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**BIODIVERSITY ECOLOGICAL SCAN AS PART OF THE
ENVIRONMENTAL AUTHORISATION PROCESS FOR THE
PROPOSED SISHEN TYRE MANAGEMENT FACILITY NEAR
KATHU, NORTHERN CAPE PROVINCE**

Prepared for

EXM Environmental Advisory (Pty) Ltd

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SAS Environmental Group of Companies

EXECUTIVE SUMMARY

Scientific Aquatic Services CC (SAS) was appointed by EXM Environmental Advisory (Pty) Ltd to conduct a terrestrial biodiversity assessment as part of the Environmental Authorisation (EA) process for the proposed Waste Tyre Management Facility, near Kathu in the Northern Cape Province. The Sishen Iron Ore Company (Pty) Ltd (SIOC) proposes to develop the facility for the storage and mechanical downsizing (cutting, shredding and granulation) of waste tyres on the farm Sekgame 461 Kuruman RD, 1.7 km south-west of the centre of Kathu in the Gamagara Local Municipality. The site is located adjacent (south) to an existing industrial area and the closest residential area is located 460 m north-east of the site.

Waste tyres will be transported to the site and downsized to approximately 30-60 mm, or even smaller. The product will be transported to offsite facilities for further processing. No further processing (recycling or recovery) of the material will be undertaken and therefore a Waste Management Licence (WML) will not be required for the proposed facility.

At the time of the assessment, the whole study area had been burnt, as such, limited identification of floral species on site could be made, whilst the lack of vegetation decreased faunal species occurrences in the study area. In light of this, data from the assessment was significantly augmented with data from previous assessments in nearby localities as well as with specialist knowledge of the region which was deemed sufficient to determine the floral and faunal assemblage of these areas. It must also be noted that a larger portion of the study areas, notably the central and southern portions, have been historically disturbed as a result of the disposal of rubble and waste herein.

From the data collected during the assessment, it was determined that the study area comprised of two habitat units, namely the Degraded Habitat and the Kathu Bushed Habitat. The Degraded Habitat has been subjected to extensive historical and current impact, resulting in the loss of plant species representative of the reference vegetation type. Additionally, due to these disturbances, this habitat is no longer considered representative of the vegetation type of the associated Ecological Support Area (ESA). The Kathu Bushveld is considered to be more intact, though anthropogenic impacts and altered ecological processes have impacted the floral species composition therein. However, the Kathu Bushveld is still considered representative of the reference vegetation type and of the indicated ESA for this portion of the study area. The remaining portions of the study area are not considered representative of the ESA (Degraded Habitat). Only two floral SCC were observed in the study area, namely *Vachellia erioloba* (National Forest Act, 1998 (Act No. 84 of 1998), amended 2001) (NFA) and *Aloe grandidentata* Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) whilst no faunal SCC were observed or are expected to occur therein due to the level of disturbance and increased anthropogenic activities. Permits must be obtained for these species from the relevant authorities if removal is required prior to site clearance, notably for the floral SCC.

Taking the above into account, the Degraded Habitat is considered to be of low sensitivity and the Kathu Bushveld Habitat is of moderately low sensitivity. As such, following the assessment of the perceived impacts to the receiving environment, it is likely that, provided all mitigation measures are implemented, the proposed development will have a low to very low impact significance on both fauna and flora in the study area.

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.



DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Appendix J
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	Section 4
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Section 4
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Section 4
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	Section 4
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: <ul style="list-style-type: none"> a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified; 	Section 3 (desktop analysis) The Central Sandy Bushveld and the Western Sandy Bushveld were identified as the main vegetation types. There are no threatened ecosystems within 10 km of the study area.
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: <ul style="list-style-type: none"> a) <i>the reasons why an area has been identified as a CBA;</i> b) <i>an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;</i> c) <i>the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);</i> d) <i>the impact on ecosystem threat status;</i> e) <i>the impact on explicit subtypes in the vegetation;</i> f) <i>the impact on overall species and ecosystem diversity of the site; and</i> g) <i>the impact on any changes to threat status of populations of species of conservation concern in the CBA;</i> 	Section 3 (desktop analysis) and 4 The study area is within 10 km of CBAs, ESAs and other natural areas.
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including:	



	<ul style="list-style-type: none"> a) <i>the impact on the ecological processes that operate within or across the site;</i> b) <i>the extent the proposed development will impact on the functionality of the ESA; and</i> c) <i>loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;</i> 	
2.3.7.3	Protected areas as defined by the National Environmental Management Protected Areas Act, 2004 including- <ul style="list-style-type: none"> a) <i>an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;</i> 	Section 3 (desktop analysis) The study area is located within 10 km of 3 protected areas.
2.3.7.4	Priority areas for protected area expansion, including- <ul style="list-style-type: none"> a) <i>the way in which the proposed development will compromise or contribute to the expansion of the protected area network;</i> 	Section 3 (desktop analysis) The study area is not located within 10 km of any priority areas of protected area expansion.
2.3.7.5	SWSAs including: <ul style="list-style-type: none"> a) <i>the impact(s) on the terrestrial habitat of a SWSA; and</i> b) <i>the impacts of the proposed development on the SWSA water quality and quantity (e.g., describing potential increased runoff leading to increased sediment load in water courses);</i> 	Section 3 (desktop analysis) No SWSAs were associated with the study area nor were any located within 10 km of the study area.
2.3.7.6	FEPA sub catchments, including- <ul style="list-style-type: none"> a) <i>the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;</i> 	Not Applicable
2.3.7.7	Indigenous forests, including: <ul style="list-style-type: none"> a) <i>impact on the ecological integrity of the forest; and</i> b) <i>percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.</i> 	Not Applicable
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	
	Results of the Floral Assessment as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities and the results of the Faunal Assessment as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities are in Sections 4 – 6 .	
3	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Appendix J
3.1.2	A signed statement of independence by the specialist;	Appendix J
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 1.2
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 2 Appendices C, D & E
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 1.2
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Section 5
	Impact Assessment Requirements	
3.1.7	Additional environmental impacts expected from the proposed development;	Section 6
3.1.8	Any direct, indirect and cumulative impacts of the proposed development;	
3.1.9	The degree to which impacts and risks can be mitigated;	
3.1.10	The degree to which the impacts and risks can be reversed;	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	



	3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate;	Not Applicable to this report
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Executive Summary & Section 7
3.1.15	Any conditions to which this statement is subjected.	Section 5 & 6
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	Not Applicable to this report
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Not Applicable to this report

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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) (NEMBA), and the associated Alien and Invasive Species Regulations, 2020].

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 also includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006)	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;
Critical Biodiversity Area (CBA)	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.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
Important Bird and Biodiversity Area (IBA)	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 NEMBA, Alien and Invasive Species Regulations, 2020.
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).
Red Data Listed (RDL) 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)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as protected species of relevance to the project.



LIST OF ACRONYMS

AIP	Alien and Invasive Plant
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CR	Critically Endangered
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
EOO	Extent of Occurrence
ESA	Ecological Support Area
EW	Extinct in the Wild
GBIF	Global Biodiversity Information Facility
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
Ha	Hectare
IBA	Important Bird and Biodiversity Area
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 (% of days when evaporative demand was more than double the soil moisture supply)
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NFA	National Forest Act, 1998 (Act No. 84 of 1998, amended 2001)
NCNCA	Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
NCPSDF	Northern Cape Provincial Spatial Development Framework
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NPAES	National Protected Area Expansion Strategy
P	Protected
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square
RDL	Red Data Listed



SABAP 2	South African Bird Atlas Project 2
SACAD	South African Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professionals
SANBI	South African National Biodiversity Institute
SanParks	South African National Parks
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
SCC	Species of Conservation Concern
SIOC	Sishen Iron Ore Company
SWSA	Strategic Water Source Area
TOPS	Threatened or Protected Species
TSP	Threatened Species Programme
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WML	Waste Management Licence
WSAs	Water Source Areas



1 INTRODUCTION

Scientific Aquatic Services CC (SAS) was appointed by EXM Environmental Advisory (Pty) Ltd to conduct a terrestrial biodiversity assessment as part of the Environmental Authorisation (EA) process for the proposed Waste Tyre Management Facility in Kathu in the Northern Cape Province. The Sishen Iron Ore Company (Pty) Ltd (SIOC) proposes to develop the facility for the storage and mechanical downsizing (cutting, shredding and granulation) of waste tyres on the farm Sekgame 461 Kuruman RD, 1.7km south-west of the centre of Kathu in the Gamagara Local Municipality. The site is located adjacent (south) to an existing industrial area, and the closest residential area is located 460 m north-east of the site (Figures 1 and 2).

The proposed facility, including the associated infrastructure, will require the clearance of indigenous vegetation of approximately 8.4 hectares (ha) and will entail the development of the following structures/infrastructure:

- Buildings, which contains equipment for shredding/cutting of waste tyres;
- Security office;
- Staff building with cafeteria;
- Admin and finance building;
- Diesel storage area (approximately 10m³);
- Waste tyre storage area;
- Workshop and parking areas; and
- Perimeter fence.

The proposed facility is henceforth referred to as the 'study area' throughout this report. The report, after consideration of the description of the ecological integrity of the study area, must guide the Environmental Assessment Practitioner (EAP), the regulatory authorities, and the developing proponent, by means of the presentation of results and recommendations as to the viability of the proposed development activities from a biodiversity resource management perspective.



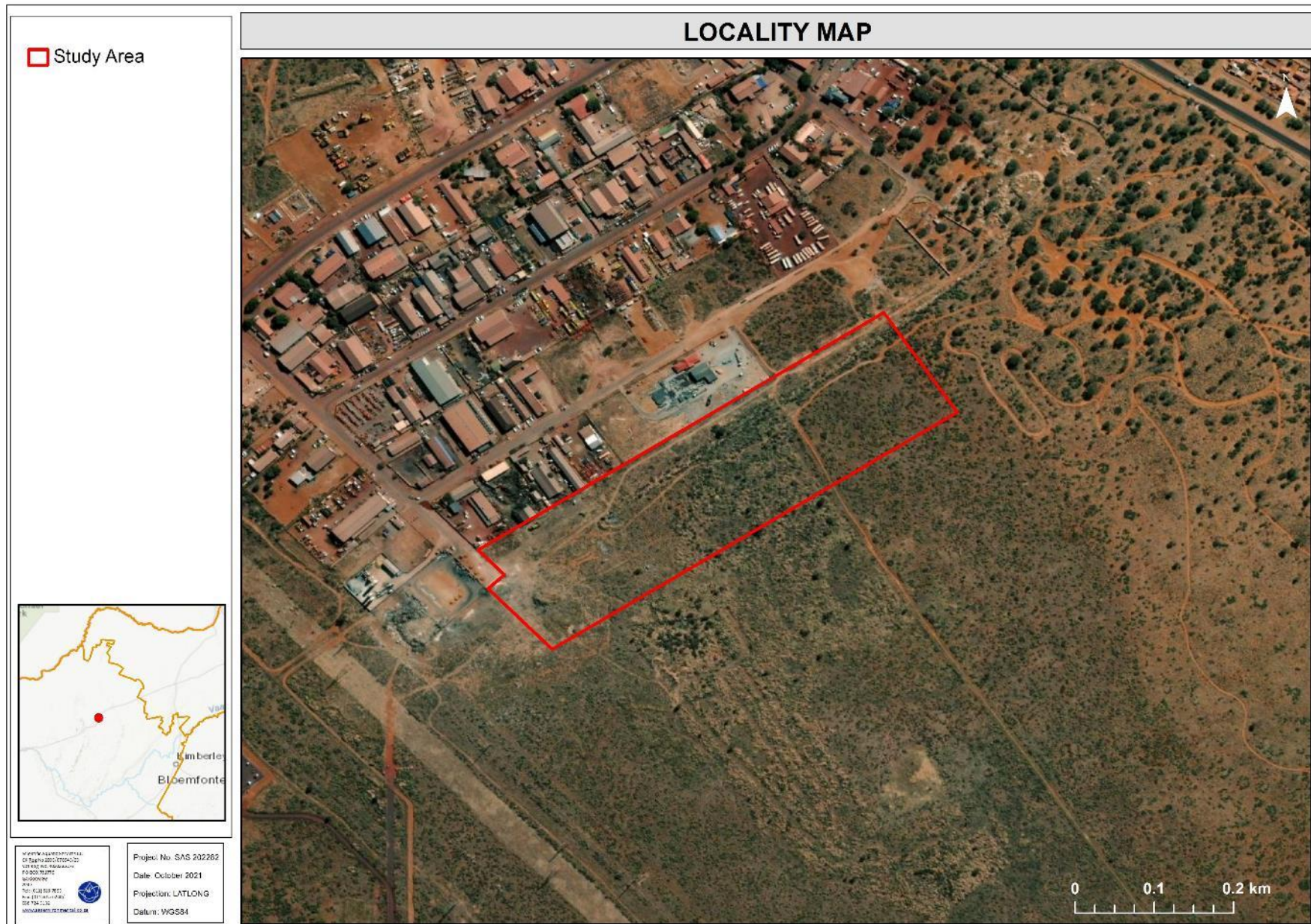


Figure 1: Digital Satellite image depicting the location of the study area in relation to surrounding areas.



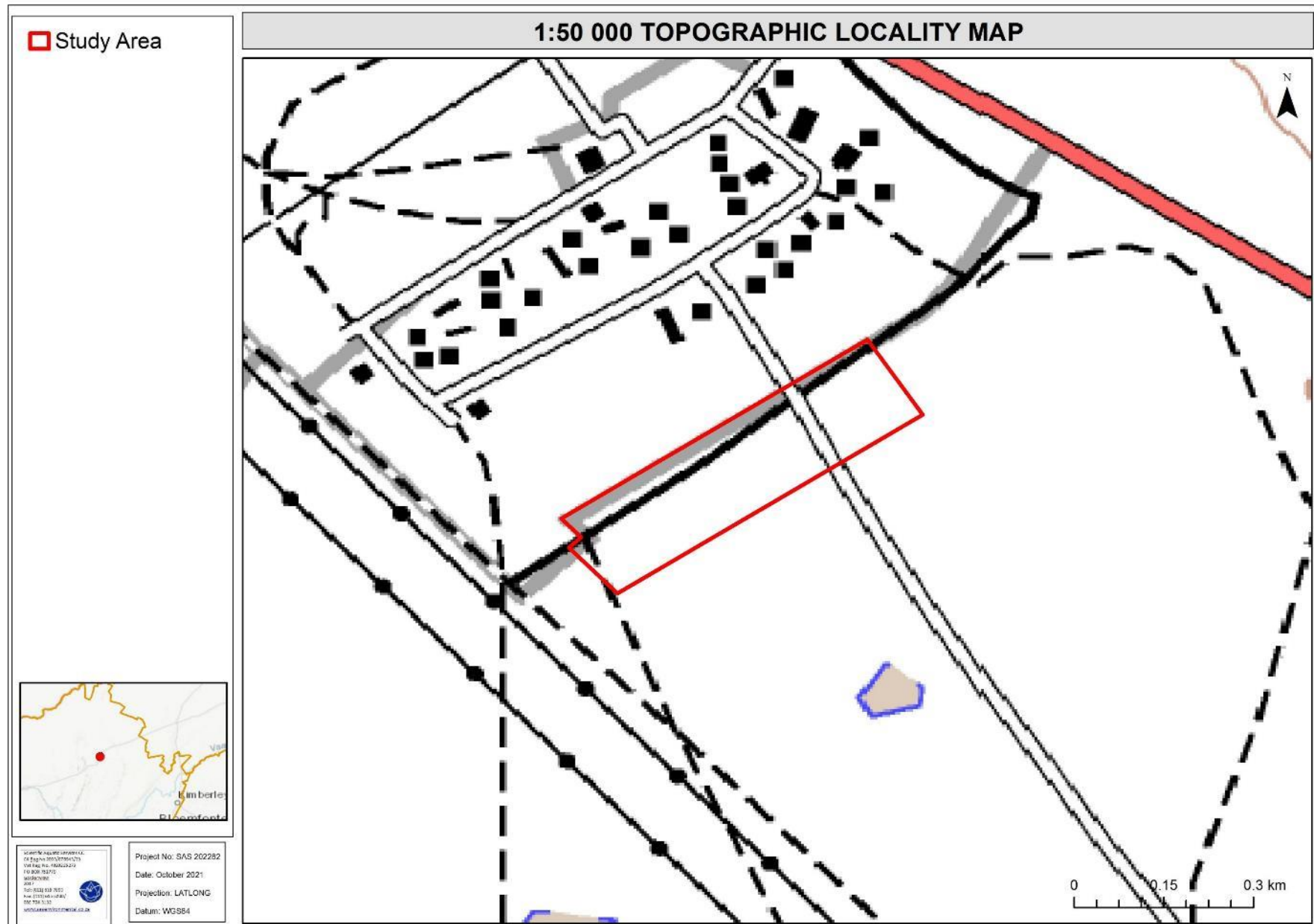


Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.



1.1 Project Scope

Specific outcomes in terms of this report are outlined below:

- To state the indemnity and terms of use of this report (Appendix A) as well as to provide the details of the specialists who prepared the reports (Appendix J);
- To outline the legislative requirements that were considered for the assessment (Appendix B of this report);
- Compile a desktop assessment with all relevant information as presented by South African National Biodiversity Institute (SANBI)'s Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>) and the Environmental Geographical Information Systems (E-GIS) website (<https://egis.environment.gov.za/>). The desktop assessment aims to gain background information on the physical habitat and potential floral and faunal ecology associated with the study area;
- To define the Present Ecological State (PES) of the biodiversity of the study area;
- To determine and describe habitats, communities and the ecological state of the study area;
- To conduct a faunal and floral Species of Conservation Concern (SCC) assessment, including the potential of suitable habitat to occur within the study area for SCC;
- To identify and consider all sensitive landscapes, including rocky ridges, wetlands or any other special features such as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs);
- To determine the environmental impacts that the proposed tyre recycling facility might have on the biodiversity associated with the study area; and
- To develop mitigation and management measures for all phases of the development.

1.2 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- The biodiversity assessment was confined to the study area and does not include detailed results of the neighbouring and adjacent properties, although ecologically important or sensitive areas according to the desktop databases of the neighbouring and adjacent properties were considered as part of the desktop assessment in Section 3 of this report;
- Sampling, by its nature, means that not all individuals are assessed and identified. Some species and taxa associated with the study area may have been missed during the assessment. It is, however, expected that most floral and faunal communities have



been accurately assessed and considered. Relevant online sources and background information were further assessed to improve on the overall understanding of the study area's ecology;

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. The field assessment was undertaken on the 27th October 2021, which falls outside of the flowering season for the area;
- At the time of the assessment, the whole study area had been burnt—this limited identification of many floral species and habit quality. In addition, the lack of vegetation also resulted in a decreased presence of faunal species. As such, the data from the site assessment has been augmented with specialist knowledge of the region as well as data from previous site assessments undertaken in the local area;
- Due to most faunal taxa's nature and habits, it is unlikely that all species would have been observed during a field assessment of limited duration. Due to the locality of the study area (agricultural lands) and the cyclical nature of many species' life stages, as well as the season of the assessment, very few faunal species were observed. As such, background data (desktop) and literature studies (previous work undertaken in the area) were used to further infer faunal species composition and sensitivities in relation to the available habitat;
- The data presented in this report are based on one site visit undertaken on the 27th October 2021. A more comprehensive assessment would require that assessments take place in all seasons of the year. However, on-site data were augmented with all available desktop data. Together with project experience in the area, the findings of this assessment are considered an accurate reflection of the ecological characteristics of the study area; and
- Some floral SCC identities will not be made known in this report, although their potential to occur on-site will still be assessed. As per the best practise guideline that accompanies the SANBI protocol and the National Web-based Environmental Screening Tool (hereafter referred to as the “**National Screening Tool**”), the name of the certain sensitive species may not appear in the final Environmental Impact Assessment (EIA) report nor any of the specialist reports released into the public domain. It will be referred to as sensitive plants, and its threat status included, e.g., critically endangered sensitive plant.



1.3 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996;
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
 - Government Notice (GN) No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 June 2020;
 - GN No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Terrestrial Animal Species as published in Government Gazette 43855 dated 30 September 2021;
- GN No. R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEMBA;
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Forest Act, 1998 (Act No. 84 of 1998, amended 2001) (NFA);
- GN No. 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the NFA; and
- 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 7 of 1998) and the Municipal Systems Act, 2000 (Act 32 of 2000).

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

2 ASSESSMENT APPROACH

2.1 Desktop Research Approach

Maps and digital satellite images were generated prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the study 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 study area included ¹:

- 2010 National Protected Area Expansion Strategy (NPAES) (Government of South Africa, 2010; DEA & SANBI, 2009), including the below-listed vector datasets:
 - NPAES Focus Areas 2010: National Protected Areas Expansion Strategy: Focus areas for protected area expansion (South African National Parks (SanParks), 2010);
 - NPAES Formal: Polygons of formal protected national parks areas in South Africa (SANParks/SANBI, 2013); and
 - NPAES Protected Areas – Informal: Informal conservation areas in South Africa (SANParks/SANBI, 2012).
- The South African Conservation Areas Database, Quarter 2 (SACAD, 2021);
- The South African Protected Areas Database, Quarter 2 (SAPAD, 2021);
- Northern Cape Critical Biodiversity Areas (2016);
- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
 - 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018a).
- The National List of Threatened Ecosystems 2011 (SANBI 2011; South Africa, 2011);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al., 2019):
 - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
 - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick et al., 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
- The International Union for Conservation of Nature (IUCN);
- The National Screening Tool (accessed 2021); and
- From the 2017 Strategic Water Source Areas (SWSA) project:
 - 2017 SWSA **Surface water** (Water Research Commission, 2017).

¹ 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
- DEA Environmental Geographical Information Systems (E-GIS) website. URL: <https://egis.environment.gov.za/>



2.2 General Approach

An on-site visual assessment of the study area was conducted to confirm the assumptions made during the consultation of the background maps and to determine whether the ecological status of the habitat associated with the study area has changed.

The vegetation surveys are based on the subjective sampling method which is a technique where the specialist chooses specific sample sites within the area of interest, based on their professional experience and background research done for the site, to allow representative recordings of floral communities and optimal detection of SCC (**Appendix C**).

For the faunal field surveys, a reconnaissance ‘walkabout’ was undertaken to confirm habitat types and to consider whether the areas are representative of these habitats, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot to identify and define the faunal assemblage within the footprint area. A detailed explanation of the method of assessment is provided in **Appendix D** of this report. The faunal categories covered in this assessment include mammals, avifauna, herpetofauna and general invertebrates.

The below list includes the steps followed during the preparation for, and the undertaking of, the field assessments:

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to the site, during which broad habitats, vegetation types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the direct footprint of the proposed parking area);
- Databases used for background information include the SANBI Threatened Species Programme (TSP), the NBA (2018), National Threatened Ecosystems (2011), SAPAD & SACAD (Quarter 2, 2021), NPAES (2011), and IUCN;
- The subjective sampling method requires that field assessment take place on foot. Based on the broad habitat units delineated before going to the site, and points of interest recorded, which is updated based on on-site observations, the selected sample areas were surveyed on foot, following subjective transects, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed; and
- Photographs were taken of each vegetation community that are representative of the typical vegetation structure of that community, as well as photos of all detected SCC



(where such species were not flagged on the National Screening Tool as sensitive species for which identities may not be made known).

For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to **Appendix E** of this report.

2.3 Sensitivity Mapping

All the ecological features associated with the study area were considered, and sensitive areas were delineated using a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Study Area

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

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

Description Of The Vegetation Type(S) Relevant To The Study Area According To The 2018 Final Vegetation Map Of South Africa, Lesotho And Swaziland (SANBI 2006–2018 & SANBI, 2018a)		National Web Based Environmental Screening Tool (2021)		
Biome	The study area is situated within the Savanna Biome .	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		
Bioregion	The study area is located within the Eastern Kalahari Bushveld Bioregion .			
Vegetation Type	Kathu Bushveld (SVk 12)			
Altitude (M)	960 – 1 300	Animal Species Theme ²	For the animal species theme, the study area has a low sensitivity .	
Climate	Summer and autumn rainfall with very dry winters.	Terrestrial Biodiversity Theme (Figure 5)	For the terrestrial biodiversity theme, the study area has a very high sensitivity due to a large portion of the study area being classed as an ecological support area.	
Climate	MAP (mm)			300
	MAT (°C)			18.5
	MFD (days)			27
	MAPE (mm)			2883
	MASMS (%)	85		
Distribution	Northern Cape Province	Plant Species Theme	For the plant species theme, the study area has a low sensitivity .	
Geology And 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. ³	Northern Cape Provincial Spatial Development Framework (NCPSDF, 2019)		
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.	The NCPSDF is to function as an innovative 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 (Figure 6).		
Vegetation & Landscape Features (Dominant Floral Taxa In Appendix D)	Medium-tall tree layer with <i>Acacia 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>A. mellifera</i> , <i>Diospyros lycioides</i> and <i>Lycium hirsutum</i> . Grass layer is variable in cover.	The study area also falls within the Gamagara Corridor . The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda Districts and runs from lime acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.		
Conservation Details Pertaining to The Area Of Interest (Various Databases)				
NBA (2018): 1) Ecosystem Threat Status 2) Ecosystem Protection Level	The study area falls within the Kathu Bushveld which is considered Least Concerned (LC) and Poorly Protected (PP) .			

² Data Conservation status is from the Global Biodiversity Information Facility (GBIF) which provides free and open access to biodiversity data.

³ Land types: A soils are red and/or yellow, freely-drained soils; Bb, Ba, Bd are upland duplex and marginal soils; Ea are Dark, blocky clay topsoils (often swelling clays) and/or red, structured clays; Fa are Shallow, and/or rocky, often steep, highly leached (very little lime).



	The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. Two headline indicators that are applied to both ecosystems and species are used in the NBA: threat status ⁴ and protection level ⁵ .
Important Bird Areas (IBA) (2015)	The study area is not located within a 10 km radius of an IBA (IBA, 2015).
National Threatened Ecosystems⁶ (2011)	The study area is not situated within a threatened ecosystem, according to the National Threatened Ecosystem Database (2011). For EIAs, the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA Regulations published under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).
SAPAD (2021, Q2) Figure 3; SACAD (2021, Q2)⁷; NPAES (2009) (Figure 4)	According to the SAPAD, (2021_Q2) there are six (6) protected areas within a 10 km radius of the study area namely the Billy Duvenhage Nature Reserve, Bredenkamp Nature Reserve, Brooks Nature Reserve, Kathu Forest Nature Reserve, Rockwood Nature Reserve, and Tswalu Kalahari Nature Reserve. This is also supported by the NPAES Protected Areas Database (2009). The NPAES Focus Areas Database (2009) indicates the Eastern Kalahari Bushveld and the Gariap Protected Area Expansion Focus Areas to be within 10 km of the study area. The SACAD, (2021_Q2) does not indicate any conservation areas within 10 km.
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 And Criteria	The study area is not within 10 km of a Strategic Water Source Area.
Northern Cape Critical Biodiversity Areas (2016)	
Critical Biodiversity Areas (Figure 7)	The study area falls in an area classed as An Ecological Support Area and Other Natural Areas.
NC WMA	The study area is located within the Lower Vaal Water Management Area (WMA)
Mining And Biodiversity Guidelines (2012)	
According To The Mining And Biodiversity Guidelines Database (2012), the study area does not fall within an area considered to have Biodiversity Importance .	

EOO = Extent of Occurrence; NBA = National Biodiversity Assessment; SAPAD = South African Protected Areas Database; SACAD = South African Conservation Areas Database; NPAES = National Protected Areas Expansion Strategy; IBA = Important Bird Area; MAP = Mean annual precipitation; MAT = Mean annual temperature; MAPE = Mean annual potential evaporation; MFD = Mean Frost Days; MASMS = Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); CBA = Critical Biodiversity Areas; ESA = Ecological Support Areas; Strategic Water Source Areas; Water Source Areas.

⁴ Ecosystem threat status tells us about the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends. The conceptual 'end point' of decline for an ecosystem is termed 'collapse' and is equivalent to extinction in the species Red Listing framework. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds.

⁵ Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected, Poorly Protected, Moderately Protected or 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 (Act No. 57 of 2003).

⁶ 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). The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised.

⁷ **SACAD (2021)**: 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.



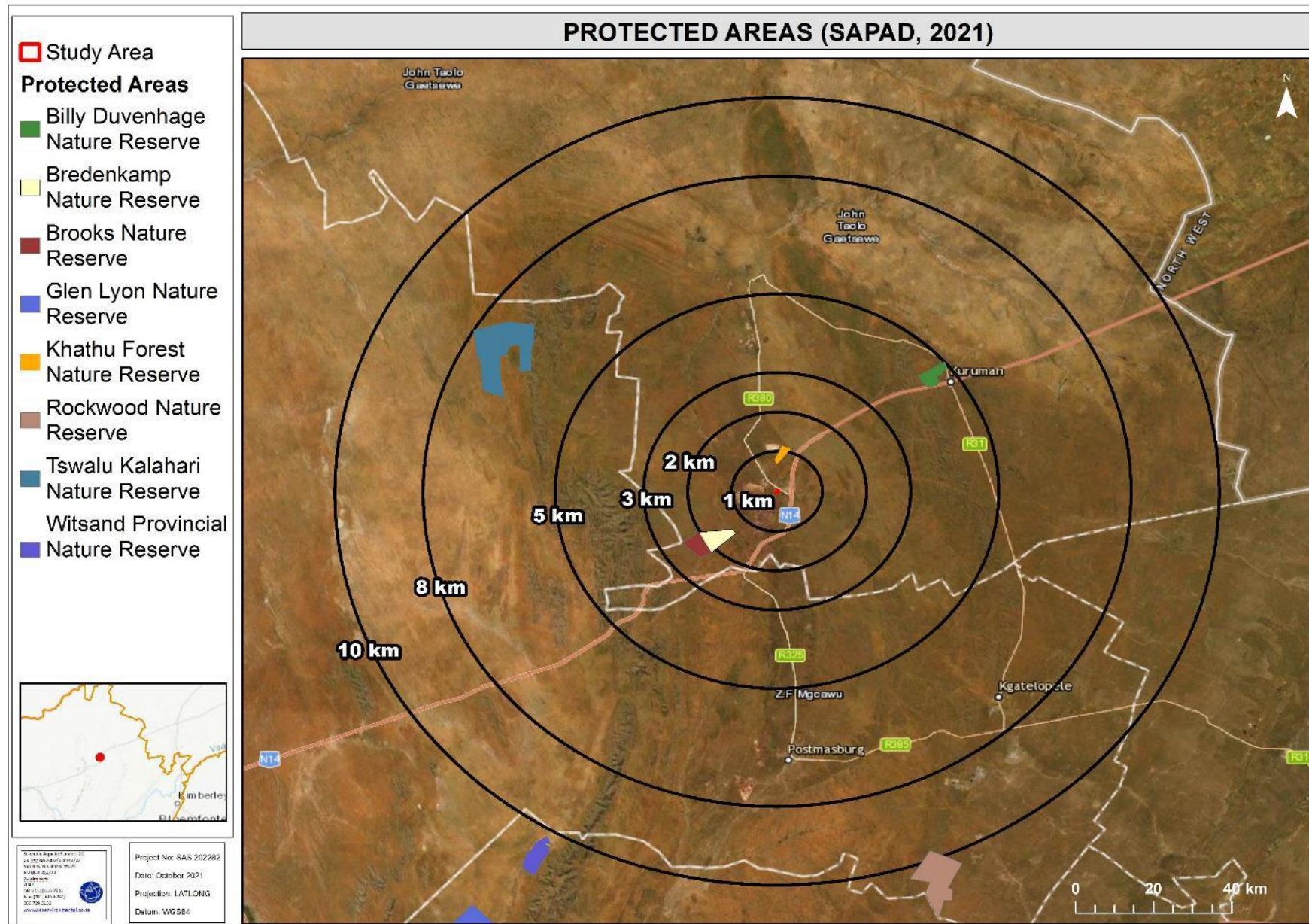


Figure 3: Protected areas within 10 km of the study area, according to the South African Protected Areas Database (SAPAD; 2021).



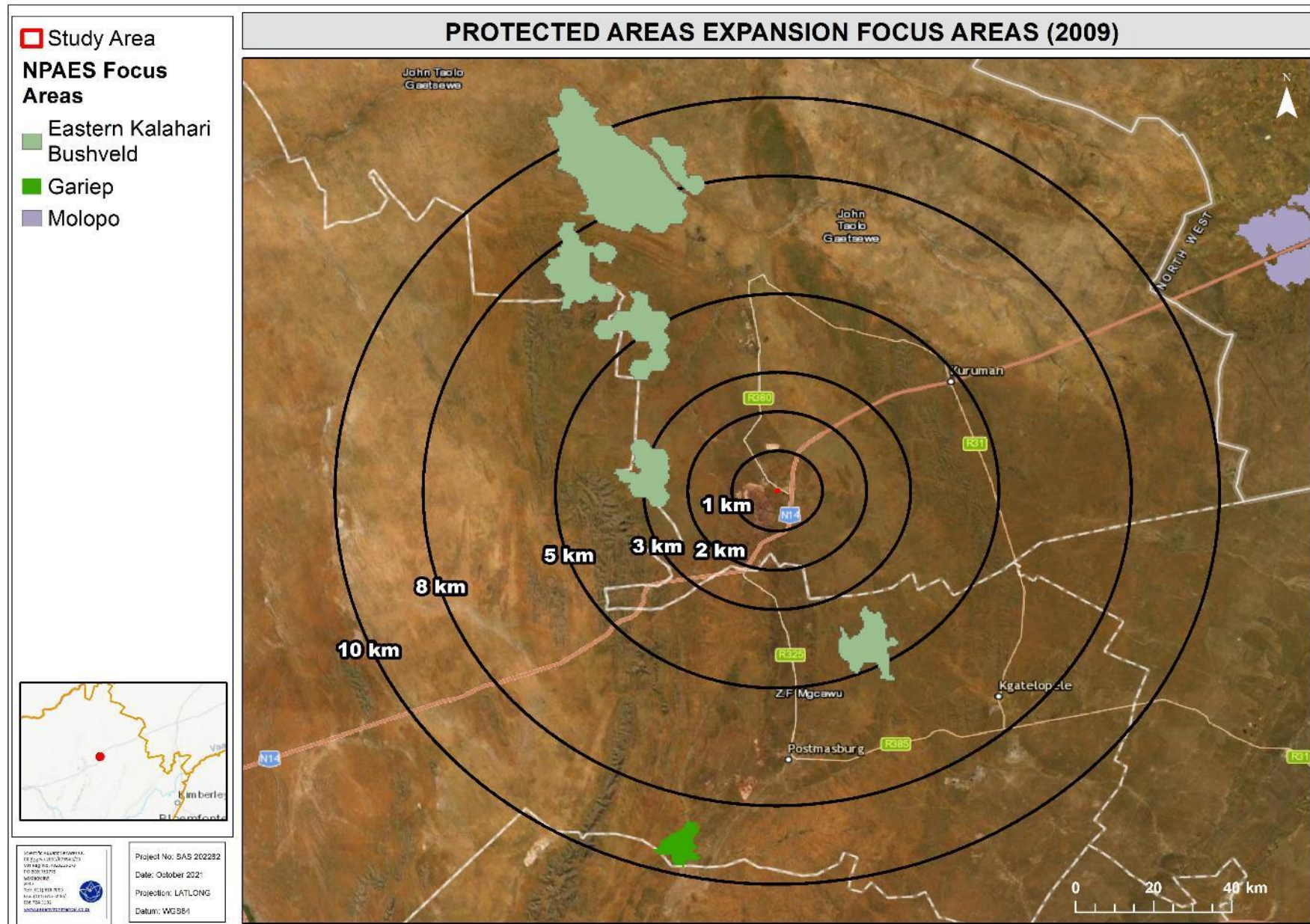


Figure 4: Protected areas within 10 km of the study area, according to the NPAES Database (2009).



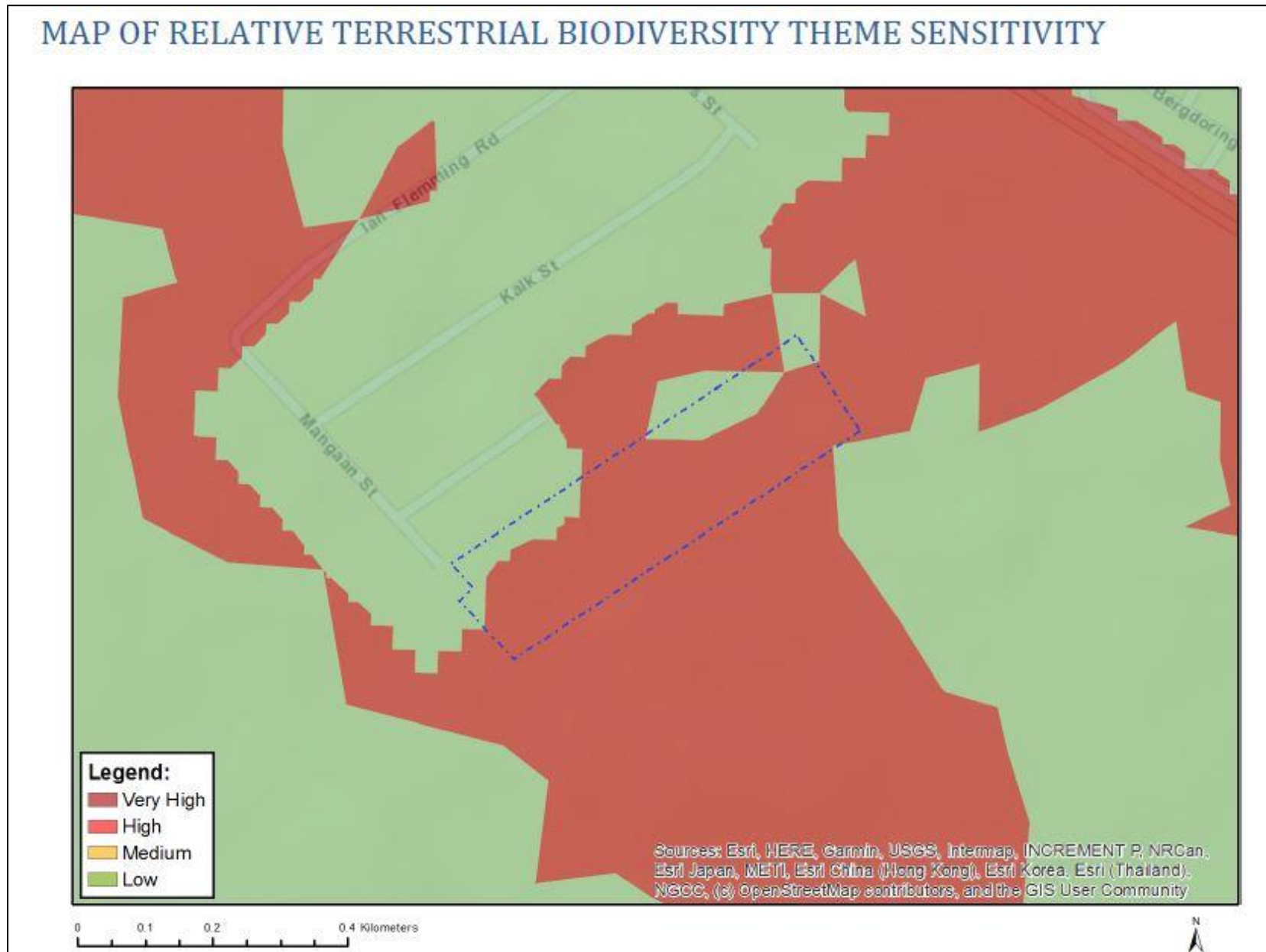


Figure 5: The study area in relation to the terrestrial biodiversity sensitivity theme (DEA Screening Tool, 2021).



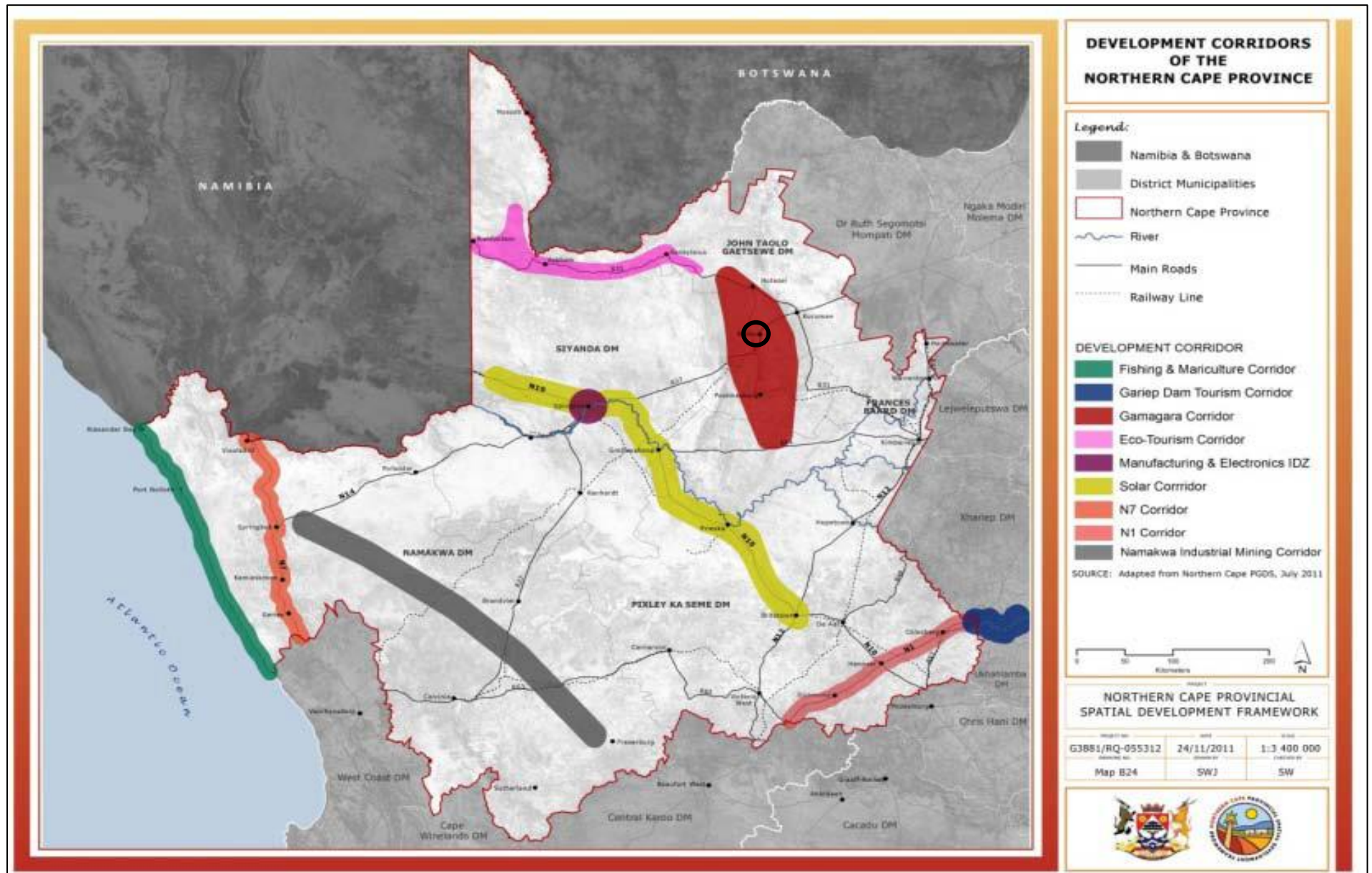


Figure 6: Development corridors of the Northern Cape Province: the study area is in the Gamagara corridor (NPSDF, 2012).



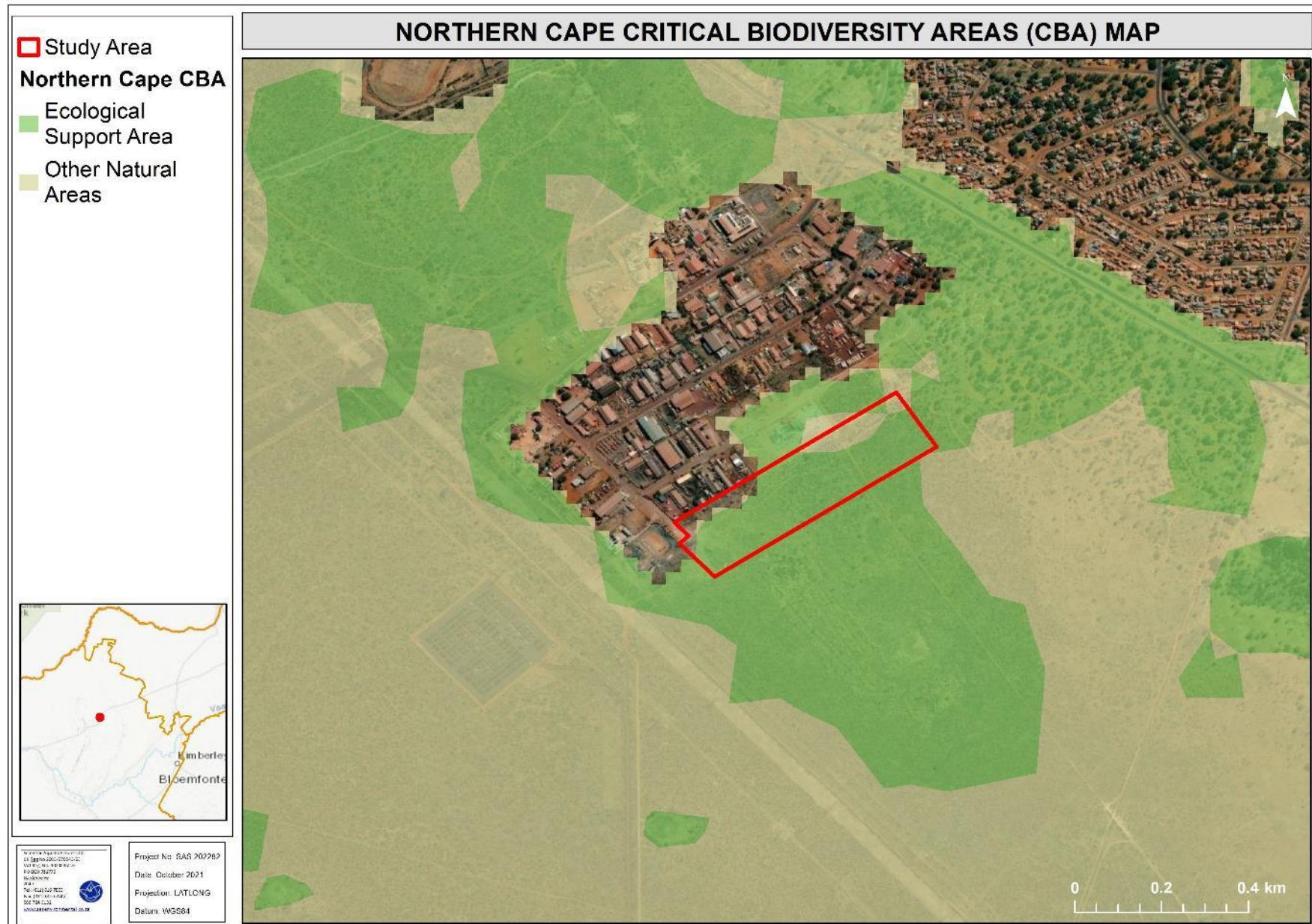


Figure 7: Critical Biodiversity Areas relative to the study area based on the Northern Cape Critical Biodiversity Areas database (2016).



4 BIODIVERSITY ASSESSMENT RESULTS

According to the updated 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018a), the study area is situated within the Least Concern **Kathu Bushveld** vegetation type – used as the reference vegetation type against which the habitat for the study area was assessed.

The proximity of the study area to the industrial area has resulted in the alteration of natural ecological processes as well as increased anthropogenic activities and impacts. Approximately 6.3 ha of the study area, predominantly in the central and western portions has been impacted upon and degraded as a result of the dumping of old building rubble and general household waste. Informal waste pickers further collect and sort this material for recycling / scrap metal herein in various smaller localities in the west of the study area. The east of the study area, for the most part, has not been subjected to such activities, and as such a more natural vegetation component was observed.

The results of the field assessment identified two broad habitat units:

- **Kathu Bushveld Habitat:** Habitat associated with the more intact and natural veld conditions observed in the eastern portion of the study area (approx. 1.9 ha in extent); and
- **Degraded Habitat:** Covers the largest extent of the study area (central and western portion). It is associated with the dumping of building and waste material and increased levels of human foot and vehicle movement which has led to significant habitat alteration and degradation. A low number of informal squatters were also observed in the western portion of the study area.

The habitat units were determined based on species composition, vegetation structure, ecological function, biophysical environment, and habitat condition. A more detailed discussion on each habitat unit is presented in Section 4.1, with the results of the faunal assessment presented in Section 4.2.

Figures 8 below depict the full extent of the habitat units within the study area.



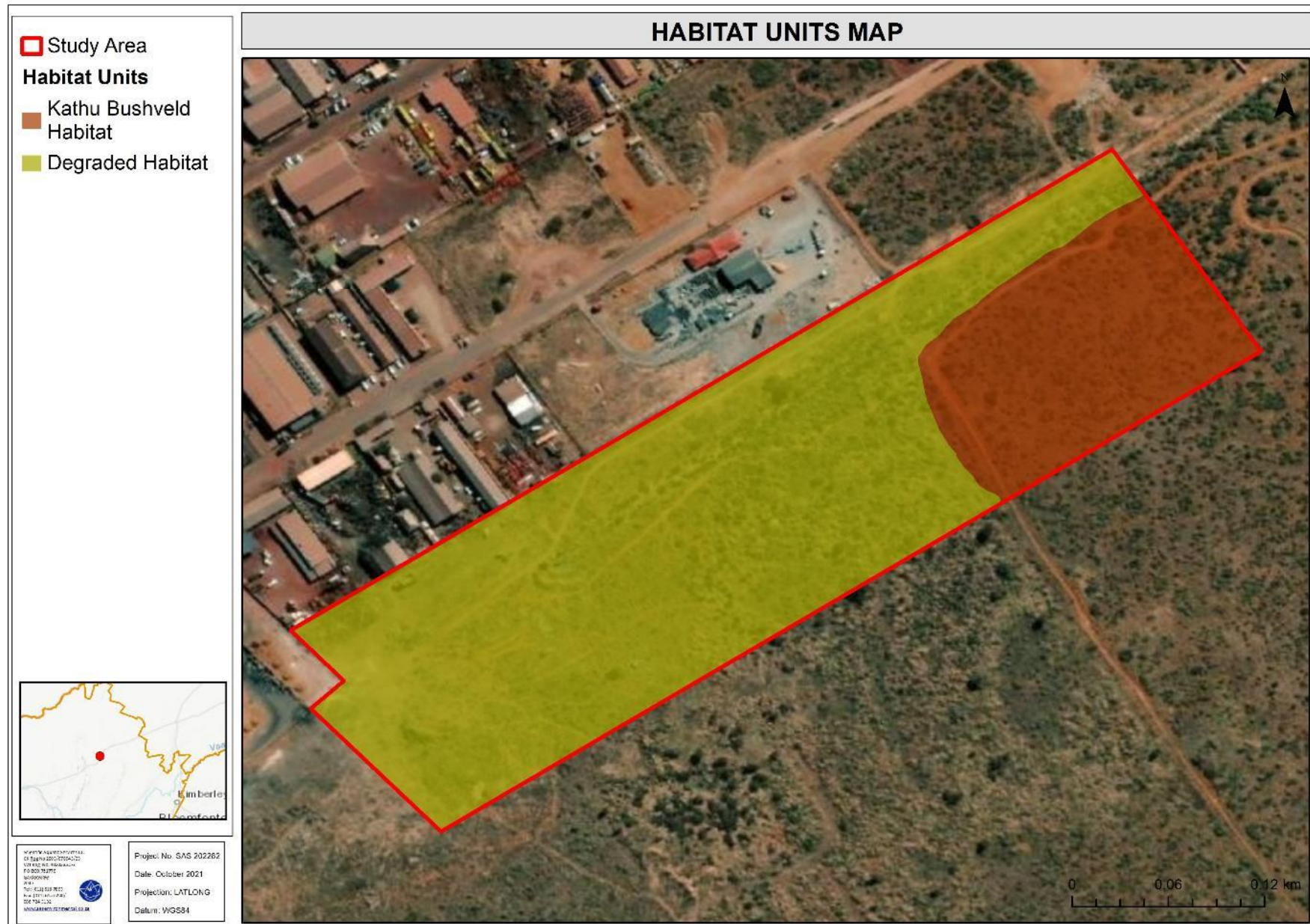




Figure 8: Habitat units associated with the study area.

4.1 Floral Assessment Results


	Kathu Bushveld	Degraded Habitat
Reference photos		
Habitat Overview	<p>This habitat unit comprises the smallest extent of the study area, approximately 1.9 ha. This habitat had been completely burnt at the time of assessment, however data from previous assessments in the neighbouring areas combined with the data obtained during the site assessment indicated that the overall species diversity of this habitat unit has been impacted upon. Although ecological processes have been altered, this habitat unit still contains floral species that are considered representative of the vegetation type as described by Mucina and Rutherford (2006).</p> <p><u>Vegetation structure</u> This habitat unit is characterised by a scattered shrub layer subtended by a continuous grassy layer</p>	<p>The vegetation associated with this habitat unit has been significantly disturbed as a result of earthmoving activities and the dumping of construction rubble and as a result of anthropogenic activities such as the dumping of refuse within the area. Floral species diversity is low and the vegetation is dominated by grass species often associated with areas of disturbance.</p> <p><u>Vegetation structure</u> Scattered grass layer amongst building rubble and refuse with a scattered shrub and tree layer.</p>
Species Overview	<p>Dominant Indigenous Vegetation:</p> <ul style="list-style-type: none"> - <u>Trees and Shrubs:</u> <i>Grewia flava</i>, <i>Tarconanthus camphoratus</i>, <i>Elephantorrhiza elephantina</i> and <i>Acacia mellifera</i>; - <u>Herbs and Forbs:</u> <i>Acanthosicyos naudinianus</i>, <i>Senna italica</i>; and - <u>Graminoids:</u> <i>Aristida meridionalis</i>, <i>Aristida congesta</i> subsp. <i>congesta</i>, <i>Heteropogon contortus</i> and <i>Eragrostis lehmanniana</i>. <p>Refer to Appendix F for a complete list of species recorded on site.</p>	<p>Dominant Indigenous Vegetation:</p> <ul style="list-style-type: none"> - <u>Trees and Shrubs:</u> <i>Grewia flava</i> and <i>Acacia mellifera</i>; - <u>Herbs and Forbs:</u> None observed; and - <u>Graminoids:</u> <i>Aristida congesta</i> subsp. <i>congesta</i>, <i>Aristida meridionalis</i>, <i>Melinis repens</i>. <p>Refer to Appendix F for a complete list of species recorded on site.</p>
	<p>Dominant Alien Vegetation: None observed at the time of assessment</p> <p>Refer to Table 2 (section 4.3) for a complete list of recorded AIP species.</p>	<p>Dominant Alien Vegetation: <i>Prosopis glandulosa</i>.</p> <p>Refer to Table 2 (section 4.3) for a complete list of recorded AIP species.</p>
Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)		
Presence of Unique Landscapes	<p>Much of the study area is indicated as an ESA, with smaller portions indicated as ONA. During the site assessment it was evident that for the most part, this designation is incorrect. The Degraded Habitat due to disturbances and alteration of vegetation structure and species composition no longer meets the requirements for an ESA. The remaining portion of the Kathu Bushveld however can still be considered representative of an ESA.</p>	



Species of Conservation Concern	<p>The following floral SCC (comprising of species under the NFA, NCNCA and NEM:BA) as per the national and provincial protected species regulations were observed within the study area:</p> <ul style="list-style-type: none"> ➤ The NFA: <ul style="list-style-type: none"> • <i>Vachellia erioloba</i>; ➤ The NCNCA: <ul style="list-style-type: none"> • Schedule 2 – Protected Species: <i>Aloe grandidentata</i>. <p>Additionally, the following floral SCC are considered to have an increased probability of occurring within the Kathu Bushveld Habitat:</p> <ul style="list-style-type: none"> ➤ <i>Boophone disticha</i> (NCNCA Schedule 2 – Protected); ➤ <i>Harpagophytum procumbens</i> (NEM:BA TOPS - Protected); and ➤ <i>Nerine laticoma</i> (NCNCA Schedule 2 – Protected Species). <p>Prior to any ground clearing activities, permits must be obtained from the Department of Forestry, Fisheries and the Environment (DFFE) and the Northern Cape Department of Environment and Nature Conservation (NCDENC) for the removal or destruction of any protected species.</p> <p>Refer to Appendix H for the list of SCC considered as part of this assessment.</p>
Concluding Remarks	
<p>At the time of the site assessment, the whole study area had been recently burnt, however, data from previous assessments in vicinity as well as specialist knowledge of the area was used to infer site conditions. Although such inference is deemed to be sufficiently accurate to determine habitat conditions and site sensitivity, there remains the probability that some species may have been missed as they have yet to regenerate/regrow post burning. By far the largest impact to the receiving environment within the study area has been the dumping of rubble and household waste, with only a small portion of the study area not being impacted by such. The open areas to the south and the east of the Degraded Habitat have also been impacted in the same manor, as such, development in the Degraded Habitat is unlikely to have a significant impact on these adjacent areas. The open space areas to the north-east and the east of the Kathu Bushveld Habitat however are still considered to be intact, hosting an increased diversity of floral species. Management of edge effects will be important to ensure that the areas adjacent to the Kathu Bushveld are not impacted upon during the construction and operational phases.</p> <p>Important considerations:</p> <ul style="list-style-type: none"> - Only the Kathu Bushveld habitat unit is considered to be representative of the reference vegetation type; - The habitat units are associated with two known floral SCC, and may provide habitat to three additional species, largely restricted to the Kathu Bushveld habitat unit; - Only one AIP was observed during the site assessment, however, the intense veld fire experienced in the study area made identification of additional AIPs impossible. AIPs are known to occur in the region and flourish in disturbed areas. As such, the areas must be monitored for AIPs and when such are found, they are to be removed / controlled as per an AIP control plan; - According to the Northern Cape CBA (2016) database, the assessment zone is located within an area classified as an ESA will smaller areas classified as ONA and is not associated with any CBAs; and - The Screening Tool output for the area indicated a low sensitivity for the plants theme and a very high sensitivity for the terrestrial biodiversity theme. Given the above data, the Degraded Habitat aligns with the indicated low sensitivity, however the Kathu Bushveld could be considered to be of a higher sensitivity listing. Similarly, the Degraded habitat does not align with the very high terrestrial biodiversity theme. The Kathu Bushveld habitat within the study area likely aligns with the terrestrial biodiversity theme as this habitat unit is considered representative of the ESA and the reference vegetation type. 	



4.2 Faunal Assessment Results

Selected examples of fauna species recorded within the Proposed railway loop	
	
<p>Left to right: <i>Cercotrichas paena</i> (Kalahari-scrub Robin), <i>Rhachitopis</i> sp (Grasshopper), <i>Lepus capensis</i> (Cape Hare) dung; diggings observed on site, likely of <i>Hystrix africaeausstralis</i> (Porcupine) and <i>Cynictis penicillate</i> (Yellow mongoose).</p>	
Species of Conservation Concern	<p>No faunal SCC or provincially listed / protected species were encountered during the field assessment. Following the site assessment and taking into consideration the locality of the study area, it is considered unlikely that any faunal SCC will occur within or make use of the study area.</p>
Faunal Habitat Overview	<p>The study area is located adjacent to the town of Kathu and the Sishen Iron Ore Mine, with an industrial area immediately to the west. The industrial area to the west is a significant barrier to faunal movement, impacting on habitat connectivity and species dispersal for all but avifauna. Sishen Mine to the south is encompassed with a fence specifically designed to inhibit access to the mining area by people. Subsequently, such fence designs also prevent the movement of medium and large mammals. Only smaller faunal species capable of moving through the fence or flying over it will enjoy access to the study area and the open areas to the south. The study area is, however connected to a larger open space area to the east, allowing for faunal species to move between these areas largely unhindered. Although such habitat connectivity exists to the east, and somewhat to the south, the proximity of the study area to anthropogenically active areas will notably impact on faunal species abundance and diversity. Further to this, much of the study area is degraded and provides limited habitat for fauna, further reducing species richness and occupancy therein. The study area is likely to serve only as a peripheral foraging ground for faunal species and is unlikely to be utilised as a breeding ground. Increased human presence and the open nature of the site will also likely result in increased poaching attempts through the setting of wire snares for small and medium size mammals as well as ground dwelling avifauna. Several small reptiles (Skinks and Lizards) were observed moving about under the shrubs and rubble, though, due to habitat disturbance and low food availability, the study area is unlikely to host a high diversity of reptiles. No amphibians are expected to occur in the study area, however several arid adapted species may be present further to the east (approximately 300 m) where a pan wetland was observed. It is unlikely though that any amphibian species associated with such wetland such as <i>Amietia angolensis</i> and <i>Tomopterna cryptotis</i> will forage or make use of the study area.</p> <p>Fauna species that occur within the study area are likely to be dominated by common and widespread species, particularly those which show a propensity for being able to inhabit degraded areas as well as areas that are in close proximity to anthropogenic activities. During the site assessment the dominant fauna observed were those of the avifaunal and insect classes, whilst signs of mammal presence were largely limited to small excavations and dung.</p> <p>Species, or signs thereof, observed during the site assessment include, but are not limited to: <i>Raphicerus campestris</i> (Steenbok), <i>Cynictis penicillate</i> (Yellow mongoose), <i>Lepus capensis</i> (Cape Hare), <i>Hystrix africaeausstralis</i> (Porcupine), <i>Sigelus silens</i> (Fiscal Flycatcher), <i>Cercotrichas paena</i> (Kalahari-scrub Robin), <i>Prinia masulosa</i> (Karoo</p>

Prinia), *Pedioplanis lineocellata* (Spotted Sand Lizard), *Cynthia cardui* (Painted Lady Butterfly), *Pachylomerus femoralis* (Flattened Giant Dung Beetle) and *Danaus chrysippus* (African Monarch). For a full list of observed species please refer to Appendix G.

Concluding Remarks

Overall, the study area will support a decreased diversity of faunal species, comprising species that are common to the region, are adapted to areas of increased habitat disturbance and able to live in close proximity to areas of increased anthropogenic activity. The current habitats associated with the study area are unlikely to support key populations of endemic or protected faunal species, with SCC unlikely to be associated with the study area. As a result of habitat degradation, noise, dust, rubbish, and the increased presence of people, it is likely that many animals will instinctively avoid the study area, opting to inhabit neighbouring areas which are less impacted, and which provide more intact habitat and increased food resources. The exception to this are those species which have shown a degree of adaptability and are still found in areas of increased activity.

Important considerations:

- Due to the location of the study area and the current surrounding land uses, development therein is unlikely to impact on habitat connectivity or faunal species movement;
- It is important that the adjacent open space areas to the east and north of the Kathu Bushveld are not impacted upon and that all edge effects are controlled;
- The screening tool indicated the site sensitivity as low for animals. Following the site assessment, the current condition of that available habitat and that of the faunal assemblage's diversity and abundance aligns with the low sensitivity output of the screening tool.



4.3 Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson et al., 2020), with 327 plant species, most of which are invasive, listed in national legislation⁸. Many introduced species are beneficial, e.g., almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to “escape” from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa’s diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

4.3.1 Legal Context

South Africa has released several Acts legislating the control of alien species. Currently, invasive species are controlled by the NEMBA – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020. AIP species defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEMBA:

- **Category 1a** species are those targeted for urgent national eradication;
- **Category 1b** species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- **Category 2** species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders “*Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3*”); and
- **Category 3** are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

⁸ Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).



Duty of care related to listed invasive species are referred to in NEMBA Section 73⁹. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US\$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e., the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

4.3.2 Site Results

During the site assessment only one AIP was recorded within the Degraded Habitat. Although no further AIPs were recorded at the time, there still remains the possibility that other AIPs may occur in the study area. At the time of the assessment the study area had been burnt. As the veld was only beginning to recover from the fire it is possible that some AIPs had yet to re-emerge post fire. Even if no further AIPs are present in the study area, there remains the chance that these species could establish in future, notably in any areas that may be disturbed as part of the construction and operational activities, including edge effects. It is important that all AIPs are suitably controlled during construction and operational activities.

Refer to table 2 below for more details on the AIP recorded within the study area.

Table 2: Alien and invasive alien species associated with the study area.

Scientific name	Common Name	Origin	Status	Kathu Bushveld	Degraded Habitat	Description
<i>Prosopis glandulosa</i>	Honey Mesquite	North and Central America	NEMBA 2		x	Multi-stemmed acacia-like shrub or small tree up to 10m high with paired, straight spines and reddish-brown branchlets. Dark green leaves with leaflets 10-25mm long. Yellow flower spikes from June to November. Yellowish to purplish, slender, straight, woody pods. Pods poisonous and pollen is a respiratory tract irritant.

⁹ Section 73(2): A person who is the owner of land on which a listed invasive species occurs must-

- notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
- take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
- take all the required steps to prevent or minimise harm to biodiversity.

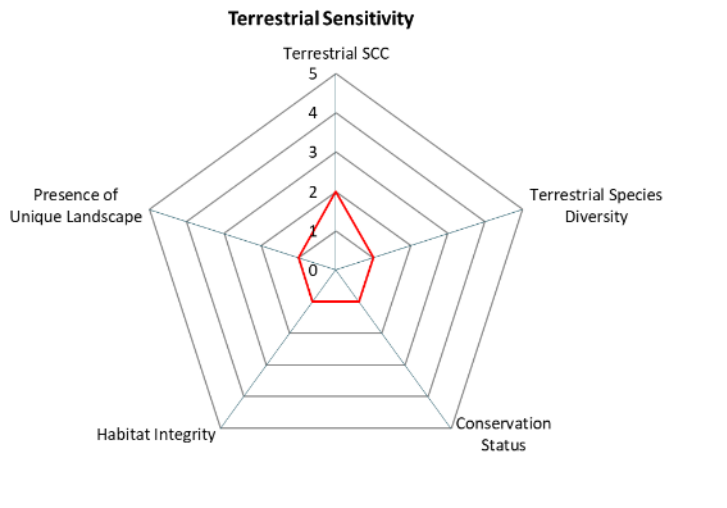
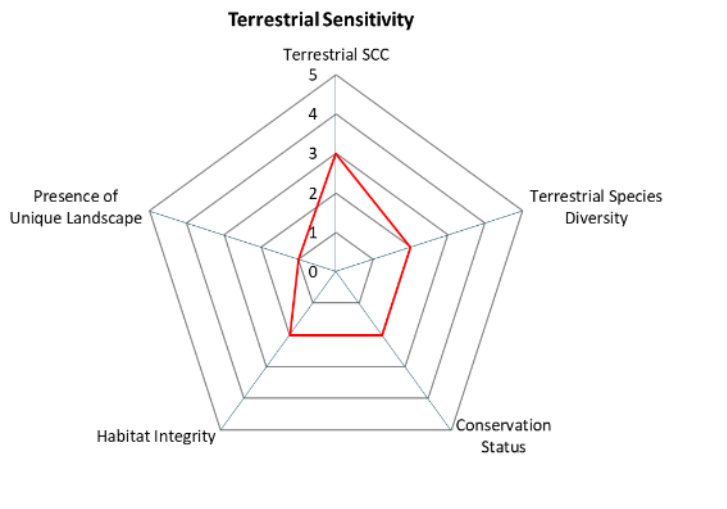


5 SENSITIVITY MAPPING

The screening tool identified the study area to be in a **Low Sensitivity** for the Plant Species and Animal Species Themes, and a **Very High Sensitivity** area for the Terrestrial Biodiversity Theme. Based on the *ground-truthed* results of the site visit, Table 3 below presents the sensitivity of each identified habitat unit for both flora fauna along with an associated conservation objective and implications for development.

Figure 9 conceptually illustrates areas of ecological sensitivity – depicting the combined sensitivity for flora and fauna. The study area is depicted according to its 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.

Table 3: A summary of the floral and faunal sensitivity of each habitat unit and implications for development.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
<p style="text-align: center;">Low</p> 	<p style="text-align: center;">Optimise development potential.</p>	<p style="text-align: center;">Degraded Habitat</p>	<ul style="list-style-type: none"> - Indigenous vegetation lacking. - Habitat has been degraded due to current and historic disturbances (e.g., dumping of building material and household waste). - High association with anthropogenic activities. - No faunal SCC were recorded in this habitat unit and no habitat is present to support such species. - A small number of <i>Vachellia erioloba</i> (NFA) and <i>Aloe grandidentata</i> (NCNCA) individuals were observed; and - No significant biodiversity features present.
<p style="text-align: center;">Moderately low</p> 	<p style="text-align: center;">Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.</p>	<p style="text-align: center;">Kathu Bushveld</p>	<ul style="list-style-type: none"> - Habitat has been impacted upon, however several species indicative of the reference vegetation unit are still present; - Faunal species diversity within the habitat unit is limited, comprising of species better adapted to/ tolerant of increased anthropogenic activities; - No faunal SCC were recorded in this habitat unit and no habitat is present to support such species; - A small number of <i>Vachellia erioloba</i> (NFA) individuals were observed; - Floral SCC such as <i>Boophone disticha</i> (NCNCA); <i>Harpagophytum procumbens</i> (NEM:BA) and <i>Nerine laticoma</i> (NCNCA) may occur in this habitat unit; and - No significant biodiversity features present.



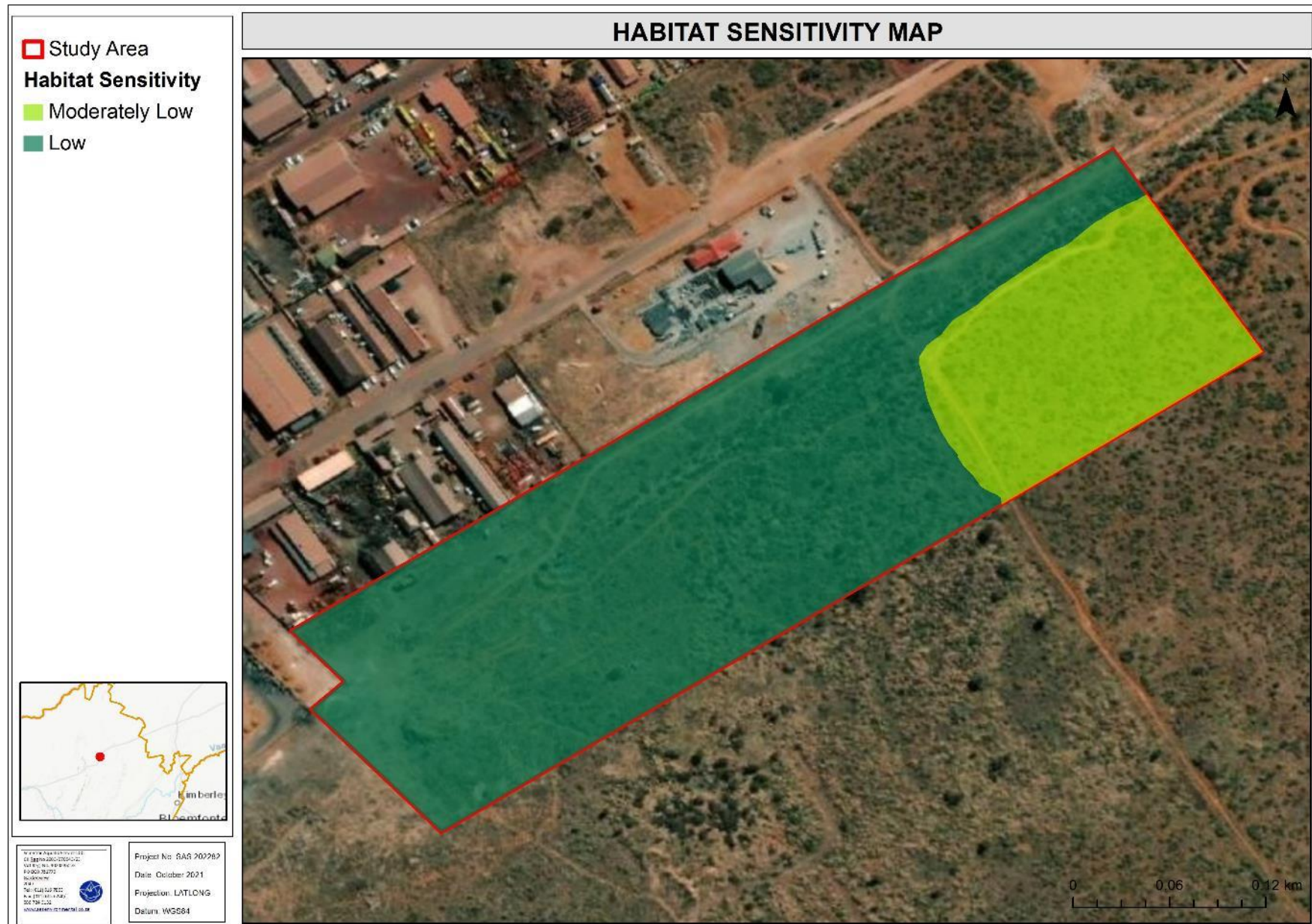


Figure 9: Combined biodiversity sensitivity for the study area.



6 IMPACT ASSESSMENT

The proposed development application will make provision for a waste tyre management facility for the storage and mechanical downsizing (cutting, shredding and granulation) of waste tyres. The sections below provide the significance of perceived impacts on the floral and faunal ecology of the study area. An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 6.1 (flora) and Section 6.2 (fauna). All mitigatory measures required to minimise the perceived impacts are presented in Section 6.3.

Table 4 indicates the perceived risks to floral and faunal species associated with the activities pertaining to the proposed development.

Table 4: Activities and aspects likely to impact on the faunal and floral resources of the study area.

ACTIVITIES AND ASPECTS REGISTER	
Pre-Construction Phase	
-	Potential failure to apply for the appropriate destruction permits (floral species) or where feasible, relocate SCC to suitable habitat outside the development footprint.
-	Impact: Loss of potential faunal or floral SCC within the development footprint areas in the study area.
-	Potential failure to manage and control AIP species before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat.
-	Impact: Spread 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.
-	Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat.
-	Impact: Loss of faunal and floral habitat outside of the direct development footprint, including a decrease in species diversity.
-	Dumping of construction material within areas where no construction is planned, thereby leading to further habitat disturbance.
-	Impact: Loss of faunal and floral habitat and diversity as AIPs outcompete and replace these species.
-	Potential increase in trapping and/or hunting attempts of faunal species, beyond the direct footprint area due to increased personnel in the area.
-	Impact: Further 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 the continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and
-	Impact: Loss of floral and faunal habitat and diversity within the direct footprint of the proposed development. Loss of surrounding floral and faunal diversity and potential 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.



ACTIVITIES AND ASPECTS REGISTER	
<ul style="list-style-type: none"> - Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants¹⁰ 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 Phase	
<ul style="list-style-type: none"> - 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. 	
<ul style="list-style-type: none"> - Increased human presence in the area once operational, potentially leading to increased illegal harvesting/ collection of medicinal plants in neighbouring open space areas, the persecution of fauna in the adjacent natural habitat, or an increased risk of fire frequency impacting on floral and faunal communities outside of the development footprint. - Impact: Loss of faunal and floral habitat and potential SCC, as well as overall species diversity within the local area. 	

6.1 Floral Impact Assessment

6.1.1 Floral Impact Assessment Results

The below table (Table 5) indicates the perceived risks to the floral ecology associated with all phases of the proposed development of the waste tyre facility. 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.

¹⁰ Sett, R. (2017). Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).



Table 5: Impact on the floral habitat, diversity, and SCC from the proposed development activities per habitat.

Habitat Unit	UNMANAGED							Significance	MANAGED							Significance
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence		Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	
PRE-CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld	5	2	3	2	2	7	7	49	5	2	2	1	2	7	5	35
								Low								Low
Degraded Habitat	5	1	2	2	2	6	6	36	5	1	1	1	2	6	4	24
								Low								Very Low
Impact on Floral SCC																
Kathu Bushveld	5	2	3	2	2	7	7	49	5	2	2	1	2	7	5	35
								Low								Low
Degraded Habitat	5	1	2	2	2	6	6	36	5	1	1	1	2	6	4	24
								Low								Very Low
CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld	5	2	3	2	3	7	8	56	5	2	2	1	2	7	5	35
								Medium Low								Low
Degraded Habitat	5	1	2	2	3	6	7	42	5	1	1	1	2	6	4	24
								Low								Very Low
Impact on Floral SCC																
Kathu Bushveld	5	2	3	2	3	7	8	56	5	2	1	1	2	7	4	28
								Medium Low								Low
Degraded Habitat	5	1	2	2	3	6	7	42	5	1	1	1	2	6	4	24
								Low								Very Low
OPERATIONAL PHASE																
Impact of floral Habitat and Diversity																
Kathu Bushveld	3	2	3	2	3	5	8	40	2	2	1	1	4	4	6	24
								Low								Very Low
Degraded Habitat	2	1	2	2	3	3	7	21	1	1	1	1	4	2	6	12
								Very Low								Very Low
Impact on Floral SCC																
Kathu Bushveld	3	2	3	2	3	5	8	40	1	2	1	1	2	3	4	12
								Low								Very Low
Degraded Habitat	2	1	2	2	3	3	7	21	1	1	1	1	2	2	4	8
								Very Low								Very Low



6.1.2 Impact Discussion

The direct impacts pertaining to the development of the waste tyre management facility on the floral ecology of the study area are anticipated to vary between medium low and very low for the habitat units prior to the implementation of mitigation measures. If mitigation measures are implemented, the impact significance for the study area is anticipated to be reduced low and very low.

Prior to mitigation measures the i) Preconstruction Phase, ii) Construction Phase and iii) Operational Phase scored an impact significance as follows:

- Preconstruction Phase: This phase scored a low impact significance;
- Construction Phase: This phase scored an impact significance ranging between low and medium low; and
- Operational Phase: This phase scored an impact significance ranging between low and very low.

With mitigation measures implemented, the direct and indirect impacts on the floral ecology for the study area may be reduced as follows:

- Preconstruction Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of low to very low;
- Construction Phase: With the implementation of mitigation measures, this phase scored an impact significance of low to very low; and
- Operational Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of very low.

The above impact significance scores above were garnered as a result of the study areas current decreased ecological condition as well as the locality of the study area overall.

6.1.2.1 Impact on Floral Habitat and Diversity

Much of the study area (Degraded habitat) has been severely impacted upon as a result of the disposal of rubble and household waste (rubbish), whilst vagrants and informal recyclers use the southern portion of the study area to sort waste and scrap metal. The Kathu Bushveld habitat has been impacted upon as a result of the alteration of natural ecological processes such as a likely increase in fire regimes. Although the proposed development will result in the loss of indigenous species, the impact will be localised within the footprint area and no regional impacts on floral communities are anticipated. Only the Kathu Bushveld is considered representative of an ESA, however, given the small footprint size, development herein is unlikely to have significant impacts on the larger ESA or regional conservation targets.



6.1.2.2 Impacts on Floral SCC

During the field assessment, only two floral SCC were observed within the study area, namely *Vachellia erioloba* (NFA) in both habitat units and *Aloe grandidentata* (NCNCA Protected) in the Kathu Bushveld habitat. Given the historic disturbances to the vegetation and proximity to the town of Kathu, further floral SCC are not expected to occur within the study area.

The screening tool indicated a low Plant Species sensitivity theme for the study area and did not list any SCC. Should any floral SCC as listed in Appendix H be observed during the construction phase, it is recommended that such species be rescued and relocated by a qualified specialist to suitable habitat outside of the disturbance footprint.

6.1.2.3 Probable Residual Impacts

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

- Potential alteration of floral habitat and species diversity in the areas adjacent to the study area; and
- Increased AIP proliferation within the study area and in the adjacent properties if not suitably managed.

6.1.2.4 Cumulative Impacts

The development of the waste tyre management facility will likely result in the total clearance of the vegetation within the study area. The loss of the Degraded habitat in the greater region is unlikely to have any additional cumulative impacts. The loss of the Kathu Bushveld habitat from the study area will further add to the loss of this vegetation type in the region and notably from the immediate area.



6.3 Faunal Impact Assessment

6.3.1 Faunal Impact Assessment Results

The below table (Table 6) indicates the perceived risks to the faunal ecology associated with all phases of the proposed development of the waste tyre facility. 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 6: Impact on the faunal habitat, diversity and SCC arising from the proposed development activities.

Habitat Unit	UNMANAGED							Significance	MANAGED							Significance
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence		Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	
PRE-CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld	5	2	3	2	2	7	7	49	5	2	2	1	2	7	5	35
								Low								Low
Degraded Habitat	5	1	2	2	2	6	6	36	5	1	1	1	2	6	4	24
								Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld and Degraded Habitat	2	2	2	2	2	4	6	24	1	2	2	1	2	3	5	15
								Very Low								Very Low
CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld	5	2	3	2	3	6	8	48	3	2	2	1	2	5	5	25
								Low								Very low
Degraded Habitat	3	1	2	2	3	4	7	28	2	2	1	1	2	4	4	16
								Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld and Degraded Habitat	2	2	2	2	3	4	7	28	2	2	2	1	2	4	5	20
								Low								Very Low
OPERATIONAL AND MAINTENANCE PHASE																
Impact of Faunal Habitat and Diversity																
Kathu Bushveld	3	2	2	2	3	5	7	35	2	2	1	1	2	4	4	16
								Low								Very Low
Degraded Habitat	1	1	2	2	3	2	7	14	1	2	1	1	2	3	4	12
								Very Low								Very Low
Impact on Faunal SCC																
Kathu Bushveld and Degraded Habitat	1	2	2	2	3	3	7	21	1	2	2	1	2	3	5	15
								Very Low								Very Low



6.3.2 Impact Discussion

Much of the study area and the habitat therein has been disturbed and degraded, limiting faunal species occupancy and diversity. The close proximity of the study area to the industrial area and areas of increased anthropogenic activity will further limit species utilisation of the study area. Species observed at the time of the assessment are considered to be common and widely spread throughout the region. With mitigation measures implemented, the impacts on the faunal ecology can be reduced to very-low levels.

Prior to mitigation measures the i) Preconstruction Phase, ii) Construction Phase and iii) Operational Phase scored an impact significance as follows:

- Preconstruction Phase: This phase scored a low to very low impact significance;
- Construction Phase: This phase scored a low impact significance across all aspects; and
- Operational Phase: This phase scored an impact significance ranging between low and very low.

With mitigation measures implemented, the direct and indirect impacts on the floral ecology for the study area may be reduced as follows:

- Preconstruction Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of low to very low;
- Construction Phase: With the implementation of mitigation measures, this phase scored an impact significance of very low; and
- Operational Phase: With the implementation of mitigation measures, this phase scored a lowered impact significance of very low.

6.2.2.1 Loss of Faunal Habitat and Diversity

The proposed development will result in a loss of faunal habitat from the area; however, the study area is associated with a moderately low diversity of fauna, and thus the proposed development is unlikely to have any significant negative impact on faunal communities. Many of the faunal species observed, or that may occur within the study area are already well adapted to anthropogenic settings and capable of habituating within these environments. The development will result in the loss of habitat; however, as much of the area is already disturbed, this is unlikely to result in an impact on the local faunal population. Additionally, many faunal species are likely to only forage intermittently in the study area and are not wholly reliant on the habitat therein for survival.



6.2.2.2 Impact on Important Faunal Species of Conservation Concern

No faunal SCC were observed within the study area. It is also unlikely that any SCC will reside within or utilise the area for foraging and less likely that SCC will breed within the study area, reflected in the very low rated impacts for faunal SCC.

6.2.2.3 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:

- Additional loss of faunal habitat in the areas adjacent the study area as a result of edge effects, possibly impacting on species abundance therein.

6.2.2.4 Possible cumulative Impacts

Although the study area comprises limited viable habitat for faunal species, the loss of this area will result in these species having to relocate to the adjacent natural habitat. This semi-migration may lead to increased competition for food resources and space, though this is not likely to be a significant threat. Increased human presence during the operational phase may also lead to a higher rate of snaring in the region.

6.4 Integrated Impact Mitigation

Table 7 below highlights the key, general integrated mitigation measures that are applicable to the proposed waste tyre facility in order to suitably manage and mitigate the ecological impacts that are associated with all phases of the proposed 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 7: A summary of the mitigatory requirements for the biodiversity associated with the study 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"> • Where <i>Vachellia erioloba</i> trees will be removed within the study area, the appropriate permits must be applied for; • Should it be required to remove the <i>Aloe grandidentata</i>, permits will be required from the department; • Prior to the commencement of construction activities, it is recommended that an AIP Management/Control Plan should be compiled for implementation: <ul style="list-style-type: none"> - Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the study area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread, or soils contaminated with AIP seeds during the construction phase; and - An AIP control should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional. 	
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 remain within the demarcated area and not 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. Any remaining natural areas not needed to be cleared/earmarked for construction should be retained, notably in the Kathu Bushveld; • If possible, clearing of vegetation should take place in a phased manner from west to east. This will allow for any faunal species within the study area to flee into the open areas to the east of the study area and avoid harm; • Smaller species that are not as readily able to move out of an area ahead of ground clearing activities such as scorpions and reptiles will be less mobile during rainfall events and cold days (winter). 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 (that may occur within the study area) 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; • No vehicles are allowed to drive in the adjacent natural areas unless on an existing road; • 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 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 dumping of litter, rubble or cleared vegetation should be allowed adjacent to the site. Rubble (existing on site) removed should be disposed of at an appropriate registered dump site away from the development footprint and not into the adjacent areas. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; 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 phase; and • 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 and within easy access. 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. 	
Alien Vegetation	
<ul style="list-style-type: none"> • Edge effects stemming from the proposed development may lead to AIP 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) (Section 4 of this report); and 	



<ul style="list-style-type: none"> • 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"> • Should any floral SCC be relocated, the relocation success of such species 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 SCC or medicinal floral species must be allowed by construction personnel; • Where floral SCC will need to be relocated or destroyed, the necessary permits for such activities must be obtained prior to such taking place from the relevant authorities; and • Should the presence of any faunal SCC be noted within the development footprint a suitably qualified specialist should be consulted on the best way to proceed. 	
Project phase	Operational 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"> • Manage all edge effects appropriately; and • Should any undeveloped areas remain within the footprint, it must be ensured that natural vegetation is encouraged to grow herein whilst ensuring that these areas do not become adhoc disposal sites for rubbish and waste. 	
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) (Section 4 of this report); • 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 both footprint area and the 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; and • Should any floral SCC remain within the footprint (<i>Vachellia erioloba</i>), it must be ensured that they are protected and not cut down/damaged by operational activities. 	



8 CONCLUSION

SAS was appointed by EXM to conduct a terrestrial biodiversity assessment as part of the EA process for the proposed Waste Tyre Management Facility, near Kathu in the Northern Cape Province. At the time of the assessment the whole study area had been burnt, as such, limited identification of floral species on site could be made, whilst the lack of vegetation decreased faunal species occurrences in the study area. In light of this, data from the assessment was significantly augmented with data from previous assessments in nearby localities as well as with specialist knowledge of the region.

Following the site assessment, it was determined that the study area comprised of two habitat units, namely the Degraded Habitat and the Kathu Bushed Habitat. The Degraded Habitat has been subjected to extensive historical and current impact, resulting in the loss of plant species representative of the reference vegetation type. Additionally, due to these disturbances, this habitat is no longer considered representative of the ESA. The Kathu Bushveld is considered to be more intact, though anthropogenic impacts and altered ecological processes have impacted the floral species composition therein. However, the Kathu Bushveld is still considered representative of the reference vegetation type and the ESA. Only two floral SCC were observed in the study area, namely *Vachellia erioloba* (NFA) and *Aloe grandidentata* (NCNCA), whilst no faunal SCC were observed or are expected to occur therein.

Taking the above into account, the Degraded Habitat is considered to be of low sensitivity and the Kathu Bushveld Habitat is of moderately low sensitivity. As such, following the assessment of the perceived impacts to the receiving environment, it is likely that, provided all mitigation measures are implemented, the proposed development will have a low to very low impact significance on both fauna and flora in the study area.

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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APPENDIX A: Indemnity and Terms of Use of this Report

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

Although SAS CC exercises due care and diligence in rendering services and preparing documents, SAS CC accepts no liability and the client, by receiving this document, indemnifies SAS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by SAS CC and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

APPENDIX B: Legislative Requirements

CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996 (ACT 108 OF 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.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF 1998) (NEMA)

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

NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT, 2004 (ACT 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.



GOVERNMENT NOTICE NUMBER R.1020: ALIEN AND INVASIVE SPECIES REGULATIONS, 2020 (IN GOVERNMENT GAZETTE 43735), INCLUDING GOVERNMENT NOTICE NUMBER 1003: ALIEN AND INVASIVE SPECIES LISTS, 2020 (IN GOVERNMENT GAZETTE 43726) 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, 2020):

- **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.

CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (ACT 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.

THE NATIONAL FOREST ACT, 1998 (ACT NO. 10 OF 1998) (NFA)

According to the department of Department of Forestry, Fisheries and the Environment (DFFE) (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 June 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 June 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 June 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 June 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.

NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSTDF, 2019)

The Northern Cape Provincial Spatial Development Framework (NCPSTDF) 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 (ACT NO. 9 OF 2009) (NCNCA)

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 June, 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 June, without a permit –

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

A specimen of a protected plant



APPENDIX C: 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 study 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 study 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 below¹¹:

- **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.

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 BODATSA, which contains records from the National Herbarium in Pretoria (PRE), the

¹¹ 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>



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 study 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 (R 152 of 2007) under Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were taken into consideration.

MTPA Species Status Report

A list of threatened species for the QDS 2528DC and 2628BA was obtained from the Mpumalanga Tourism and Parks Agency (MTPA). This list includes confirmed recordings of species but does not provide exact localities due to the sensitive nature of such information.

Specially Protected and Protected Species

The Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA) provides a list of Protected Species (Schedule 11) (Section 69(1)(a) of the MNCA) and Specially Protected Species (Schedule 12) (Section 69(1)(b) of the MNCA) for the Mpumalanga Province. These species formed part of the SCC assessment.

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:

- **“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.

Low POC	Medium POC	High POC	Confirmed
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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.

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 C1: 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.

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 study 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/study area.

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a study 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).

Vegetation structure has been described following the guideline in Edwards (1983). Refer to Figure C1 below:



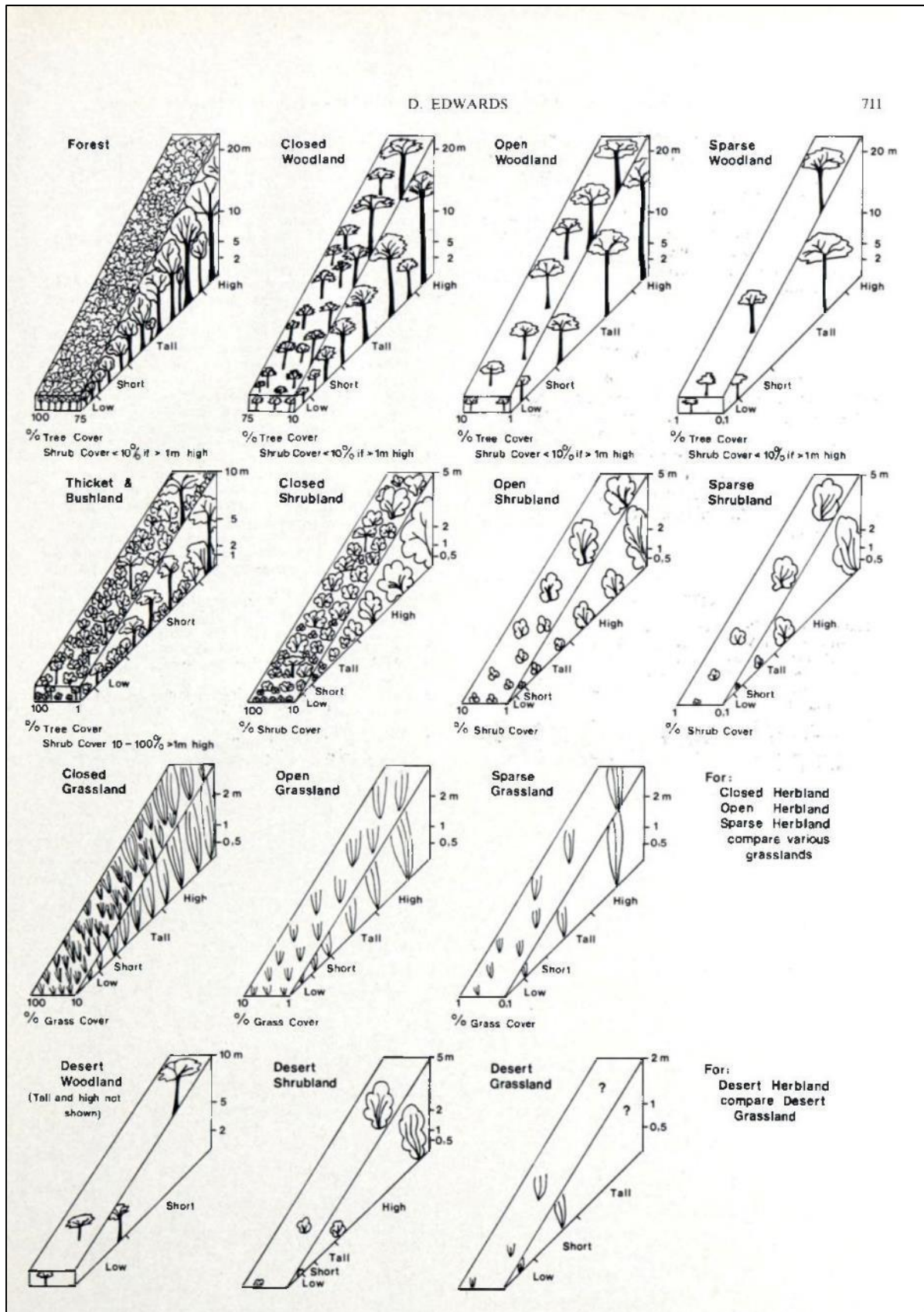


Figure C1: Diagrammatic representation of structural groups and formation classes. Only dominant growth forms are shown.



APPENDIX D: 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 study 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. Specific attention was paid to mammal SCC as listed by the IUCN, 2015.

Avifauna

The Southern African Bird Atlas Project 2 database (<http://sabap2.adu.org.za/>) was compared with the recent field survey of avifaunal species identified on the study area. Field surveys were undertaken utilising visual observation and bird call identification techniques in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (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 study area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Amphibians

Identifying amphibian species is done using direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. 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 study 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 International Union for the Conservation of Nature (IUCN).

Invertebrates

Whilst conducting transects through the study 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 study 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 Union for the Conservation of Nature (IUCN).

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks 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 study area.



Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC is described:

- **“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.

Faunal Habitat Sensitivity

The sensitivity of the study 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 study 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 study 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 study 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 study area in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table D1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 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 optimising 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 E: 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'¹². 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 necessary¹³.

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

¹² The definition has been aligned with that used in the ISO 14001 Standard.

¹³ 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 <	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected <	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	RATING
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



Table D2: Significance Rating Matrix.

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

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 impacts¹⁴ 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.

¹⁴ Mitigation measures should address both positive and negative impacts



APPENDIX F: Vegetation Type(s)

Kathu Bushveld (SVk 12)

Remark: One of the most strikingly dominant areas of fairly tall *Vachellia erioloba* is centered on the town of Kathu, which was built around many of these trees.



Figure F1: SVk 12 Kathu Bushveld: Open savanna dominated by *Vachellia erioloba*, *A. 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 Source: Mucina & Rutherford (2006) Figure 9.82, page 522.

Table F1: Dominant & typical floristic species of the Kathu Bushveld (Mucina & Rutherford, 2012)

Group	Species
Woody Species	
Tall trees	<i>Vachellia erioloba</i> (d).
Small trees	<i>Vachella mellifera</i> subsp. <i>detinens</i> (d), <i>Boscia albitrunca</i> (d), <i>Terminalia sericea</i> .
Tall shrubs	<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> .
Graminoid Species	
Grasses	<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> .
Herbaceous species	
Herbs	<i>Acrotome inflata</i> , <i>Erlangea misera</i> , <i>Gisekia africana</i> , <i>Heliotropium ciliatum</i> , <i>Hermbstaedtia 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>
Biogeographically Important Taxa (Kalahari endemics)	
Small trees	<i>Vachella luederitzii</i> var. <i>luederitzii</i> .
Graminoids	<i>Anthephora argentea</i> , <i>Megaloprotachne albescens</i> , <i>Panicum kalaharense</i> .
Herbs	<i>Neuradopsis bechuanensis</i>

*(d) – Dominant species for the vegetation type

APPENDIX G: Species List

Observed and Expected Floral Species

Table G1: Dominant floral species encountered within the study area. Alien species are indicated with an asterisk (*). Protected species as indicated in Bold.

	Kathu bushveld	Transformed
Trees and shrubs		
<i>Acacia erioloba</i>	X	X
<i>Acacia mellifera</i>	X	X
<i>Aloe grandidentata</i>	X	
<i>Asparagus retrofractus</i>	X	
<i>Elephantorrhiza elephantina</i>	X	
<i>Grewia flava</i>	X	X
<i>Helichrysum sp.</i>	X	
<i>Indigofera sp.</i>	X	
* <i>Prosopis glandulosa</i>		X
<i>Searsia ciliata</i>	X	
<i>Tarconanthus camphoratus</i>	X	X
<i>Ziziphus mucronata</i>	X	
Forbs and Herbs		
<i>Acanthosicyos naudinianus</i>	X	
<i>Adenogramma aethiopicum</i>	X	
<i>Geigeria ornativa</i>	X	
<i>Senna italica</i>	X	
<i>Tribulus terrestris</i>	X	
Grasses		
<i>Aristida congesta var congesta</i>	X	X
<i>Aristida diffusa</i>	X	
<i>Aristida meridionalis</i>	X	X
<i>Cenchrus ciliaris</i>	X	
<i>Cyndon dactylon</i>	X	
<i>Eragrostis lehmanniana</i>	X	
<i>Eragrostis spp</i>	X	X
<i>Heteropogon contortus</i>	X	X
<i>Melinis repens</i>		X

1a: Category 1a – Invasive species that require compulsory control.

1b: Category 1b – Invasive species that require control by means of an invasive species management programme.

2: 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.

3: Category 3 – Ornamentally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread (Bromilow, 2001).



Table G2: Mammal species recorded during the field assessment.

Scientific Name	Common Name	IUCN
<i>Raphicerus campestris</i>	Steenbok	LC
<i>Lepus capensis</i>	Cape Hare	LC
<i>Cynictis penicillata</i>	Yellow mongoose	LC
<i>Hystrix africaeaustralis</i>	Porcupine	LC

LC = Least Concern, N-End Near-endemic

Table G3: Avifaunal species recorded during the field assessment.

Scientific Name	Common Name	IUCN
<i>Streptopelia capicola</i>	Cape Turtledove	LC
<i>Pycnonotus nigricans</i>	Red-eyed Bulbul	LC
<i>Colies colius</i>	White-backed Mousebird	LC
<i>Corvus albus</i>	Pied crow	LC
<i>Upupa africana</i>	African Hoopoe	LC
<i>Prinia masulosa</i>	Karoo Prinia	LC
<i>Passer melanurus</i>	Cape Sparrow	LC
<i>Sporopipes squamifrons</i>	Scaly-feathered Finch	LC
<i>Spreo bicolor</i>	Pied Starling	LC
<i>Saxicola torquata</i>	African Stonechat	LC
<i>Cisticola fulvicapillus</i>	Neddicky	LC
<i>Numida meleagris</i>	Helmeted Guineafowl	LC
<i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC
<i>Parus cinerascens</i>	Ashy Tit	LC
<i>Batis pririt</i>	Pirit Batis	LC
<i>Sigelus silens</i>	Fiscal Flycatcher	LC
<i>Erythropgia paena</i>	Kalahari scrub Robin	LC

LC = Least Concern, N-End Near-endemic

Table G4: Reptile species recorded during the field assessment.

Scientific Name	Common Name	IUCN
<i>Trachylepis</i> sp	Skink	NYBA
<i>Pedioplanis lineocellata</i>	Spotted Sand Lizzard	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed

Table G5: General invertebrate recorded during the field assessment.

Scientific Name	Common Name	IUCN
<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>Belenois aurata</i>	Brown-veined White	NYBA
<i>Danaus chrysippus</i>	African Monarch	NYBA
<i>Eurema brigitta</i>	Broad-bordered Grass Yellow	NYBA
<i>Pachylomerus femoralis</i>	Flattened Giant Dung Beetle	NYBA
<i>Sphingonotus scabriculus</i>	Blue-wing	NYBA



Scientific Name	Common Name	IUCN
<i>Acanthacris ruficornis</i>	Garden Locust	NYBA
<i>Gastrimargus</i> sp.	N/A	NYBA
<i>Psammodes bertolonii</i>	Toktokkie	NYBA
<i>Rhachitopsis</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>Cynthia cardui</i>	Painted Lady Butterfly	LC
<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 G6: Arachnid species recorded during the site assessment.

Scientific Name	Common Name	IUCN
<i>Ageledidae</i> sp	Funnel-web Spider	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed



APPENDIX H: 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. For the POC assessment, a list of Red Data Listed (RDL) species previously recorded within the 10 km of the study area was pulled from the Botanical Database of Southern Africa (BODATSA) (<http://posa.sanbi.org/>). This list was further cross-checked with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) TOPS flora) to identify provincially protected species previously recorded for the area.

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 <500 km², OR



- Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy, 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.

The below tables present the results of the POC assessment.

POC for RDL Floral SCC obtained from BODATSA

Table H1: Red Data Listed plant species recorded in the QDS 2723CA. Species list obtained from the new Plants of southern Africa (new POSA) online catalogue. Information on species distributions and conservation status were derived from the Red List of South African Plants website (<http://redlist.sanbi.org/index.php>).

Scientific Name	IUCN	Habitat description	POC
<i>Barleria media</i>	VU	Range: Kalahari region near Kuruman. Major habitats: Kuruman Mountain Bushveld Description: Uncertain, possibly rocky slopes or koppies.	L
<i>Cleome conrathii</i>	NT	Range: Kuruman to Pretoria. Major habitats: Grassland, Savanna Description: Stony quartzite slopes, usually in red sandy soil, grassland or deciduous woodland, all aspects	L
<i>Antimima mucronata</i>	VU	Range: Moorreesburg, Hopefield, Malmesbury and Vredenburg. Major habitats: Piketberg Quartz Succulent Shrubland, Saldanha Granite Strandveld, Swartland Shale Renosterveld, Swartland Granite Renosterveld Description: Well-drained, clay, stony soils in open patches amongst shrubs.	L

Table H2: Plant species triggering the sensitivity for the Plant Species Theme as identified by the National Web-based Screening Tool.

The screening Tool did not indicate the presence of sensitive plant species.



NATIONALLY PROTECTED SPECIES

NEMBA TOPS List for South Africa¹⁵

Table H3: TOPS list for South Africa – plant species.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Adenia wilmsii</i>	No common name	Low	Provincial distribution: Mpumalanga Range: Lydenburg to Waterval Boven Description: Dolerite outcrops or red loam soil, in open woodland, 1300-1500 m.	EN; P
<i>Adenium swazicum</i>	Swaziland Impala Lily	Low	Range: Kruger National Park to Swaziland along the Lebombo Mountains and adjacent areas in south-western Mozambique.	VU
<i>Adenium swazicum</i>	Swaziland Impala Lily	Low	Provincial distribution: Mpumalanga	VU
<i>Aloe albida</i>	Grass Aloe	Low	Provincial distribution: Mpumalanga Range: Aloe albida has a restricted range in the mountains south of Barberton, Mpumalanga, extending to Malolotja in north-western Swaziland.	NT
<i>Aloe pillansii</i> (now <i>Alloidendron pillansii</i>)	False Quiver Tree	Low	Provincial distribution: Northern Cape Range: Richtersveld and southern Namibia.	EN
<i>Aloe simii</i>	No common name	Low	Provincial distribution: Mpumalanga Range: This species is endemic to a small area in the transition area between the Mpumalanga Lowveld and Escarpment, where it occurs from Sabie southwards to White River and around Nelspruit. Description: It occurs along drainage lines and in wetlands in open woodland and grassland, 600-1100 m.	EN; P
<i>Clivia mirabilis</i>	"Oorlogskloof" Bush Lily	Low	Provincial distribution: Northern Cape, Western Cape	VU; P
<i>Diaphanathe millarii</i>	Tree Orchid	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal Range: East London and Durban.	VU
<i>Disa macrostachya</i>	No common name	Low	Provincial distribution: Northern Cape	EN; P
<i>Disa nubigena</i>	No common name	Low	Provincial distribution: Western Cape	Rare; P
<i>Disa physodes</i>	No common name	Low	Provincial distribution: Western Cape	CR; P
<i>Disa procera</i>	No common name	Low	Provincial distribution: Western Cape	EN; P
<i>Disa sabulosa</i>	No common name	Low	Provincial distribution: Western Cape	EN; P
<i>Encephalartos aemulans</i>	Ngotshe Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos altensteinii</i>	Bread Palm	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P
<i>Encephalartos arenarius</i>	Dune Cycad	Low	Provincial distribution: Eastern Cape	EN
<i>Encephalartos brevifoliolatus</i>	Escarpment Cycad	Low	Provincial distribution: Limpopo	EW
<i>Encephalartos caffer</i>	Breadfruit Tree	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P

¹⁵ National Environmental Management: Biodiversity Act 10 of 2004 - Threatened or Protected Species Regulations, 2007. Government Notice R152 in Government Gazette 29657 dated 23 February 2007. Commencement date: 1 June 2007 [GN R150, Gazette no. 29657], as amended.



NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Encephalartos cerinus</i>	Waxen Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos cupidus</i>	Blyde River Cycad	Low	Provincial distribution: Limpopo, Mpumalanga Description: Grassland, on steep, rocky slopes or cliffs and sometimes near seepage areas bordering gallery forests.	CR
<i>Encephalartos dolomiticus</i>	Wolkberg Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos dyerianus</i>	Lowveld Cycad	Low	Provincial distribution: Limpopo	CR; P
<i>Encephalartos eugene-maraisii</i>	Waterberg Cycad	Low	Provincial distribution: Limpopo	EN
<i>Encephalartos friderici-guilielmi</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P
<i>Encephalartos ghellinckii</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P
<i>Encephalartos heenanii</i>	Woolly Cycad	Low	Provincial distribution: Mpumalanga Description: Open areas of montane grasslands amidst scarp forest in deep valleys and ravines.	CR
<i>Encephalartos hirsutus</i>	Venda Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos horridus</i>	Eastern Cape Blue Cycad	Low	Provincial distribution: Eastern Cape	EN
<i>Encephalartos humilis</i>	No common name	Low	Provincial distribution: Mpumalanga Description: Montane and mistbelt grassland, rocky sandstone slopes.	VU; P
<i>Encephalartos inopinus</i>	Lydenburg Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos laevifolius</i>	Kaapsehoop Cycad	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga Description: Steep, rocky slopes in mistbelt grassland, 1300-1500 m.	CR
<i>Encephalartos lanatus</i>	No common name	Low	Provincial distribution: Gauteng and western Mpumalanga Description: Sheltered, wooded ravines in sandstone ridges, 1200-1500 m.	NT; P
<i>Encephalartos latifrons</i>	Albany Cycad	Low	Provincial distribution: Eastern Cape	CR
<i>Encephalartos lebomboensis</i>	Lebombo Cycad	Low	Provincial distribution: KwaZulu-Natal, Mpumalanga Description: Cliffs and rocky ravines in savanna and grassland.	EN
<i>Encephalartos lehmannii</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P
<i>Encephalartos longifolius</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P
<i>Encephalartos middelburgensis</i>	Middelburg Cycad	Low	Provincial distribution: Gauteng, Mpumalanga Description: Open grasslands and in sheltered valleys.	CR
<i>Encephalartos msinganus</i>	Msinga, Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos natalensis</i>	Natal Giant Cycad	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P
<i>Encephalartos ngoyanus</i>	Ngoye Dwarf Cycad	Low	Provincial distribution: KwaZulu-Natal	VU
<i>Encephalartos nubimontanus</i>	Blue Cycad	Low	Provincial distribution: Limpopo	EW
<i>Encephalartos paucidentatus</i>	No common name	Low	Provincial distribution: Mpumalanga Description: Forest, occurs on steep rocky slopes and alongside streams in deep gorges.	VU; P
<i>Encephalartos princeps</i>	No common name	Low	Provincial distribution: Eastern Cape	VU; P
<i>Encephalartos senticosus</i>	No common name	Low	Provincial distribution: KwaZulu-Natal	VU; P



NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Encephalartos transvenosus</i>	Modjadje Cycad	Low	Provincial distribution: Limpopo	LC; P
<i>Encephalartos trispinosus</i>	No common name	Low	Provincial distribution: Eastern Cape	VU; P
<i>Encephalartos woodii</i>	Wood's Cycad	Low	Provincial distribution: KwaZulu-Natal	EW
<i>Euphorbia clivicola</i>	No common name	Low	Provincial distribution: Limpopo	CR; P
<i>Euphorbia meloformis</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P
<i>Euphorbia obesa</i>	No common name	Low	Provincial distribution: Eastern Cape	EN; P
<i>Harpagophytum procumbens</i>	Devil's Claw	Medium	Provincial distribution: Free State, Limpopo, Northern Cape, North West	LC; P
<i>Harpagophytum zeyherii</i>	Devil's Claw	Low	Provincial distribution: Gauteng, Limpopo, Mpumalanga, North West	LC; P
<i>Hoodia currorii</i>	Ghaap	Low	Provincial distribution: Limpopo	P
<i>Hoodia gordonii</i>	Ghaap	Low	Provincial distribution: Free State, Northern Cape, Western Cape	DDD; P
<i>Jubaeopsis caffra</i>	Pondoland Coconut	Low	Provincial distribution: Eastern Cape	EN
<i>Merwillia plumbea</i>	Blue Squill	Low	Provincial distribution: KwaZulu-Natal, Mpumalanga Major habitats: Grassland Description: Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	NT
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	Lebombo Wattle	Low	Provincial distribution: KwaZulu-Natal	Now LC
<i>Protea odorata</i>	Swartland Sugarbush	Low	Provincial distribution: Western Cape	CR; P
<i>Siphonochilus aethiopicus</i>	Wild Ginger	Low	Provincial distribution: KwaZulu-Natal, Limpopo, Mpumalanga Range: Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa. Description: Tall open or closed woodland, wooded grassland or bushveld.	CR
<i>Stangeria eriopus</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P
<i>Warburgia salutaris</i>	Pepper-bark Tree	Low	Provincial distribution: KwaZulu-Natal, Limpopo, Mpumalanga Range: North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Also occurs in Swaziland, Mozambique and Zimbabwe and Malawi. Description: Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	EN
<i>Zantedeschia jucunda</i>	Yellow Arum Lilly	Low	Provincial distribution: Limpopo	VU

CR = Critically Endangered, EN = Endangered, EW = Extinct in the Wild, NT = Near Threatened, VU = Vulnerable, P = Protected, POC = Probability of Occurrence.



PROVINCIALY PROTECTED FLORA

Table H4: POC assessment results for provincially protected floral species as per the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). Threatened status and additional information on species threat status, habitat and distribution was obtained from The Red List of South African Plants (<http://redlist.sanbi.org/index.php>). The Potential of Occurrence (POC) of these floral SCC within the study area is also provided.

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.

Family	Species	POC Score	Habitat and distribution details	STATUS
Apocynaceae	<i>Fockea angustifolia</i>	Low	<p>Indigenous (succulent; climber)</p> <p>Provincial distribution: Free State, KwaZulu-Natal, Limpopo, Northern Cape, North West.</p> <p>Major habitats: Terrestrial</p> <p>Description: In dry open woodland and scrub often with Acacia or Commiphora.</p> <p>Suitable habitat on site: N/A</p>	LC Schedule 2
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Low	<p>Indigenous (herb; shrub)</p> <p>Provincial distribution: Widely distributed in the southern African region</p> <p>Major habitats: Terrestrial.</p> <p>Description: It is often found growing in disturbed areas on the roadside and abandoned fields.</p> <p>Suitable habitat on site: Recorded in the Transformed Habitat</p>	LC Schedule 2
Apocynaceae	<i>Stapelia grandiflora</i>	Low	<p>Indigenous (succulent)</p> <p>Provincial distribution: Eastern Cape, Free State, Northern Cape, Western Cape.</p> <p>Major habitats: Terrestrial.</p> <p>Suitable habitat on site: N/A</p>	LC Schedule 2
Asphodelaceae	<i>Kniphofia ensifolia</i> subsp. <i>ensifolia</i>	Low	<p>Indigenous (herb)</p> <p>Provincial distribution: Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga, Northern Cape, North West</p> <p>Major habitats: Terrestrial</p> <p>Description: Occurs mainly in grassland along streams. It prefers heavy clay soils that are inundated with water during the warm summer months.</p> <p>Suitable habitat on site: N/A</p>	LC Schedule 2
Celastraceae	<i>Gymnosporia buxifolia</i>	Low	<p>Indigenous (shrub; tree)</p> <p>Provincial distribution: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape.</p> <p>Major habitats: Terrestrial.</p> <p>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</p>	LC Schedule 2



Family	Species	POC Score	Habitat and distribution details	STATUS
			riverbeds, often on termite mounds and it is often found as undergrowth to taller trees. Suitable habitat on site: Recorded along Moisture-driven Habitat and within the Ghaap Plateau Vaalbosveld Habitat.	
Crassulaceae	<i>Crassula corallina</i>	Low	Indigenous (succulent; herb) Provincial distribution: Eastern Cape, Free State, Northern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: It grows in quartzite outcrops in desert-like habitat and dry floodplain. Suitable habitat on site: Rockier habitat within the Ghaap Plateau Vaalbosveld Habitat.	LC Schedule 2
Crassulaceae	<i>Crassula lanceolata</i>	Low	Indigenous (succulent; herb) Provincial distribution: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape. Major habitats: Terrestrial Description: Prefers rocky areas Suitable habitat on site: Ghaap Plateau Vaalbosveld Habitat	LC Schedule 2
Euphorbiaceae	<i>Euphorbia duseimata</i>	Low	Indigenous (succulent; dwarf shrub) Provincial distribution: Free State, Northern Cape, North West. Major habitats: Terrestrial. Description: Sandy or turfy soils, Kalahari Thornveld and Bushveld. Suitable habitat on site: N/A	LC Schedule 2
Euphorbiaceae	<i>Euphorbia spartaria</i>	Low	Indigenous (succulent; shrub) Provincial distribution: N/A Major habitats: N/A Description: N/A Suitable habitat on site: N/A	LC Schedule 2
Fabaceae	<i>Lessertia pauciflora</i>	Low	Indigenous (herb) Provincial distribution: Eastern Cape, Free State, Limpopo, Northern Cape, North West, Western Cape. Major habitats: Terrestrial. Description: Short grassland and dry stream beds on volcanic soil; 1700–2200 m. Suitable habitat on site: Cryptic Wetlands (edges where there is an increase in rock cover)	LC Schedule 1
Iridaceae	<i>Duthieastrum linifolium</i>	Low	Indigenous; Endemic (geophyte; herb) Provincial distribution: Free State, Northern Cape, North West. Major habitats: Terrestrial. Description: N/A Suitable habitat on site: N/A	LC Schedule 2



Family	Species	POC Score	Habitat and distribution details	STATUS
Iridaceae	<i>Moraea falcifolia</i>	Low	<p>Indigenous (geophyte; herb)</p> <p>Provincial distribution: Eastern Cape, Northern Cape, Western Cape.</p> <p>Major habitats: Albany Thicket, Fynbos, Nama Karoo, Succulent Karoo.</p> <p>Description: Dry, open, stony or clay flats.</p> <p>Suitable habitat on site:</p>	LC Schedule 2
Iridaceae	<i>Moraea simulans</i>	Low	<p>Indigenous (geophyte; herb)</p> <p>Provincial distribution: Free State, Gauteng, Mpumalanga, North West, Western Cape.</p> <p>Major habitats: Terrestrial.</p> <p>Description: In xeric grassland and bush. usually in stony ground, especially in disturbed sites.</p> <p>Suitable habitat on site: Ghaap Plateau Vaalbosveld Habitat</p>	LC Schedule 2
Oleaceae	<i>Olea europaea</i>	Low	<p>Indigenous</p> <p>Provincial distribution: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape.</p> <p>Major habitats: Terrestrial.</p> <p>Description: This tree is found in a variety of habitats, often near water, e.g. on rocky hillsides, on stream banks and in woodland (where it can reach 12 m) (SANBI PlantZAfrica).</p> <p>Suitable habitat on site: Ghaap Plateau Vaalbosveld Habitat and Moisture-driven Hbaitat.</p>	LC Schedule 2
Scrophulariaceae	<i>Jamesbrittenia atropurpurea</i>	Low	<p>Indigenous (shrub; dwarf shrub)</p> <p>Provincial distribution: Eastern Cape, Free State, Gauteng, Northern Cape, North West, Western Cape.</p> <p>Major habitats: Terrestrial.</p> <p>Description: Most records are in and around pans, probably always on calcareous soils.</p> <p>Suitable habitat on site: Moisture-driven Habitat.</p>	LC Schedule 2
Scrophulariaceae	<i>Jamesbrittenia aurantiaca</i>	Low	<p>Indigenous (herb)</p> <p>Provincial distribution: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Mpumalanga, Northern Cape, North West.</p> <p>Major habitats: Terrestrial.</p> <p>Description: Rocky hillsides, grasslands and riverbanks.</p> <p>Suitable habitat on site: N/A</p>	LC Schedule 2



PROTECTED TREE SPECIES AS PER THE NFA

Table H5: Protected trees as defined by The National Forest Act, 1998, (Act No. 84 of 1998) (NFA) for the study area. 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	Description	POC
Brassicaceae	<i>Boscia albitrunca</i>	LC	Range: Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. Description: hot dry areas as well as the bushveld, open woodland and are associated with termite mounds.	Medium
Fabaceae	<i>Vachellia erioloba</i>	LC	Range: Free State, Gauteng, Limpopo, Mpumalanga, Northern Cape, North West Province. Description: Savanna, semi-desert, and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops.	Confirmed
Fabaceae	<i>Vachellia haematoxylon</i>	LC	Range: Northern Cape Description: Found in arid areas, usually on sandy soils.	Low



APPENDIX I: Faunal SCC

Faunal Species of Conservation Concern

The tables below list the faunal Species of Conservation Concern as listed under TOPS (2007):

Table I1: TOPS list of faunal species (2007).

Scientific Name	Common Name
CRITICALLY ENDANGERED SPECIES	
REPTILIA	
<i>Caretta</i>	Loggerhead Sea Turtle
<i>Dermochelys coriacea</i>	Leatherback Sea Turtle
<i>Eretmochelys imbricate</i>	Hawksbill Sea Turtle
AVES	
<i>Grus carunculatus</i>	Wattled Crane
<i>Hirundo atrocaerulea</i>	Blue Swallow
<i>Neophron percnopterus</i>	Egyptian Vulture
<i>Poicephalus robustus</i>	Cape Parrot
MAMMALIA	
<i>Bunolagus monticularis</i>	Riverine Rabbit
<i>Chrysospalax</i>	Rough-haired Golden Mole
ENDANGERED SPECIES	
REPTILIA	
<i>Chelonia mydas</i>	Green Turtle
<i>Cordylus giganteus</i>	Giant Girdled Lizard
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle
<i>Psammobates geometricus</i>	Geometric Tortoise
AVIFAUNA	
<i>Anthropoides paradiseus</i>	Blue Crane
<i>Balearica regulorum</i>	Grey Crowned Crane
<i>Ephippiorhynchus senegalensis</i>	Saddle-billed Stork
<i>Gypaetus barbatus</i>	Bearded Vulture
<i>Gyps africanus</i>	White-backed Vulture
<i>Gyps coprotheres</i>	Cape Vulture
<i>Necrosyrtes</i>	Hooded Vulture
<i>Pelecanus rufescens</i>	Pink-backed Pelican
<i>Scotopelia peli</i>	Pel's Fishing Owl
<i>Torgos tracheliotus</i>	Lappet-faced Vulture
MAMMALIA	
<i>Amblysomus robustus</i>	Robust Golden Mole
<i>Damaliscus tunatus</i>	Tsessebe
<i>Diceros bicornis</i>	Black Rhinoceros
<i>Equus zebra</i>	Mountain Zebra
<i>Lycaon pictus</i>	African Wild Dog
<i>Neamblysomus gunningi</i>	Gunning's Golden Mole
<i>Ourebia ourebi</i>	Oribi
<i>Paraxerus palliatus</i>	Red Squirrel
<i>Petrodromus tetradactylus</i>	Four-toed Elephant-shrew
VULNERABLE SPECIES	
AVES	
<i>Trigonoceps occipitalis</i>	White-headed Vulture
<i>Aquila rapax</i>	Tawny Eagle
<i>Ardeotis kori</i>	Kori Bustard
<i>Ciconia nigra</i>	Black Stork



Scientific Name	Common Name
<i>Circaetus fasciolatus</i>	Southern Banded Snake Eagle
<i>Eupodotis caerulescens</i>	Blue Korhaan
<i>Falco fasciinucha</i>	Falcon
<i>Falco naumanni</i>	Lesser Kestrel
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Geronticus calvus</i>	Bald Ibis
<i>Neotis ludwidgei</i>	Ludwig's Bustard
<i>Polemaetus bellicosus</i>	Martial Eagle
<i>Terathopus ecaudatus</i>	Bateleur
<i>Tyto capensis</i>	Grass Owl
MAMMALIA	
<i>Acinonyx jubatus</i>	Cheetah
<i>Chrysospalax trevelyani</i>	Giant Golden Mole
<i>Cricetomys gambianus</i>	Giant Rat
<i>Damaliscus pyrgorgus pyrgargus</i>	Bontebok
<i>Dendrohyrax arboreus</i>	Tree Hyrax
<i>Hippotragus equinus</i>	Roan Antelope
<i>Pholidota temminckii</i>	Pangolin
<i>Neamblysomus julianae</i>	Juliana's Golden Mole
<i>Neotragus moschatus</i>	Suni
<i>Panthera leo</i>	Lion
<i>Panthera pardus</i>	Leopard
<i>Philantomba monticola</i>	Blue Duiker
PROTECTED SPECIES	
AMPHIBIA	
<i>Pyxicephalus adspersus</i>	Giant Bullfrog
<i>Pyxicephalus edulis</i>	African Bullfrog
REPTILIA	
<i>Bitis gabonica</i>	Gaboon Adder
<i>Bitis schneideri</i>	Namaqua Dwarf Adder
<i>Bradypodion taeniabronchum</i>	Smith's Dwarf Chameleon
<i>Cordylus cataphractus</i>	Girdled Lizard
<i>Crocodylus niloticus</i>	Nile crocodile
<i>Python natalensis</i>	African Rock Python
AVES	
<i>Bucowus leadeateri</i>	Southern Ground-Hornbill
<i>Circus ranivorus</i>	African Marsh Harrier
<i>Neotis denhami</i>	Denham's Bustard
<i>Spheniscus</i>	Jackass Penguin
MAMMALIA	
<i>Atelerix frontalis</i>	South African Hedgehog
<i>Ceratotherium simum</i>	White Rhinoceros
<i>Connochaetes</i>	Black Wildebeest
<i>Crocuta</i>	Spotted Hyaena
<i>Felis nigripes</i>	Black-footed Cat
<i>Parahyaena brunnea</i>	Brown Hyaena
<i>Leptailurus serval</i>	Serval
<i>Loxodonta africana</i>	African elephant
<i>Lutra maculicollis</i>	Spotted-necked Otter
<i>Millivora capensis</i>	Honey Badger
<i>Raphicerus sharpei</i>	Sharpe's Grysbok
<i>Redunca</i>	Reedbuck
<i>Vulpes chama</i>	Cape Fox



South African Bird Atlas Project 2 list**Table I4: Avifaunal Species for the pentads within the 2723CA study area.**

Pentads	Link to pentad summary on the South African Bird Atlas Project 2 web page
2740_2300	http://sabap2.birdmap.africa/coverage/pentad/2740_2300



APPENDIX J: Declaration and Specialists CV's

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

Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Faith Mamphoka	MA Geography and Environment Science (University of the Western Cape)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)

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

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Nelanie Cloete		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047		
Telephone:	011 616 7893	Fax:	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:	Kim Marais		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401		
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications	BSc (Hons) Zoology (University of the Witwatersrand) BSc (Zoology and Conservation) (University of the Witwatersrand)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Member of South African Wetland Forum		



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

I, Christopher Hooton, declare that -

- I act as the **independent specialist (author)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Specialist Signature

I, Faith Mamphoka, declare that -

- I act as the **independent specialist (author)** 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, Kim Marais, 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 June 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 June 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

Kim Marais



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

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 FAITH MAMPHOKA

PERSONAL DETAILS

Position in Company	Junior Field Ecologist & GIS Technician
Joined SAS Environmental Group of Companies	2021

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Wetland Society (SAWS) #123202
Member of the International Society of Wetland Scientists
Member of the Western Cape Wetlands Forum (WCWF)
SACNASP Candidate Natural Scientist (Environmental Science) #129757

EDUCATION

Qualifications

Master's Degree, Geography & Environment Science (UWC)	2018 - 2019
Honours Degree, Geography (UWC)	2017
BSc. Geology and Geography (Wits University)	2012 - 2014

Short Courses

Tools for Wetland Assessment (Rhodes University)	2020
Spatial Data Science (ESRI Online)	2020
Introduction to Spatial Analysis and Geoprocessing (ESRI Online)	2020
SWM2001x: Solid Waste Management (WBGx Online through EdX)	2020
Wetland Delineation (WC Wetlands Forum)	2019
Wetland Health (WC Wetlands Forum)	2019
Introduction to Earth Observation (Stellenbosch University)	2016

KEY DISCIPLINES

- Desktop Freshwater and Terrestrial Ecosystem Delineation
- Wetland Delineation and Assessment
- Wetland hydrogeology
- Spatial analysis and geoprocessing
- Detail mapping and quality control
- WebApp Builder, ESRI Products, Planet GIS, Global Mapper
- AUTOCAD to shapefile conversion, geodatabase management
- Projections and SG Diagrams





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
Environmental legal compliance, Monitoring and Auditing	2021

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 conditions





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **KIM MARAIS**

PERSONAL DETAILS

Position in Company	Senior Scientist Water Resource Manager
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

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

