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**BIODIVERSITY ASSESSMENT AS PART OF THE
ENVIRONMENTAL AUTHORISATION PROCESS FOR THE
PROPOSED KOLOMELA MINE EXPANSION NEAR
POSTMASBURG, NORTHERN CAPE**

Prepared for

EXM Advisory Services (Pty) Ltd.

August 2021

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EXECUTIVE SUMMARY

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the part of the EIA and EA process for the proposed Kolomela Mine Expansion near Postmasburg, Northern Cape Province.

During the field assessment, five broad floral habitat units were identified for the assessment area, namely:

1. **Thornveld Habitat:** This habitat unit was associated with deep, sandy red soils and was characterised by the presence of thorny woody species, particularly *Vachellia* and *Senegalia* species. Different community compositions were supported within the habitat unit and as such, three subunits are recognised:
 - a. **Senegalia-Tarconanthus Thornveld:** consisting largely of open thornveld habitat that was dominated by *Senegalia mellifera* subsp. *detinens* and *Tarconanthus camphoratus*;
 - b. **Senegalia Thornveld:** dominated by *Senegalia mellifera* subsp. *detinens*. Encroachment of *S. mellifera* subsp. *detinens* varied throughout the subunit, with some areas more encroached than others; and
 - c. **Kalahari Thornveld:** this subunit was characterised by an open to semi-dense tree savanna in which *Vachellia erioloba* and *Boscia albitrunca* were present and interspaced by grassy plains.
2. **Calcrete Habitat:** this habitat unit consisted of shallow, gravelly shrublands (in which the grass layer is poorly developed) which were mosaiced by shrubby grassland in which shrubs (particularly *Rhigozum trichotomum*) were present (and sometimes encroaching);
3. **Moisture-driven Habitat:** The Moisture-driven Habitat includes **watercourses** as delineated within the Freshwater Ecological Assessment (SAS 202147, 2021), and includes Cryptic Wetlands and (natural, linear) Linear Drainage Lines. The Moisture-driven Habitat also includes **non-watercourse habitat** which is not considered true watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) (NWA), i.e., Seasonal Depressions and Anthropogenic Drainage Lines. Different community compositions were supported within the habitat unit and as such, three subunits are recognised within the watercourse and non-watercourse habitats:
 - a. **Watercourse Habitat included:**
 - i. Cryptic Wetlands: pans considered to meet the classification as watercourses in the NWA (SAS 219099, 2021) with distinct vegetation communities considered to be key indicators of wetlands in arid regions; and
 - ii. Linear Drainage Line Habitat: this subunit was associated with a thickened woody formation within the drainage lines or immediately adjacent to it;
 - b. **Non-watercourse Habitat:**
 - i. Seasonal Depressions: these consisted of low-lying areas where water will preferentially flow or accumulate during rain events, but the floral communities lack wetland indicator vegetation (e.g., vegetation within the centre of the Seasonal Depressions especially differed from that of the Cryptic Wetlands); and
 - ii. Anthropogenic Drainage Line: these areas have been artificially created and support a range of species that have an affinity for wet conditions, including *Typha capensis*.
4. **Mountain Bushveld:** this habitat unit consisted of a gently sloped hill that was largely underlain by a banded iron stone formation; and
5. **Transformed Habitat:** This habitat unit includes areas where vegetation is significantly degraded or entirely absent because of mining-related activities.

Species diversity and habitat integrity:

The assessment zone is located within two vegetation types, namely the Postmasburg Thornveld (comprising most of the assessment zone) and the Kuruman Mountain Bushveld (comprising a small section in the west of the assessment zone), i.e., the reference vegetation types. Overall, the habitat within the study area ranged from well-vegetated areas to transformed areas in which indigenous vegetation was scarce.

The floral sensitivities were as follows: the Transformed Habitat was of low floral sensitivity, the *Senegalia* Thornveld and the Non-water course habitat (including both the Seasonal Depressions and



the Anthropogenic Drainage Line Habitat) were of moderately low floral sensitivity, the *Tarchonanthus-Senegalia* Thornveld, the Kalahari Thornveld, and the Calcrete Habitat were of intermediate floral sensitivity whereas the Mountain Bushveld habitat and the Water course habitat (including both the Cryptic Wetlands and the Linear Drainage Line Habitat) were of moderately high floral sensitivity.

For the faunal assessment mostly, common wide-ranging species were noted within the assessment areas, yet, the SCC *Hippotragus equinus* (Roan Antelope) and *Ardeotis kori* (Kori Bustard) were observed during the field investigation and several more may occur within the study area. As the study area is arid in nature with reduced primary productivity and floral richness it is inferred that fauna will range throughout the study area to meet their dietary needs and in most cases will not be restricted to particular unit or subunit. The Mountain Bushveld provided the least disturbed habitat and due to the floral composition, provided suitable breeding and foraging habitat for several SCC. Due to the intact nature of the Mountain Bushveld it is considered of moderately high sensitivity. The Moisture driven habitat which includes the subunits (Cryptic wetlands, Linear drainage line habitat, Anthropogenic drainage line and Seasonal depressions) are ephemeral in nature and although they did not host a unique assemblage of fauna are anticipated to provide important water channelling properties. The Moisture driven habitat and subunits provide valuable freshwater habitat intermittently and thus are considered of intermediate sensitivity. The Thornveld Habitat which includes the subunits: *Tarconanthus-Senegalia* Thornveld, *Senegalia* Thornveld and Kalahari Thornveld Habitat, and the Calcrete habitat are considered of intermediate sensitivity as they provide sufficient forage and shelter for the existing fauna but lack unique features and niche habitats. As a result of previous vegetation clearing the Transformed Habitat is considered of low sensitivity.

Conservation significance of the assessment area:

The assessment area is located within the Griqualand West Centre (GWC) of plant endemism. This semi-arid region is broadly described as Savanna, forming part of the Eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby et al. 2015).

According to Mucina and Rutherford (2018 database), the entire assessment area and all assessment areas fall within the Postmasburg Thornveld and the Kuruman Mountain Bushveld (i.e., the reference states). Both the Postmasburg Thornveld and the Kuruman Mountain Bushveld vegetation types are listed as least concern in Mucina and Rutherford (2006), and in the updated 2018 Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a).

The results of the online National Web-Based Environmental Screening Tool (2020) indicate the Terrestrial Sensitivity for the study to be of very high sensitivity. The high sensitivity regions are a result of CBAs, and ESA which were confirmed to be present on site.

The assessment area includes a section of Critical Biodiversity Areas (CBAs) and Ecological Support Area (ESA) which are associated with the Cryptic Wetlands and Linear Drainage Lines that are found within the assessment zone (2016 Northern Cape Critical Biodiversity Areas, NCDENC 2016).

The proposed development will not impact on any threatened ecosystems. The development will, however, impact on CBA1 and ESA habitat (particularly within the central section of the assessment zone). Areas confirmed as having as CBA1 habitat included the Calcrete Habitat, the Kalahari Thornveld, and the Watercourse Habitat (including the Cryptic Wetlands and the Linear Drainage Lines). Areas confirmed as having as ESA habitat included the *Senegalia* Thornveld, the Kalahari Thornveld, the Mountain Bushveld, and the Moisture-driven Habitat (including the Cryptic Wetlands, the Linear Drainage Lines, and the Seasonal Depressions). CBA1 are areas that are considered irreplaceable or near irreplaceable (i.e., high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas. ESAs are areas that must retain their ecological processes to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it is not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017). Due to their ecological importance, it is recommended that impacts to CBA1 and ESAs be avoided as far as possible and kept to approved areas only.

Species of Conservation Concern (SCC):



The National Web-based Environmental Screening Tool for the assessment area indicate that the Animal Species Theme was of high sensitivity whereas the Plant Species Theme was of a low sensitivity.

The assessment zone is associated with several protected floral species including seven provincially protected species (in terms of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA)), namely *Gymnosporia buxifolia*, *Gomphocarpus fruticosus*, *Olea europaea* subsp. *africana*, *Ruschia* cf. *griquensis*, *Nymania capensis*, *Boophone disticha*, and *Gomphocarpus tomentosa*, and three nationally protected tree species (in terms of the National Forest Act, 1998 (Act No. 10 of 1998) (NFA), *Vachellia erioloba*, *Boscia albitruca* and *Vachellia haematoxylon*. Permits from the Northern Cape Department of Environment and Nature Conservation (NCDENC) (for provincially protected species) and authorisation from the Department of Forestry, Fisheries, and the Environment (DFFE) (for nationally protected species) should be obtained to remove, cut, or destroy any of the above-mentioned protected species before any vegetation clearing may take place. A walkdown of the entire construction footprint is recommended during the summer season after the region has received sufficient rainfall and all SCC identified and marked. Where possible, development layouts should be designed to avoid disturbing SCC, particularly NFA protected tree species. SCC that cannot be avoided during the development and mining activities should be rescued and relocated to suitable surrounding habitat within the assessment zone during the development phase. In instances where SCC cannot be avoided (as in the case of *V. erioloba* that does not transplant well), and relocation of such species not feasible, permits from the NCDENC and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

Several SCC potentially utilise the study area on a permanent or temporary bases. These species are: *Orycteropus afer* (Aardvark, Specially Protected by NCNCA), *Otocyon megalotis* (Bat-eared Fox, Specially Protected by NCNCA), *Hippotragus equinus* (Roan Antelope, TOPS), *Poecilogale albinuch* (African Striped Weasel, Specially Protected by NCNCA), *Ictonyx striatus* (Striped Polecat, Specially Protected by NCNCA), *Vulpus chama* (Cape Fox, TOPS), *Neotis ludwigii* (Ludwig's Bustard, EN), *Polemeatus bellicosus* (Martial Eagle, EN), *Aquila rapax* (Tawny Eagle, EN), *Ardeotis kori* (Kori Bustard, NT), *Cursorius rufus* (Burchell's courser, VU), *Gyps africanus* (White-backed Vulture, CR), *Torgos tracheliotos* (Lappet-faced Vulture, EN), *Falco biarmicus* (Lanner Falcon, VU), *Sagittarius serpentarius* (Secretarybird, VU), *Opisththalmus carinatus* (Robust Burrowing Scorpion, Protected by NCNCA), *Opisththalmus wahlbergii* (Kalahari Burrower, Protected by NCNCA), *Opisththalmus pluridens* (Protected by NCNCA), *Opisththalmus ater* (TOPS) and *Harpactira baviana* (Specially Protected by NCNCA) (and potentially species belonging to the genus *Pterinochilus*). Should any of the above listed species burrows or nests be detected a suitably qualified specialist is to be contacted in order to determine the best way forward. In some instances it will be the necessary to obtain permits from the (NCDENC and DFFE if any of these species or nests thereof will be disturbed.

Concluding Remarks:

From a floral resource management perspective, Prior to mitigation measures implemented, the impact significance on the floral habitat and diversity within the assessment zone was deemed to range between **medium-high and very low** for all phases of the proposed mine expansion activities. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the assessment zone can be reduced to **medium-low and very low** significance levels. For the impacts associated with SCC, prior to the implementation of mitigation measures the impact significance was deemed to range between **medium-high and very low** across the assessment zone. With the implementation of mitigation measures, the direct and indirect impacts on the SCC communities for the assessment zone can be reduced to **medium-low and very low** significance levels.

From a faunal ecological perspective, the sensitivity of the habitat units varies from moderately high (Mountain Bushveld) to intermediate within the Thornveld Habitat, Calcrete Habitat and Moisture Driven Habitat and low for the Transformed Habitat. The perceived impacts to the faunal habitat, diversity and SCC during the construction and operational phases are anticipated to be medium-high to medium low for the portions of Mountain Bushveld, Thornveld Habitat, Calcrete Habitat and the Moisture driven Habitat where natural vegetation persists. Impacts to the Transformed Habitat are anticipated to be medium low to low. Should the recommended mitigation measures be undertaken it is possible that all impact scores will decrease in most cases. Due to the scale of the transformation proposed within the



Thornveld habitat and the more sensitive mountain Bushveld, impacts in these units remain medium high in some cases even with mitigation fully implemented.

DRAFT





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Part A: Background Information

Prepared by: Scientific Terrestrial Services CC
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Report reviewers: N. Cloete (Pr.Sci.Nat)
C. Steyn (Pr.Sci.Nat)
Report Reference: STS 210024



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 June 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 June 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.	Part A – C: Cover Page Part A: Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Part A: 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;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
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;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna) <i>*For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 202147, 2021)</i>
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: 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;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
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	Section 5.3.6
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: 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>	Part A: Section 3 (desktop analysis) Part B: Section 3.2, 5.3.3 Part C: Section 3



	<ul style="list-style-type: none"> 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> 	
2.3.7.2	<p>Terrestrial Ecological Support Areas (ESAs), including:</p> <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	<p>Protected areas as defined by the National Environmental Management Protected Areas Act, 2004 including-</p> <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> 	Part A: Section 3 (desktop analysis)
2.3.7.4	<p>Priority areas for protected area expansion, including-</p> <ul style="list-style-type: none"> a) <i>the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;</i> 	Part A: Section 3 (desktop analysis)
2.3.7.5	<p>SWSAs including:</p> <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> 	Not Applicable
2.3.7.6	<p>FEPA sub catchments, including-</p> <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> 	<i>*For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 202148, 2021)</i>
2.3.7.7	<p>Indigenous forests, including:</p> <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.	
	<p>Part B: Results of the Floral Assessment as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities.</p> <p>Part C: Results of the Faunal Assessment as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.</p>	
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;	Part A: Appendix E
3.1.2	A signed statement of independence by the specialist;	Part A: Appendix E
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;	Part B: Section 1.3 (flora) Part C: Section 1.3 (fauna)
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;	Part A: Appendix C Part B: Section 2 (flora) Part B: Appendix A (flora) Part C: Section 2 (fauna) Part C: Appendix A (fauna)
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;	Part B: Section 1.3 (flora) Part C: Section 1.3 (fauna)



3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Part B: Section 4 (flora) Part C: Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 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);	Part B: Section 5 (flora) Part C: Section 5 (fauna)
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	Part A: Executive summary Part B: Section 6 (flora) Part C: Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	Part B: Section 5.4 (flora) Part C: Section 5.4 (fauna)
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), 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); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act;
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 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), 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

AICP	Alien and Invasive Control Plans
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DMS	Dense Media Separation
DSO	Direct Shipping Ore
DWS	Department of Water and Sanitation
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
GWC	Griqualand West Centre
Ha	Hectare
IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature
LoM	Life of Mine
MAMSL	Meters Above Mean Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
MPRDA	Minerals and Petroleum Resources Development Act
NBA	National Biodiversity Assessment
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 Areas Expansion Strategy
PRECIS	Pretoria Computer Information Systems
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SANBI	South African National Biodiversity Institute
SanParks	South African National Parks
SAPAD	South Africa Protected Area Database
STS	Scientific Terrestrial Services CC
SWSA	Strategic Water Source Areas
TOPS	Threatened or Protected species (in terms of NEMBA)
VEGMAP	The National Vegetation Map Project
VU	Vulnerable
WRD	Waste Rock Dump
WSA	Water Source Area



1 INTRODUCTION

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Authorisation (EA) proposed expansion activities at the Kolomela Mine, near Postmasburg, Northern Cape Province, henceforth referred to as the “assessment area.

The Sishen Iron Ore Company (Pty) Ltd, part of Kumba Iron Ore Limited (hereafter Kumba), owns and operates Kolomela Mine located approximately 8 km south west of Postmasburg in the Tsantsabane Local Municipality, Northern Cape Province. The Kolomela Mine is located within the Tsantsabane Local Municipality which is an administrative area in the Siyanda District Municipality of the Northern Cape. The extent of the Kolomela Mine Expansion is located in Figures 1 and 2.

The Minister of Mineral Resources granted a mining right for the mining of iron ore at Kolomela Mine on 5 May 2008, (Ref: (NC) 069 MR) and is valid until 17 September 2038, unless cancelled or suspended.

Kolomela Mine operates as a conventional open cast mine where ore is extracted by means of drilling, blasting, loading and hauling. Ore extracted from the pits is transported to a direct shipping ore (DSO) plant which involves the crushing and screening of recovered ore material into stockpiles of ‘lump’ and ‘fines’. The processed iron ore is loaded onto an internal railway line which is connected to a direct rail link to Transnet’s Sishen-Saldanha railway line from where the iron ore is transported to the Port of Saldanha for export. Kolomela Mine also utilises a Modular Dense Media Separation (DMS) Processing Plant for the processing of low grade ore not suitable for processing at the DSO plant. Kolomela produced 10.8 million tonnes during its first full year of production in 2013 and currently produces 13-14 million tonnes per annum (Mtpa) facilitated by enhanced stripping techniques and processing of 1-3 Mtpa of lower grade of ore at the Tierbult DMS Modular Plant.

Iron ore is currently extracted from three opencast pits, namely Klipbankfontein, Leeuwfontein and Kapstevél North. Kolomela is in the process of developing the Kapstevél South Pit which is required to sustain the mining production at approximately 14 Mtpa (Mtpa) until 2031. The current the Life of Mine (LoM) including the Kapstevél South Pit currently stands at 2032, but with the potential to be extended in future with the development of the Ploegfontein, Tierbult and Heuningkranz ore bodies, the mining of which are already authorised.

Kolomela proposes to expand and amend some of the existing activities and also develop new infrastructure to support continued and future production at the mine. This includes:

- Amendment of the Kapstevél South Pit footprint area.



- Amendment of the Kapsteval Waste Rock Dumps and haul roads.
- Amendment of Kapsteval Evaporation Ponds and stormwater management infrastructure.
- Additional park-up, laydown and ore stockpile areas.
- Development of new DMS tailings management infrastructure
- A new Photovoltaic Solar Facility.
- A new Waste Tyre Management Facility.
- A conveyor and railway line to transfer material to and from the DMS plant.
- Amendment to the future Kapsteval DMS conveyor footprint to facilitate widened haul roads.
- Amendment of Kapsteval Waste Rock Dumps and Additional Waste Rock Dumps.
- Additional Low Grade Ore Storage Areas.
- New radio masts.
- Provision for an area of relaxation and safety berms around pits.

The existing and planned infrastructure at Kolomela mine are shown in (Figure 3).

Authorisation is thus being sought from the Department of Mineral Resources & Energy (DMRE) for activities listed under the National Environmental Management Act (No. 107 of 1998) and the National Environmental Management: Waste Act (No. 59 of 2008) as well as amendment of the environmental management programme in terms of Section 102 of the Minerals & Petroleum Resources Development Act (No. 28 of 2002).

The purpose of this report (Part A) is to define the biodiversity of the assessment area from a desktop conservation database perspective. It is the objective of this desktop assessment to provide detailed information to guide the fieldwork components (discussed in Parts B and C) to ensure that all relevant ecological aspects are considered prior to performing the field assessments. This report is not a standalone report and should be considered together with the outcome of the biodiversity assessments (Part B and C).



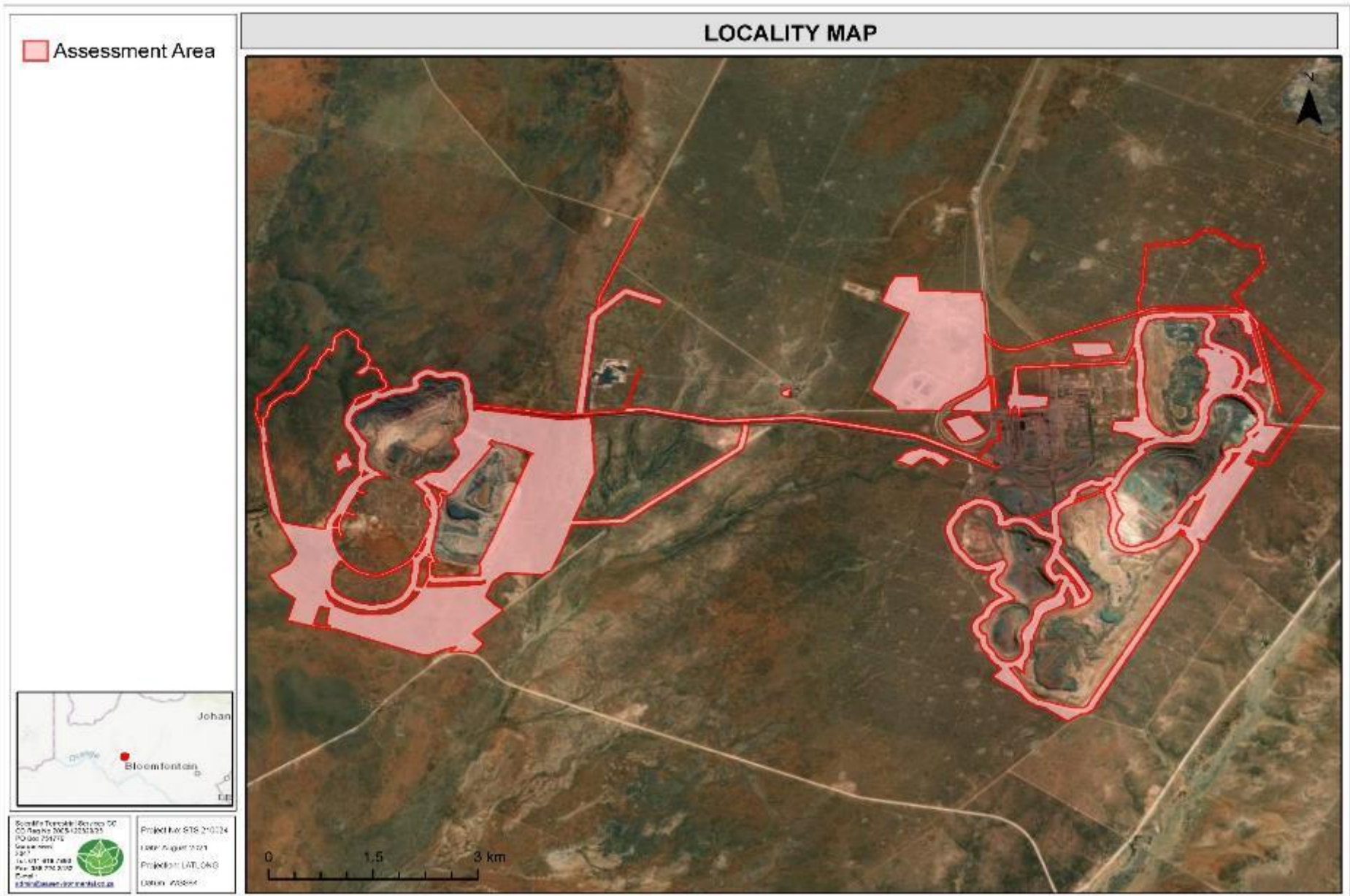


Figure 1: Digital satellite image depicting the assessment area in relation to surrounding areas.



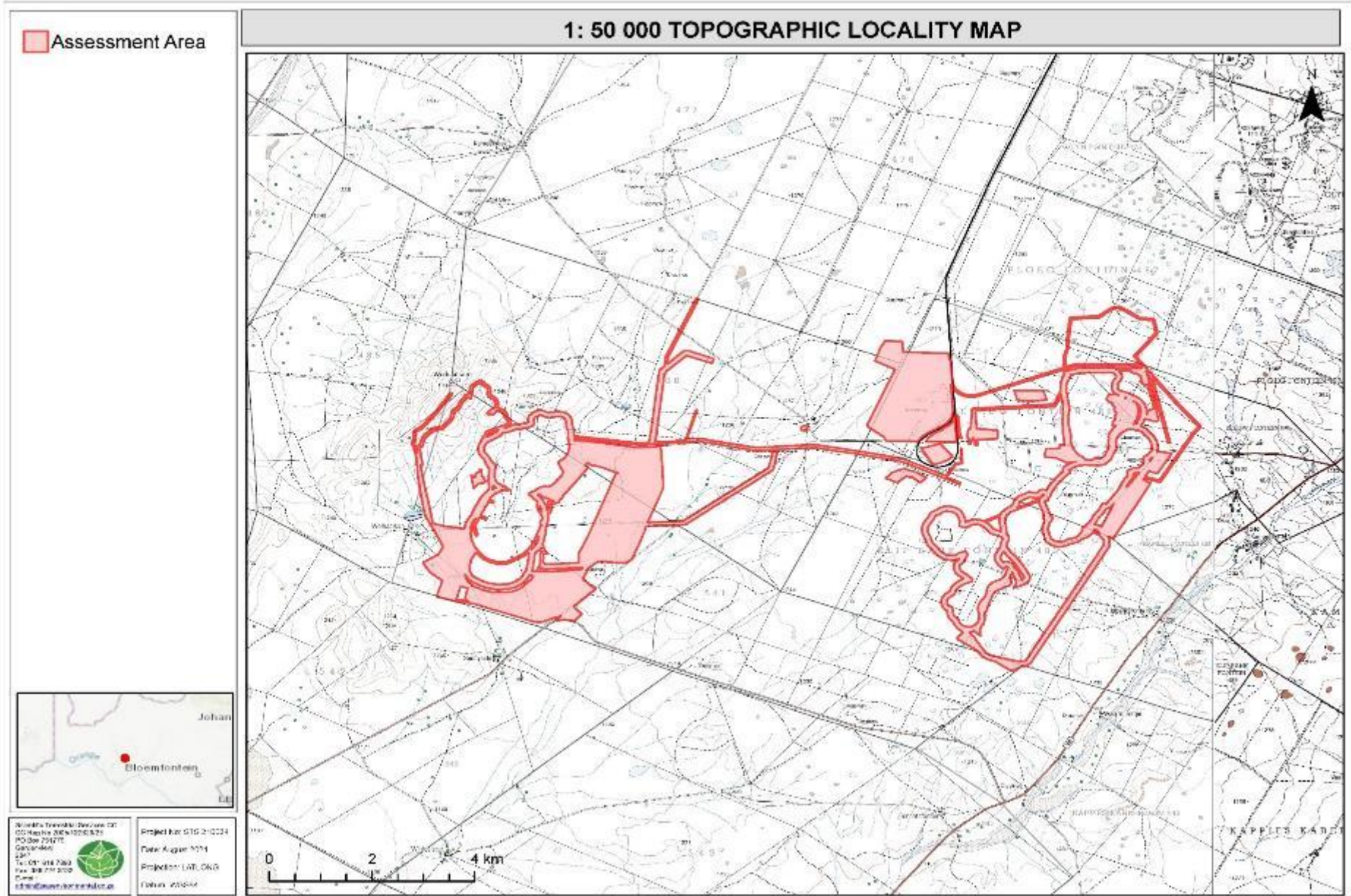


Figure 2: The assessment area depicted on a 1:50 000 topographical map in relation to the surrounding area.



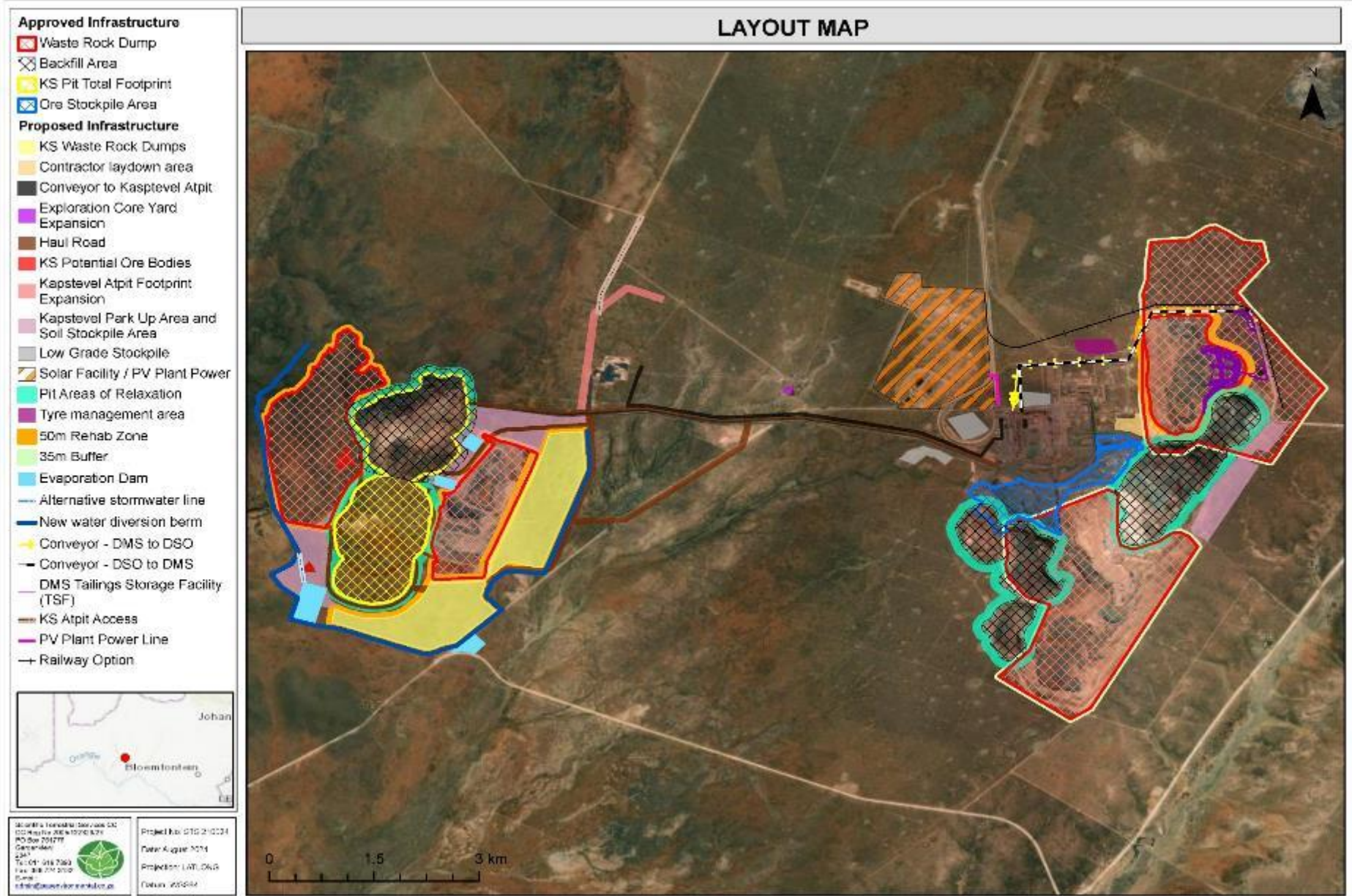


Figure 3: Conceptual illustration of the assessment area and the proposed infrastructure development layout in relation to the surrounding areas.



1.1 Scope of Work

Specific outcomes in terms of Part A of the report are as follows:

- Compile a desktop assessment with all relevant information as presented by 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 assessment area;
- 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 E);
- To outline the legislative requirements that were considered for the assessment (Appendix B of this report); and
- To provide the methodologies followed relating to the impact assessment and development of the mitigation measures (Appendix C) that was applied in the floral and faunal assessments (Part B and Part C).

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The biodiversity desktop assessment is confined to the assessment area and does not include detailed results of the adjacent properties, although the sensitivity of surrounding areas has been included on the relevant maps;
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics within the assessment area at the scale required to inform an environmental process. However, this information is useful as background information to the study and, based on the desktop results; sufficient decision making can take place with regards to the proposed development; and
- The field assessment was undertaken during mid-winter (28 June to 2 July 2021). The field assessment aimed to determine the ecological status of the assessment area and to “ground-truth” the results of the desktop assessment (as presented in Parts B and C).



1.3 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996¹;
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- 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 August 2021;
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- 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 National Forest Act, 1998 (Act No. 84 of 1998); 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

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. Relevant databases and

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



documentation that were considered during the desktop assessment of the assessment area included ²:

- 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 1 (SACAD, 2021);
- The South African Protected Areas Database, Quarter 1 (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 2006–2018; 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 Web-Based Environmental Screening Tool (accessed 2021);
- The 2013 Mining and Biodiversity Guidelines⁵ with a 2012 spatial dataset used for mapping (SANBI, 2012); and
- From the 2017 Strategic Water Source Areas (SWSA) project:

² Datasets obtained from:

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



- 2017 SWSA Surface water (Water Research Commission, 2017).

The field assessment took place from 28 June to 2 July 2021 to determine the ecological status of the assessment area and to “ground-truth” the results of the desktop assessment. Results of the field assessment is presented in Parts B and C.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Assessment area based on National and Provincial Datasets

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

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Table 1: Summary of the biodiversity characteristics associated with the assessment area [Quarter Degree Square (QDS) 2822BB)].

DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE ASSESSMENT AREA ACCORDING TO THE 2018 FINAL VEGETATION MAP OF SOUTH AFRICA, LESOTHO AND SWAZILAND (SANBI 2006–2018 & SANBI, 2018A)(FIGURE 4)		
Biome	The assessment area is situated within the Savanna Biome .	
Bioregion	The assessment area occurs within the Eastern Kalahari Bushveld Bioregion .	
Vegetation type (Figure 4)	Postmasburg Thornveld (Svk 14) (95% of the assessment area)	Kuruman Mountain Bushveld (Svk 10) (5% of assessment area)
Altitude (m)	1 180 –1 440 m	1 100 –1 800
Climate	Summer and autumn rainfall with very dry winters.	
Climate	MAP (mm)	306
	MAT (°C)	17.0
	MFD (Days)	38
	MAPE (mm)	2752
	MASMS (%)	84
Distribution	Northern Cape Province	Northern Cape and North-West Provinces
Geology & soils	Red aeolian sand of the Kalahari Group overlying the volcanics and sediments of the Griqualand West Supergroup that outcrop in places. Deep soils are of the Hutton form	The Kuruman and Asbestos Hills consist banded iron formation, with jaspilite, chert and riebeckite-asbestos of the Asbestos Hills Subgroup of the Griqualand West Supergroup (Vaalian).
Conservation	Least threatened. Target 16%. None of the unit is conserved in statutory conservation areas, but very little has been transformed	Least threatened. Target 16%. None conserved in statutory conservation areas. Very little transformed.
Vegetation & landscape features (dominant floral taxa in appendix D)	Flats surrounded by mountains supporting open, shrubby thornveld characterised by a dense shrub layer, often lacking a tree layer. The grass layer is very sparse. Shrubs generally low with a karroid affinity	Rolling hills with generally gentle to moderate slopes and hill pediment areas with an open shrubveld with <i>Calobota cuspidosa</i> formerly (<i>Lebeckia macrantha</i>) prominent in places. Grass layer is well developed
CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)		NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (2020)
NBA (2018):	The assessment area is located within the Postmasburg Thornveld and the Kuruman Mountain Bushveld , both of which are considered Least Concern ecosystems and are currently Poorly Protected (Figure 4) .	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
	1) Ecosystem Threat Status 2) Ecosystem Protection Level	The northern and a small south western portion of the new water diversion berm, the northern portion of the rehabilitation zone of the KS South WRD Approved EG Dump and a small southern portion of the western evaporation dam occur in the Kuruman Mountain Bushveld. The majority of the access and haul, the entire Kapsteveld Atpit Footprint Expansion Area, the majority of the conveyors, large portions of the stockpile areas, small portions of the Solar Facility, the entire PV Plant power line, large portions of the rehabilitation zones and areas of relaxation, and the majority of the railway line occur in the Postmasburg Thornveld. The remaining footprint areas largely occur in already mined or transformed sites.
		Animal species theme (Figure 5)
	Plant species theme	For the plant species theme, the assessment area is considered to have a low sensitivity , indicating that there is a low possibility of observing any floral SCC.



	i. 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 ³ and protection level ⁴ .	Terrestrial biodiversity theme	For the Terrestrial Biodiversity Theme, the assessment area is considered to have a very high sensitivity . The triggered sensitivity features include a Category 1 Critical Biodiversity Area (CBA), an Ecological Support Areas (ESA), and a Freshwater Ecosystem Priority Area.
National Threatened Ecosystems⁵ (2011)	The assessment area is located within an ecosystem that is currently considered to be Least Concern . Least Concern ecosystems have not experienced a significant loss of natural habitat or deterioration in condition.	STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)	
IBA (2015)	The assessment area is not located within or near an IBA (within 10 km).	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.	
SAPAD (2021, Q1); SACAD (2021, Q1); NPAES (2009).	According to the South African Protected Areas Database (SAPAD, 2021) ⁶ , the South African Conservation Areas Database (SACAD, 2021) ⁷ and the National Protected Areas Expansion Strategy (NPAES, 2009), no protected areas or conservation areas are indicated within 10 km of the assessment area.	Name & Criteria	The assessment area is not within 10 km of a Surface Water SWSAs.

³ 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 (Figure 3). 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.

⁴ 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 57 of 2003).

⁵ 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.

⁶ **SAPAD (2020)**: The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

⁷ **SACAD (2020)**: 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.



NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) (FIGURE 6)		NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019)
CRITICAL BIODIVERSITY AREA (CBA): CATEGORY 1	<p>The middle section of the assessment area (portions of the haul roads, conveyors, the Solar Facility, general surface infrastructure, the new water diversion berm, the rehabilitation zone of the KS South WRD and an evaporation dam) fall within an area identified as a Category 1 CBA, which seems to be a buffer associated with a watercourse.</p> <p>Critical Biodiversity Area (CBA) 1 areas are areas that are considered Irreplaceable or near-irreplaceable (i.e. high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas.</p>	<p>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.</p> <p>The assessment area is located within the Griqualand West Centre (GWC) of plant endemism (Figure 7). This semi-arid region is broadly described as savanna, forming part of the eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby <i>et al.</i> 2019). The assessment area also falls within the Gamagara Corridor (Figure 8). The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda Districts and runs from lime acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.</p>
ECOLOGICAL SUPPORT AREA (ESA)	<p>Small western portions of the assessment area falls within areas identified as ESAs.</p> <p>According to the Technical Guidelines for CBA Maps document ESAs are areas that must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it's not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017).</p>	MINING AND BIODIVERSITY GUIDELINES (2012)
OTHER NATURAL AREAS (ONA)	<p>The majority of the assessment area falls within an area that is identified as ONAs.</p> <p>According to the Technical Guidelines for CBA Maps document, ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017).</p>	<p>Risk for mining: Highest risk for mining.</p> <p>Implications for mining: Environmental screening, EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide a site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision making for mining, water use licences, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services.</p>
CBA REASONS	<p>The Northern Cape Critical Biodiversity Areas (2016) database also includes the "reasons" layer, which is based on the planning units used in the spatial analysis and provides a list of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target (CBA Map Reason Metadata).</p> <p>According to this Northern Cape Critical Biodiversity Areas Reasons layer, the triggering biodiversity and ecological features for the CBA and ESAs within the Assessment area include the below: All natural wetlands; Freshwater Ecosystem Priority Area (FEPA) catchment; Conservation Areas; Landscape structural elements; Postmasburg Thornveld; Kuruman Mountain Bushveld</p>	

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



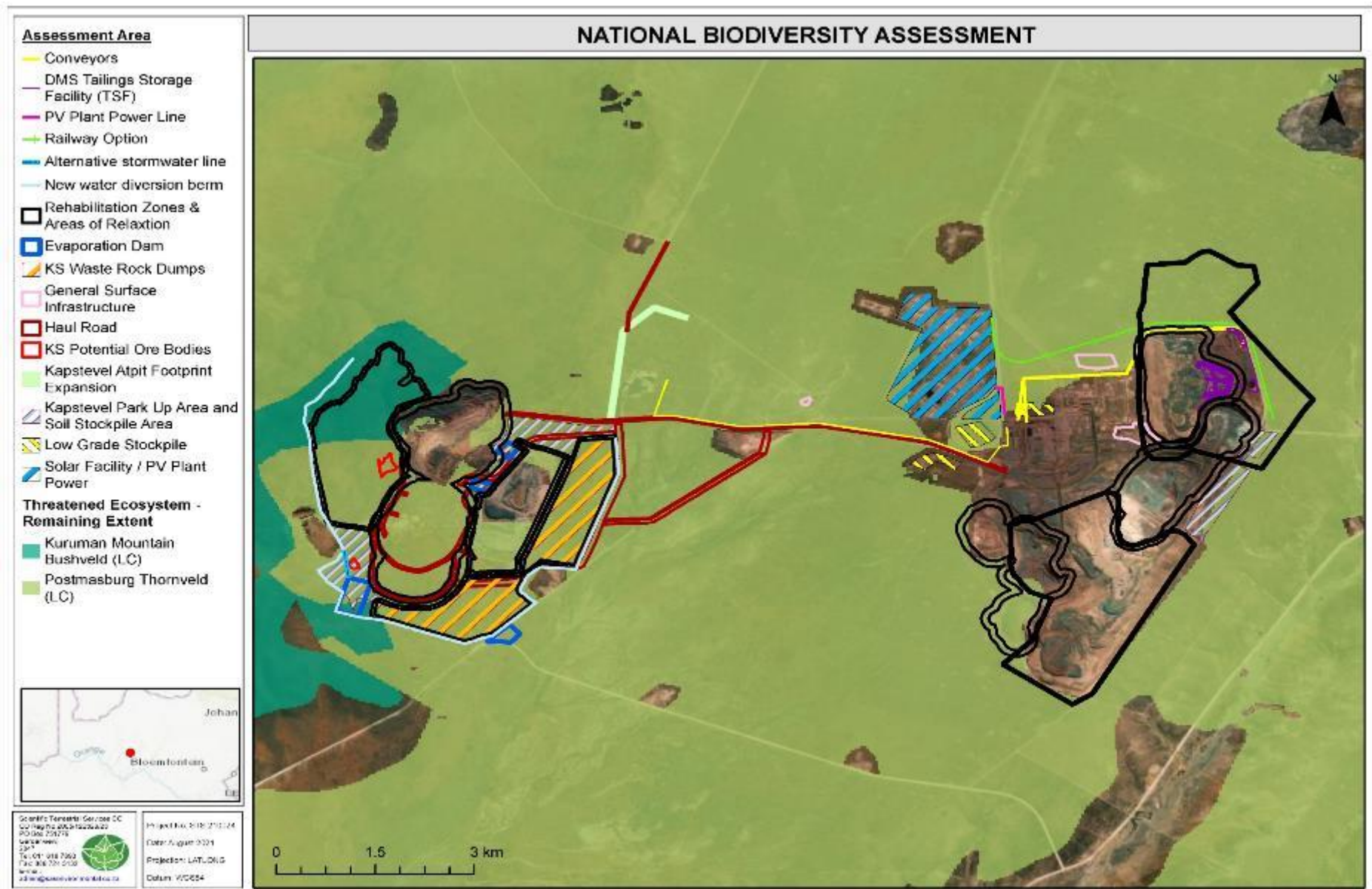


Figure 4: The assessment area located within the remaining extent of the least concern Postmasburg Thronveld and Kuruman Mountain Bushveld, according to the National Biodiversity Assessment (NBA, 2018).



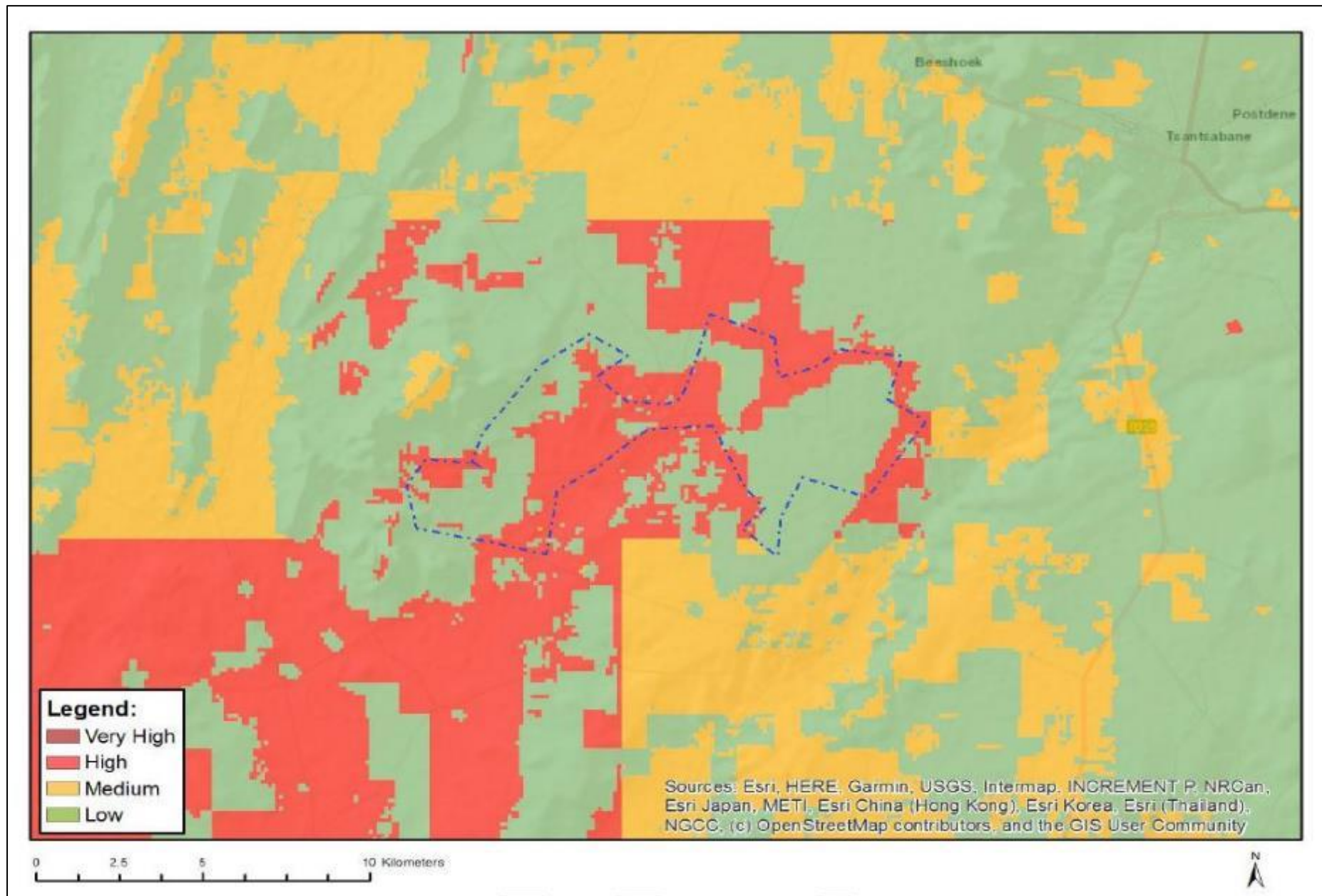


Figure 5: Sensitivity of the Animal Species Theme for the assessment area, according to the National Web-based Screening Tool (2021).



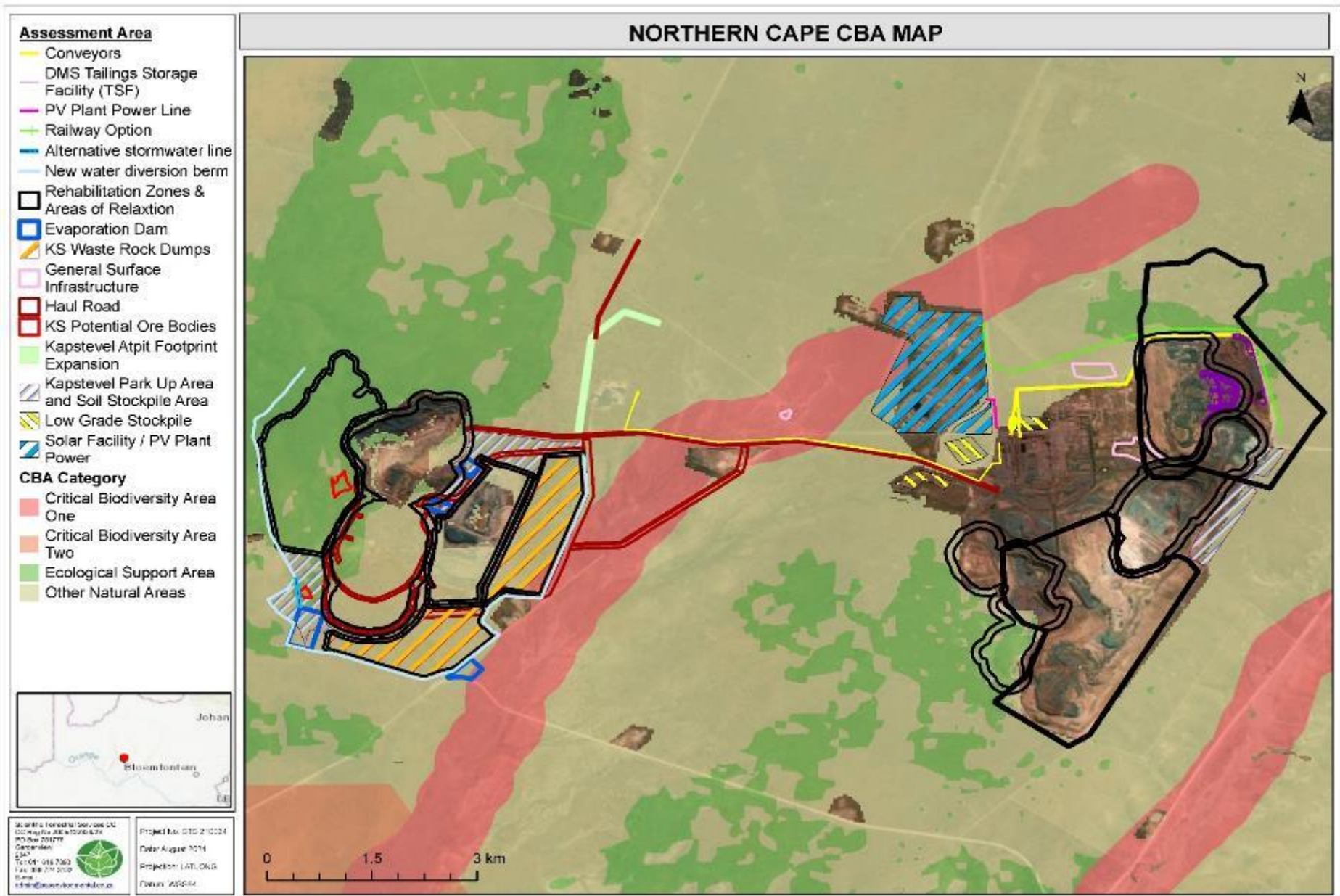


Figure 6: Important biodiversity features relating to the assessment area according to the Northern Cape CBA Map (2016).



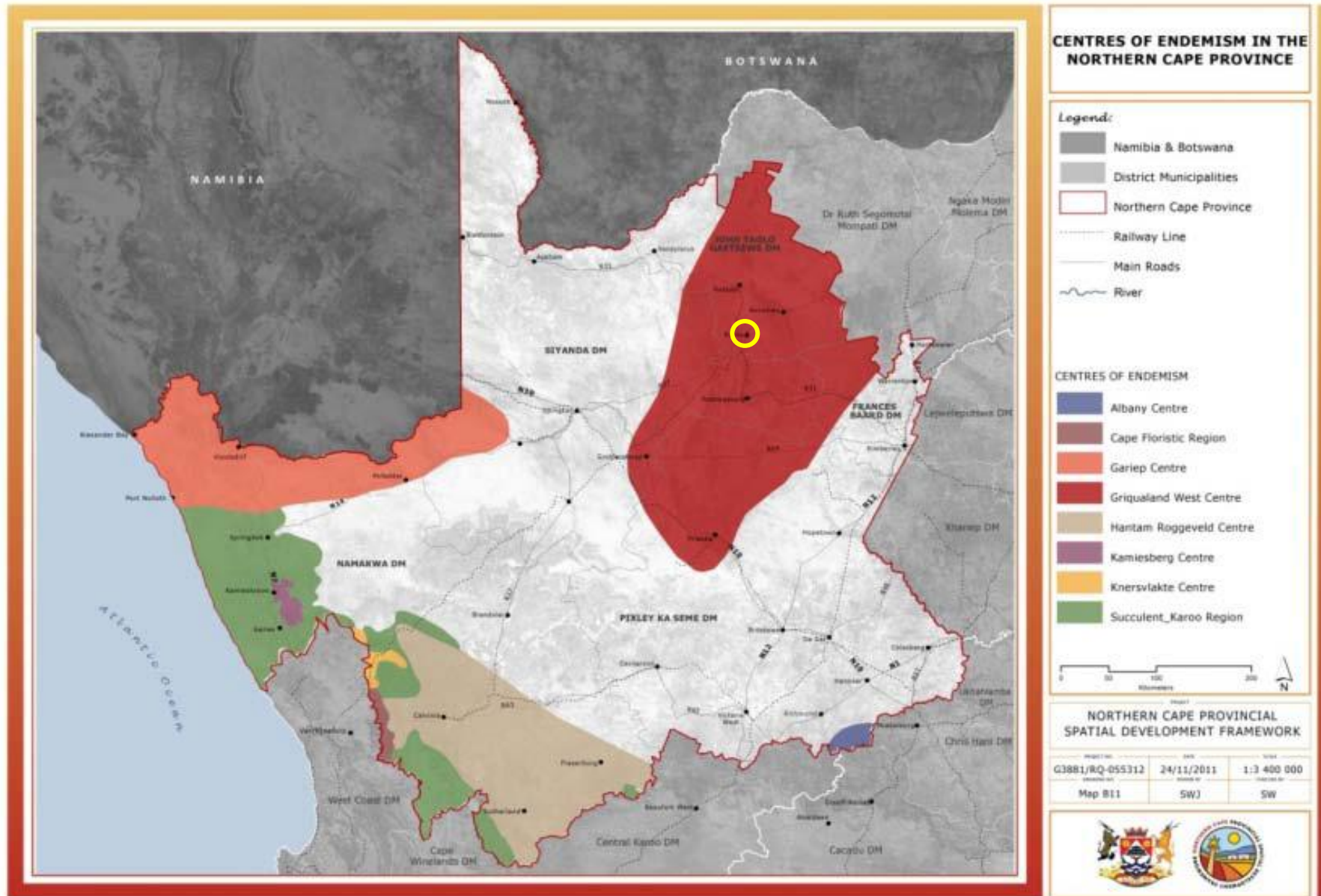


Figure 7: Centres of endemism of the Northern Cape Province: the assessment area indicated by the yellow circle (NPSDF, 2012).



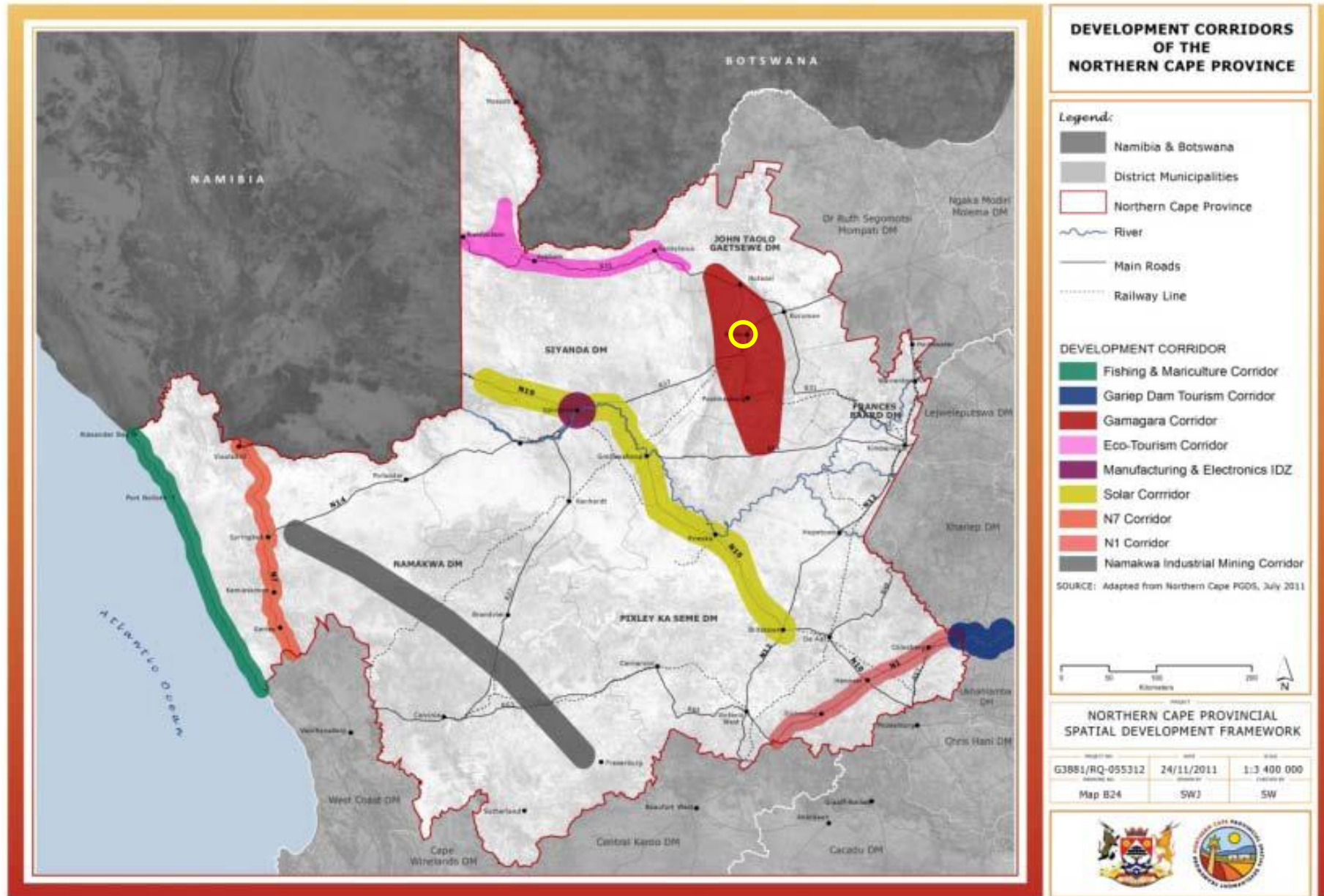


Figure 8: Development corridors of the Northern Cape Province: the assessment area is indicated by the yellow circle (NPSDF, 2012).



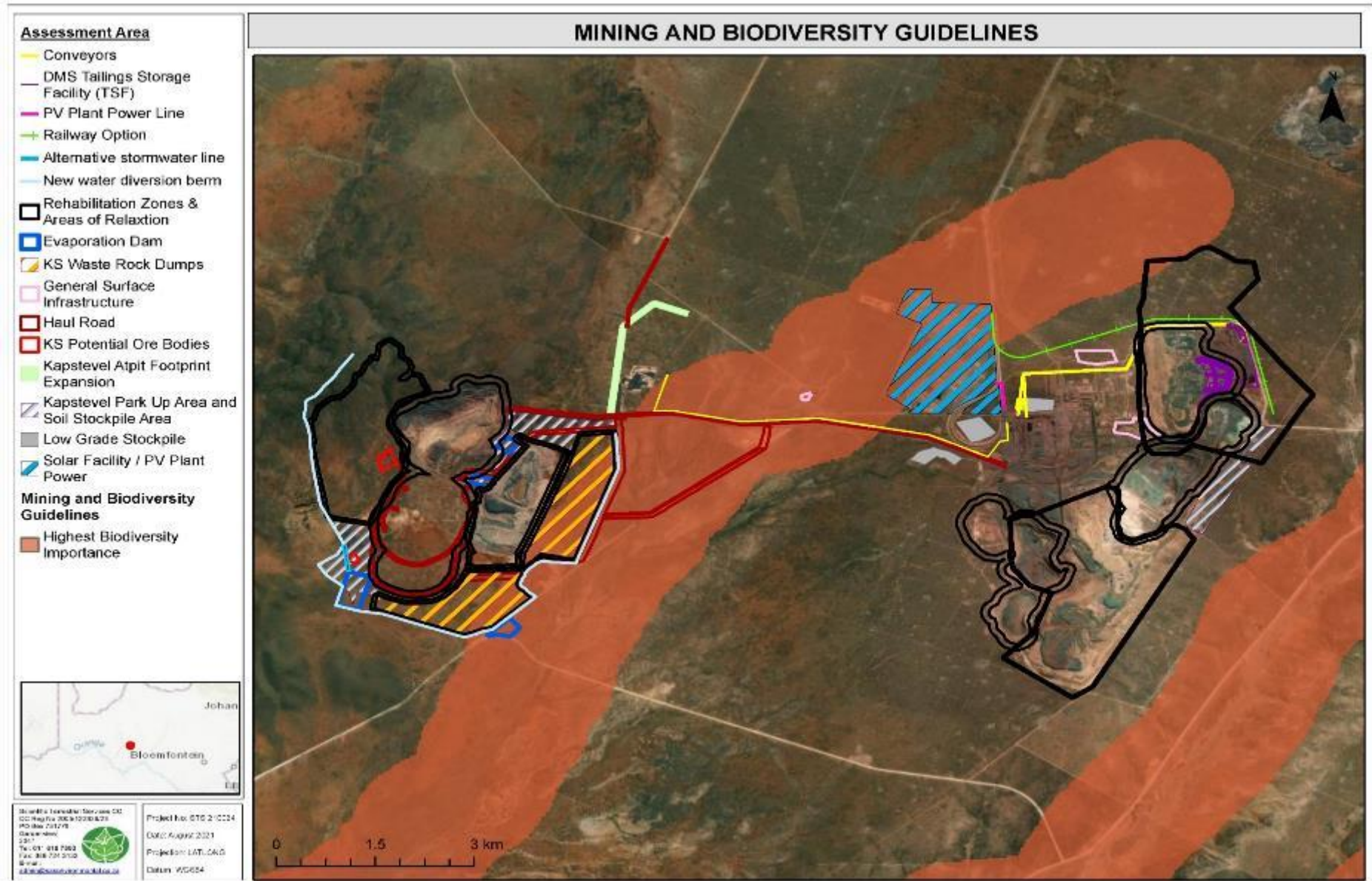


Figure 9: The highest biodiversity importance areas associated with the assessment and investigation areas, according to the Mining and Biodiversity Guidelines (2013).



4 STRUCTURE OF THE BIODIVERSITY REPORT

Part A of this report served to introduce the assessment area, as well as the general approach to the study. Part A also presents the results of general desktop information reviewed as part of the study including the information generated by the relevant authorities as well as the context of the site in relation to the surrounding anthropogenic activities and ecological character.

Part B presents the results of the floral field assessment, data analyses and discussion of the results. Part B then presents the results of the impact assessment where the impacts on floral ecology and biodiversity are discussed.

Part C presents the results of the faunal field assessment, data analyses and discussion of the results. Part C then presents the results of the impact assessment where the impacts on faunal ecology and biodiversity are discussed.

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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 STS 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 June become available from ongoing research or further work in this field or pertaining to this investigation.

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APPENDIX B: Legislative Requirements

The Constitution of the Republic of South Africa, 1996

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

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

The National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed and environmental authorisation obtained. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the anticipated impacts

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

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

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

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

Furthermore, a person June 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. This act in terms of alien and invasive species aims to:

- Prevent the unauthorised 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 June harm such ecosystems or habitats.

Alien species are defined, in terms of the NEMBA 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 June be grown in demarcated areas, if there is a permit and that steps are taken to prevent their spread; and
- **Category 3:** Ornamentally used plants that June no longer be planted.

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

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

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: Impact Assessment Methodology

Ecological Impact Assessment Method

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the applicant to understand the process and rationale upon which risks/impacts have been assessed. The method 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'⁸. The interaction of an aspect with the environment June 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 be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table B1. 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 the level of mitigation that June be necessary⁹.

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

⁸ The definition has been aligned with that used in the ISO 14001 Standard.

⁹ Some risks/impacts that have low significance will however still require mitigation.



The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 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, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table C1: Criteria for assessing significance of impacts
LIKELIHOOD DESCRIPTORS

Probability of impact	RATING
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	RATING
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5
CONSEQUENCE DESCRIPTORS	
Severity of impact	RATING
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	RATING
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	RATING
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



Table C2: 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 C3: Positive/Negative Mitigation Ratings.

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

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
 - Primary project site and related facilities that the proponent and their 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 June occur later or at a different location.
- Risks/Impacts were assessed for all stages of the project cycle including:
 - Pre-construction;
 - Construction;
 - Operation;
 - Closure and decommissioning.
- If applicable, transboundary or global effects were assessed.
- Individuals or groups who June 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

According to the DEA *et al.*, (2013) “Rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect people and other life forms from natural disaster and provide people with a rich heritage of nature-based cultural traditions. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding which is attenuated by wetlands”.

According to the DEA *et al.*, (2013) Ecosystem services can be divided into 4 main categories:

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water;
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment;
- Regulating services are the benefits obtained from an ecosystem’s control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards; and
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

Loss of biodiversity puts aspects of the economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa’s Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) (hereafter referred to as the Biodiversity Act) and is fundamental to the notion of sustainable development. In addition, International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa (DEA *et al.*, 2013).

The primary environmental objective of the Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that “any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations”.

Pressures on biodiversity are numerous and increasing. According to the DEA *et al.*, (2013) Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world. The most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including¹⁰:

- Cultivation and grazing activities;
- Rural and urban development;
- Industrial and mining activities, and
- Infrastructure development.

Impacts on biodiversity can largely take place in four ways (DEA *et al.*, 2013):

¹⁰ Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.



- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;
- **Indirect impacts:** are impacts associated with a project that June occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated (DEA *et al.*, 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
 - **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
 - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
 - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended post closure land use; and



- **Species reinstatement** which focuses on the re-introduction of any ecologically important species which June be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.
- **Offset impact:** refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative June be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.¹¹

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed project.

- Mitigation and performance improvement measures and actions that address the risks and impacts¹² 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 where possible.
- 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 wherever possible.

Recommendations

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

¹¹ Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

¹² Mitigation measures should address both positive and negative impacts



APPENDIX D: Vegetation Types

SVk 14 Postmasburg Thornveld

Dominant and typical floristic species of Postmasburg Thornveld (Mucina & Rutherford, 2012). The table contains the important taxa associated with the vegetation type.

Woody Layer	
Tall Tree	<i>Vachellia erioloba</i> (d).
Small Trees	<i>Vachellia karroo</i> (d), <i>Vachellia tortilis</i> subsp. <i>heteracantha</i> (d), <i>Searsia lancea</i> (d), <i>Ziziphus mucronata</i> (d).
Tall Shrubs	<i>Searsia tridactyla</i> (d), <i>Diospyros lycioides</i> subsp. <i>lycioides</i> , <i>Ehretia rigida</i> subsp. <i>rigida</i> , <i>Grewia flava</i> , <i>Tarchonanthus camphoratus</i> .
Low Shrubs	<i>Vachellia hebeclada</i> subsp. <i>hebeclada</i> (d), <i>Felicia muricata</i> , <i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i> , <i>Lantana rugosa</i> , <i>Melolobium microphyllum</i> , <i>Chaenostoma halimifolia</i> (formerly <i>Sutera halimifolia</i>).
Succulent Shrubs	<i>Kalanchoe rotundifolia</i> , <i>Lycium cinereum</i>
Forb layer	
Herbs	<i>Dicoma anomala</i> , <i>Geigeria filifolia</i> , <i>Geigeria ornativa</i> , <i>Hibiscus pusillus</i> , <i>Jamesbrittenia aurantiaca</i> , <i>Selago densiflora</i> , <i>Osteospermum scariosum</i> (formerly <i>Tripteris aghillana</i>)
Geophytic Herb	<i>Boophone disticha</i>
Grass layer	
Graminoids	<i>Digitaria eriantha</i> subsp. <i>eriantha</i> (d), <i>Enneapogon scoparius</i> (d), <i>Eragrostis lehmanniana</i> (d), <i>Aristida adscensionis</i> , <i>Aristida congesta</i> , <i>Aristida diffusa</i> , <i>Eragrostis superba</i> , <i>Heteropogon contortus</i> , <i>Melinis repens</i> , <i>Schmidtia pappophoroides</i> , <i>Stipagrostis uniplumis</i>
Biogeographically Important Taxon (Griqualand West endemics)	
Succulent Shrub	<i>Euphorbia bergii</i> .
Graminoid	<i>Digitaria polyphylla</i>

(d) = dominant species

(The genus for all *Senegalia* and *Vachellia* spp. were formerly *Acacia*, and the genus for all *Searsia* spp was formerly *Rhus*)

Additional Remarks: In contrast to eastern parts of the unit, *Tarchonanthus camphoratus* is conspicuously absent in the western parts.

SVk 10 Kuruman Mountain Bushveld



Figure D2: Kuruman Mountain Bushveld: Open low bushveld with the usually leafless *Lebeckia macrantha* clearly visible at an altitude of approximately 1680 m near Bretby between Danielskuil and Kuruman. Image source: Mucina and Rutherford (2006) Figure 9.80, page 521.



Dominant and typical floristic species of Kuruman Mountain Bushveld (Mucina & Rutherford, 2012). The table contains the important taxa associated with the vegetation type.

Woody Layer	
Small Trees	<i>Searsia lancea</i>
Tall Shrubs	<i>Diospyros austro-africana</i> , <i>Euclea crispa</i> subsp. <i>crispa</i> , <i>Euclea undulata</i> , <i>Olea europaea</i> subsp. <i>africana</i> , <i>Searsia pyroides</i> var. <i>pyroides</i> , <i>Searsia tridactyla</i> , <i>Tarchonanthus camphoratus</i> , <i>Tephrosia longipes</i>
Low Shrubs	<i>Searsia ciliata</i> (d), <i>Amphiglossa triflora</i> , <i>Anthospermum rigidum</i> subsp. <i>pumilum</i> , <i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i> , <i>Helichrysum zeyheri</i> , <i>Lantana rugosa</i> , <i>Wahlenbergia nodosa</i>
Succulent Shrubs	<i>Ebracteola wilmaniae</i> , <i>Hertia pallens</i>
Herbaceous Climber	<i>Rhynchosia totta</i>
Forb layer	
Herbs	<i>Dicoma anomala</i> , <i>Dicoma schinzii</i> , <i>Geigeria ornativa</i> , <i>Helichrysum cerastioides</i> , <i>Heliotropium strigosum</i> , <i>Hibiscus marlothianus</i> , <i>Kohautia cynanchica</i> , <i>Kyphocarpa angustifolia</i> .
Geophytic Herb	<i>Boophone disticha</i> , <i>Pellaea calomelanos</i> .
Grass layer	
Graminoids	<i>Andropogon chinensis</i> (d), <i>Andropogon schirensis</i> (d), <i>Anthehora pubescens</i> (d), <i>Aristida congesta</i> (d), <i>Digitaria eriantha</i> subsp. <i>eriantha</i> (d), <i>Themeda triandra</i> (d), <i>Triraphis andropogonoides</i> (d), <i>Aristida diffusa</i> , <i>Brachiaria nigropedata</i> , <i>Bulbostylis burchellii</i> , <i>Cymbopogon caesius</i> , <i>Diheteropogon amplexans</i> , <i>Elionurus muticus</i> , <i>Eragrostis chloromelas</i> , <i>Eragrostis nindensis</i> , <i>Eustachys paspaloides</i> , <i>Heteropogon contortus</i> , <i>Melinis repens</i> , <i>Schizachyrium sanguineum</i> , <i>Trichoneura grandiglumis</i> .
Biogeographically Important Taxon (Griqualand West endemics)	
Tall Shrub	<i>Calobota cuspidosa</i> (formerly <i>Lebeckia macrantha</i>) (d).
Low Shrubs	<i>Justicia puberula</i> , <i>Tarchonanthus obovatus</i>
Succulent Shrub	<i>Euphorbia wilmaniae</i>
Graminoid	<i>Digitaria polyphylla</i>
Herb	<i>Sutera griquensis</i>
Endemic Taxa	
Succulent Shrub	<i>Euphorbia planiceps</i>

(d) = dominant species

(The genus for all *Searsia* spp was formerly *Rhus*)

Additional Remarks: Many species in this unit are widely distributed to the northeast of the subcontinent and reach their southwestern limit in this unit (e.g. *Andropogon schirensis*). There are distinct floristic differences with the relatively nearby and parallel mountains of the SVk 15 Koranna-Langeberg Mountain Bushveld. For example, *Croton gratissimus* is common in the last mentioned unit but rare in Kuruman Mountain Bushveld. *Calobota cuspidosa* (formerly *Lebeckia macrantha*) shows just the reverse distributional pattern between these units. A very low form (<0.5 m) of *Vachellia hebeclada* is common in the north on Makhubung hill, north of Heuningvlei.



APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

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

Samantha-Leigh Daniels	PhD Candidate Plant Science (University of Pretoria)
Daryl van der Merwe	MSc Conservation Biology (University of Cape Town)
Christien Steyn	MSc. Plant Science (University of Pretoria)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Sanja Erwee	BSc Zoology (University of Pretoria)

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:	Christien Steyn		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047		
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	christien@sasenvgroup.co.za		
Qualifications	MSc (Plant Science) (University of Pretoria) BSc (Hons) Plant Science (Invasion Biology) (University of Pretoria) BSc Environmental Science (University of Pretoria)		
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 Botanical Society of South Africa (BotSoc)		

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)		

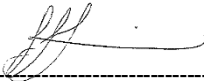


Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Kim Marais		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047		
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications	BSc (Hons) Zoology (University of the Witwatersrand) BSc (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 June be specified by the competent authority

I, Samantha-Leigh Daniels, declare that -

- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that 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



Signature of the Specialist

I, Daryl van der Merwe, declare that -

- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that 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



Signature of the Specialist

I, Christien Steyn, 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



Signature of the Specialist

I, Christopher Hooton, declare that -

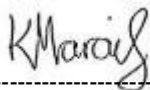
- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that June compromise 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.



Specialist Signature

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



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 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



Signature of the Specialist

I, Sanja Erwee, declare that -

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



Signature of the Specialist





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

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Association of Botanists (SAAB)
 Member of the Botanical Society of South Africa (BotSoc)
 Member of the *Association for Tropical Biology and Conservation (ATBC)*

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, North West

KEY SPECIALIST DISCIPLINES

Biodiversity Assessment

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Alien and Invasive Control Plan (AICP)
- Terrestrial Monitoring
- Desktop Studies, Mapping and Background Information Research

Training

- Plant species identification
- Herbarium usage and protocols





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

CURRICULUM VITAE OF DARYL VAN DER MERWE

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Legislative Requirements, Processes and Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTIEN STEYN

PERSONAL DETAILS

Position in Company	Floral Ecologist
Joined SAS Environmental Group of Companies	2018

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Council for Natural Scientific Professions (SACNASP)
 Member of the South African Association of Botanists (SAAB)
 Member of the Botanical Society of South Africa (BotSoc)

EDUCATION

Qualifications

MSc (Plant Science) (University of Pretoria)	2017
BSc (Hons) Plant Science (Invasion Biology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Free State

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Input into Terrestrial Rehabilitation Plan design with the focus on the re-establishment of vegetation
- Floral Rescue and Relocation Plans
- Alien and Invasive Control Plan (AICP)
- Alien and Invasive Plant Identification and awareness training
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Desktop Studies, Mapping and Background Information Research

Training

- Advanced Grass Identification Course
- Practical Plant Identification, including Herbarium Usage and Protocols
- Vegetation Classification and Mapping: Use of Geographic Information System for understanding vegetation pattern and biodiversity conservation.
- Introduction to Statistics for Biologists: Applications of plant ecology principles in plant conservation, i.e., species distribution modelling, alien plant invasions, conservation planning
- Plant Functional Trait Course: Hands-on, field-based exploration of plant functional traits, along with experience in the usage of plant traits data in climate-change research and ecosystem ecology





**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 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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

Short Courses

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

AREAS OF WORK EXPERIENCE

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

Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

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

Legislative Requirements, Processes and Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **SANJA ERWEE**

PERSONAL DETAILS

Position in Company	GIS Technician and Visual Specialist
Joined SAS Environmental Group of Companies	2014

EDUCATION

Qualifications

BSC Zoology (University of Pretoria) 2013

Short Courses

Global Mapper	2015
SANBI BGIS Course	2017
Global Mapper Lidar Course	2017
ESRI MOOC ARCGIS Cartography	2018

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Delineation
- Plant species and Landscape Plan

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

GIS

- Mapping and GIS for various sectors and various disciplines (biodiversity, freshwater, aquatic, soil and land capability).

