



**SCIENTIFIC TERRESTRIAL SERVICES**

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**BIODIVERSITY ASSESSMENT AS PART OF THE  
INTEGRATED ENVIRONMENTAL AUTHORISATION  
PROCESS FOR KUDUMANE MANGANESE RESOURCES  
EXPANSION PROJECT, NEAR HOTAZEL IN THE  
NORTHERN CAPE PROVINCE**

**Prepared for**

**SRK Consulting (South Africa) (Pty) Ltd.**

**September 2021**

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**Report reference:** STS 210044



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## EXECUTIVE SUMMARY

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Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Integrated Environmental Authorisation (IEA) process for the Kudumane Manganese Resources (Pty) Ltd (KMR) Expansion Project, near Hotazel in the Northern Cape Province. It is the intension of KMR to expand its existing operations and construct additional infrastructure to improve production capacity.

KMR is in the John Taolo Gaetsewe District Municipality in the Northern Cape, approximately three (3) km south-west of the town of Hotazel, approximately 60 km north of the town of Kathu, and approximately 45 km north of Sishen Airport. KMR currently holds two Mining Rights which will collectively be referred to as the Mining Right Areas (MRAs):

- Mining Right NC/30/5/1/2/2/0268 MR: covering the farms York A 279 and Telele 312 (hereafter referred to as “York” and “Telele”, respectively); and
- Mining Right NC/ 30/5/1/2/2/10053 MR: over the farms Devon 277, Hotazel 280 and Kipling 271 (hereafter referred to as “Devon”, “Hotazel”, and “Kipling”, respectively).

KMR is an established opencast manganese mine and intends to expand its current operations to extend the life of its operation and improve production capacity, through the inclusion of key mining related activities and infrastructure within their approved MRAs. The infrastructure and activities associated with the proposed KMR Expansion Project requires a new Environmental Authorisation (EA), the amendment of the mine’s existing Environmental Management Programmes (EMPrs), a Waste Management Licence (WML) and a Water Use Licence Application (WULA) to authorise the below listed key infrastructure:

- A new Opencast Pit mine on Kipling;
- Expansion of the Hotazel and York Opencast Pits to allow for the mining of KMRs boundary pillar associated with each pit; and
- Two attenuation dams on the Ga-Mogara River, to allow for the expansion of the York and Hotazel Opencast Pits.

The above key infrastructure will have secondary infrastructure and activities associated with them, including Waste Rock Dumps (WRDs), Run of Mine (RoM) Stockpiles, Pollution Control Dams (PCDs), Haul Road Expansion and additional, smaller surface infrastructure such as offices, parking etc.

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

### **Conservation Summary (Desktop database research)**

The Proposed KMR Expansion Activities is situated within the Savanna Biome and within the Eastern Kalahari Bushveld Bioregion and the Kalahari Duneveld Bioregion. The mine occurs in two vegetation types, namely the located within the Kathu Bushveld and Gordonia Duneveld vegetation types (Mucina and Rutherford, 2006) – both of which have a Least Concern (LC) conservation status.

For the **Terrestrial Biodiversity Theme** (Online Web Based National Environmental Screening Tool), the proposed KMR Expansion Activities is considered to have a *very high sensitivity*. The triggered sensitivity features include an Ecological Support Areas (ESA). For the **Animal Species Theme** the proposed KMR Expansion Activities largely fall in a *Low Sensitivity* area, with small, scattered sections mapped as *Medium Sensitivity* areas. The medium sensitivities were triggered by the potential occurrence of the avifauna species *Sagittarius serpentarius* (Secretary bird) (EN). For the **Plant Species Theme**, the proposed KMR Expansion Activities are within a *Low Sensitivity* area and as such no species of conservation concern are anticipated to be associated with the site.

The proposed KMR Expansion Activities is further located in the Griqualand West Centre (GWC) of plant endemism and the Gamagara Corridor.



### **Habitat Summary (ground-truthed results)**

Based on the results of the field investigation of July 2021 by STS, three broad habitat units were distinguished for the proposed KMR Expansion Activities:

- **Ga-Mogara Habitat Unit.** The Ga-Mogara habitat refers to the vegetation communities associated with the Ga-Mogara River<sup>1</sup> – conforming to the definition of a watercourse as per the National Water Act, 1998 (Act No. 36 of 1998) (NWA) – as delineated by the Freshwater Ecologist (SAS 202196, 2021). The Ga-Mogara Habitat is considered degraded from a floral perspective in most sections associated with the proposed KMR Expansion Activities, with alien vegetation prolific in some sections and impacts from overgrazing and mining pressures more evident in others. The Ga-Mogara Habitat encompasses the channel and banks of the Ga-Mogara River;
- **Savannah Habitat Unit.** This habitat unit includes vegetation communities that are typical of the Savannah biome (i.e., characterised by a grassy ground layer and a distinct upper layer of woody plants) and elements of the two reference vegetation types are present within this habitat unit. The Savannah Habitat was divided into three subunits based on variances in species composition, habitat condition, vegetation structure, and/or soil types, namely the Degraded Thornveld, Karoid Shrubland and Mixed Thornveld; and
- **Transformed Habitat Unit.** This habitat is currently transformed in nature due largely to mining activities or mining-related infrastructure.

The data gathered during the site visit indicate that the Transformed Habitat Unit is of **Low Sensitivity**, the Degraded Thornveld and sections of the Karoid Shrubland of **Moderately Low Sensitivity**, the Mixed Thornveld and other sections of the Karoid Shrubland of **Intermediate Sensitivity**, with the Ga-Mogara Habitat Unit of **Moderately High Sensitivity**.

From a faunal perspective, Savanna (all subunits) and the Ga-Mogara Riverine Vegetation Habitat units are considered of **Intermediate Sensitivity**. This sensitivity rating is assigned on the basis that that these localities retain ecological function, although they are subjected to grazing pressures, fragmentation from existing anthropogenic developments active mining which is taking place in the area. These habitats provides suitable potential habitat for several SCC; however, none are severely range restricted nor is their habitat considered threatened. The Transformed Habitat unit was assigned a **Low faunal sensitivity** as this habitat unit offers very little resources to sustain fauna.

No threatened plant species were recorded on site and their potential occurrence within KMR Expansion Activities is low. The habitat was not deemed suitable to support threatened floral species and this aligned with the outcome of the Screening Tool which produced a low sensitivity for the Plant Species Theme. The proposed KMR Expansion Activities are, however, associated with habitat that supports provincially and nationally protected floral SCC. The proposed activities will therefore directly impact on these species' numbers within the footprint area. The SCC recorded on site include species protected under the NCNCA (Schedule 1 and 2) and the NFA, as well as one NEMBA TOPS listed species. The habitat associated with the Savannah and Ga-Mogara Habitat provide the most favourable conditions for these protected species and moderate to high abundances of these species were recorded on site. Most of the proposed activities will minimally impact on protected floral species. The Pit expansions, WRDs, Stockpiles and Haul Road impacting on areas where protected SCC were present in higher abundances.

No SCC were observed on site however 14 SCC have an increased POC and may occur on site. The potentially occurring SCC which will mostly utilise the Savanna habitat and may traverse the Ga-Mogara Habitat unit are:

- *Felis nigripes* (Black Footed Cat, NT & SP) with a high Potential of Occurrence (POC);
- *Atelerix frontalis* (Southern African Hedgehog, NT) with a medium POC;
- *Smutsia temminckii* (Pangolin, VU & P) with a medium POC;
- *Neotis ludwigii* (Ludwig's Bustard, EN) with a medium POC;
- *Polemeatus bellicosus* (Martial Eagle, EN) with a medium POC;

<sup>1</sup> Please note that for the purposes of this report the spelling "Gamagara River" and the spelling "Ga-Mogara River" as used in the DWS RQIS database, is to be considered synonyms and may be used interchangeably.



- *Aquila rapax* (Tawny Eagle EN) with a medium POC;
- *Ardeotis kori* (Kori Bustard, NT) with a medium POC;
- *Cursorius rufus* (Burchell's courser, VU) with a high POC;
- *Gyps africanus* (White-backed Vulture VU) with a high POC;
- *Torgos tracheliotos* (Lappet Faced Vulture, EN) with a medium POC;
- *Sagittarius serpentarius* (Secretarybird, VU) with a medium POC, which is a finding that concurs with the listing of the DFF screening tool;
- *Ceratogyrus darlingi* (Rear-horned Baboon Spider, P) with a medium POC;
- *Harpactira hamiltoni* (Highveld Baboon Spider, P) with a medium POC,
- *Opisththalmus carinatus* (Robust Burrowing Scorpion, P) with a medium POC; and
- *Opisththalmus wahlbergii* (Kalahari Burrowing Scorpion, P) with a medium POC.

### **Impact Statement**

The proposed KRM Expansion Activities will inevitably impact upon the terrestrial ecology within the footprint areas as a result of vegetation clearance and earth works. Much of the proposed expansion will occur within habitat that is either already transformed, or which is currently in poor conditions with floral communities notably degraded. Within these areas, the expansion activities are expected to have minimal impacts to the receiving environment and the species therein; instead, with mitigation measures implemented, the impacts can be adequately minimised to remain site-specific to local in extent.

Some concerns include the footprint encroaching into habitat of conservation significance such as the Ga-Mogara Habitat Unit, as well as into habitat with increased presence of protected species (provincially and nationally protected).

Most significant impacts to affect the floral and faunal habitat integrity, species diversity and SCC associated with the KRM Expansion Activities include, but are not limited to, the following:

- Mining activities within sensitive habitat such as the Ga-Mogara and intact Mixed Thornveld and Karoid Shrubland;
- Placement of mining infrastructure within floral and faunal SCC habitat;
- Destruction, removal, hunting or harvesting of floral and faunal SCC during construction and operational activities;
- Potentially poorly implemented and monitored rescue and relocation of floral SCC that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of floral SCC individuals.
- Continued expansion resulting in increasingly fragmented habitat;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species and persistence of indigenous fauna in the area; and
- Rehabilitation efforts are likely to result in sub-optimal recovery of pre-mining conditions, especially regarding the WRDs that will remain permanent features, resulting in residual impacts to floral and faunal communities.

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





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**Part A: Background Information**

Prepared by:	Scientific Terrestrial Services CC
Report author:	C. Steyn (Pr.Sci.Nat)
Report reviewer:	N. Cloete (Pr.Sci.Nat)
Report Reference:	STS 210044



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## 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.

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
<b>Theme-Specific Requirements as per Government Notice No. 320</b>		
<b>Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output</b>		
2	<b>Terrestrial Biodiversity Specialist Assessment</b>	
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.	<b>Part A – C:</b> Cover Page <b>Part A:</b> Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	<b>Part A:</b> Section 1
2.3	<b>The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:</b>	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	<b>Part B:</b> Section 3 (flora) <b>Part C:</b> Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	<b>Part B:</b> Section 3 (flora) <b>Part C:</b> Section 3 (fauna)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	<b>Part A:</b> Section 3 (desktop analysis) <b>Part B:</b> Section 3 (flora) <b>Part C:</b> 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;	<b>Part A:</b> Section 3 (desktop analysis) <b>Part B:</b> Section 3.2 – 3.3 (flora) <b>Part C:</b> Section 3.2 – 3.5 (fauna)  <i>*For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 202196, 2021)</i>
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: <ul style="list-style-type: none"> <li>a) main vegetation types;</li> <li>b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;</li> <li>c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and</li> <li>d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;</li> </ul>	<b>Part A:</b> Section 3 (desktop analysis) <b>Part B:</b> Section 3 (flora) <b>Part C:</b> 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	Not Applicable.
2.3.7	<b>The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:</b>	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: <ul style="list-style-type: none"> <li>a) <i>the reasons why an area has been identified as a CBA;</i></li> </ul>	<b>Part A:</b> Section 3 (desktop analysis)



No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
	<ul style="list-style-type: none"> <li>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></li> <li>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></li> <li>d) <i>the impact on ecosystem threat status;</i></li> <li>e) <i>the impact on explicit subtypes in the vegetation;</i></li> <li>f) <i>the impact on overall species and ecosystem diversity of the site; and</i></li> <li>g) <i>the impact on any changes to threat status of populations of species of conservation concern in the CBA;</i></li> </ul>	<p><b>Part B:</b> Section 3.2, 5.2.3  <b>Part C:</b> Section 3, 4 &amp; 5</p>
2.3.7.2	<p>Terrestrial Ecological Support Areas (ESAs), including:</p> <ul style="list-style-type: none"> <li>a) <i>the impact on the ecological processes that operate within or across the site;</i></li> <li>b) <i>the extent the proposed development will impact on the functionality of the ESA; and</i></li> <li>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></li> </ul>	
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"> <li>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></li> </ul>	<p><b>Part A:</b> Section 3 (desktop analysis)</p> <p>However, not applicable as no protected areas or areas of conservation concern are within 10 km of the proposed project,</p>
2.3.7.4	<p>Priority areas for protected area expansion, including-</p> <ul style="list-style-type: none"> <li>a) <i>the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;</i></li> </ul>	<p><b>Part A:</b> Section 3 (desktop analysis)</p>
2.3.7.5	<p>SWSAs including:</p> <ul style="list-style-type: none"> <li>a) <i>the impact(s) on the terrestrial habitat of a SWSA; and</i></li> <li>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></li> </ul>	<p>Not Applicable to this report</p>
2.3.7.6	<p>FEPA sub catchments, including-</p> <ul style="list-style-type: none"> <li>a) <i>the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;</i></li> </ul>	<p>Not Applicable to this report</p>
2.3.7.7	<p>Indigenous forests, including:</p> <ul style="list-style-type: none"> <li>a) <i>impact on the ecological integrity of the forest; and</i></li> <li>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></li> </ul>	<p>Not Applicable to this report</p>
<b>2.4</b>	<b>The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.</b>	
	<p><b>Part B:</b> Results of the <b>Floral Assessment</b> as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities.  <b>Part C:</b> Results of the <b>Faunal Assessment</b> as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.</p>	
<b>3</b>	<b>Terrestrial Biodiversity Specialist Assessment Report</b>	
<b>3.1</b>	<b>The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:</b>	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	<b>Part A:</b> Appendix E
3.1.2	A signed statement of independence by the specialist;	<b>Part A:</b> 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;	<b>Part B:</b> Section 1.3 (flora) <b>Part C:</b> Section 1.3 (fauna)



No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
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;	<b>Part A:</b> Appendix C <b>Part B:</b> Section 2 (flora) <b>Part B:</b> Appendix A (flora) <b>Part C:</b> Section 2 (fauna) <b>Part C:</b> 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;	<b>Part B:</b> Section 1.3 (flora) <b>Part C:</b> 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);	<b>Part B:</b> Section 4 (flora) <b>Part C:</b> Section 4 (fauna)
	<p><b>Impact Assessment Requirements</b></p> <p>3.1.7 Additional environmental impacts expected from the proposed development;</p> <p>3.1.8 Any direct, indirect and cumulative impacts of the proposed development;</p> <p>3.1.9 The degree to which impacts and risks can be mitigated;</p> <p>3.1.10 The degree to which the impacts and risks can be reversed;</p> <p>3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources;</p> <p>3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);</p>	<b>Part B:</b> Section 5 (flora) <b>Part C:</b> 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;	<b>Not Applicable to this report</b>
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	<b>Part A:</b> Executive summary <b>Part B:</b> Section 6 (flora) <b>Part C:</b> Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	<b>Part B:</b> Section 5.1 (flora) <b>Part C:</b> Section 5.1 (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.	<b>Not Applicable to this report</b>
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	<b>Not Applicable to this report</b>





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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].

<b>Alien species</b> (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.
<b>Biological diversity or Biodiversity</b> (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.
<b>Biome</b> - 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).
<b>Bioregion</b> (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;
<b>Critical Biodiversity Area (CBA)</b>	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
<b>Corridor</b>	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
<b>Disturbance</b>	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.
<b>Ecoregion</b>	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
<b>Endangered</b>	Organisms in danger of extinction if causal factors continue to operate.
<b>Endemic species</b>	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.
<b>Ecological Support Area (ESA)</b>	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
<b>Ground-truth</b>	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.
<b>Habitat</b> (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
<b>Important Bird and Biodiversity Area (IBA)</b>	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.
<b>Indigenous vegetation</b> (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.
<b>Integrity (ecological)</b>	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
<b>Invasive species</b>	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.



<b>Listed alien species</b>	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.
<b>Least Threatened</b>	Least threatened ecosystems are still largely intact.
<b>Native species (syn. indigenous species)</b>	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).
<b>Red Data listed (RDL) species</b>	According to the Red List of South African plants ( <a href="http://redlist.sanbi.org/">http://redlist.sanbi.org/</a> ) 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.
<b>Species of Conservation Concern (SCC)</b>	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as protected species of relevance to the project.



## LIST OF ACRONYMS

AIP	Alien and Invasive Plant
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resources Act, 1983 [Act No. 43 of 1983]
CBA	Critical Biodiversity Area
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
GN	Government Notice
GWC	Griqualand West Centre
Ha	Hectares
IBA	Important Bird and Biodiversity Area
IEA	Integrated Environmental Authorisation
IUCN	International Union for Conservation of Nature
KMR	Kudumane Manganese Resources Pty) Ltd
LC	Least Concern
MAP	Mean annual precipitation
MAPE	Mean Annual Potential Evaporation
masl	Meters Above Mean Sea Level
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
MR	Mining Right
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]
NFA	National Forest Act, 1998 [Act No. 84 of 1998]
NPAES	National Protected Area Expansion Strategy
PCD	Pollution Control Dam
PV	Photovoltaic
QDS	Quarter Degree Squares
RDL	Red Data listed
SABAP 2	South African Bird Atlas Project 2
SACAD	South African Conservation Areas Database
SACNASP	Professional member of the South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SanParks	South African National Parks
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern



STS	Scientific Terrestrial Services
SWSA	Strategic Water Source Areas
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WML	Waste Management Licence
WRD	Waste Rock Dump
WSA	Water Source Area
WUL	Water Use Licence
WULA	Water Use Licence Application



# 1 INTRODUCTION

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Integrated Environmental Authorisation (IEA) process for the Kudumane Manganese Resources (Pty) Ltd (KMR) Expansion Project, near Hotazel in the Northern Cape Province. It is the intention of KMR to expand its existing operations and construct additional infrastructure to improve production capacity.

KMR is in the John Taolo Gaetsewe District Municipality in the Northern Cape, approximately three (3) km south-west of the town of Hotazel, approximately 60 km north of the town of Kathu, and approximately 45 km north of Sishen Airport. KMR currently holds two Mining Rights:

1. Mining Right NC/30/5/1/2/2/0268 MR: covering the farms York A 279 and Telele 312 (hereafter referred to as “York” and “Telele”, respectively); and
2. Mining Right NC/ 30/5/1/2/2/10053 MR: over the farms Devon 277, Hotazel 280 and Kipling 271 (hereafter referred to as “Devon”, “Hotazel”, and “Kipling”, respectively).

The mine is therefore managed under two Environmental Management Programmes (EMPrs), a Water Use Licence (WUL) and a WUL Amendment. The two Mining Rights will henceforth collectively be referred to as the “**Mining Right Areas (MRAs)**” (Figures 1 and 2); unless referring to an individual farm.

The purpose of this report (Part A) is to define the biodiversity associated with the proposed Expansion Activities 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).



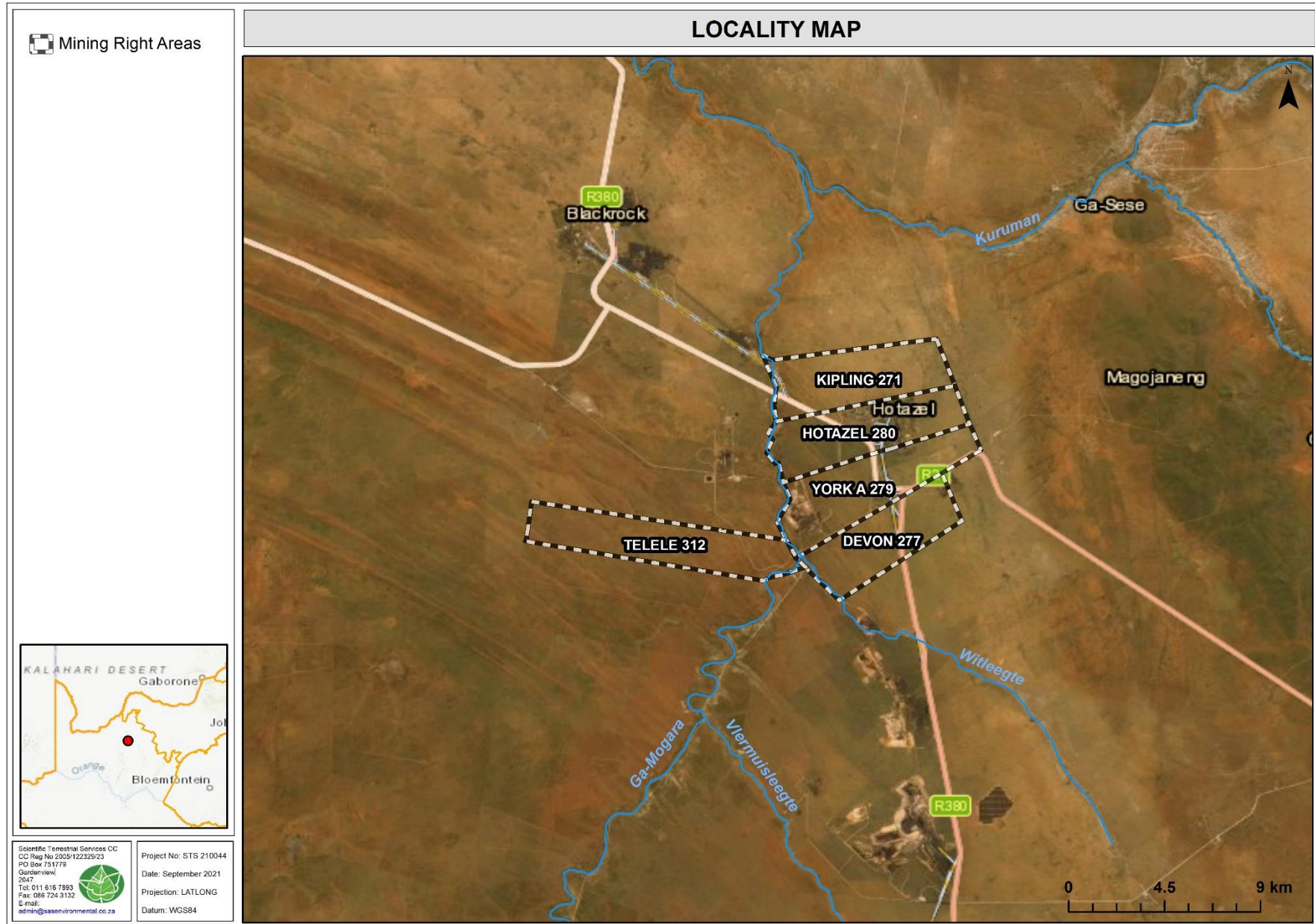


Figure 1: Digital satellite image depicting the MRAs in relation to surrounding areas.





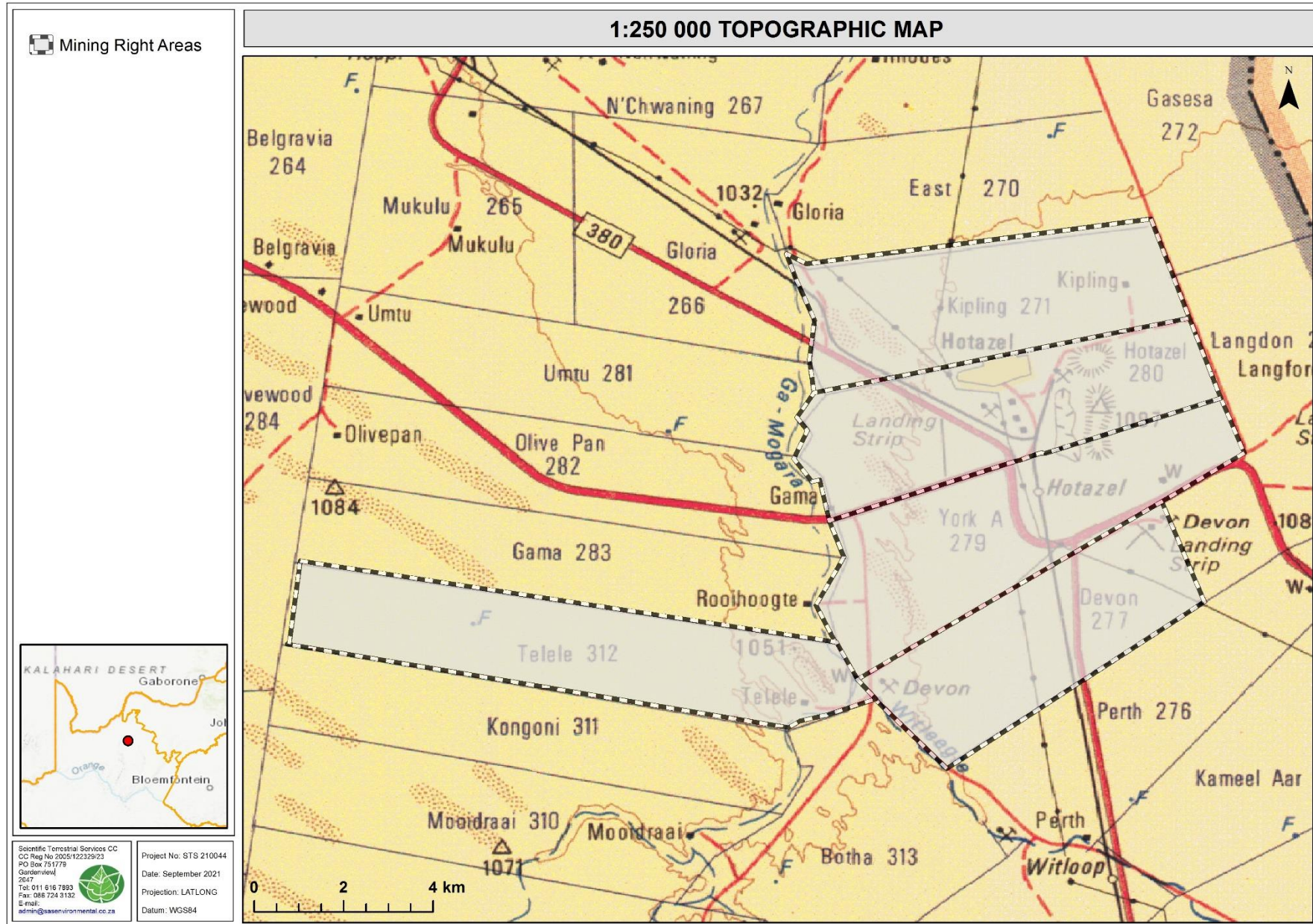


Figure 2: The MRAs depicted on a 1:250 000 topographical map in relation to the surrounding area.



## 1.1 Project Description

KMR is an established opencast manganese mine and intends to expand its current operations to extend the life of its operation and improve production capacity through the inclusion of key mining-related activities and infrastructure within their approved MRAs.

The infrastructure and activities associated with the proposed KMR Expansion Project require a new Environmental Authorisation (EA), the amendment of the mine's existing EMPs, a Waste Management Licence (WML) and a Water Use Licence Application (WULA) to authorise the below listed **key infrastructure**:

- A new Opencast Pit mine on Kipling;
- Expansion of the Hotazel and York Opencast Pits to allow for the mining of KMRs boundary pillar associated with each pit; and
- Two attenuation dams on the Ga-Mogara River, to allow for the expansion of the York and Hotazel Opencast Pits. An Options Analysis was undertaken by SRK to determine the best approach for KMR to extend the open pit mining operations in a westerly direction beyond the 1:100-year floodline (The extension of the pits is restricted by a drainage channel of the Ga-Mogara River on the western side). Option-1/Scenario 1 was determined to be the best and most cost-effective option and includes the construction of dams along the river course to attenuate the flow before reaching the open pit areas. In this option, there are no diversion channels. The report states: "*The capture and attenuation of the flowing upstream ponds is technically a good option and if the ponds overflow, the open pit operation can be suspended until the storm has abated. The mitigation measure will be to monitor upstream flows and give sufficient time to evacuate the pit. If the water flows into the pit, then the pit can be pumped dry and mining can commence.*".

The above key infrastructure will have **secondary infrastructure** and activities associated with them, which includes:

- Development and expansion of Waste Rock Dumps (WRDs) at the proposed Kipling operation and the existing Hotazel operation;
- Establishment and expansion of ore stockpiles dumps at the proposed Kipling operation and the existing Hotazel and York operations;
- New haul road between the proposed Kipling operation and the existing Hotazel operation and upgrading of the existing haul roads between the Hotazel and York operations;



- Development and expansion of sewerage treatment plants at Kipling (new), Hotazel and York (Expansion);
- Supporting infrastructure such as admin offices ancillary infrastructure on the farm Kipling;
- Waste and fuel storage areas;
- Relocation and development of new Pollution Control Dams (PCDs);
- Upgrading the intersection along the R380 before the R31 – intersection used by KMR as haul truck transport entrance;
- Establishment of a Contractor's camp; and
- Extension of existing mine powerlines and railway.

The above activities are depicted in Figures 3 – 7 as they are proposed to take place within each farm.

## **1.2 Scope of Work**

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

- To compile a desktop assessment with all relevant information as presented by South African National Biodiversity Institute's (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 proposed KMR Expansion Activities;
- 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).



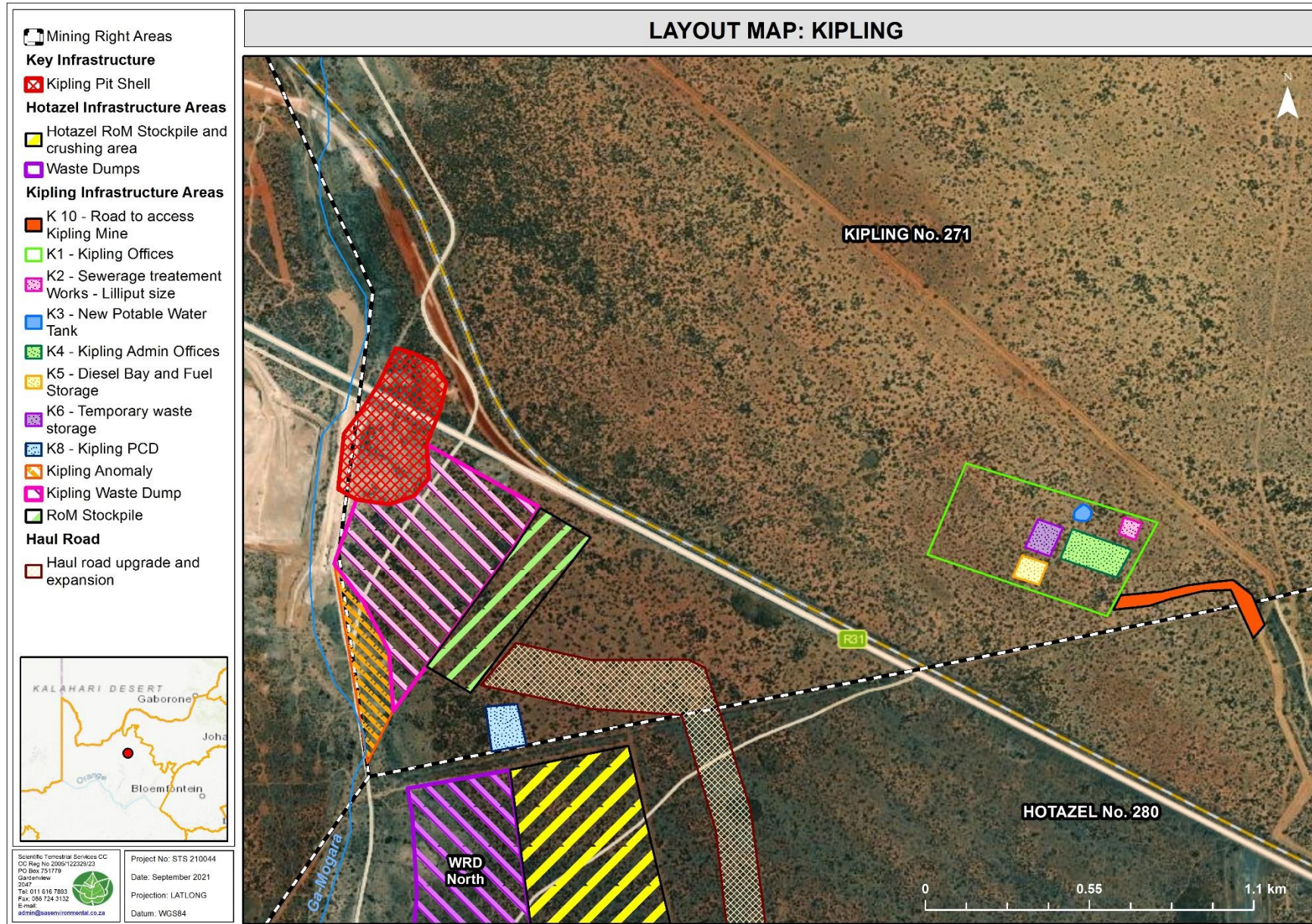


Figure 3: Proposed KMR Expansion Activities associated with the farm Kipling.



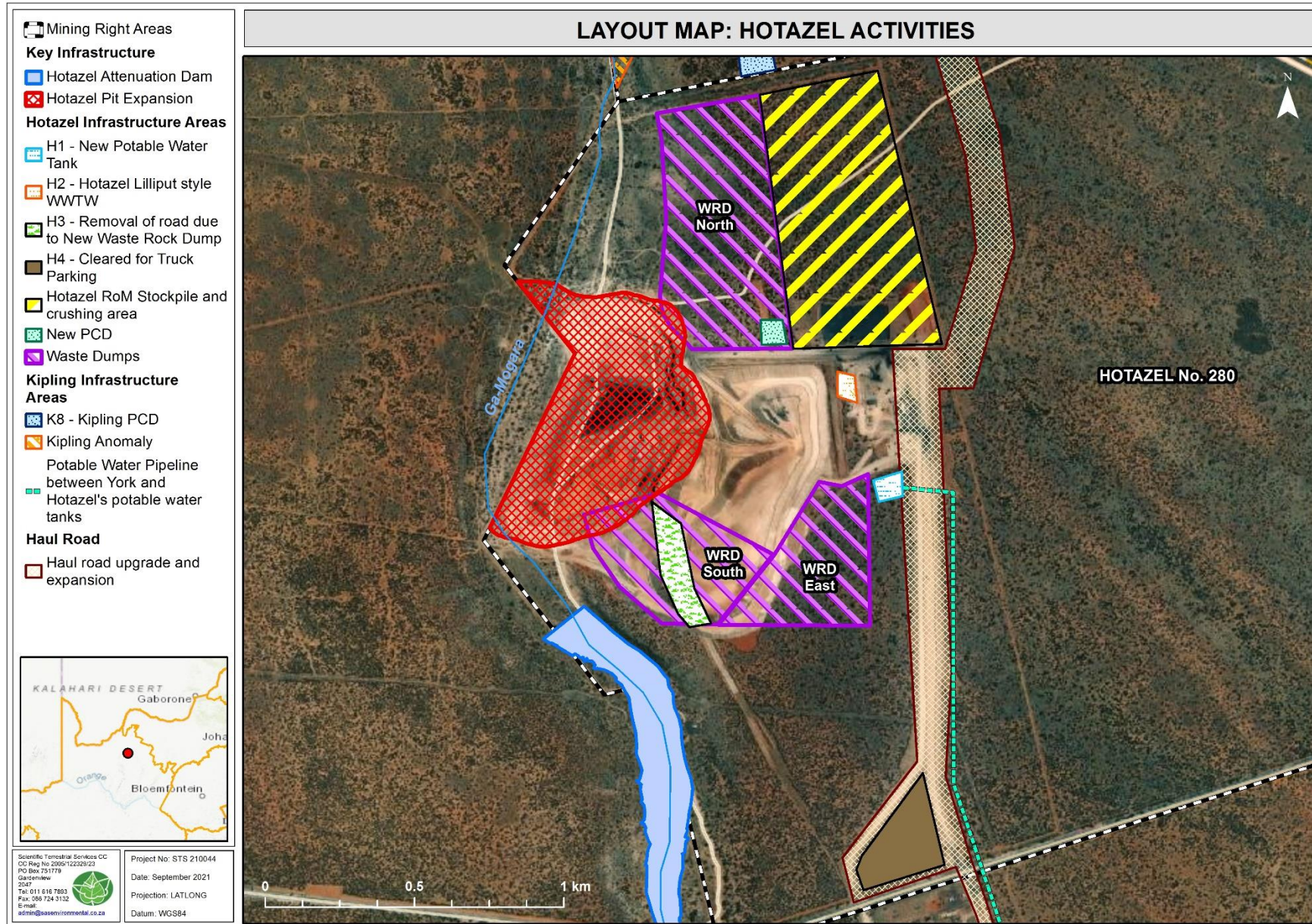


Figure 4: Proposed KMR Expansion Activities associated with the farm Hotazel.



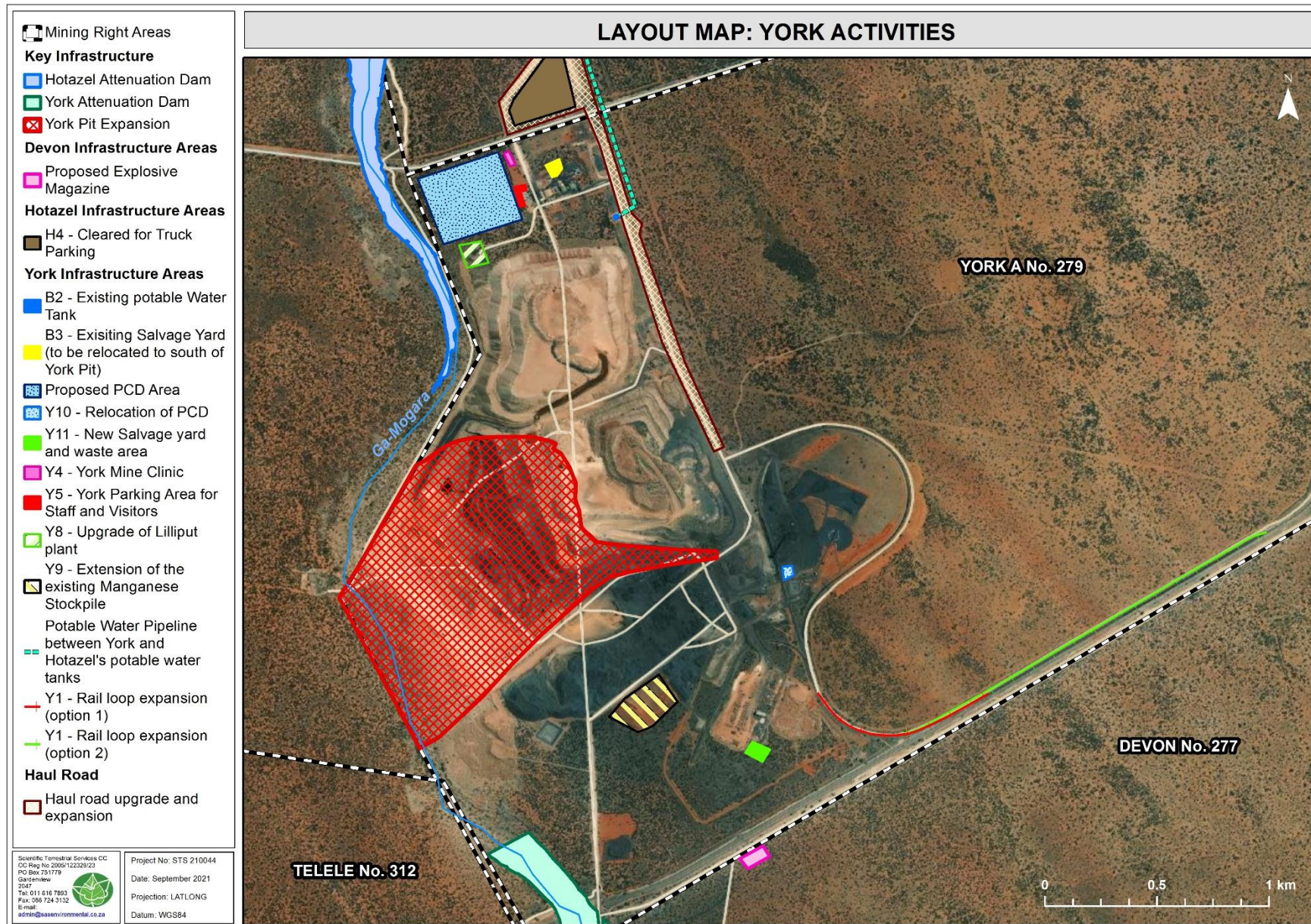


Figure 5: Proposed KMR Expansion Activities associated with the farm York.



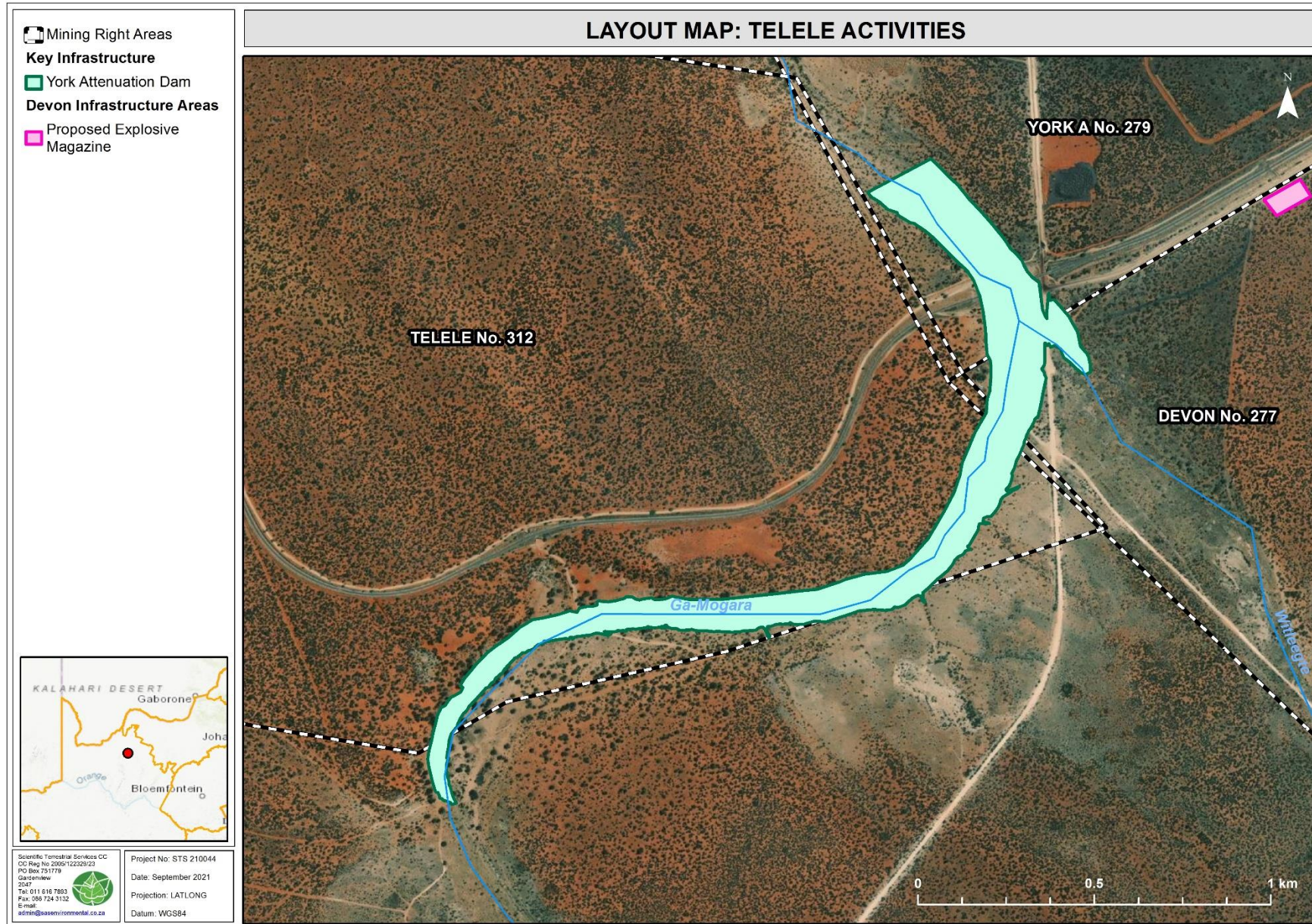


Figure 6: Proposed KMR Expansion Activities associated with the farm Telele.



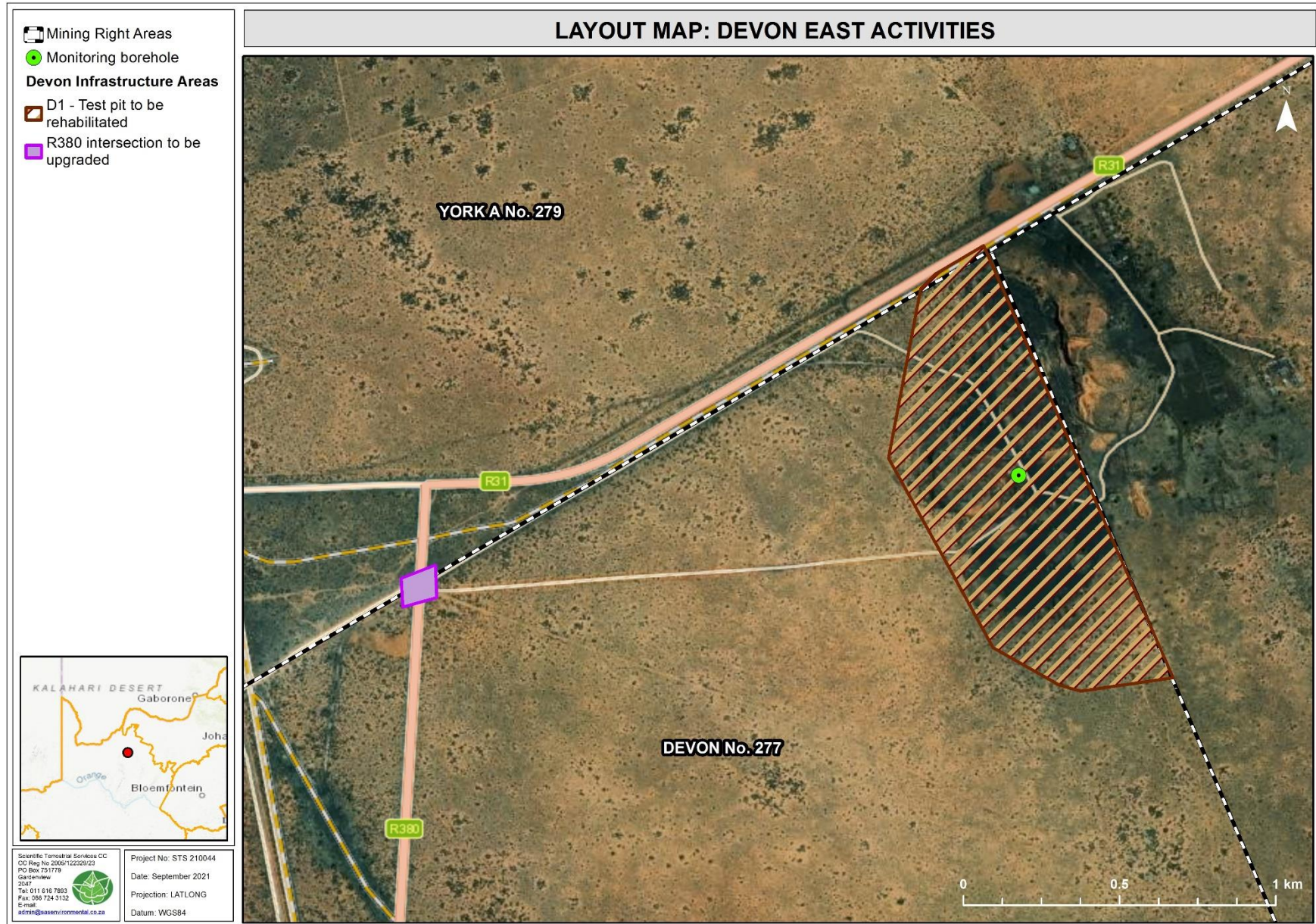


Figure 7: Proposed KMR Expansion Activities associated with the farm Devon.





### **1.3 Assumptions and Limitations**

The following assumptions and limitations are applicable to this report (Part A only):

- The biodiversity desktop assessment is confined to the proposed KMR Expansion Activities and does not include detailed results of the entire extent of the MRAs and 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 associated with the proposed KMR Expansion Activities at the scale required to inform an environmental process. However, this information is useful as background information to the study and, if desktop results are considered with the outcome of the faunal and floral assessments (Parts B and C); sufficient decision making can take place with regards to the proposed Expansion Activities; and
- The field assessment was undertaken during winter (20<sup>th</sup> – 23<sup>rd</sup> of July 2021). The field assessment aimed to determine the ecological status of the proposed KMR Expansion Activities and to “ground-truth” the results of the desktop assessment (as presented in Parts B and C).

### **1.4 Legislative Requirements**

The following legislative requirements were considered during the biodiversity assessment and are applicable to Parts A – C:

- The Constitution of the Republic of South Africa, 1996<sup>2</sup>;
- 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 June 2021;
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);

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<sup>2</sup> 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.



- 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 documentation that were considered during the desktop assessment of the proposed KMR Expansion Activities included <sup>3</sup>:

- 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).

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<sup>3</sup> 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/>



- The South African Conservation Areas Database, Quarter 1 (SACAD, 2021)<sup>4</sup>;
- The South African Protected Areas Database, Quarter 1 (SAPAD, 2021)<sup>5</sup>;
- Northern Cape Critical Biodiversity Area (CBA) Map (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) – hereafter referred to as the “screening tool”;
- The 2013 Mining and Biodiversity Guidelines<sup>6</sup> with a 2012 spatial dataset used for mapping (SANBI, 2012); and
- From the 2017 Strategic Water Source Areas (SWSA) project:
  - 2017 SWSA Surface water (Water Research Commission, 2017).

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<sup>4</sup> **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.

<sup>5</sup> **SAPAD (2021)**: 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).

<sup>6</sup> Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector. Pretoria. 100 pages



### 3 RESULTS OF THE DESKTOP ANALYSIS

#### 3.1 Conservation Characteristics associated with the Proposed KMR Expansion Activities 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 to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation are provided.

**Table 1: Summary of the biodiversity characteristics associated with the proposed KMR Expansion Activities [Quarter Degree Squares (QDSs) 2722BB, 2722BD, 2723AA and 2723AC].**

DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE PROPOSED KMR EXPANSION ACTIVITIES ACCORDING TO THE 2018 FINAL VEGETATION MAP OF SOUTH AFRICA, LESOTHO AND SWAZILAND (SANBI 2006–2018 & SANBI, 2018A) – FIGURE 8										
<b>Biome</b>	The proposed KMR Expansion Activities are situated within the <b>Savanna Biome</b> .									
<b>Bioregion</b>	The proposed KMR Expansion Activities are situated within the <b>Eastern Kalahari Bushveld Bioregion</b> and the <b>Kalahari Duneveld Bioregion</b> . Most of the proposed activities are in the Kalahari Duneveld Bioregion, with only the York Attenuation Dam and the Kipling Offices in the Eastern Kalahari Bushveld Bioregion.									
<b>Vegetation types</b>	<b>KATHU BUSHVELD (SVk 12)</b> (Eastern Kalahari Bushveld Bioregion)					<b>GORDONIA DUNEVELD (SVkd 1)</b> (Kalahari Duneveld Bioregion)				
<b>Climate</b>	Summer and autumn rainfall with very dry winters.					Summer and autumn rainfall with very dry winters.				
	<b>MAP (mm)</b>	<b>MAT (°C)</b>	<b>MFD (Days)</b>	<b>MAPE (mm)</b>	<b>MASMS (%)</b>	<b>MAP (mm)</b>	<b>MAT (°C)</b>	<b>MFD (Days)</b>	<b>MAPE (mm)</b>	<b>MASMS (%)</b>
	300	18.5	27	2883	85	182	18.6	21	2912	86
<b>Altitude (m)</b>	960–1 300 m					800–1 200 m				
<b>Distribution</b>	Northern Cape Province: Plains from Kathu and Dibeng in the south, through Hotazel, vicinity of Frylinckspan to the Botswana border roughly between Van Zylsrus and McCarthysrus.					Northern Cape Province: Areas with dunes comprising the largest part of the South African side of the Kgalagadi Transfrontier Park. South of the Molopo River border with Botswana (west of Van Zylsrus), interleaving with NKb 5 Kalahari Karroid Shrubland in the west (south of Rietfontein to the Orange River area) and in the south (around Upington and north of Groblershoop). Also occurs as a number of loose dune cordons south of the Orange River near Keimoes and between Upington and Putsonderwater. Eastern boundary is found at the longitude of Pearson’s Hunt, but with outliers near Niekershoop in the southeast and Floradora in the northeast.				
<b>Geology &amp; soils</b>	Aeolian red sand and surface calcrete, deep (>1.2 m) sandy soils of Hutton and Clovelly soil forms. Land types mainly Ah and Ae, with some Ag.					Aeolian sand underlain by superficial silcretes and calcretes of the Cenozoic Kalahari Group. Fixed parallel sand dunes, with Af land type almost exclusively.				



<p><b>Conservation</b></p>	<p><b>Least threatened.</b> Target 16%. None conserved in statutory conservation areas. More than 1% already transformed, including the iron ore mining locality at Sishen, one of the biggest open-cast mines in the world. Erosion is very low.</p>	<p><b>Least threatened.</b> Target 16%. Some 14% statutorily conserved in the Kgalagadi Transfrontier Park. Very little transformed. Generally low erosion, but some areas with spectacular destabilisation of normally vegetated dunes (through local overstocking) favoured by photographers. Erosion is normally very low.</p>	
<p><b>Vegetation &amp; landscape features (dominant floral taxa in Appendix D)</b></p>	<p>Medium-tall tree layer with <i>Vachellia erioloba</i> in places, but mostly open and including <i>Boscia albitrunca</i> as the prominent trees. Shrub layer generally most important with, for example, <i>Senegalia mellifera</i>, <i>Diospyros lycioides</i> and <i>Lycium hirsutum</i>. Grass layer is variable in cover.</p> <p><b>Remark</b> One of the most strikingly dominant areas of fairly tall <i>Vachellia erioloba</i> is centred on the town of Kathu, which was built around many of these trees.</p>	<p>Parallel dunes about 3–8 m above the plains. Open shrubland with ridges of grassland dominated by <i>Stipagrostis amabilis</i> on the dune crests and <i>Vachellia haematoxylon</i> on the dune slopes, also with <i>Senegalia mellifera</i> on lower slopes and <i>Rhigozum trichotomum</i> in the interdune straaten.</p> <p><b>Remarks</b> The unit extends into Namibia to a large extent (Leistner 1967) and very little into Botswana. Only degenerates into semimobile dunes, where heavily disturbed through intense grazing pressure.</p>	
<p><b>CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)</b></p>		<p><b>NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (2020)</b></p>	
<p><b>NBA (2018):</b></p> <p>1) <b>Ecosystem Threat Status</b></p> <p>2) <b>Ecosystem Protection Level</b></p>	<p>Most of the proposed KMR Expansion Activities occur in the remaining extent of the Gordonia Duneveld, a vegetation type that is of Least Concern (LC) in terms of its conservation status but has the protection status of Moderately Protected. The York Attenuation Dam, test pit to be rehabilitated, the R380 intersection upgrade and the eastern section of the Kipling Offices occur in the Kathu Bushveld vegetation type which is currently considered LC and Poorly Protected.</p> <p>Refer to <b>Figure 9</b> for a depiction of the proposed KMR Expansion Activities within the remaining extent of the abovementioned vegetation types.</p> <p>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: <b>threat status</b><sup>7</sup> and <b>protection level</b><sup>8</sup>.</p>	<p>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</p>	<p>The proposed KMR Expansion Activities largely fall in a Low Sensitivity area, with small, scattered sections throughout the MRAs mapped as Medium Sensitivity areas (<b>Figure 10</b>). The medium sensitivities were triggered by the potential occurrence of the avifauna species <i>Sagittarius serpentarius</i> (Secretary bird) (EN).</p>
<p><b>National Threatened Ecosystems (2011)</b></p>	<p>The proposed KMR Expansion Activities are located within an ecosystem that is currently considered to be <b>LC</b>, i.e., ecosystems have not experienced a significant loss of natural habitat or deterioration in condition.</p> <p>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</p>	<p><b>Animal species theme</b></p>	<p>For the plant species theme, the proposed KMR Expansion Activities are within a Low Sensitivity area and as such no species of conservation concern are anticipated to be associated with the site.</p>
		<p><b>Plant species theme</b></p>	
		<p><b>Terrestrial biodiversity theme</b></p>	<p>For the Terrestrial Biodiversity Theme, the proposed KMR Expansion Activities largely fall in a Low Sensitivity area, with a significant stretch mapped as <b>Very High Sensitivity</b> areas (<b>Figure 11</b>). The triggered sensitivity features include an Ecological Support Areas (ESA).</p>

<sup>7</sup> 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.

<sup>8</sup> 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)3.



	EIA Regulations 2014, as amended, published under the NEMA. The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the legislated National List of Threatened Terrestrial Ecosystems has not yet been revised.	<b>STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)</b>	
<b>IBA (2015)</b>	The KMR Expansion Activities are not located within or near an IBA (within 10 km).	Surface Water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. they include transboundary areas that extend into Lesotho and Swaziland. The Sub-National Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage	
<b>SAPAD (2021, Q1); SACAD (2021, Q1); NPAES (2010)</b>	According to the SAPAD (2021), the SACAD (2021) and the NPAES (2010), no protected areas or conservation areas are indicated within 10 km of the proposed KMR Expansion Activities.	<b>Name &amp; Criteria</b>	The proposed KMR Expansion Activities are not within 10 km of a Surface Water SWSA. It is, however, within 10 km of a Ground Water SWSA, but this falls outside of the scope of the biodiversity assessment.
<b>NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) (FIGURE 12)</b>		<b>NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019)</b>	
<b>ECOLOGICAL SUPPORT AREA (ESA)</b>	<p>Several sections of the proposed KMR Expansion Activities traverses an ESA, including all key infrastructure and much of the secondary infrastructure (Kipling offices, RoM Stockpiles, parts of the WRDs, Haul Road expansion, Devon's site to be rehabilitated, and some of the smaller surface infrastructure such as parking areas and salvage yards etc).</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>	<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 proposed KMR Expansion Activities are located within the <b>Griqualand West Centre (GWC)</b> of plant endemism (Figure 13). 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 proposed KMR Expansion Activities also fall within the <b>Gamagara Corridor</b> (Figure 14). 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>	
<b>OTHER NATURAL AREAS (ONA)</b>	<p>The Kipling offices, RoM Stockpiles, parts of the WRDs, Haul Road expansion, Devon's site to be rehabilitated, and some of the smaller surface infrastructure such as parking areas and salvage yards etc, are situated in Other natural Areas (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>	<b>MINING AND BIODIVERSITY GUIDELINES (2012)</b>	
		The proposed KMR Expansion Activities are situated within an area currently not ranked under the mining and biodiversity guidelines. (2013).	

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



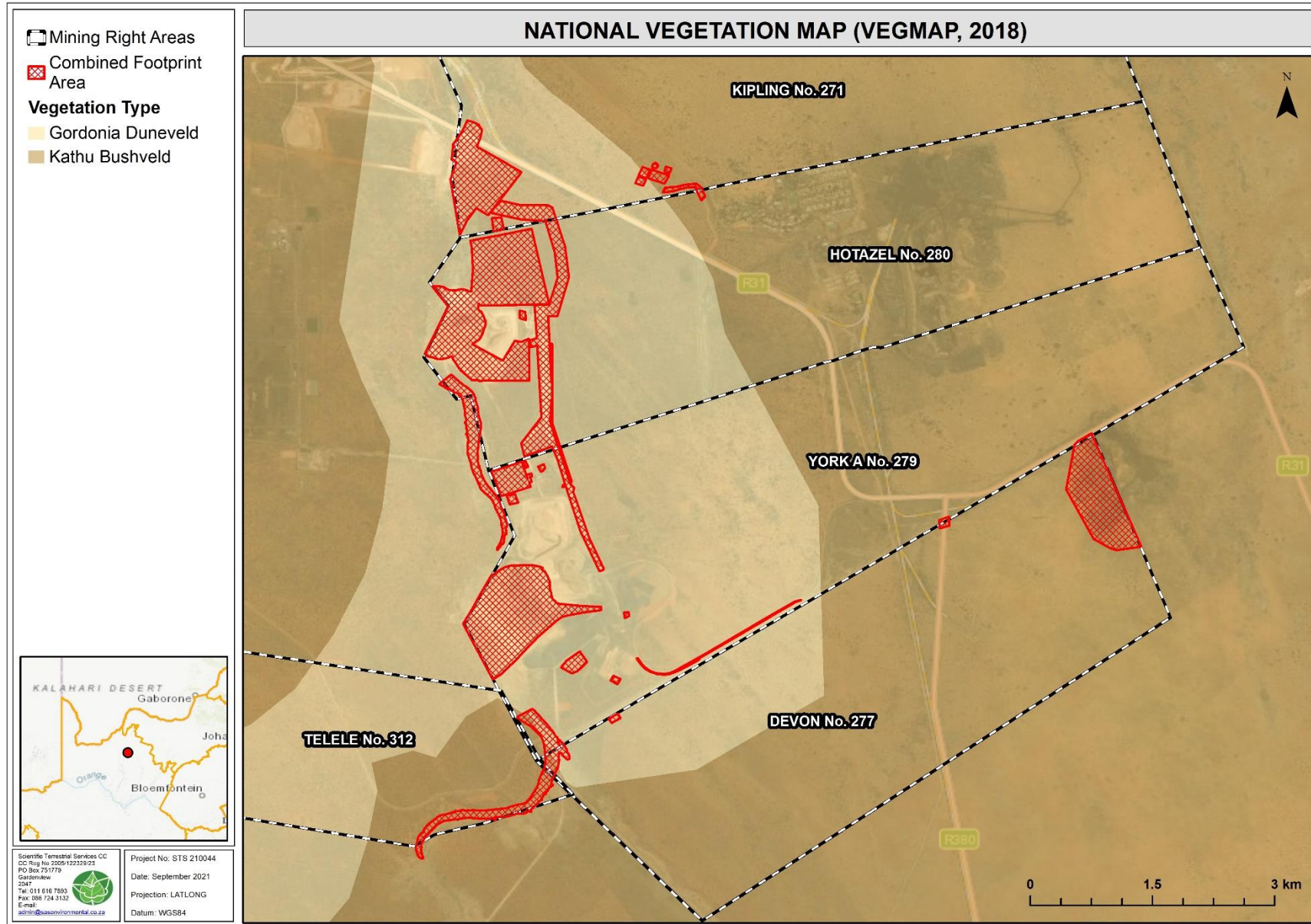


Figure 8: The vegetation types associated with the proposed KMR Expansion Activities (SANBI, 2006-2018).



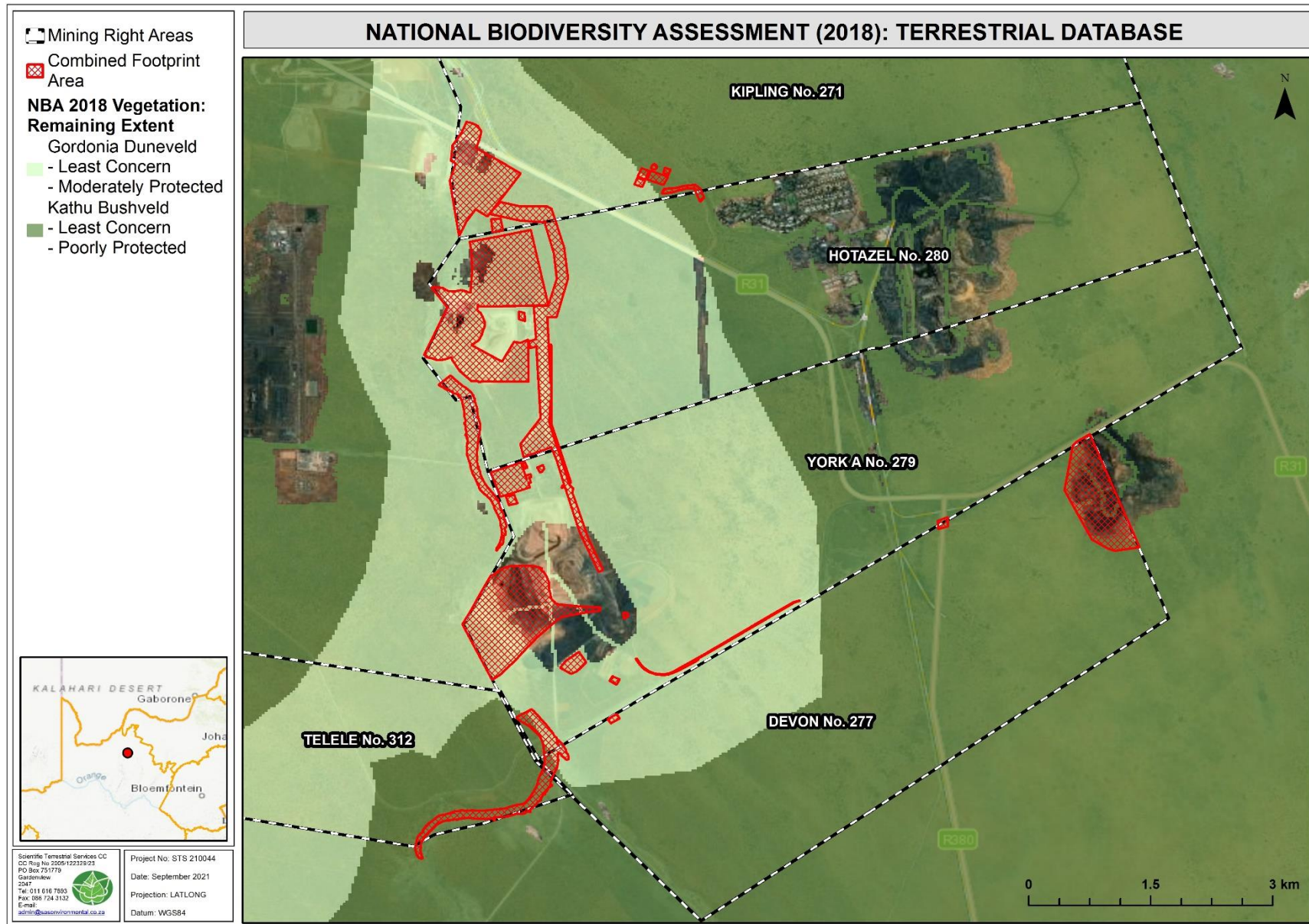


Figure 9: The proposed KMR Expansion Activities located within the remaining extent of the least concern Kathu Bushveld and Gordonia Duneveld, according to the National Biodiversity Assessment (NBA, 2018).





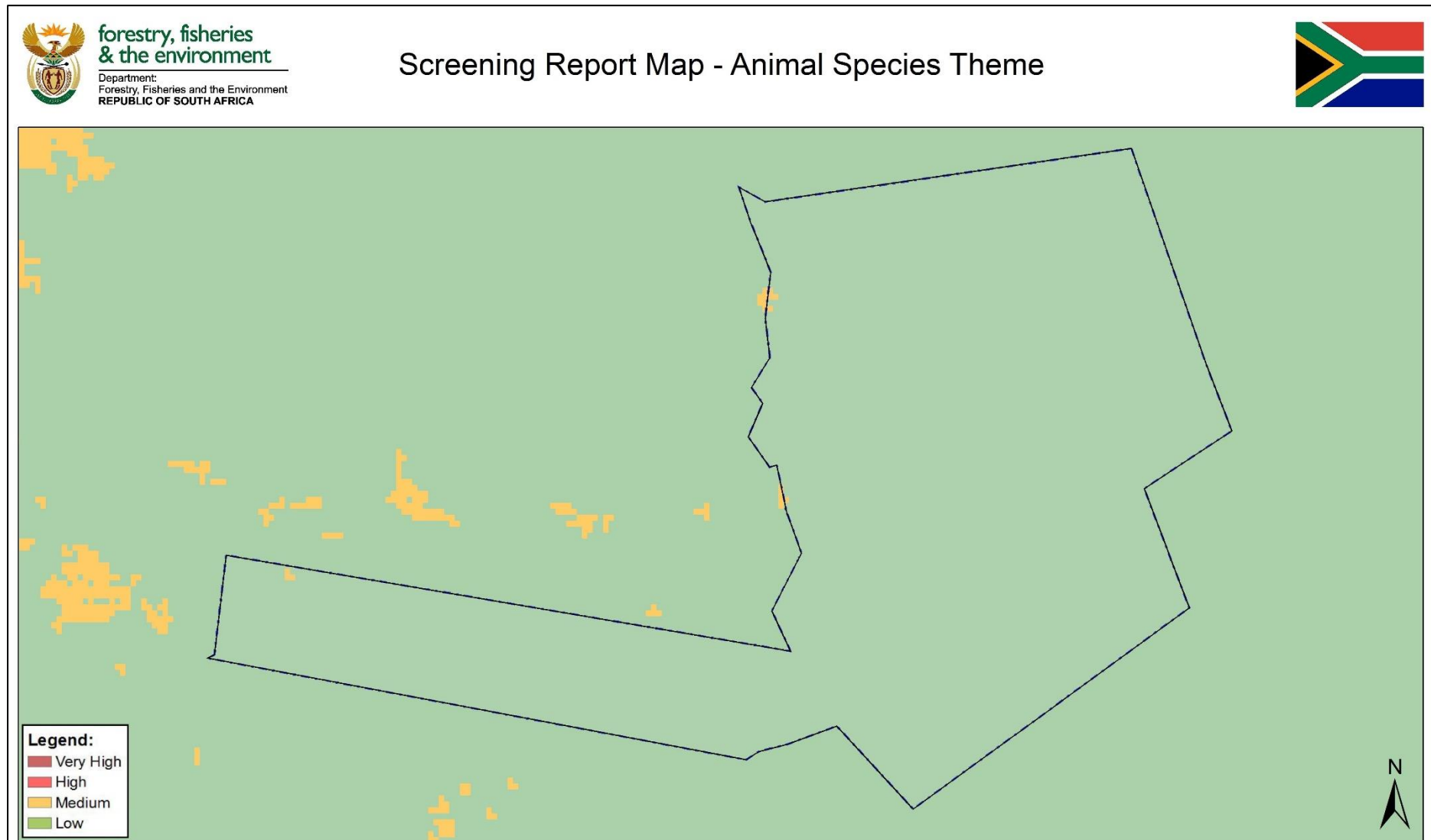


Figure 10: Outcome of the Animal Species Theme for the MRAs as obtained from the Screening Tool.



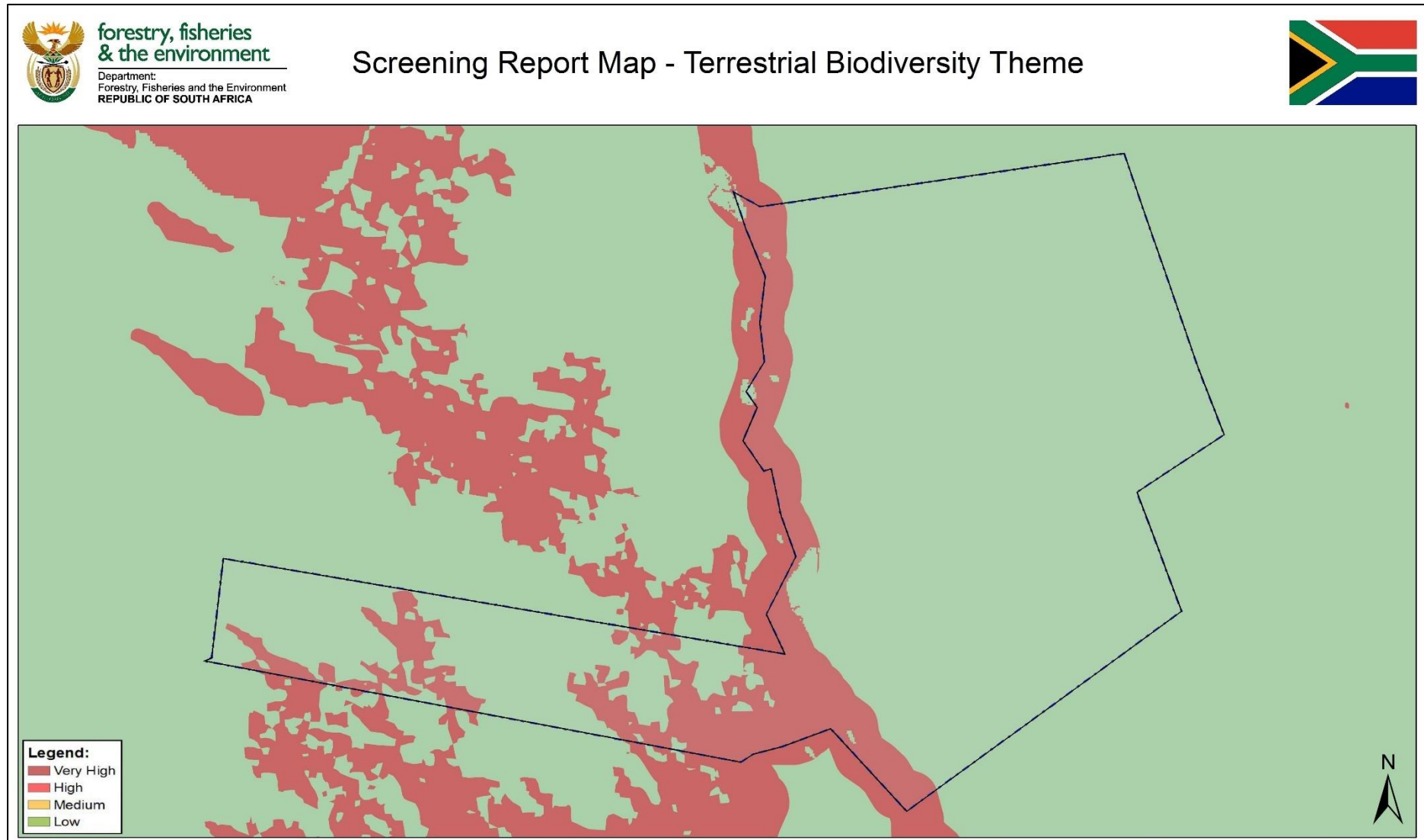


Figure 11: Outcome of the Terrestrial Biodiversity Theme for the MRAs as obtained from the Screening Tool.



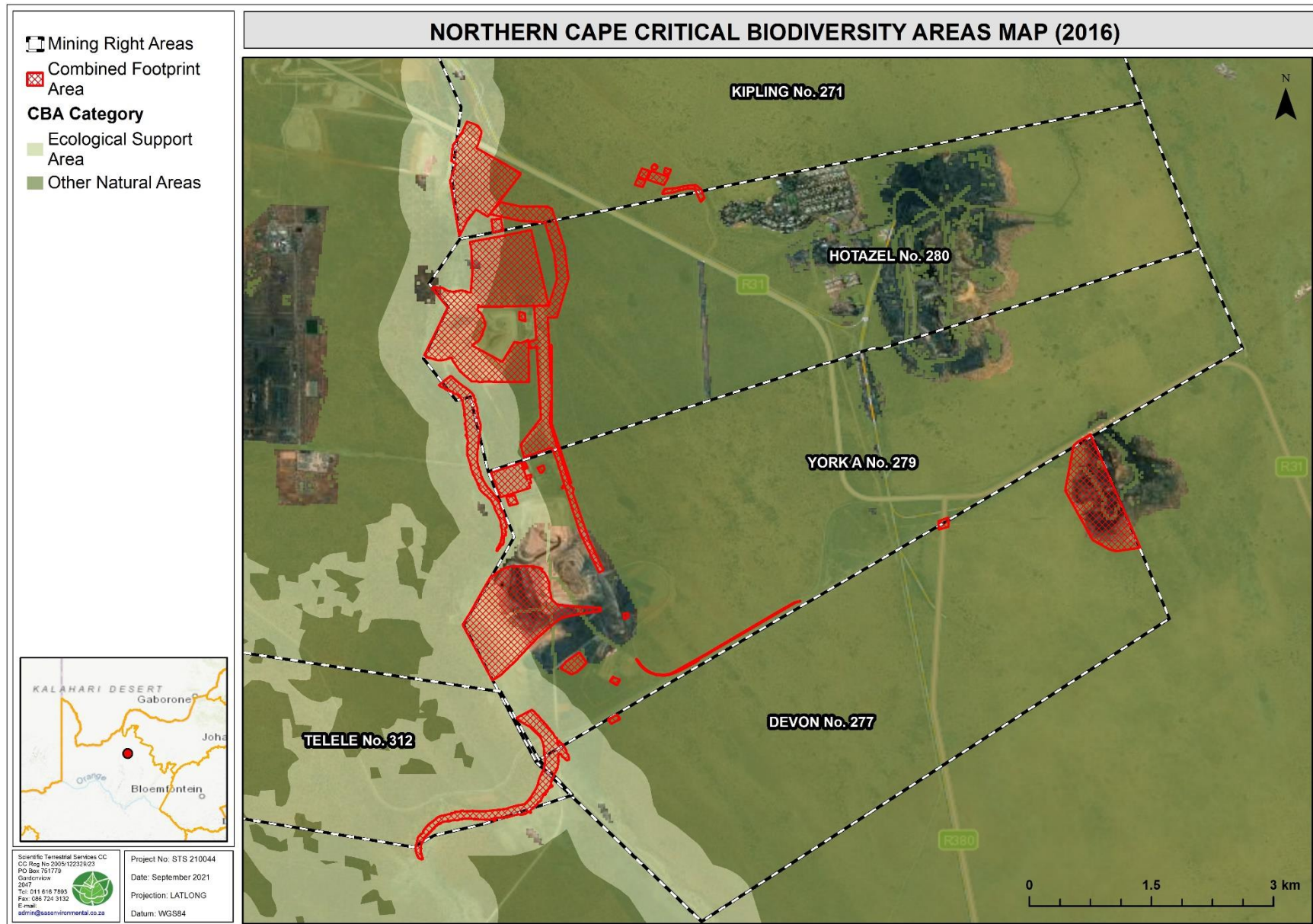


Figure 12: Important biodiversity features relating to the proposed KMR Expansion Activities according to the Northern Cape CBA Map (2016).



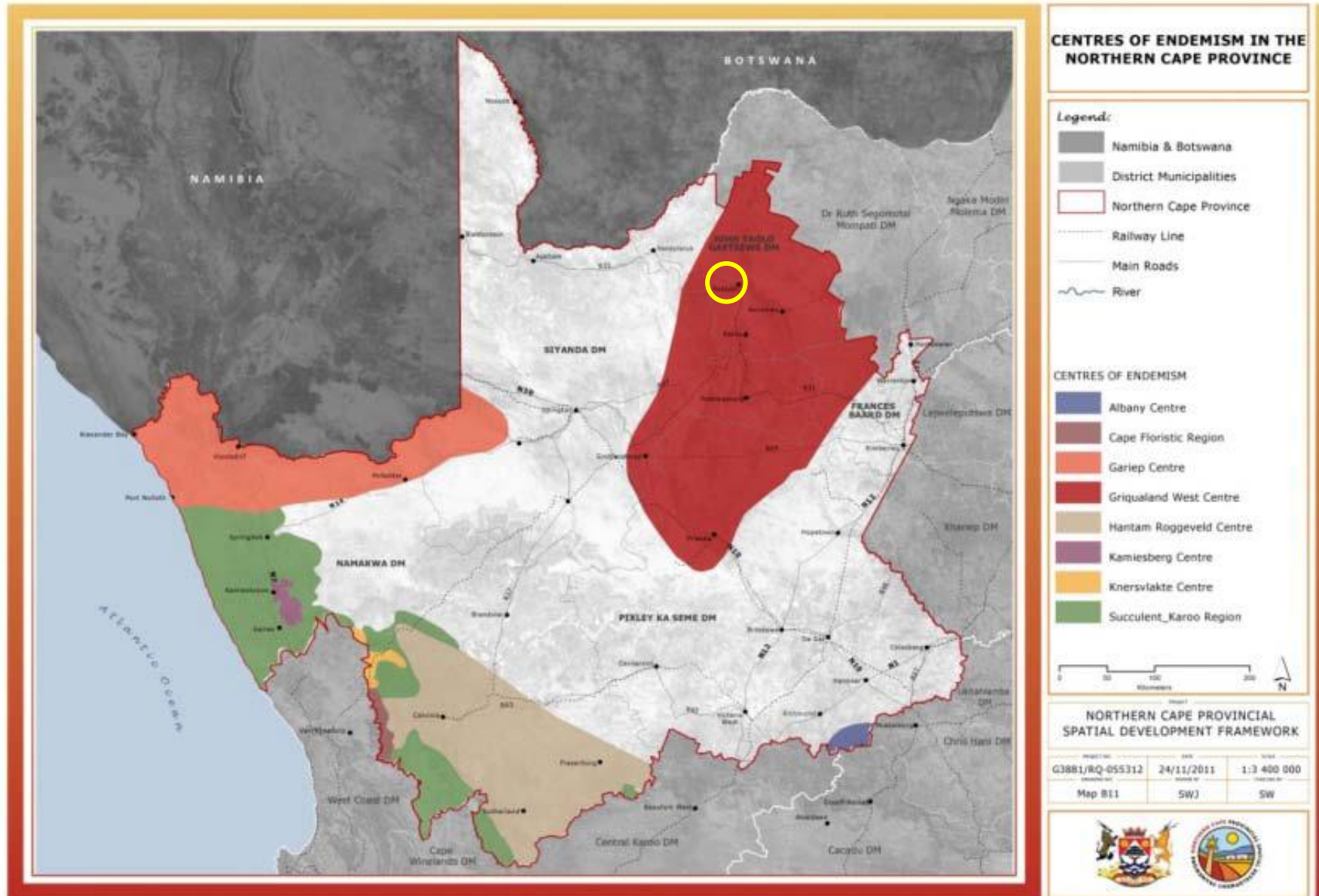


Figure 13: Centres of endemism of the Northern Cape Province: the proposed KMR Expansion Activities indicated by the yellow circle (NPSDF, 2012).



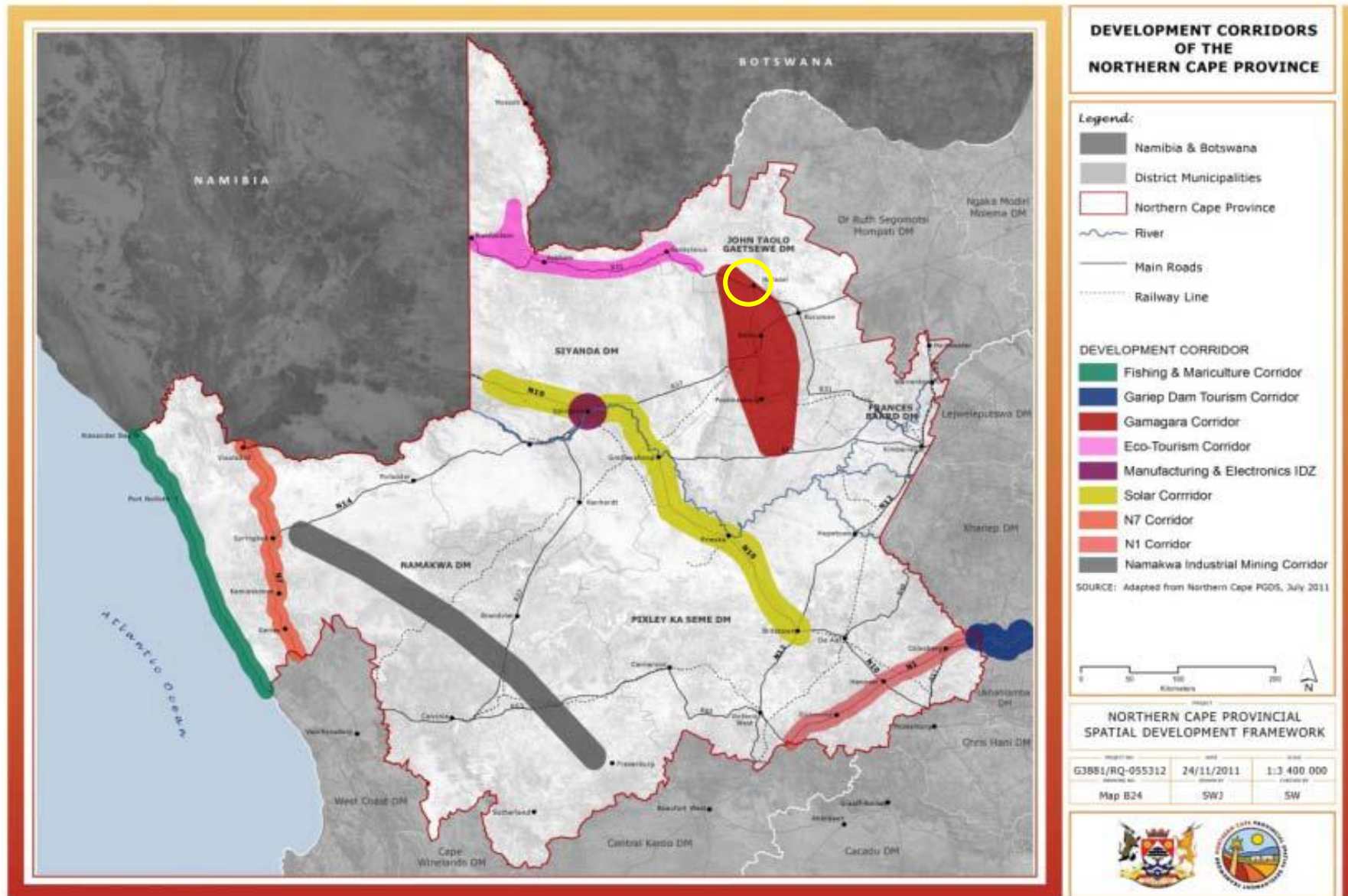


Figure 14: Development corridors of the Northern Cape Province: the assessment zone is indicated by the yellow circle (NPSDF, 2012).



## 4 STRUCTURE OF THE BIODIVERSITY REPORT

**Part A** of this report served to introduce the proposed KMR Expansion Activities, 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.

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

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



## APPENDIX B: Legislative Requirements

### 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 cause harm such as 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, 2017):

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

## **THE CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (ACT NO. 43 OF 1983) (CARA)**

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of 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 Environment, Forestry and Fisheries (DEFF) (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (<https://www.daff.gov.za/daffweb3/>):

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

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

### **Section 12:**

Declaration of trees as protected

- 1) The Minister may declare-
  - a. particular tree,
  - b. a particular group of trees,
  - c. a particular woodland; or
  - d. trees belonging to a particular species,



to be a protected tree, group of trees, woodland or species.

- 2) The Minister 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 (NCPSDF, 2019)**

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

### **THE NORTHERN CAPE NATURE CONSERVATION ACT (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

All specialists are required to assess each proposed activity/aspect of the KMR Expansion Project in relation to the construction, operational, closure and decommissioning phases to identify the potential impacts that may be associated with such activity and to develop appropriate mitigation measures that can be implemented to reduce or eliminate the potential impacts identified.

The specialist will assess the potential impact identified according to the Impact Assessment Methodology described below. This Impact Assessment Methodology has been formalised by SRK to comply the EIA Regulations of 2014 (as amended) promulgated under NEMA, which states the following:

- *An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision, and must include – an assessment of each identified potentially significant impact, including –*
  - i. cumulative impacts;*
  - ii. the nature, significance and consequence of the impact and risk;*
  - iii. the extent and duration of the impact and risk;*
  - iv. the probability of the impact and risk occurring;*
  - v. the degree to which the impact and risk can be reversed;*
  - vi. the degree to which the impact and risk may cause irreplaceable loss of resources; and*
  - vii. the degree to which the impact and risk can be mitigated.*

Based on the above, the Impact Assessment Methodology requires that each potential impact identified is clearly described (providing the nature of the impact) and be assessed in terms of the following factors (see Table C1):

- **extent** (spatial scale) - *will the impact affect the national, regional or local environment, or only that of the site?;*
- **duration** (temporal scale) - *how long will the impact last?;*
- **magnitude** (severity) - *will the impact be of high, moderate or low severity?;* and
- **probability** (likelihood of occurring) - *how likely is it that the impact may occur?*

To enable a scientific approach for the determination of the environmental significance (importance) of each identified potential impact, a numerical value has been linked to each factor. The following ranking scales are applicable:

**Table C1: Risk matrix**

<b>Occurrence</b>	<b>Duration (D):</b>	<b>Probability (P):</b>
	5 – Permanent	5 – Definite/don't know
	4 - Long-term (ceases with the operational life)	4 – Highly probable
	3 - Medium-term (5-15 years)	3 – Medium probability
	2 - Short-term (0-5 years)	2 – Low probability
<b>Severity</b>	1 – Immediate	1 – Improbable
		0 – None
<b>Severity</b>	<b>Extent/scale (E):</b>	<b>Magnitude (M):</b>
	5 – International	10 - Very high/uncertain
	4 – National	8 – High
	3 – Regional	6 – Moderate
	2 – Local	4 – Low
	1 – Site only	2 – Minor
0 – None		



Once the above factors had been ranked for each identified potential impact, the environmental significance of each impact can be calculated using the following formula:

$$\text{Significance} = (\text{duration} + \text{extend} + \text{magnitude}) \times \text{probability}$$

The maximum value that can be calculated for the environmental significance of any impact is 100. The environmental significance of any identified potential impact is then rated as either: high, moderate, or low on the following basis:

- More than 60 significance value indicates a **high (H)** environmental significance impact;
- Between 30 and 60 significance value indicates a **moderate (M)** environmental significance impact; and
- Less than 30 significance value indicates a **low (L)** environmental significance impact.

In order to assess the degree to which the potential impact can be reversed and be mitigated, each identified potential impact will need to be assessed twice:

- Firstly, the potential impact will be assessed and rated prior to implementing any mitigation and management measures; and
- Secondly, the potential impact will be assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact before and after mitigation is to indicate that the significance rating of the initial impact is and should be higher in relation to the significance of the impact after mitigation measures have been implemented.

In order to assess the degree to which the potential impact can cause irreplaceable loss of resources, the following classes (%) will be used and will need to select based on the specialist informed decision and discretion:

- 5      100% - Permanent loss
- 4      75% - 99% - Significant loss
- 3      50% - 74% - Moderate loss
- 2      25% - 49% - Minor loss
- 1      0% - 24% - Limited loss

Please note that the Loss of Resources aspect will not affect the overall significance rating of the impact.

In terms of assessing the cumulative impacts, specialists are required to address this in a sentence/paragraph fashion as the spatial extent of the cumulative impacts will vary from project to project. Cumulative impact, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing or potential impacts eventuating from similar or diverse activities or undertakings in the area.

## Results

The impact assessment results will be presented in a table format as provided in Table C-2 for the planning, construction, operational and maintenance phases of the project. Please also refer to Excel Spreadsheet accompanying this document which needs to be completed and submitted to SRK, separately in support of the specialist report.



Nature of the impact	Significance of potential impact <b>BEFORE</b> mitigation							Mitigation Measures	Significance of potential impact <b>AFTER</b> mitigation							Degree of mitigation (%)						
	P	D	E	M	LoR	Significance	P		D	E	M	LoR	Significance									
<b>ACTIVITY: Site clearing of vegetation</b>																						
<b>Pre-Construction Phase</b>																						
Description of potential impact	-	4	4	3	6		52	Moderate							3	2	1	4		21	Low	59,6
<b>Construction Phase</b>																						
	-						0	#N/A												0	#N/A	#DIV /0!
<b>Operational Phase</b>																						
	-						0	#N/A												0	#N/A	#DIV /0!
<b>Closure/Rehabilitation Phase</b>																						
	-						0	#N/A												0	#N/A	#DIV /0!
<b>Cumulative Impacts</b>																						
	-						0	#N/A												0	#N/A	#DIV /0!



## 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, including<sup>9</sup>:

- 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):

- **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;

<sup>9</sup> Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.





- **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.<sup>10</sup>

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 impacts<sup>11</sup> 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.

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<sup>10</sup> Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

<sup>11</sup> Mitigation measures should address both positive and negative impacts



## APPENDIX D: Vegetation Types

### Kathu Bushveld (SVk 12)



Kathu Bushveld (SVk 12): Open savanna dominated by *Vachellia erioloba*, *Senegalia melifera* and *Grewia flava* with low cover of *Stipagrostis ciliata* against the red sand east of Oupos, in the Kuruman District north of Kathu. Image taken from Mucina and Rutherford (2006), Figure 9.82 (page 522). ©M.C. Rutherford.

Table D1: Dominant & typical floristic species of the Kathu Bushveld (Mucina & Rutherford, 2006)

GROUP	SPECIES
<b>Woody Species</b>	
Tall tree	<i>Vachellia erioloba</i> (d).
Small trees	<i>Senegalia mellifera</i> subsp. <i>detinens</i> (d), <i>Boscia albitrunca</i> (d), <i>Terminalia sericea</i> .
Tall shrubs	<i>Diospyros lycioides</i> subsp. <i>lycioides</i> (d), <i>Dichrostachys cinerea</i> , <i>Grewia flava</i> , <i>Gymnosporia buxifolia</i> , <i>Rhigozum brevispinosum</i> .
Low shrubs	<i>Aptosimum decumbens</i> , <i>Grewia retinervis</i> , <i>Nolletia arenosa</i> , <i>Sida cordifolia</i> , <i>Tragia dioica</i> .
<b>Herbaceous species</b>	
Herbs	<i>Acrotome inflata</i> , <i>Erlangea misera</i> , <i>Gisekia africana</i> , <i>Heliotropium ciliatum</i> , <i>Hermbstaedtia fleckii</i> , <i>H. odorata</i> , <i>Limeum fenestratum</i> , <i>L. viscosum</i> , <i>Lotononis platycarpa</i> , <i>Senna italica</i> subsp. <i>arachoides</i> , <i>Tribulus terrestris</i> .
<b>Graminoids</b>	
Grasses	<i>Aristida meridionalis</i> (d), <i>Brachiaria nigropedata</i> (d), <i>Centropodia glauca</i> (d), <i>Eragrostis lehmanniana</i> (d), <i>Schmidtia pappophoroides</i> (d), <i>Stipagrostis ciliata</i> (d), <i>Aristida congesta</i> , <i>Eragrostis biflora</i> , <i>E. chloromelas</i> , <i>E. heteromera</i> , <i>E. pallens</i> , <i>Melinis repens</i> , <i>Schmidtia kalahariensis</i> , <i>Stipagrostis uniplumis</i> , <i>Tragus berteronianus</i> .
<b>BIOGEOGRAPHICALLY IMPORTANT TAXA (KALAHARI ENDEMICS)</b>	
<b>Woody Species</b>	
Small trees	<i>Vachellia luederitzii</i> var. <i>luederitzii</i> .
<b>Herbaceous species</b>	
Herbs	<i>Neuradopsis bechuanensis</i> .
<b>Graminoids</b>	
Grasses	<i>Antheplora argentea</i> , <i>Megaloprotachne albescens</i> , <i>Panicum kalaharensense</i> .

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



### Gordonia Duneveld (SVkd 1)



**Gordonia Duneveld (SVkd 1):** Sparse dune shrubland with *Vachellia haematoxylon* (the silver bush on the slopes) and *Stipagrostis amabilis* (the grass on the dune ridge) in the valley of the Auob River in the Kgalagadi Transfrontier Park. Image taken from Mucina and Rutherford (2006), Figure 9.86 (page 525). ©D. Mucina.

**Table D2: Dominant & typical floristic species of the Gordonia Duneveld (Mucina & Rutherford, 2006)**

GROUP	SPECIES
<b>Woody Species</b>	
Small trees	<i>Senegalila mellifera</i> subsp. <i>detinens</i> (d).
Tall shrubs	<i>Grewia flava</i> (d), <i>Rhigozum trichotomum</i> (d).
Low shrubs	<i>Aptosimum albomarginatum</i> , <i>Monechma incanum</i> , <i>Requienia sphaerosperma</i> .
Succulent shrubs	<i>Lycium bosciifolium</i> , <i>L. pumilum</i> , <i>Talinum cafferum</i> .
<b>Herbaceous species</b>	
Herbs	<i>Hermbsstaedtia fleckii</i> (d), <i>Acanthosicyos naudinianus</i> , <i>Hermannia tomentosa</i> , <i>Limeum arenicolum</i> , <i>L. argute-carinatum</i> , <i>Oxygonum dregeanum</i> subsp. <i>canescens</i> var. <i>canescens</i> , <i>Sericorema remotiflora</i> , <i>Sesamum triphyllum</i> , <i>Tribulus zeyheri</i> .
<b>Graminoids</b>	
Grasses	<i>Schmidtia kalahariensis</i> (d), <i>Brachiaria glomerata</i> , <i>Bulbostylis hispidula</i> , <i>Centropodia glauca</i> , <i>Eragrostis lehmanniana</i> , <i>Stipagrostis ciliata</i> , <i>S. obtusa</i> , <i>S. uniplumis</i> .
<b>BIOGEOGRAPHICALLY IMPORTANT TAXA (KALAHARI ENDEMICS)</b>	
<b>Woody Species</b>	
Tall shrub	<i>Vachellia haematoxylon</i> (d).
<b>Herbaceous species</b>	
Herbs	<i>Helichrysum arenicola</i> , <i>Kohautia ramosissima</i> , <i>Neuradopsis austro-africana</i> .
<b>Graminoids</b>	
Grasses	<i>Stipagrostis amabilis</i> (d), <i>Antheophora argentea</i> , <i>Megaloprotachne albescens</i> .

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



## APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

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

Christien Steyn	MSc. Plant Science (University of Pretoria)
Paige Ezzey	BSc (Hons) Animal, Plant and Environmental Sciences (University of the Witwatersrand)
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)

### 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	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	<a href="mailto:christien@sasenvgroup.co.za">christien@sasenvgroup.co.za</a>		
Qualifications	MSc Plant Science (University of Pretoria) BSc (Hons) Plant Science (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	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	<a href="mailto:Nelanie@sasenvgroup.co.za">Nelanie@sasenvgroup.co.za</a>		
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	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	<a href="mailto:kim@sasenvgroup.co.za">kim@sasenvgroup.co.za</a>		
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, Christien Steyn, 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, Paige Ezzey, 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.




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Specialist Signature



I, Christopher Hooton, declare that -

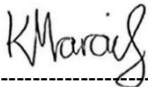
- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that June compromise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



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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





## 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 PAIGE FRANCES EZZEY**

**PERSONAL DETAILS**

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

**EDUCATION**

**Qualifications**

BSc (Hons) Animal, Plant and Environmental Sciences (University of the Witwatersrand)	2019
B.Tech Nature Conservation (Tshwane University of Technology)	2017
N. Diploma Nature Conservation (Tshwane University of Technology)	2015

**AREAS OF WORK EXPERIENCE**

**South Africa** – Gauteng, Mpumalanga, Limpopo, North West Province

**KEY SPECIALIST DISCIPLINES**

**Terrestrial Ecological Assessments:**

- Detailed Faunal Field Assessments, Fauna Ecology and Species Assemblage Reports
- Ecological Scan
- Red Data/Species of Special Concern Faunal Species Assessments
- Consulting maps, aerial photographs and digital satellite images
- Desktop studies, Mapping and General GIS
- Compilation of Impact Assessments
- Faunal Field Data Analysis and Preparation

**Training**

- GIS mapping in ArcGIS and Global Mapper
- Philosophy of Science
- Statistics for field biology
- Academic writing
- Advanced grass identification course with Frits Van Oudtshoorn





**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  
Zimbabwe, Sierra Leone, Zambia

**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 (Crisis 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

