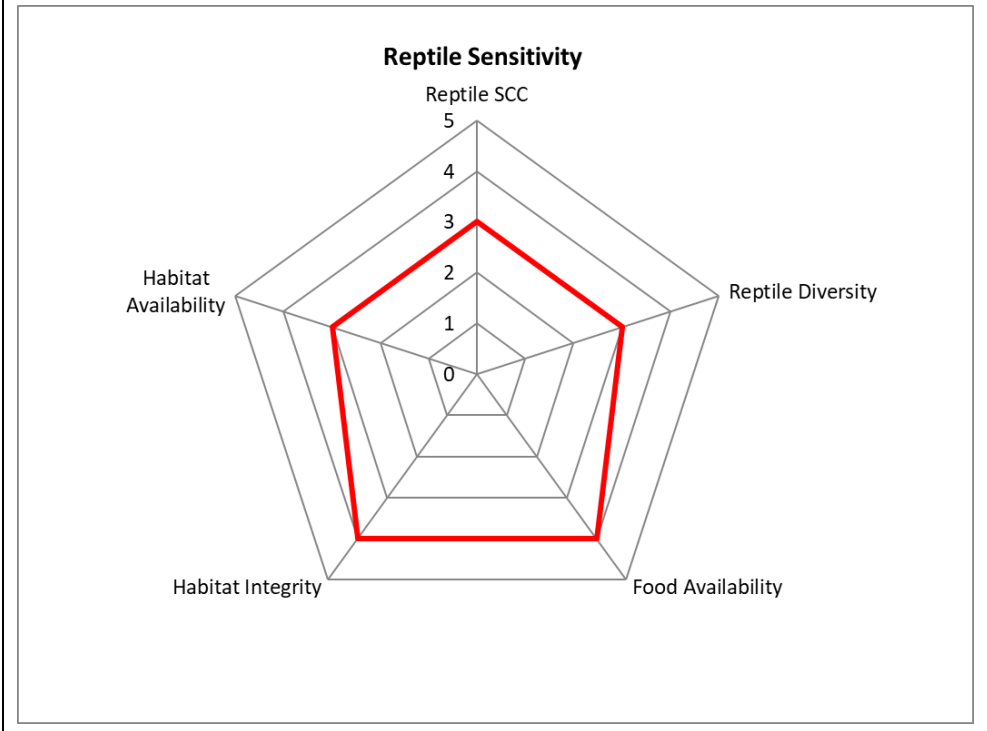



Faunal Discussion	Food resources are highly cyclical and seasonal due to the arid nature of the region. As such, during the late winter and early summer months, as observed, food resources become very limited due to the die back of many herbaceous species. Following good rains, the herbaceous and woody layers recover, providing increased food resources. This cyclical nature of food resource availability in turn affects the abundance and diversity of mammal species within and surrounding the focus area. Moreover, the focus area is comprised of a single habitat unit and as the overall extent and habitat diversity is low, this will lead to similar species occurring throughout. During the site assessment, it was evident that the overall habitat and resources within the focus area are unlikely to support an increased diversity of species, this was confirmed through the limited mammal sightings and limited evidence of occurrence (spoor and dung). Species that were observed include <i>Hystrix africae australis</i> (Porcupine), <i>Sylvicapra grimmia</i> (Common Duiker), <i>Cynictis penicillata</i> (Yellow mongoose) and <i>Tragelaphus strepsiceros</i> (Kudu) amongst others. Many of these species are likely to only traverse the focus area whilst foraging as they need to forage over greater distances to obtain suitable nourishment within this arid environment.
Conclusion	Overall, the focus area is considered to have an intermediate mammal sensitivity. Previous land uses such as livestock farming as well as potentially increased fire intensities has led to a decrease in the overall habitat suitability. Farm fences further can limit mammal species movement and hinder habitat connectivity; however, this is more applicable to medium and large mammals as smaller mammals are less hindered by these obstacles. The construction of the powerline will require vegetation clearance and loss of habitat within the finalised tower footprints; however the overall physical footprint of the powerline (towers) is expected to be small, whilst vegetation between the towers will remain intact. As such, the overall loss of habitat resulting from the construction of the powerline is unlikely to lead to extensive impacts to the current mammal diversity and abundance in the region.



5.3 Herpetofauna

Table 5: Field assessment results pertaining to herpetofauna within the focus area.

Faunal Class: Herpetofauna	Reptile Habitat Sensitivity	Intermediate		
<p>Notes on Photograph: Top left: <i>Trachylepis occidentalis</i> (Western Three-striped skink); Top right: <i>Pedioplanis namaquensis</i> (Namaqua Sand Lizard); Middle: <i>Pedioplanis lineocellata lineocellata</i> (Spotted Sand Lizzard). Bottom: <i>Agama aculeata</i> (Ground Agama).</p>				
<p>Reptile Sensitivity Graph:</p>				
				
<p>Faunal SCC/ Endemics/ TOPS/</p>	<p>No reptile SCC were observed during the field assessment. There is a possibility that <i>Python sebae</i> (African Rock Python, TOPS) may occur in the focus area. African Rock pythons often utilise burrows dug by Aardvark and other burrowing species to breed in and escape to when disturbed. The only amphibian SCC that may potentially occur on site is that of <i>Pyxicephalus adspersus</i> (Giant Bullfrog, NT). The focus area however lies at the margin of the known distribution of this species, furthermore it has not been recorded from any of the quarter degree squares associated with the focus area, suggesting that it is unlikely to occur there</p>			



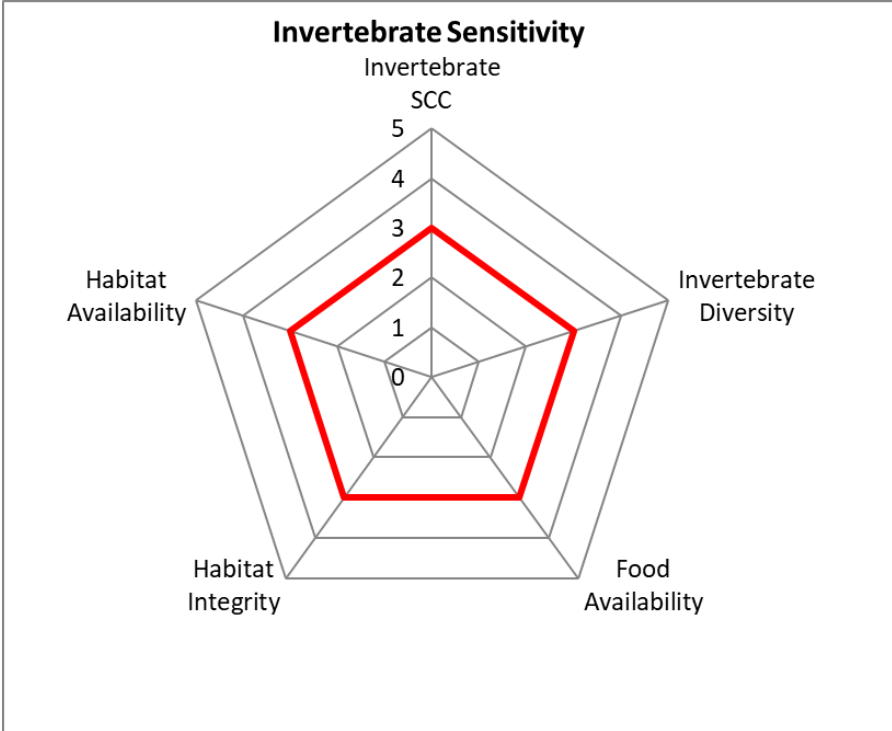






Faunal Discussion	<p>Reptiles:</p> <p>The focus area is expected to have an intermediate reptile diversity, with three species (above) being observed during the assessment. Reptiles are inherently secretive in nature, seeking shelter or moving away before they can be observed, which makes it difficult to accurately assess reptile diversity. The focus area is well utilised by reptiles as sufficient burrows and vegetation structure are available for habitation, however rocky areas that would provide additional niche habitat are lacking. As such, although the focus area may potentially provide habitat to a large diversity of species, the homogenous sandy substrate of the focus area and lack of additional niche habitats will likely exclude several of these potential species. Reptile species previously observed within the area (3Foxes Biodiversity Solutions, 2019) include <i>Naja nivea</i> (Cape Cobra), <i>Bitis arietans arietans</i> (Puff Adder), <i>Lygodactylus capensis capensis</i> (Cape Gecko), <i>Psammophylax tritaeniatus</i> (Striped Skaapsteker), <i>Psammobates oculifer</i> (Serrated Tent Tortoise) and <i>Agama aculeata</i> (Ground Agama) amongst others. Many of these species rely on suitably food resources, predominantly sourced from small mammal and invertebrate populations, and as such the overall diversity and abundance of these species within the focus are will fluctuate seasonally in accordance to the available food supplies and rainfall patterns.</p> <p>Amphibians:</p> <p>The focus area lies within or near the range of approximately 10 amphibian species, however there are no natural (seasonal or permanent) water or artificial earth dams within the focus area. These areas of either permanent or seasonal, provided they are long standing enough, are for the most part necessary for amphibians to breed within, bar a small number of amphibians who are capable of breeding outside of any water source. The overall abundance and diversity of amphibian species within the focus area will be largely restricted due to the lack of permanent or seasonal water bodies within or immediately adjacent to the focus area. Only amphibian species which are relatively independent of water are likely to occur in the focus area. Species previously recorded in the surrounding areas (3Foxes Biodiversity Solutions, 2019) include <i>Amietophrynus garmani</i> (Eastern Olive Toad) and <i>Breviceps adspersus</i> (Bushveld Rain Frog), both of which may potentially occur within the focus area.</p>
Conclusion	<p>Although a limited reptile assemblage of herpetofauna was observed within the focus area, it is still important to ensure that the impacts from the development of the powerline are kept as low as possible, ensuring that no excessive vegetation clearance takes place and that as far as possible, no soils disturbance occurs outside that of the prescribed tower footprint areas. The construction of the powerline will result in the displacement of reptile species from the direct footprint areas, however, these impacts are expected to be localised, with the remaining natural areas still able to meet the habitat requirements of the current herpetofauna.</p>



5.4 Invertebrates

Table 6: Field assessment results pertaining to invertebrates within the focus area.

Faunal Class: Invertebrates	Insect Habitat Sensitivity	Intermediate														
<p>Notes on Photograph: Top: Left - <i>Cynthia cardui</i> (Painted Lady) (left) and <i>Passalidius fortipes</i> (Burrowing ground beetle) (right). Middle: <i>Sternocera</i> sp (Giant Jewel Bug) (left) and <i>Zonocerus elegans</i> (Elegant Grasshopper) (right). Bottom: Solifugae observed within some leaf litter (left) and <i>Uroplectes carinatus</i> (right) observed within the focus area.</p>			 													
<p>Insect Sensitivity Graph:</p>  <p>Invertebrate Sensitivity Graph Data:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>Invertebrate SCC</td> <td>3</td> </tr> <tr> <td>Invertebrate Diversity</td> <td>3</td> </tr> <tr> <td>Food Availability</td> <td>2</td> </tr> <tr> <td>Habitat Integrity</td> <td>2</td> </tr> <tr> <td>Habitat Availability</td> <td>2</td> </tr> </tbody> </table>			Category	Score	Invertebrate SCC	3	Invertebrate Diversity	3	Food Availability	2	Habitat Integrity	2	Habitat Availability	2	   	
Category	Score															
Invertebrate SCC	3															
Invertebrate Diversity	3															
Food Availability	2															
Habitat Integrity	2															
Habitat Availability	2															
<p>Faunal SCC/ Endemics/ TOPS/</p>	<p>No insect or arachnid SCC were observed during the site assessment however <i>Opisththalmus carinatus</i> (Robust Burrowing Scorpion) and <i>O. wahlbergii</i> (Kalahari Burrower) which are listed in Schedule 2 of the NCNCA (2009) as protected, are known to occur within the region and may occur within the focus area. Furthermore, it is possible that <i>Pterinochilus</i> spp (Golden-brown baboon spiders) may occur within the focus area.</p>															



<p>Faunal Discussion</p>	<p>Invertebrate diversity of the focus area was considered intermediate, however the abundance levels therein of invertebrate species will likely increase during the more favourable seasons, notably following good rains. Rain is often an extremely important environmental cue for invertebrates to breed or in some instances such as with insects enter a new stage within their life cycles. The net increase in insect species results in increased food resources for arachnids as well as other faunal species. As such, insects are considered an important indicator of the environmental health of habitats, whilst also fulfilling key ecological functions within the ecosystem. Coleopterans, Orthopterans and Hymenopterans were the most abundant insect species within the focus area. Suitable habitat for invertebrates, notably species well adapted to living in sandy substrates and the arid thornveld of the region is provided throughout the focus area. Niche habitats for specialist invertebrate species was limited as the topography was flat with no natural ridges or rocky locations that are often favoured by many larger ground dwelling arachnid species. The homogeneity of the vegetation is likely mimicked by the invertebrate species assemblage; therefore, it is expected that mostly common insect species will be encountered within focus area due to the lack of specialist or niche habitat.</p> <div data-bbox="430 480 2101 788" style="text-align: center;"> </div> <p style="text-align: center;">Species From left to right: <i>Quintilia</i> sp (Karoo Cicadas), <i>Rachitopis</i> sp, <i>Belenois aurota</i> (Brown veined White), <i>Nomadacris septemfasciata</i> (Red Locust)</p>
<p>Conclusion</p>	<p>Suitable habitat for common invertebrates is provided throughout the focus area, notably those species well adapted to the arid and sandy substrates of the region. The proposed development of the powerline will result in the clearance of vegetation and will result in the loss of habitat and potential food resources for invertebrate species within the proposed footprints. Although these impacts are unavoidable, they can be suitably minimised by ensuring that they are localised only to the demarcated footprint areas of the powerline poles. This will ensure that the overall project poses a limited threat to invertebrate species along the proposed route, notably that of the burrowing and ground dwelling invertebrates.</p>



5.5 Faunal Species of Conservation Concern 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 several factors to determine the probability of faunal SCC occurrence within the focus area. Species listed in Appendix G whose known distribution ranges and habitat preferences include the focus area were taken into consideration. The species listed below are considered to have an increased probability of occurring within or being affected by the focus area.

Table 7: Faunal SCC that obtained a POC score of 60% or more.

Scientific Name	Common Name	POC %
Genus <i>Pterinochilus</i>	Golden-brown baboon spiders	60%
<i>Opisthophthalmus carinatus</i>	Robust Burrowing Scorpion	60%
<i>Opisthophthalmus wahlbergi</i>	Kalahari Burrower Scorpion	60%
<i>Python sebae</i>	African Rock Python	60%
<i>Felis nigripes</i>	Black-footed Cat	70%
<i>Smutsia temminckii</i>	Ground Pangolin	60%
<i>Orycteropus afer</i>	Aardvark	80%
<i>Atelerix frontalis</i>	South African Hedgehog	60%
<i>Poecilogale albinuch</i>	African Striped Weasel	60%
<i>Ictonyx striatus</i>	Striped Polecat	70%
<i>Vulpus chama</i>	Cape Fox	60%
<i>Otocyon megalotis</i>	Bat-eared Fox	70%

The focus area falls within the known distribution ranges of the above-listed arachnid SCC and there is suitable habitat to support these species. These arachnid SCC are protected by the NCNCA because of illegal collection of specimens for the pet trade as well as the loss of habitat through mining and other developments in the region. As they are not highly mobile species, often retreating to their burrows when disturbed or during the heat of the day, they are placed at increased risk during ground clearing activities. For these specific species it is recommended that a site walk down of the final footprint area is undertaken prior to any vegetation clearance and earth works taking place. Should any species be observed, they are to be carefully relocated to nearby habitat which is similar to that from where they were removed. Such relocation activities may require permits from national or provincial levels and will likely need to be overseen by a suitably qualified specialist. The remaining SCC listed above are all largely mobile species and unlikely to reside permanently within the focus area. As such, at the onset of activities it is likely, should they be in the area, they will move off on their own accord with little risk or harm done to them. However, should any of the above



species be located denning or nesting within the focus area, no further activities are to take place until a suitably qualified specialist has been consulted.

Due to the possible presence of faunal SCC and suitable habitat within the focus area, it can be concluded that the proposed development may potentially impact upon faunal SCC in the region, however given the small size of the footprint areas and suitable habitat in the adjacent properties, these impacts can be suitably managed. Should any faunal SCC listed in Appendix C of this report be encountered during the development of the proposed activities, all operations must be stopped immediately, and a biodiversity specialist must be consulted in order to determine the best way forward.



6. 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 floral and faunal 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 8: A summary of sensitivity of the 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 within the designated focus area.	<p>Development activities in this area are unlikely to have a significant impact on the receiving environment, provided that all mitigation measures are adhered to, and that the construction footprint is kept as small as possible. The relevant permits will need to be obtained for all plant species protected under NFA (and potentially other species protected under the NCNCA) that will be removed/destroyed during development activities. Relevant permits should also be obtained for any protected faunal species within the footprints should they need relocation.</p> <p>Development options: The proposed development will directly impact on the Kathu Bushveld. The proposed powerline development will thus result in the loss of floral and faunal diversity, habitat, and SCC. As far as is feasible, development should be restricted to the authorised footprint only and all potential edge effects on any adjacent, more sensitive habitat units must be strictly managed and controlled. Where possible, disturbances within the focus area that fall outside of the direct footprint should be managed to increase/return diversity and ecological functioning.</p>



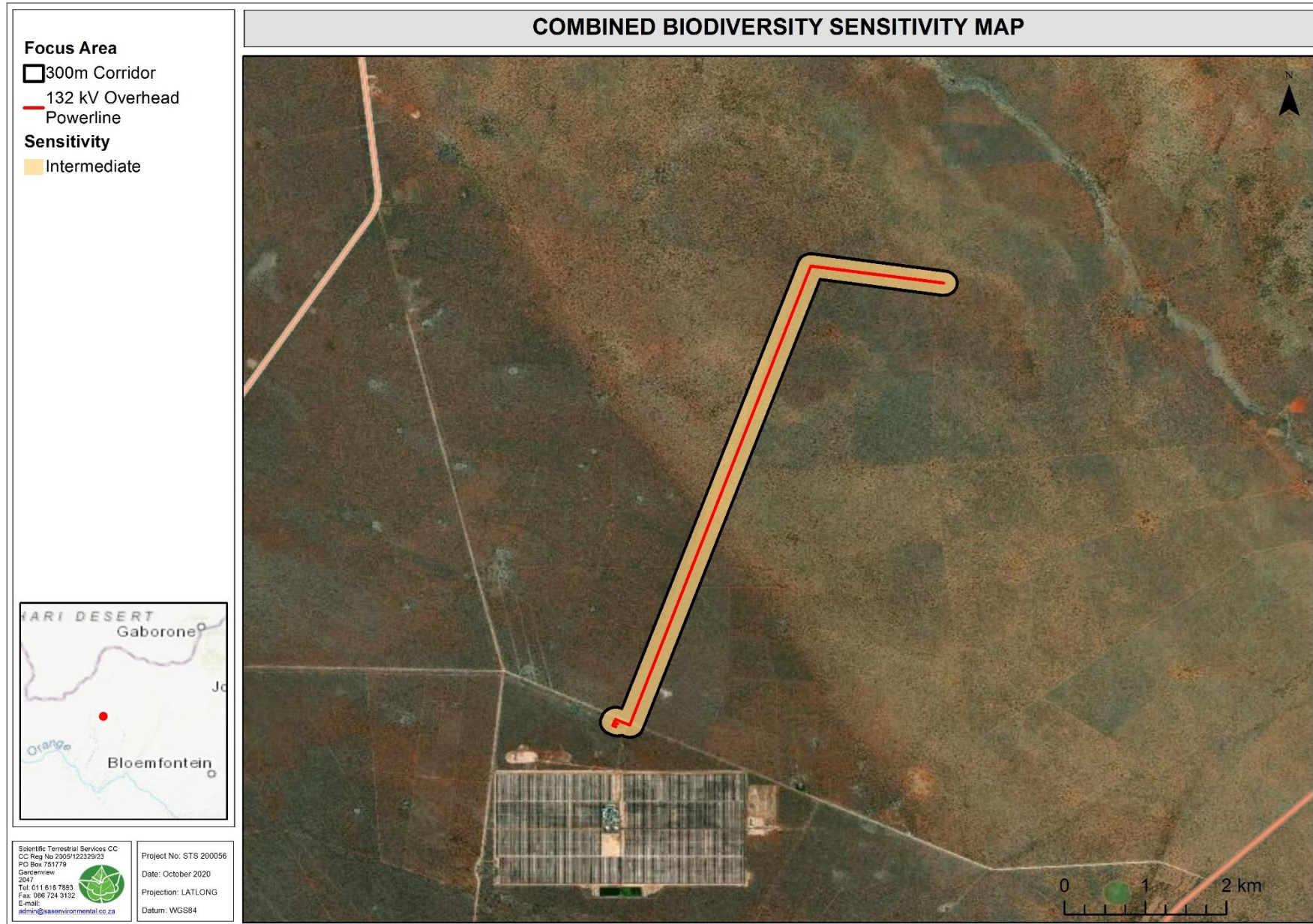


Figure 10: Combined sensitivity map of the focus area for fauna and flora.



7. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts on the floral and faunal ecology of the focus area. An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 7.1 and 7.2. All mitigatory measures required to minimise the perceived impacts are presented in Section 7.3.

The table below indicates the perceived risks to floral and faunal species associated with the activities pertaining to the proposed development.

Table 9: Activities and Aspects likely to impact on the faunal and floral resources of the focus area.

ACTIVITIES AND ASPECTS REGISTER	
Pre-Construction Phase	
-	Potential failure to relocate floral or faunal SCC to suitable habitat outside the development footprint.
-	Impact: Loss of faunal or floral SCC within the development footprint areas in the focus area.
-	Potential failure to obtain permits for nationally and provincially protected species that must be removed during the construction phase.
-	Impact: Uncontrolled and / or unauthorised loss of floral SCC within the development footprint areas in the focus area.
-	Inconsiderate planning, infrastructure placement and design, leading to the loss of potential sensitive floral and faunal species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint.
-	Impact: Degradation and modification of the receiving environment, loss of faunal and floral habitat.
-	Potential failure to design and implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat.
-	Impact: Spreading of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
Construction Phase	
-	Site clearing and the removal of vegetation.
-	Impact: Loss of faunal and floral habitat, diversity, and the possible loss of floral SCC.
-	Potential failure to monitor the success of relocated floral SCC.
-	Impact: Loss of SCC individuals.
-	Proliferation of AIP species and/or indigenous bush encroaching species that colonise in areas of increased disturbances and poor veld conditions, outcompeting native species, including the further transformation of adjacent natural habitat.
-	Impact: Loss of favourable faunal and floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of faunal and floral SCC.
-	Dumping and laydown of construction material within areas where no construction is planned thereby leading to habitat disturbance - allowing the establishment and spread of AIPs and further alteration of faunal habitat.
-	Impact: Loss of preferred faunal and floral habitat, diversity and SCC as AIPs outcompete the indigenous plant species in these disturbed areas.
-	Potential overexploitation through the trapping and/or hunting of faunal species, including faunal SCC, beyond the direct footprint area.
-	Impact: Local loss of faunal abundance and diversity.
-	Potentially poorly managed edge effects: <ul style="list-style-type: none"> • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to continual proliferation of AIP species and bush encroachers in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and • Compaction of soils outside of the focus area due to indiscriminate driving of construction vehicles through natural vegetation.



ACTIVITIES AND ASPECTS REGISTER	
-	Impact: Loss of floral and faunal habitat, diversity, and SCC within the direct footprint of the proposed development. Loss of surrounding floral and faunal diversity and floral SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
-	Possible increased fire frequency during construction.
-	Impact: Loss or alteration of floral and faunal habitat and species diversity.
-	Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants ⁶ and potentially further decreasing optimal growing/re-establishing conditions.
-	Impact: Declines in plant functioning leading to loss of floral species and habitat for optimal growth.
Operational and Maintenance Phases	
-	Potential failure to monitor the success of relocated floral SCC.
-	Impact: Loss of SCC individuals.
-	Increased introduction and proliferation of alien plant species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the footprint area.
-	Impact: Ongoing or permanent loss of faunal and floral habitat, diversity, and potential SCC.
-	Increased human presence in the area as part of maintenance activities, potentially leading to illegal harvesting/ collection of floral SCC, the persecution of fauna, or an increased risk of fire frequency impacting on floral and faunal communities in the surrounding natural habitat.
-	Impact: Loss of faunal and floral habitat, medicinal flora, and SCC, as well as overall species diversity within the local area.

7.1 Floral Impact Assessment

7.1.1 Floral Impact Assessment Results

The below table indicates the perceived risks to the floral ecology associated with all phases of the proposed development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

⁶ Sett, R. (2017). Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).



Table 10: Impact on the floral habitat, diversity, and SCC from the proposed development activities per habitat.

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
PRE-CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld Habitat	4	3	3	3	4	7	10	70 Medium-low	2	3	2	2	2	5	6	30 Low
Impact on Floral SCC																
Kathu Bushveld Habitat	4	3	3	3	4	7	10	70 Medium-low	2	3	2	2	2	5	6	30 Low
CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld Habitat	5	3	3	3	3	8	9	72 Medium-low	4	3	2	2	2	7	6	42 Low
Impact on Floral SCC																
Kathu Bushveld Habitat	5	3	3	3	3	8	9	72 Medium-low	3	3	2	1	2	6	5	30 Low
OPERATIONAL AND MAINTENANCE PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld Habitat	3	3	3	3	4	6	10	60 Medium-low	2	3	2	1	3	5	6	30 Low
Impact on Floral SCC																
Kathu Bushveld Habitat	3	3	3	2	4	6	9	54 Low	2	3	2	1	2	5	5	25 Very Low



7.1.2 Impact Discussion

The direct impact of the proposed development on the **floral ecology** of the focus area is not anticipated to be detrimental, with impact significance varying between medium-low and low for the Kathu Bushveld Habitat unit prior to the implementation of mitigation measures. If mitigation measures are implemented, the impact significance for the focus area is anticipated to be low. A low level of impact on **floral SCC** is anticipated due to the the proposed OHLP being on private property where harvesting can be better controlled.

Due to the focus area's location within a rural, and relatively undisturbed region, the surrounding natural vegetation within the local region is likely to be impacted by the proposed development. Vegetation clearing activities, an increased number of vehicles moving within the focus area, as well as increased edge effects, can all collectively create an ideal scenario for the proliferation of alien invasive plant species or the ongoing encroachment of indigenous woody species, which could result in a further disturbance of the terrestrial habitat both within the focus area and beyond. As part of the rehabilitation actions, disturbed areas not within the development footprint must be rehabilitated appropriately with AIP establishment and bush encroaching controlled within such areas. It will be essential for construction and maintenance vehicles to restrict their movement to existing roads (of which there are several) to further lower disturbance footprint within the focus area.

7.1.2.1 Impact on Floral Habitat and Diversity

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed development. The proposed development will result in the clearance of vegetation that is of intermediate sensitivity.

The floral communities associated with the Kathu Bushveld habitat unit are well represented in the focus area and in the surrounding region. As such a significant loss of floral communities is not anticipated. The proposed development will result in the loss of indigenous species, but the impact will be localised within the footprint area and no regional (provincial) impacts on floral communities are anticipated. All individuals of nationally and provincially protected floral species that were recorded during the site assessment will require permits for relocation if they will be impacted by construction activities – prior to the commencement of the construction phase.



7.1.2.2 Impacts on Floral SCC

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed development. The proposed development is highly likely to result in the clearance of several NFA protected tree species as well as some provincially protected species under the NCNCA. As such, the impact significance for floral SCC varied between medium-low and low for the Kathu Bushveld Habitat unit prior to the implementation of mitigation measures. Provided that strict mitigation measures are implemented such as ensuring vegetation and SCC are cleared only where infrastructure is placed, the impact on protected floral species and their associated communities could be localised for some species and even avoided for others – thus resulting in very low impact significance.

7.1.2.3 Probable Residual Impacts

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

- Destruction of ecologically intact habitat outside of the authorised development;
- Permanent loss of and altered floral species diversity outside of the focus area, including loss of favourable habitat for SCC;
- Loss of NFA protected tree species and of NCNCA protected floral species resulting from increased vegetation clearing and/or harvesting in the region; and
- Potential AIP proliferation and ongoing bush encroachment into adjacent natural vegetation communities.

7.1.2.4 Cumulative Impacts

A threat for the floral ecology within the focus area is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area. The proposed development will also increase the movement of humans within the area and could lead to increased harvesting of floral SCC and / or the degradation of floral habitat due to continued exposure to anthropogenic disturbances.

Development activities within the focus area will entail the loss of floral species because of vegetation clearing within the construction footprint. The habitat unit has been impacted upon historically because of mismanagement and the overutilisation of the veld, resulting in the current intermediate sensitivity of the area. However, the focus area is still capable of providing habitat to several NFA protected species and NCNCA species. Cognisance must be given to



the fact that the development is for that of a powerline and as such should not require total habitat clearance along the planned route, only that of the designated footprint areas and potentially tall trees that may contact the OHPL. As such the impact associated with the loss of floral habitat is medium-low (70) during the construction phase, and low for the operational phase prior to mitigation being implemented. Should effective mitigation take place, the impact can be lowered to low significance levels during the construction and operational phases, respectively.

Table 11: Cumulative impacts associated with the floral habitat, diversity and SCC arising from the proposed development activities

Nature: Impact on protected species and associated habitats due to cumulative loss and fragmentation of habitat. The development of the powerline to connect the existing substation to the solar facility will contribute to cumulative floral impacts which relates to impact on species diversity and their associated habitats.		
	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	Very short (1)	Medium-term (3)
Magnitude	Low (4)	Low to Moderate (5)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Medium (30)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	The cumulative impacts of the proposed project can be mitigated if mitigation measures are implemented, e.g. vegetation maintenance, AIP clearing and prevention and/or control of bush encroachment (to name a few). However, longer-term cumulative impacts are more likely to result from other developments in the area that will result in larger areas of vegetation clearing.	
Mitigation:		
<ul style="list-style-type: none"> ➤ Several floral species that are protected under Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) were recorded within the focus area and surrounding areas, with numerous others having the potential to be found within the focus area. If any such species are removed and relocated as part of the construction activities, the success of relocation must be monitored during the operational phase to ensure a higher probability of success. Negative cumulative impacts on SCC can be lowered if harvesting of SCC is prevented and where feasible, this should be an important long-term management goal; ➤ Linear developments are often corridors along which disturbances occur and AIPs spread. The proposed project should thus manage disturbances and AIPs along the entire extent as well as within a 30 m buffer surrounding the powerline. This will decrease the potential for AIPs to become a significant threat to indigenous flora; ➤ Bush encroachment should be managed to avoid a further cumulative loss of favourable habitat for floral communities in the area, which can be achieved through limiting disturbances during the maintenance phase. The remainder of the property is managed by the farm owner; ➤ All soils compacted because of maintenance activities should be ripped and reprofiled to natural levels and revegetated with indigenous vegetation. Establishment of reintroduced vegetation within such disturbed areas must be monitored as part of maintenance activities to ensure no cumulative loss of floral habitat; ➤ No dumping of waste should take place during maintenance activities, especially not within any sensitive habitat or areas designated as "open space; and ➤ Vehicles should be restricted from travelling in sensitive environments. Where possible, monitoring and maintenance should occur on foot. 		



7.2 Faunal Impact Assessment

7.2.1 Faunal Impact Assessment Results

The below table indicates the perceived risks to the faunal ecology associated with all phases of the proposed powerline development and operation. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.



Table 12: Impact on the faunal habitat, diversity and SCC arising from the proposed development activities.

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
PRE-CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld Habitat	4	3	2	2	3	7	7	49	2	3	1	2	2	5	5	25
								Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld Habitat	4	3	2	2	3	7	7	49	2	3	1	2	2	5	5	25
								Low								Very Low
CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld Habitat	4	3	2	2	3	7	7	49	3	3	1	1	2	6	4	24
								Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld Habitat	4	3	2	2	3	7	7	49	2	3	1	1	2	5	4	20
								Low								Very Low
OPERATIONAL AND MAINTENANCE PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld Habitat	2	3	2	1	3	5	6	30	2	3	1	1	2	5	4	20
								Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld Habitat	2	3	2	1	3	5	6	30	2	3	1	1	2	5	4	20
								Low								Very Low



7.2.2 Impact Discussion

The proposed construction and operation of the powerline is expected to have a limited impact on faunal communities (species diversity and overall abundance). The habitat along the proposed route is largely intact however and as such supports (habitat and food resources) several faunal species. The proposed powerline will, however, have a small, actualised footprint area, with only the areas for the towers necessitating vegetation clearance. These tower footprints are unlikely to be large and as such large tracts of vegetation do not need to be cleared, provided correct planning is undertaken. The remaining vegetation between and surrounding the tower footprints will ensure that any species displaced from the cleared footprint areas will still have sufficient and suitable habitat to retreat to and inhabit.

7.2.2.1 Loss of Faunal Habitat and Ecological Structure

The proposed development of the powerline will result in a loss of faunal habitat within the footprint areas of the powerline towers. As these footprints will be small the impact stemming from the loss of habitat in these areas is expected to be low, provided mitigation measures are implemented. Provided all vegetation between the towers remains intact and is not impacted upon, the powerline is unlikely to have a significant impact to the overall levels of available faunal habitat nor on the overall ecological structure and habitat connectivity.

7.2.2.2 Impact on Important Faunal Species of Conservation Concern

No faunal SCC were directly observed within the focus area; however, several SCC do have an increased probability of occurring within the focus area. The smaller arachnid SCC may occur within the focus area on a permanent basis whilst the large more mobile SCC are likely to occur periodically within the focus area, either whilst foraging or as a thoroughfare.

It is imperative that vegetation clearance is kept to a minimum and that prior to any clearance activities taking place, the footprint areas be actively searched (walkdown) for the presence of SCC, notably that of the smaller arachnid species and that of any burrows that may be utilised by SCC. Should any SCC be observed, all mitigation measures as stipulated in Section 7.3 must be adhered to. A suitably qualified ecologist and the provincial authorities should also be contacted to advise on the best route forward.



7.2.2.3 Probable Residual Impacts

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

- Continued loss of faunal habitat through improperly controlled edge effects and AIP proliferation; and
- Potential loss of and altered faunal species diversity, abundance, and SCC due to increased personnel within the focus area.

7.2.2.4 Possible Cumulative Impacts

The region in which the focus area is located has already been subjected to extensive agricultural and mining activities in the past. More recently the region has seen a surge in the development of renewable energy operations, notably solar farms, and related infrastructures such as powerlines and roads. Agricultural practices are still ongoing within the region and within the properties that the focus area traverses, whilst mining activities and the development of other solar farms is occurring to the south, north and west of the focus area. All these developments have already led to a loss of habitat and faunal species diversity and abundance in the region. The development of the proposed powerline will result in the small and localised loss of habitat along the proposed route; however, this habitat loss will lead to the displacement of faunal species. Although this displacement is not expected to be significant, it will be occurring within a region that has, and still is, experiencing larger scale species displacement due to surrounding developments. As such, displaced species will be competing for remaining habitat and food resources with other species who have also been displaced. Habitat and food resources are finite, and as such the continued displacement and shrinking of available habitat will likely lead to an overall decrease in species abundances and potentially diversity, as species will compete with each other for the remaining areas in which to inhabit.

Table 13: Cumulative impacts associated with the faunal habitat, diversity and SCC arising from the proposed development activities

Nature: Impact on protected faunal species and their associated habitat due to cumulative loss and partial fragmentation of habitat. .		
	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	Very short (1)	Permanent (4)
Magnitude	Low (4)	Moderate (4)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Medium (36)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	The cumulative impacts of the proposed project can be mitigated if mitigation measures are implemented. However, longer-term cumulative impacts are more	



	likely to result from other developments in the area that will result in larger areas of vegetation clearing and subsequently habitat loss for faunal species.
Mitigation:	
<ul style="list-style-type: none"> ➤ Rehabilitation of any disturbed sites must be undertaken and monitored to ensure that habitat and food resources are reinstated as far as possible; ➤ Vegetation (grasses and small shrubs) should be allowed to grow under the pylons in order to ensure that partial habitat is provided for faunal species in these areas. This will help minimise the cumulative impacts as some species will be able to re-inhabit these areas. ➤ AIPs should be managed if they appear along the powerline route, notably in the disturbed areas; ➤ Bush encroachment should be managed to avoid a further cumulative loss of favourable habitat for faunal communities in the area; ➤ No dumping of waste should take place during maintenance activities, especially not within any sensitive habitat or areas designated as “open space; and ➤ Vehicles should be restricted from travelling in sensitive environments. Where possible, monitoring and maintenance should occur on foot or along the designated roads. 	

7.3 Integrated Impact Mitigation

The table below highlights the key, general integrated mitigation measures that are applicable to the proposed development to suitably manage and mitigate the ecological impacts that are associated with all phases of the proposed powerline development.

Provided that all management and mitigation measures are implemented, as stipulated in this report, the overall risk to floral and faunal diversity, habitat and SCC can be mitigated and minimised.

Table 14: A summary of the mitigatory requirements for the biodiversity associated with the focus area.

Project phase	Pre-construction Phase
Impact Summary	Loss of floral and faunal habitat, species, and SCC
Proposed mitigation and management measures:	
Floral and Faunal Habitat and Diversity	
<ul style="list-style-type: none"> • Minimise loss of indigenous vegetation where possible through planning and where necessary by incorporating the sensitivity of the biodiversity report as well as other specialist studies; • Ensure that no development occurs outside of the planned development footprint; and • Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: <ul style="list-style-type: none"> - An AIP Management/Control Plan should be implemented by a qualified professional. No uncertified chemicals may be used for chemical control of AIPs. Trained personnel to be used for the application of chemical control or for the use of dangerous tools / machinery if mechanical clearing is to be pursued. 	
Floral and Faunal SCC	
<ul style="list-style-type: none"> • All floral and faunal SCC and protected tree species that will be affected by the construction activities, must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. Permits might be required from provincial (DENC) and national authorities such as DEFF; 	



Project phase	Construction Phase
Impact Summary	Loss of floral and faunal habitat, species and SCC
Proposed mitigation and management measures:	
Development footprint	
<ul style="list-style-type: none"> • The construction footprint must be kept as small as possible to minimise the impact on the surrounding environment (edge effect management); • Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint. It is recommended that vegetation only be cleared where infrastructure will be placed and that taller trees that could affect the powerline cables be trimmed instead of completely cleared; • Clearing of vegetation should take place in a phased manner. This will allow for faunal species within the focus area to flee and avoid harm; • Smaller species such as scorpions and reptiles will be less mobile during rainfall events and cold days (winter) and as such will not readily be able to move out of an area ahead of ground clearing activities. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own; • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be avoided or, if required, must be limited to what is absolutely necessary, and the footprint thereof kept to a minimal; • No collection of floral SCC must be allowed by construction personnel; • No hunting or trapping of faunal species is to be allowed by construction personnel; • Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed; • Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: <ul style="list-style-type: none"> - Demarcating all footprint areas during construction activities; - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; - All soils compacted because of construction activities should be ripped and profiled and reseeded; and - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas; • Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site; • No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed because of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must 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. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and • Upon completion of construction activities, it must be ensured that no soils be left bare, and that indigenous species be used to revegetate the disturbed area. 	
Alien Vegetation	
<ul style="list-style-type: none"> • Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2014); • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the construction and operational phase of the development, and a 30 m buffer surrounding the footprint and disturbed areas should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas; 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 complies with legal standards. 	
Floral and Faunal SCC	



<ul style="list-style-type: none"> • The relocation success of floral SCC should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful; • No collection of floral or faunal SCC or medicinal floral species must be allowed by construction personnel; • Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the proposed development footprint area; • No trapping or hunting of fauna whatsoever must be allowed; and • Should the presence of any faunal SCC be noted, or their breeding sites be located, notably ground dwelling or nesting species, within the development footprint a suitably qualified specialist should be consulted on the best way to proceed. 	
Project phase	Operational and Maintenance Phase
Impact Summary	Loss of floral and faunal habitat, species and SCC
Proposed mitigation and management measures:	
Development footprint	
<ul style="list-style-type: none"> • Disturbed areas are to be rehabilitated to a similar state as that of pre-disturbance conditions – where veld condition can be improved, it is recommended. Where this is not possible due to operational and maintenance requirements, it is recommended that at a minimum a suitable herbaceous layer is maintained within the footprint of the powerline towers so as to ensure that no erosion occurs; and • At a minimum a short graminoid and herbaceous layer must be maintained around all powerline towers so that a semblance of faunal habitat is reinstated in these areas; 	
Alien Vegetation	
<ul style="list-style-type: none"> • Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2016), in line with the NEMBA Alien and Invasive Species Regulations (2014); • 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; 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 complies with legal standards. 	
Floral and Faunal SCC	
<ul style="list-style-type: none"> • Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations. 	



8. CONCLUSION

Scientific Terrestrial Services (STS) was appointed to conduct a biodiversity assessment as part of the Basic Assessment (BA) process for the proposed development of an OHPL, near the town of Kathu, Northern Cape Province, henceforth referred to as the “focus area”. The focus area consists of a 132kV OHPL and an associated 300 m 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 located within a rural, and fairly undisturbed area within the Northern Cape. As such, the surrounding areas consist largely of natural veld and is in relatively good condition although there is evidence of small amounts of degradation (3 Foxes Biodiversity Solution, March 2019). During the field assessment, one habitat unit was identified within the focus area, namely the Kathu Bushveld habitat and is deemed to be of intermediate sensitivity for fauna and flora.

No South African National Biodiversity Institute (SANBI) Red Data Listed plant species were observed during the field assessment. However suitable habitat does exist for the presence of these species. Three NFA species were encountered within the focus area and surrounds, namely *B. albitrunca*, *V. erioloba*, and *V. haematoxylon*. Furthermore, several NCNCA protected floral species were encountered within the focus area and surrounds.. The focus area, given the natural habitat, can support several faunal SCC. Not all faunal SCC are likely to permanently reside within the focus area, as many require large areas to forage and survive. However, smaller Arachnid SCC such as *Opisthophthalmus carinatus* (Robust Burrowing Scorpion), *O. wahlbergii* (Kalahari Burrower) and *Pterinochilus* spp (Golden-brown baboon spiders) may occur within the footprint areas and as such will be at increased risk from ground clearing activities. Permits will be required from DEFF for the individual protected trees that will have to be removed for construction to proceed, along with permits from DENC for provincially protected flora, whilst any faunal SCC located will likely require provincial and possibly national permits to relocate them prior to construction activities. Furthermore, should any SCC as listed in the 2015 TOPS list of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) that are identified during the walk-through of the areas designated for clearing activities, these individuals are to be relocated to suitable habitat in the surrounding area by a specialist.

Following the ecological assessment of the biodiversity within the focus area, the impacts associated with the proposed development activities were determined. The impacts on the floral and faunal habitat, diversity and SCC are considered to range from medium-low to low



significance impacts prior to the implementation of mitigation measures. With mitigation fully implemented all impacts can be reduced to low and very low significance impacts. No significant impacts⁷ on the biodiversity associated with the focus area are anticipated for the proposed development.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the focus area will be made in support of the principle of sustainable development.

⁷ **Significant impact:** An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets (DEA *et. Al*, 2017).



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APPENDIX A: Legislative Requirements and Indemnity

The Constitution of the Republic of South Africa, 1996

The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

The National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), 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 Environmental Impact Assessment process depending on the nature of the activity and scale of the impact.

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

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.



The National Forest Act, 1998 (Act No. 10 of 1998), as amended in October 2011 (NFA)

According to the department of Department of Environment, Forestry and Fisheries (DEFF) (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (<https://www.daff.gov.za/daffweb3/>):

“In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization.”

Applicable sections of the NFA pertaining to the proposed project include the below:

Section 12:

Declaration of trees as protected

- 1) The Minister may declare-
 - a. particular tree,
 - b. a particular group of trees,
 - c. a particular woodland; or
 - d. trees belonging to a particular species, to be a protected tree, group of trees, woodland or species.
- 2) The Minister may make such a declaration only if he or she is of the opinion that the tree, group of trees, woodland or species is not already adequately protected in terms of other legislation.
- 3) In exercising a discretion in terms of this section, the Minister must consider the principles set out in section 3(3) of the NFA.

Section 15(1):

No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence granted by the Minister or in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or both a fine and imprisonment.

Government Notice 598 Alien and Invasive Species Regulations (2014), including the Government Notice No. 1003 Alien Invasive Species List as published in the Government Gazette 43726 of 2020, as it relates to the NEMBA

NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aims to:

- Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur,
- Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004) as:

- (a) A species that is not an indigenous species; or
- (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its



natural distribution range by natural means of migration or dispersal without human intervention.

Categories according to NEMBA (Alien and Invasive Species Regulations, 2017):

- **Category 1a:** Invasive species that require compulsory control;
- **Category 1b:** Invasive species that require control by means of an invasive species management programme;
- **Category 2:** Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and
- **Category 3:** Ornamentally used plants that may no longer be planted.

The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)

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.

National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA)

This act was developed in 2003 for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes

Restricted activities involving national and protected parks:

48(1) Despite other legislation, no person may conduct commercial prospecting, mining, exploration, production, or related activities–

- (a) in a special nature reserve, national park, or nature reserve
- (b) in a protected environment without the written permission of the Minister and the Cabinet member responsible for minerals and energy affairs; or
- (c) in a protected area referred to in section 9(b), (c) or (d).

Northern Cape Provincial Spatial Development Framework (NCPSDF, 2019)

The Northern Cape Provincial Spatial Development Framework (NCPSDF) was developed in 2011 to meet the requirements of the Northern Cape Planning and Development Act, 1998 (Act 7 of 1998) and the Municipal Systems Act, 2000 (Act 32 of 2000).

The Northern Cape Nature Conservation Act (NCNCA, Act No 9 of 2009)

The purpose of this Act is to provide for the sustainable utilisation of wild animals, aquatic biota and plants; to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; to provide for offences and penalties for contravention of the Act; to provide for the appointment of nature conservators to implement the provisions of the Act; to provide for the issuing of permits and other authorisations; and to provide for matters connected therewith.

Restricted activities involving specially protected plants:

49(1) No person may, without a permit –

- (a) Pick;
- (b) Import;
- (c) Export;
- (d) Transport;
- (e) Possess;
- (f) Cultivate; or
- (g) Trade in,

A specimen of a specially protected plant

Restricted activities involving protected plants



50 (1) Subject to the provision of section 52, no person may, without a permit –

- (a) Pick;
- (b) Import;
- (c) Export;
- (d) Transport;
- (e) Cultivate; or
- (f) Trade in,

A specimen of a protected plant.

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APPENDIX B: Floral Method of assessment

Floral Species of Conservational Concern Assessment

Prior to the site visit, a record of floral SCC and their habitat requirements was developed for the focus area, which includes consulting the National Web-based Environmental Screening Tool. Because not all SCC have been included in the Screening Tool layers (e.g. NT and DD taxa), it remains important for the specialist to be on the lookout for additional SCC. For this study, two primary sources were consulted and are described below.

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the focus area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, “*low*”, “*medium*”, “*high*” and “*very high*” sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g. for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below⁸:

- **Very High:** Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km² are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa’s National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.
- **High:** Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat.
- **Medium:** Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
- **Low:** Areas where no SCC are known or expected to occur.

⁸ More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website:
<https://screening.environment.gov.za/screeningtool/#/pages/welcome>



BRAHMS Online Website

The Botanical Database of Southern Africa (BODATSA) is accessed to obtain plant names and floristic details (<http://posa.sanbi.org/>) for species of conservation concern within a selected boundary;

- This website provides access to South African plant names (taxa), specimens (herbarium sheets) and observations of plants made in the field (botanical records). Data is obtained from the Botanical Database of Southern Africa (BODATSA), which contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH).
- Information on habitat requirements etc. is obtained from the SANBI Red List of South African Plants website (<http://redlist.sanbi.org/>).
- Typically, data is extracted for the Quarter Degree Square (QDS) in which the focus area is situated but where it is deemed appropriate, a larger area can be included.

NEMBA TOPS Species

The Threatened or Protected Species (TOPS) Regulations (GN 255 of 2015) under Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA), were taken into consideration.

Provincial: Specially Protected and Protected Species

The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), provides a list of Specially Protected Species (Schedule 1) (Section 49(1) of the NCNCA) and Protected Species (Schedule 2) (Section 50(1) of the NCNCA) for the Northern Cape Province. These species formed part of the SCC assessment.

Nationally Protected Trees

The National Forest Act, 1998 (act 10 of 1998), as amended in September 2011 (NFA), affords protection to a list of tree species. All nationally protected trees were included as SCC in this report.

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species. The Probability of Occurrence (POC) for each floral SCC is described as:

- **“Confirmed”**: if observed during the survey;
- **“High”**: if within the species’ known distribution range and suitable habitat is available;
- **“Medium”**: if either within the known distribution range of the species or if suitable habitat is present; or
- **“Low”**: if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Vegetation Surveys

When planning the timing of a floristic survey, it is important to remember that the primary objective is not an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of SCC and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

The vegetation survey incorporates the subjective (or stratified) sampling method. Subjective sampling is a sampling technique in which the specialist relies on his or her own professional experience when choosing sample sites within the focus area. This allows representative recordings of floral communities and optimal detection of SCC. Subjective sampling is used to consider different areas (or habitat units) which are identified within the main body of a habitat/focus area.

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a focus area equally and thus increase the potential to miss floral SCC. Random sampling methods also tend to require more time in the field to locate the amount of SCC that can be detected using subjective sampling methods - In the context of an EIA where time constraints



are often restrictive, priority needs to be given to collecting data in the shortest time possible without compromising the efficiency of locating SCC (SANBI, 2020).

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance, and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. To present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

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

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimizing development potential.
≥3.5 <4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.



APPENDIX C: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of human habitation nearby the focus area and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations.

Mammals

Mammal species were recorded during the field assessment with the use of visual identification, spoor, call and dung. In addition to this, infrared camera traps were placed in areas/ along paths of increased use in order to photographically capture species moving past that point. Specific attention was paid to mammal SCC as listed by the IUCN.

Reptiles

During the field assessment, suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected for the presence of reptiles, and any individuals encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the focus area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the IUCN.

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Due to the arid environment and lack of suitable moisture driven habitats, the likelihood of recording any species was low. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the focus area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the IUCN.

Invertebrates

Whilst conducting transects through the focus area, all insect species visually observed were identified, and where possible photographs taken.

It must be noted however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the focus area at the time of survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the International IUCN.

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Dead logs were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC species within the focus area.

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal 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%				

Faunal Habitat Sensitivity

The sensitivity of the focus area for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal 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):

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

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



Table C1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
$\geq 1.5 < 2.5$	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
$\geq 2.5 < 3.5$	Intermediate	Preserve and enhance biodiversity of the habitat unit surrounds while optimising development potential.
$\geq 3.5 < 4.5$	Moderately high	Preserve and enhance the biodiversity of the habitat limit development and disturbance.
$\geq 4.5 \leq 5.0$	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.



APPENDIX D: Impact Assessment Methodology

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'⁹. 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 Table 3. 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 necessary¹⁰.

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 considers the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-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, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances

⁹ The definition has been aligned with that used in the ISO 14001 Standard.

¹⁰ Some risks/impacts that have low significance will however still require mitigation.



where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table D1: 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 < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m	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 D2: 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 D3: 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 impacts¹¹ 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.

¹¹ Mitigation measures should address both positive and negative impacts



APPENDIX E: Vegetation Types

Kathu Bushveld (SVk 12)



Figure E1: SVk 12 Kathu Bushveld: Open savanna dominated by *Vachellia erioloba*, *Senegalia mellifera* and *Grewia Flava* with low cover of *Stipagrostis ciliata* against the red sand east of Oupos, in the Kuruman District north of Kathu. Image by M.C. Rutherford.

Remarks: One of the most strikingly dominant areas of tall *V. erioloba* is centred on the town of Kathu, which was built around many of these trees.

Table E1: Floristic species of *The Kathu Bushveld* (Mucina & Rutherford, 2006).

Plant Community	Species
Dominant and typical floristic species	
Woody Layer	
Trees	Small Tree: <i>Senegalia erubescens</i> (d), <i>Boscia albitrunca</i> (d), <i>Terminalia sericea</i> . Tall Tree: <i>Vachellia erioloba</i>
Shrubs	Tall Shrub: <i>Diospyros lycioides</i> subsp. <i>lycioides</i> (d), <i>Dichrostachys cinerea</i> , <i>Grewia flava</i> , <i>Gymnosporia buxifolia</i> , <i>Rhigozum brevispinosum</i> . Low Shrubs: <i>Aptosimum decumbens</i> , <i>Grewia retinervis</i> , <i>Nolletia arenosa</i> , <i>Sida cordifolia</i> , <i>Tragia dioica</i> . Succulent Shrub: <i>Kalanchoe rotundifolia</i> , <i>Talinum cafferum</i> .
Forb layer	
Herbs	<i>Acrotome inflata</i> , <i>Erlangea misera</i> , <i>Gisekia africana</i> , <i>Heliotropium ciliatum</i> , <i>Hermbsstaedtia fleckii</i> , <i>H. odorata</i> , <i>Limeum fenestratum</i> , <i>L. viscosum</i> , <i>Lotononis platycarpa</i> , <i>Senna italica</i> subsp. <i>arachoides</i> , <i>Tribulus terrestris</i> .
Gramminoid layer	
Graminoids	<i>Aristida meridionalis</i> (d), <i>Brachiaria nigropedata</i> (d), <i>Centropodia glauca</i> (d), <i>Eragrostis lehmanniana</i> (d), <i>Schmidtia pappophoroides</i> (d), <i>Stipagrostis ciliata</i> (d), <i>Aristida congesta</i> , <i>Eragrostis biflora</i> , <i>E. chloromelas</i> , <i>E. heteromera</i> , <i>E. pallens</i> , <i>Melinis repens</i> , <i>Schmidtia kalahariensis</i> , <i>Stipagrostis uniplumis</i> , <i>Tragus berteronianus</i> .

*(d) is for dominant



APPENDIX F: Floral SCC

South Africa uses the internationally endorsed [IUCN Red List Categories and Criteria](#) in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. Due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction but may nonetheless be of high conservation importance. Because the Red List of South African plants is used widely in South African conservation practices such as systematic conservation planning or protected area expansion, we use an amended system of categories designed to highlight those species that are at low risk of extinction but of conservation concern.

Definitions of the national Red List categories

Categories marked with ^N are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

- **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW)** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
- **Regionally Extinct (RE)** A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
- **Critically Endangered, Possibly Extinct (CR PE)** Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
- **Critically Endangered (CR)** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN)** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
- **Vulnerable (VU)** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
- **Near Threatened (NT)** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
- ^N**Critically Rare** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
- ^N**Rare** A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:
 - Restricted range: Extent of Occurrence (EOO) <500 km², OR
 - Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km², OR
 - Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
 - Small global population: Less than 10 000 mature individuals.
- **Least Concern** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.



- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in [Plants of southern Africa: an online checklist](#) are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Table F1: Floral SCC expected to occur within the QDS 2723CA in which the focus area is located. Additional information on species threat status as defined in The Red List of South African Plants (<http://redlist.sanbi.org/index.php>) is presented. Species presented below are protected under Schedule 2 (Protected Species) of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009).

Scientific Name	IUCN	Growth form	Habitat description	POC
Family: AIZOACEAE - All species				
<i>Trianthema parvifolia</i>	LC	Succulent; Herb	It occurs in open sandy, stony, or gravelly soils, often in disturbed places, 500-1600 m Suitable habitat on site: Throughout the focus area.	High
<i>Plinthus sericeus</i>	LC	Dwarf Shrub	Free State, Northern Cape, North West Free State, Northern Cape	Low
<i>Mestoklema arboriforme</i>	LC	Succulent	Suitable habitat on site: Throughout the focus area but more likely to be recorded in the <i>Boscia albitrunca</i> -dominated <i>Kathu Bushveld</i> where soils were less sandy.	Medium
<i>Nananthus aloides</i>	LC	Succulent	Succulent Range: Northern Cape, North West. Major habitats: Terrestrial. Description: Widespread in the climatically severe southern African interior. It grows mostly at the edge of pans in finely decomposed limestone, the plants often sunken into the ground, or among stones (The encyclopaedia of succulents). Population trend: None provided.	Low
<i>Trichodiadema pomeridianum</i>	LC	Succulent	Eastern Cape, Free State, Northern Cape, North West, Western Cape	Low
<i>Plinthus karoocicus</i>	LC	Dwarf Shrub	Eastern Cape, Free State, Northern Cape, North West	Medium
<i>Prepodesma orpenii</i>	LC	Succulent	Succulent Range: Northern Cape. Major habitats: Terrestrial. Description: Arid subtropics. It grows in dry plane lands on barren loamy shales or in crevices between quartzitic limestone stones (The encyclopaedia of succulents). Population trend: Stable.	Low
Family: AMARYLLIDACEAE - All Species (except those listed in Schedule 1)				
<i>Haemanthus humilis</i>	LC	Geophyte;	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Mpumalanga	Low



Scientific Name	IUCN	Growth form	Habitat description	POC
<i>Nerine laticoma</i>	LC	Geophyte;	Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga, Northern Cape, North West. It usually occurs in large colonies on deep, red, sandy soils. Suitable habitat on site: Sections of the <i>Vachellia haematoxylon</i> -dominated <i>Kathu Bushveld</i> where deep, red, sandy soils occurred (central sections).	High
Family: APOCYNACEAE - All Species (except those listed in Schedule 1)				
<i>Raphionacme velutina</i>	LC	Succulent; Geophyte; Herb	Gauteng, KwaZulu-Natal, Limpopo, Northern Cape, North West In grassland and open woodland, mostly in drier areas. Suitable habitat on site: Throughout the focus area.	High
<i>Fockea angustifolia</i>	LC	Succulent; Climber	Succulent; climber Range: Free State, KwaZulu-Natal, Limpopo, Northern Cape, North West Major habitats: Terrestrial. Description: Occurs in dry areas on stony hillsides on granite or limestone (Pooley, 2005).	Low
<i>Stapelia olivacea</i>	LC	Succulent	Eastern Cape, Free State, Northern Cape, Western Cape This species grows amongst stones and boulders in mountainous areas. Despite its wide range, it is locally very rare and does not appear to be common anywhere today.	Low
<i>Microlooma armatum</i>	LC	Dwarf Shrub; Shrub	Wide-range of shrubby habitats, in Namibia it is rarer and appears to be restricted to specific rock formations.	Medium
<i>Piaranthus decipiens</i>	LC	Succulent	Free State, Northern Cape, North West Among bushes and trees in sandy and loamy soils. Suitable habitat on site: Throughout the focus area.	Medium
<i>Acokanthera oppositifolia</i>	LC	Shrub; tree	Eastern Cape, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West, Western Cape Usually found growing in the shade of other vegetation on forest margins woodland and bush clumps, this species is widespread over many parts of the country with the exception of the drier parts.	Low
<i>Cynanchum viminale</i>	LC	Climber	Widespread in Africa and the Middle East to India, Indochina, Southern China, Indomalaya and Australia. Also on Indian Oceans islands including Mauritius, Réunion and the Seychelles. A species mostly of drier scrub and rocky areas but also found as a twining climber in shade in woodland and riverine vegetation Suitable habitat on site: Throughout the focus area.	High
<i>Brachystelma circinatum</i>	LC	Succulent; Geophyte	Succulent; geophyte Range: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Western Cape. Major habitats: Terrestrial. Description: Grows in various stony places and has adapted to different environmental factors (The encyclopaedia of succulents). Population trend: Not provided.	Medium



Scientific Name	IUCN	Growth form	Habitat description	POC
			Suitable habitat on site: Throughout the focus area.	
<i>Gomphocarpus fruticosus</i>	LC	Herb; Shrub	Herb; shrub Range: Widespread across South Africa, extending northwards to Angola, Zambia and Mozambique. Major habitats: Albany Thicket, Desert, Fynbos, Grassland, Indian Ocean Coastal Belt, Nama Karoo, Savanna, Succulent Karoo. Description: Dry sandy soils in open or disturbed places, often on riverbanks. Suitable habitat on site: Throughout the focus area.	High
<i>Gomphocarpus tomentosus</i>	LC	Herb; Shrub	Herb; shrub Range: Widespread across the central and north-eastern interior of South Africa, extending northwards within southern Africa to southern Angola, Zimbabwe and southern Mozambique. Major habitats: Grassland, Nama Karoo, Savanna. Description: Sandy open or disturbed areas. Suitable habitat on site: Throughout the focus area.	Medium
Family: ASPHODELACEAE - All Species (except those listed in Schedule 1)				
<i>Bulbine abyssinica</i>	LC	Succulent; Geophyte; Herb	Succulent; geophyte; herb Range: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: It favours rocky grassland and shallow soil overlying rock but can also be found in woodland and along seepage areas.	Low
<i>Trachyandra laxa</i>	LC	Succulent; Geophyte	Northern Cape, North West	Low
<i>Aloe grandidentata</i>	LC	Succulent; Herb	It occurs on rocky ridges in karroid shrubland and Kalahari thornveld. Recorded within the <i>Boscia albitrunca</i> -dominated <i>Kathu Bushveld</i> underneath <i>Senegalia melifera</i> . There is additional habitat available for this species throughout the focus area.	Confirmed
<i>Bulbine narcissifolia</i>	LC	Succulent; Geophyte; Herb	Eastern Cape, Free State, Gauteng	Low
<i>Aloe claviflora</i>	LC	Succulent; Herb	Well drained areas on rocky slopes or flat stony areas at the margins of Kalahari thornveld. Usually, but not always, on calcrete.	Low
<i>Bulbine frutescens</i>	LC	Succulent; Dwarf Shrub	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape	Low
Family: CAPPARACEAE - All <i>Boscia</i> Species				
<i>Boscia albitrunca</i>	LC	tree	Shrub; tree Range: Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. Major habitats: Terrestrial. Description: This species is found in the drier parts of southern Africa, in areas of low rainfall.	Confirmed



Scientific Name	IUCN	Growth form	Habitat description	POC
			Recorded in high abundances in the <i>Boscia albitrunca</i> -dominated <i>Kathu Bushveld</i> . None recorded in the remainder of the focus area.	
Family: CARYOPHYLLACEAE - All <i>Dianthus</i> Species				
<i>Dianthus namaensis</i>	LC	Herb	Northern Cape	Low
Family: CELASTRACEAE - All <i>Gymnosporia</i> Species				
<i>Gymnosporia buxifolia</i>	LC	Shrub; tree	Shrub; tree Range: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: Its natural habitat is in grasslands, fynbos, Nama-karoo, forests, thickets and savanna-bushveld. It occurs on hillsides, dry slopes of valleys, sometimes in riverbeds, often on termite mounds and it is often found as undergrowth to taller trees. Recorded throughout the focus area but more frequently encountered in the <i>Vachellia haematoxylon</i> -dominated <i>Kathu Bushveld</i> .	Confirmed
Family: CRASSULACEAE - All Species (except those listed in Schedule 1)				
<i>Kalanchoe brachyloba</i>	LC	Succulent; Shrub	Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West	Low
<i>Crassula capitella</i>	LC	Succulent; Herb	Eastern Cape, Free State, Western Cape	Low
<i>Kalanchoe lanceolata</i>	LC	Succulent; Shrub	Gauteng, Limpopo, Mpumalanga, North West	Low
<i>Kalanchoe rotundifolia</i>	LC	Succulent; Dwarf Shrub	Succulent; dwarf shrub Range: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. Major habitats: Terrestrial. Description: A very common plant found growing as a pioneer plant usually in shade or half-shade, single or in large communities under trees or shrubs in bushland, woodland, open and secondary forests, savanna, open veld; sandy, limestone, brackish or rocky soils or on rocks, either in dry or wet habitats, sometimes in salt marshes. Suitable habitat on site: Throughout the focus area.	Medium
Family: EUPHORBIACEAE - All <i>Euphorbia</i> Species and <i>Alchornea laxiflora</i>				
<i>Euphorbia mauritanica</i>	LC	Succulent	Flats and stony slopes. <i>Euphorbia mauritanica</i> grows very well in dry climates and in coastal as well as inland areas with colder winters. This plant occurs extensively throughout the Northern Cape, Western Cape, Eastern Cape, Free State, KwaZulu-Natal, as well as in Namibia. This is the most widely distributed of all the South African shrubby euphorbias. It is found in most of southern Africa, especially the Succulent Karoo, where it is frequently dominant in valleys and hillsides. Suitable habitat on site: Throughout the focus area.	Medium
<i>Euphorbia rhombifolia</i>	LC	Succulent; Shrub	It occurs on stony slopes and flats.	Low
<i>Euphorbia crassipes</i>	LC	Succulent; Shrub	Namibia to Kliprand, Pofadder, Prieska and Kimberley.	Medium
<i>Euphorbia juttae</i>	LC	Succulent; Dwarf Shrub	Gravelly flats.	Low
<i>Euphorbia spartaria</i>	LC	Succulent; Shrub	Northern Cape	Low
<i>Euphorbia avasmontana</i>	LC	Succulent	Arid rocky slopes.	Low



Scientific Name	IUCN	Growth form	Habitat description	POC
<i>Euphorbia inaequilatera</i>	LC	Succulent	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape	High
<i>Euphorbia duseimata</i>	LC	Succulent; Dwarf Shrub	Succulent; dwarf shrub Range: Free State, Northern Cape, North West. Major habitats: Terrestrial. Description: Sandy or turfy soils, Kalahari Thornveld and Bushveld. One individual recorded within the <i>Vachellia haematoxylon</i> -dominated Kathu Bushveld.	Confirmed
Family: IRIDACEAE - All Species (except those listed in Schedule 1)				
<i>Babiana bainesii</i>	LC	Geophyte; Herb	Geophyte; herb Range: Limpopo, Northern Cape, North West. Major habitats: Terrestrial. Description: Grassland, usually among small rocks.	Medium
<i>Gladiolus permeabilis</i>	LC	Geophyte; Herb	Deep sandy soils and kalahari dunes, low karroid shrubland, rocky outcrops in short, dry grassland, and open woodland.	Medium
<i>Moraea polystachya</i>	LC	Geophyte; Herb	Geophyte; herb Range: Eastern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: The habitat is well-drained flats and slight slopes, with collectors often referring to the presence of calcrete deposits.	Low
<i>Moraea pallida</i>	LC	Geophyte; Herb	Open grassland and bushveld, sometimes in wetlands or rocky sites.	Medium
<i>Lapeirousia littoralis</i>	LC	Geophyte; Herb	Flats with deep red sandy soils.	Medium
Family: ORCHIDACEAE - All Species (except those listed in Schedule 1)				
<i>Disperis macowanii</i>	LC	Geophyte; Herb	Eastern Cape, KwaZulu-Natal, Limpopo, Western Cape	Low
Family: OXALIDACEAE - All Oxalis Species				
<i>Oxalis depressa</i>	LC	Succulent; Geophyte	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West Suitable habitat on site: Suitable habitat within the <i>Vachellia haematoxylon</i> -dominated Kathu Bushveld.	High
<i>Oxalis lawsonii</i>	LC	Geophyte	Free State, Northern Cape, North West Suitable habitat on site: Suitable habitat within the <i>Vachellia haematoxylon</i> -dominated Kathu Bushveld.	High
Family: SCROPHULARIACEAE - All <i>Jamesbrittenia</i>, <i>Diascia</i>, <i>Halleria</i>, <i>Manulea</i>, <i>Nemesia</i>, and <i>Phyllopodium</i> species, <i>Polycarena filiformis</i> and <i>Chaenostoma longipedicellatum</i>				
<i>Jamesbrittenia integerrima</i>	LC	Herb; Dwarf Shrub	Northern Cape	Low
<i>Jamesbrittenia atropurpurea</i>	LC	Shrub; Dwarf Shrub	Shrub; dwarf shrub Range: Eastern Cape, Free State, Gauteng, Northern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: This species grows in clay or loam flats, slopes and ridges among scrub. Recorded within the <i>Boscia albitrunca</i> -dominated Kathu Bushveld.	Confirmed
<i>Jamesbrittenia aurantiaca</i>	LC	Herb	Northern Cape	Medium

CR PE = Critically Endangered (Possibly Extinct); EN = Endangered; EW = Extinct in the Wild; NT = Near Threatened; VU = Vulnerable; P = Protected LC = Least Concern; NT = Not Evaluated.



Table F2: TOPS plant list for the floral species expected to occur within the Northern Cape.

Family	Scientific Name	Habitat	Threat Status	POC
Aizoaceae	<i>Cheiridopsis peculiaris</i>	Gravels and shale derived from metamorphic rocks of the Namaqualand Complex	CR	Low
Aizoaceae	<i>Conophytum herreanthus</i> subsp. <i>herreanthus</i>	Quartz patches	CR	Low
Asphodelaceae	<i>Aloidendron pillansii</i>	Succulent Karoo shrubland on dry, rocky dolomite and gneiss hillsides.	EN	Low
Amaryllidaceae	<i>Haemanthus graniticus</i>	Namaqualand Klipkoppe Shrubland or Namaqualand Granite Renosterveld.	EN	Low
Aizoaceae	<i>Lithops dorotheae</i>	Fine-grained, sheared, feldspathic quartzite	EN	Low
Asphodelaceae	<i>Aloidendron dichotomum</i>	On north-facing rocky slopes (particularly dolomite) in the south of its range. Any slopes and sandy flats in the central and northern parts of range.	VU	Low
Amaryllidaceae	<i>Brunsvigia herrei</i>	Succulent Karoo Shrubland, granitic soils on flats and sometimes in deposits of fairly large stones.	VU	Low
Aizoaceae	<i>Conophytum bachelorum</i>	Rocky outcrops	VU	Low
Aizoaceae	<i>Conophytum ratum</i>	Spongy quartz soil.	VU	Low
Amaryllidaceae	<i>Gethyllis grandiflora</i>	Sandy and or stony soils in arid karroid shrubland.	VU	Low
Amaryllidaceae	<i>Gethyllis namaquensis</i>	Coastal dunes and gravelly mountain slopes in succulent karoo shrubland.	LC	Low
Amaryllidaceae	<i>Brunsvigia josephinae</i>	Heavy clay soils.	VU	Low
Asphodelaceae	<i>Aloe krapohlana</i>	Occurs in the extremely arid northern regions of the Succulent Karoo, on clay, stony (mostly quartzitic) and sandy soils on flats and slopes.	P	Low
Amaryllidaceae	<i>Cyrtanthus herrei</i>	Deeply shaded rock ledges on south-facing rocky slopes.	P	Low
Aizoaceae	<i>Sceletium tortuosum</i>	Quartz patches and is usually found growing under shrubs in partial shade.	P	Medium
Pedaliaceae	<i>Harpagophytum procumbens</i>	Well drained sandy habitats in open savanna and woodlands.	P	High

CR= Critically Endangered, EN= Endangered, VU= Vulnerable, P= Protected

Table F3: List of potential plant SCC for the QDS 2527AA derived from current literature for vegetation found in the area as well as the international IUCN Red Data list, the South African Red Data List, and the Botanical Database of Southern Africa (BODATSA; <http://posa.sanbi.org/>).

Family	Scientific Name	IUCN	Growth form	POC
Acanthaceae	<i>Barleria media</i>	VU	Herb	Medium
Cleomaceae	<i>Cleome conrathii</i>	NT	Herb	Medium

CR PE = Critically Endangered (Possibly Extinct); EN= Endangered; EW = Extinct in the Wild; NT = Near Threatened; VU= Vulnerable; P= Protected LC = Least Concern; POC = Probability of Occurrence.

Table F4: Protected trees as defined by The National Forest Act, 1998, (Act No. 84 of 1998) (NFA) for the QDS 2527AA. Additional information on species threat status as defined in The Red List of South African Plants (<http://redlist.sanbi.org/index.php>) is presented.

Family	Scientific Name	IUCN	Growth form	POC
Fabaceae	<i>Vachellia erioloba</i>	LC	Tree	Confirmed
Fabaceae	<i>Vachellia haematoxylon</i>	LC	Tree	Confirmed
Brassicaceae	<i>Boscia albitrunca</i>	LC	Tree	Confirmed



APPENDIX G: Faunal SCC

The tables below list the faunal Species of Conservation Concern for the focus area:

Table G1: TOPS list of faunal species (2015) that may occur within the Northern Cape.

Scientific Name	Common Name	Threat Status
<i>Homopus signatus</i>	Speckled tortoise	VU
<i>Pachydactylus goodi</i>	Good's Gecko	VU
<i>Cordylus macropholis</i>	Large-scaled Lizard	P
<i>Cordylus imkeae</i>	Rooiberg Girdled Lizard	P
<i>Opisthophthalmus ater</i>	Steinkopf Burrowing Scorpion	CR
<i>Acinonyx jubatus</i>	Cheetah	VU
<i>Manis temminckii</i>	Pangolin	VU
<i>Ceratotherium simum</i>	Southern White Rhinoceros	P
<i>Crocuta crocuta</i>	Spotted Hyaena	P
<i>Felis nigripes</i>	Black-footed Cat	P
<i>Hyaena brunnea</i>	Brown Hyaena	NT
<i>Neophron percnopterus</i>	Egyptian Vulture	CR
<i>Aquila rapax</i>	Tawny Eagle	EN
<i>Torgos tracheliotos</i>	Lappet-faced Vulture	EN
<i>Gyps africanus</i>	White-backed Vulture	CR
<i>Gyps coprotheres</i>	Cape Vulture	EN
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN
<i>Polemaetus bellicosus</i>	Martial Eagle	EN
<i>Terathopius ecaudatus</i>	Bateleur	EN
<i>Anthropoides paradiseus</i>	Blue Crane	P
<i>Ardeotis kori</i>	Kori Bustard	P
<i>Python sebae</i>	African Rock Python	P
<i>Orycteropus afer</i>	Aardvark	P

CR= Critically Endangered, EN=Endangered, NT=Near Threatened, VU=Vulnerable, P=Protected



Faunal Species of Conservation Concern

Table G2: Threatened species not yet listed above that may occur in the focus area.

Common Name	Species	NCCA 2009 Status	IUCN Status
Honey badger	<i>Mellivora capensis</i>	Specially Protected	LC
African wild cat	<i>Felis silvestris</i>	Specially protected	LC
Striped polecat	<i>Ictonyx striatus</i>	Specially protected	LC
African striped weasel	<i>Poecilogale albinucha</i>	Specially protected	LC
Aardwolf	<i>Proteles cristata</i>	Specially protected	LC
Cape fox	<i>Vulpes chama</i>	Specially protected	LC
Southern African hedgehog	<i>Atelerix frontalis</i>	Specially protected	LC
Leopard	<i>Panthera pardus</i>	Specially protected	VU
Black eagle	<i>Aquila verreauxii</i>	Specially Protected	VU
White-backed Vulture	<i>Gyps africanus</i>	Specially Protected	CR
Ludwig's Bustard	<i>Neotis ludwigii</i>	Specially protected	EN
Martial Eagle	<i>Polemeatus bellicosus</i>	Specially Protected	EN
Tawny Eagle	<i>Aquila rapax</i>	Specially Protected	EN
Cape Vulture	<i>Gyps coprotheres</i>	Specially Protected	EN
Lappet-faced Vulture	<i>Torgos tracheliotos</i>	Specially Protected	EN
Burchell's courses	<i>Cursorius rufus</i>	Protected	VU
Lanner Falcon	<i>Falco biarmicus</i>	Specially Protected	VU
Secretarybird	<i>Sagittarius serpentarius</i>	Specially Protected	VU
Kori Bustard	<i>Ardeotis kori</i>	NA	NT
African Rock Pipit	<i>Anthus crenatus</i>	Protected	NT
Burrowing scorpion	<i>Opisththalmus carinatus</i>	Specially Protected	NYBA
Burrowing scorpion	<i>Opisththalmus wahlbergii</i>	Specially Protected	NYBA
Common flap-neck chameleon	<i>Chamaeleo dilepis</i>	Specially Protected	LC
African rock python	<i>Python sebae</i>	Specially Protected	-

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed, NE = Not Evaluated, NA = Not applicable



APPENDIX H: Species List

Floral Species List

Table H1: Dominant floral species encountered in the Focus area. Alien species are indicated with an asterisk (*).

SPECIES LIST			
Woody Species	Forbs	Succulents	Graminoids
* <i>Prosopis glandulosa</i> var. <i>torreyana</i>	<i>Aptosimum elongatum</i>	<i>Aloe grandidentata</i> (NCNCA)	<i>Antheophora pubescens</i>
<i>Aptosimum albomarginatum</i>	<i>Boophone disticha</i>	<i>Euphorbia</i> cf. <i>duseimata</i> (NCNCA)	<i>Aristida congesta</i> subsp. <i>congesta</i>
<i>Asparagus laricinus</i>	<i>Chamaecrista</i> sp.	<i>Ruschia calcarea</i> (NCNCA)	<i>Aristida meridionalis</i>
<i>Asparagus retrofractus</i>	<i>Crinum</i> sp.		<i>Aristida</i> sp.
<i>Blepharis</i> cf. <i>marginata</i>	<i>Cullen tomentosum</i>		<i>Aristida stipitata</i>
<i>Boscia albitrunca</i>	<i>Dicoma capensis</i>		<i>Cymbopogon</i> cf. <i>excavatus</i>
<i>Cadaba aphylla</i>	<i>Felicia muricata</i>		<i>Enneapogon cenchroides</i>
<i>Chrysocoma</i> sp.	<i>Gazania krebsiana</i>		<i>Enneapogon</i> cf. <i>desvauxii</i>
<i>Crotalaria spartioides</i>	<i>Geigeria ornativa</i>		<i>Eragrostis</i> cf. <i>echinochloidea</i> × <i>obtusa</i>
<i>Diospyrous lycoides</i>	<i>Glossochilus burchellii</i>		<i>Eragrostis lehmanniana</i>
<i>Ehretia rigida</i>	<i>Helichrysum argyrosphaerum</i>		<i>Eragrostis nindensis</i>
<i>Elephantorrhiza elephantina</i>	<i>Hermannia comosa</i>		<i>Eragrostis rotifer</i>
<i>Grewia flava</i>	<i>Hermannia</i> sp.		<i>Eragrostis</i> sp.
<i>Gymnosporia buxifolia</i>	<i>Hermannia tomentosa</i>		<i>Fingerhuthia africana</i>
<i>Lantana rugosa</i>	<i>Hermbstaedtia fleckii</i>		<i>Melenis repens</i>
<i>Lasiosiphon polycephalus</i>	<i>Hirpicium echinus</i>		<i>Pogonarthria squarrosa</i>
<i>Leucas capensis</i>	<i>Indigofera alternans</i>		<i>Schmidtia kalahariensis</i>
<i>Lycium hirsutum</i>	<i>Jamesbrittenia atropurpurea</i>		<i>Stipagrostis ciliata</i>
<i>Lycium</i> sp.	<i>Laggera decurrens</i>		
<i>Pteronia glauca</i>	<i>Ledebouria</i> sp.		
<i>Rhigozum trichotomum</i>	<i>Leonotis</i> sp.		
<i>Senegalia mellifera</i> subsp. <i>detinens</i>	<i>Limeum aethiopicum</i>		
<i>Tarchonanthus camphoratus</i>	<i>Lotononis</i> sp.		
<i>Terminalia sericea</i>	<i>Othonna</i> sp.		
<i>Vachellia erioloba</i>	<i>Polygala hottentotta</i>		
<i>Vachellia haematoxylon</i>	<i>Pomaria burchellii</i> subsp. <i>burchellii</i>		
<i>Vachellia hebeclada</i> subsp. <i>hebeclada</i>	<i>Requienia sphaerosperma</i>		
<i>Ziziphus mucronata</i>	<i>Sansevieria</i> cf. <i>aethiopica</i>		
	<i>Senna italica</i> subsp. <i>arachoides</i>		
	<i>Sesamum triphyllum</i>		
	<i>Sida ovata</i>		
	<i>Solanum</i> sp.		
	<i>Vahlia capensis</i>		
	<i>Xenostegia tridentata</i> ssp. <i>angustifolia</i>		



Faunal Species List

Table H2: Mammal species recorded during the field assessment.

Scientific Name	Common Name	IUCN Status
<i>Canis mesomelas</i>	Black-backed Jackal	LC
<i>Sylvicapra grimmia</i>	Common duiker	LC
<i>Lepus capensis</i>	Cape hare	LC
<i>Pedetes capensis</i>	Springhare	LC
<i>Fukomys damarensis</i>	Damara mole rat	LC
<i>Galerella sanguinea</i>	Slender Mongoose	LC
<i>Oryx gazella</i>	Gemsbok	LC
<i>Elephantulus intufi</i>	Bushveld Sengi	LC
<i>Tragelaphus strepsiceros</i>	Kudu	LC
<i>Phacochoerus africanus</i>	Warthog	LC
<i>Raphicerus campestris</i>	Steenbok	LC
<i>Hystrix africaeaustralis</i>	Porcupine	LC

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

Table H3: Herpetofauna species recorded during the field assessment.

Scientific name	Common Name	IUCN Status
<i>Pedioplanis lineocellata</i>	Spotted sand lizard	NYBA
<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	NYBA
<i>Trachylepis occidentalis</i>	Western Three-striped skink	NYBA
<i>Pseudapsis cana</i>	Mole snake	NYBA
<i>Naja nivea</i>	Cape Cobra	LC
<i>Agama aculeata</i>	Ground Agama	LC
<i>Psammophylax tritaeniatus</i>	Striped Skaapsteker	LC
<i>Ptenopus garrulus</i>	Common barking gecko	LC
<i>Trachylepis spilogaster</i>	Kalahari tree skink	LC

LC = Least Concern, NYBA = Not Yet Been Assessed

Table H4: General insects recorded during the field assessment.

Scientific Name	Common Name	IUCN Status
<i>Hodotermes mossambicus</i>	Northern harvester termite	NYBA
<i>Junonia hierta</i>	Yellow Pansy	LC
<i>Passalidius fortipes</i>	Burrowing ground beetle	NYBA
<i>Apterogyna</i> sp.	Velvet ant	NA
<i>Eremoides bicristatus</i>	Crested Owlfly	NYBA
<i>Stips</i> sp.	Ridged seed beetle	NYBA
<i>Gonometa postica</i>	African silk moth	NYBA
<i>Calidea dregii</i>	Rainbow Shield Bug	NYBA
<i>Catopsilia florella</i>	African Migrant	NYBA
<i>Belenois aurota</i>	Brown-veined White	NYBA
<i>Quintilia</i> sp.	Karoo Cicadas	NYBA
<i>Junonia orithya</i>	Eyed Pansy	NYBA
<i>Danaus chrysippus</i>	African Monarch	NYBA
<i>Colotis euippe</i>	Smokey Orange Tip	NYBA



Scientific Name	Common Name	IUCN Status
<i>Eurema brigitta</i>	Broad-bordered Grass Yellow	NYBA
<i>Spalia</i> sp	Sandman	NYBA
<i>Loxostege frustalis</i>	Karoo Moth	NYBA
<i>Nomadacris septemfasciata</i>	Red Locust	NYBA
<i>Conistica saucia</i>	Rock Grasshopper	NYBA
<i>Sphingonotus scabriculus</i>	Blue-wing	NYBA
<i>Acanthacris ruficornis</i>	Garden Locust	NYBA
<i>Gastrimargus</i> sp.	N/A	NYBA
<i>Rhachitopis</i> sp	N/A	NYBA
<i>Systophlochius palochius</i>	Orange wing	NYBA
<i>Anterhynchium fallax</i>	N/A	NYBA
<i>Camponotus fulvopilosus</i>	Bal-byter	NYBA
<i>Crematogaster peringueyi</i>	Cocktail Ant	NYBA
<i>Pantala flavescens</i>	Wandering Glider	LC
<i>Mylabris oculata</i>	CMR Bean Beetle	NYBA

LC = Least Concern, NYBA = Not yet been assessed by the IUCN

Table H5: Arachnid species recorded during the site assessment.

Common Name	Scientific Name	IUCN Status
<i>Uroplectes carinatus</i>	Common Lesser-thicktail Scorpion	NA
Grass funnel-web spiders	<i>Agelena</i> sp.	NA
Sun spider	Solifugae sp	NA

LC = Least Concern, NYBA = Not Yet Been Assessed, NA = Not applicable



APPENDIX I: Specialist Information

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

Samantha-Leigh Daniels	PhD Candidate (Plant Science) (University of Pretoria)
Chris Hooton	BTech Nature Conservation (Tshwane University of Technology)
Nelanie Cloete	MSc (Environmental Management) (University of Johannesburg) Pr. Sci. Nat.
Stephan van Staden	MSc (Environmental Management) (University of Johannesburg) Pr. Sci. Nat.

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:	Nelanie Cloete		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	084 311 4878
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	Nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA)		

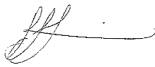
Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	082 442 7637
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	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, Samantha-Leigh Daniels, 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** 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, 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, Nelanie Cloete, 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



Signature of the Specialist

I, Stephen van Staden, 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



Signature of the Specialist





**SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION**

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

Position in Company	Contract Ecologist
Joined SAS Environmental Group of Companies	2020

EDUCATION

Qualifications

PhD (Plant Science) (University of Pretoria)	Present
MSc (Plant Science) (University of Pretoria)	2017
BSc (Hons) Zoology & Entomology (University of Pretoria)	2014
BSC Zoology & Entomology (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal

KEY SPECIALIST DISCIPLINES

Experience

- Desktop Delineations
- Invertebrate and plant surveys along the Sani Pass as part of an ongoing research project
- Bush encroachment surveys within Mpumalanga
- Grassland Surveys at Rietvlei Nature Reserve

Training

- Plant species identification
- Herbarium usage and protocols





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 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 NELANIE CLOETE

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Botanical Science and Terrestrial Ecology
Joined SAS Environmental Group of Companies	2011

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 400503/14)
 Member of the South African Association of Botanists (SAAB)
 Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group
 Member of the Grassland Society of South Africa (GSSA)
 Member of the Botanical Society of South Africa (BotSoc)
 Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2013
MSc Botany (University of Johannesburg)	2007
BSc (Hons) Botany (University of Johannesburg)	2005
BSc (Botany and Zoology) (Rand Afrikaans University)	2004

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, Northern Cape, Eastern Cape, Free State
Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Plant species and Landscape Plan

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 condition





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **STEPHEN 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

- Terry Calmeyer (Former Chairperson of IAIA SA)
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SLR Consulting
Tel: +27 11 467 0945
Email: apheiffer@slrconsulting.com
- Marietjie Eksteen
Managing Director: Jacana Environmental
Tel: 015 291 4015

