

**FAUNAL AND FLORAL ECOLOGICAL ASSESSMENT AS
PART OF THE ENVIRONMENTAL ASSESSMENT AND
AUTHORISATION PROCESS FOR A PROPOSED COAL
MINE ON THE REMAINING EXTENT OF THE FARM THE
DUEL 186 MT, LIMPOPO PROVINCE**

Prepared for

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Section A: Background

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (STS) was appointed to conduct a faunal and floral ecological assessment as part of the Environmental Assessment and authorisation process for a proposed coal mine on the remaining extent of the farm The Duel 186 MT, Limpopo Province, hereafter referred to as “study area”. The N1 between Musina, west from the study area, meets the R525 regional road that reaches the village of Tshipise, north of the study area. The Nzhelele Nature Reserve is situated east of the study area. The land coverage in the vicinity and within the study area is mixed between rural settlement, hunting camps and ecotourism. Some of the properties in the area are also focused on mixed farming, with a mixture of livestock, game and irrigated agriculture. Hunting, game trading and eco-tourism is an established socio-economic driver in the area. There are a number of properties utilised for conventional and trophy hunting with ecotourism spin-off activities. The ecological assessment was confined to the study area and did not include an ecological assessment of surrounding properties. The surrounding area was however considered as part of the desktop assessment of the area.

This report, after consideration and description of the ecological integrity of the mining right application area and mining footprint area, must guide the Environmental Assessment Practitioner (EAP), authorities and proponent, by means of a presentation and analyses of the data collected as well as a reasoned opinion and presentation of management and mitigation recommendations, as to the suitability of the proposed mining development from a biodiversity resource management point of view and in line with best practice principles and the concept of sustainable development.

The study area is located within an area of increased ecological importance and sensitivity when compared to most potential and current mining localities in South Africa. The terrestrial and drainage features within the bulk of the proposed footprint areas are in a largely natural to natural condition. In addition, the project area is located adjacent to a conservation area, namely Nzhelele Nature Reserve and also comprises Critical Biodiversity Areas (Limpopo C-Plan Version 2), areas of Highest Biodiversity Importance (Mining and Biodiversity Guidelines, 2012) and is located within an international conservation area, i.e. the Vhembe Biosphere Reserve (South African Conservation Areas Database, SACAD 2018 Q3). Therefore, on this basis, should the project proceed it will have an ecological impact of high significance both within and potentially beyond the boundaries of the project. Further details on the findings of the study as well as opinions based on the analysed data as well as recommended mitigatory measures are presented below.

Floral Assessment Results

The study area falls within the Savanna biome (Mucina and Rutherford, 2006) and is situated within the Central Bushveld Bioregion, as well as the Mopane Bioregion (Mucina & Rutherford, 2006). Moreover, the study area falls within two vegetation types namely, Musina Mopane Bushveld and Soutpansberg Mountain Bushveld vegetation types (Mucina & Rutherford, 2012 and 2018 data sets). The field assessment confirmed that the vegetation within the study area is representative of both the above-mentioned vegetation types - thus considered representative of the reference states of these vegetation types. Furthermore, several freshwater features are present within the study area and consist of a floral species composition similar to the two overarching vegetation types. Three broad habitat units were thus identified within the study area, i.e. Soutpansberg Mountain Bushveld, Mopane Bushveld and Freshwater Habitat:

- The **Soutpansberg Mountain Bushveld** habitat unit is considered of high ecological importance and sensitivity, and any impacts from the proposed mining activities and associated infrastructure are anticipated to be significant. The clearing of vegetation and site preparation associated with the northern portions of the proposed Interim Waste Dump and the Plant area in the extreme southern portion of the study area will have a significant impact on floral habitat. Most notably for floral species protected under the National Forest Act, 1998 (Act 84 of 1998, as amended in September 2011) (NFA), National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Lists of Species that are Threatened or Protected (TOPS) and the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). Moreover, significant impacts are expected for species specifically associated with the micro-habitat within the rock outcrops and aspect-specific habitat within the south-facing ridges.



- The **Mopane Bushveld** habitat unit is considered of moderately high ecological importance and sensitivity. Impacts associated with vegetation clearing will be of highest significance for the proposed Open Pit. The Open Pit, together with the proposed Interim Discard Dump, southern portion of the proposed Interim Waste Dump and the Plant area, will lead to significant loss of preferred floral habitat and diversity associated with the Mopane Bushveld within the study area. This is mainly due to the fact that the proposed mine layout extends across the majority of the Mopane Bushveld habitat unit within the study area; and
- The **Freshwater Habitat** is considered of moderately high ecological sensitivity and importance from a floral perspective. As such, any impacts on the freshwater systems associated with the study area are likely to be significant on a local and regional scale. With the current proposed mine layout, all freshwater systems that fall within the project footprint area will be negatively impacted. In addition, downstream impacts on floral ecology are likely to emanate from the mining impacts on the Freshwater Habitat Unit, including reduced recharge, sedimentation resulting from potential poor erosion control, as well as alien and invasive plant (AIP) proliferation along the Freshwater Habitat, thus further altering floral community structure. It is recommended that no mining-related activities should take place within the Freshwater Habitat Unit and associated buffer zones as defined by NEMA (32 metres), GN704 of the NWA (100 metres), particularly because the impacts will not remain localised and has a high potential to impact on downstream systems.

Faunal Assessment Results

Initial field assessments were undertaken during February 2015 by Scientific Aquatic Services, in order to determine the ecological status of the study area. To provide updated information of the faunal ecology associated with the study area, a second field assessment was undertaken from the 26th to the 28th of February 2019. During the 2015 field assessment, a reconnaissance 'walkabout' was undertaken to determine the general habitat types found throughout the study area. Following this, specific study sites were selected that were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support faunal SCC – particularly within the areas where infrastructure is proposed.

Below are the summarized results of the studies:

Mammals

The faunal Species of Conservation Concern (SCC) observed in the study area included signs of *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena) were observed, both listed as Near Threatened by the IUCN (2019). *Panthera pardus* is also listed under Schedule 3 of the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). as a protected wild animal. Both of these species are listed as Near Threatened by the IUCN due to decreasing habitat, habitat fragmentation and human- carnivore conflict. These threats may be significant enough that *Panthera pardus* may soon qualify for Vulnerable status. Furthermore, both *Hyaena brunnea* and *Panthera pardus* are listed as protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).

Avifauna

No avifaunal SCC were observed at the time of the assessment. According to Birdlife South Africa, the study area falls within the Soutpansberg Important Bird Area (IBA). This IBA provides habitat to numerous listed bird species, with special focus on larger raptors that are known to inhabit the Soutpansberg.

The study area is considered a Special Habitat Location for the *Guttera pucherani* (Crested Guinea Fowl), a protected species under the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). Furthermore, the study area borders the Nzhelele Nature Reserve (NNR). Listed below are avifaunal SCC that have been observed within the NNR and are therefore expected to occur within the study area: *Terathopius ecaudatus* (Bateleur), *Gyps coprotheres* (Cape Vulture), *Ardeotis kori* (Kori Bustard), *Falco biarmicus* (Lanner Falcon), *Torgos tracheliotos* (Lappet-faced Vulture), *Polemaetus bellicosus* (Martial Eagle), *Sagittarius serpentarius* (Secretarybird), *Bucorvus leadbeateri* (Southern Ground-Hornbill), *Aquila rapax* (Tawny Eagle) and *Gyps africanus* (White-backed Vulture).



Amphibians

Although no amphibian SCC were observed during the surveys there is a moderate likelihood that *Pyxicephalus adspersus* (Giant Bullfrog) may occur around the Mutamba River, as this species remains buried within the soil up to 1m deep for the majority of the year, emerging during periods of high rainfall to breed. This species is not listed in the Limpopo SoER (2004), however it is listed as a protected species in the LEMA (2003) under schedule 3 (Protected Wild Animals).

Reptiles

No Reptile SCC were recorded at the time of the assessments. One RDL reptile species which may occur in the distribution range of the study area is *Python natalensis* (South African Python) which is considered Vulnerable in South Africa (Limpopo SoER, 2004). This species may occur throughout the study area and surrounding areas. The development of the mine will negatively impact on both the habitat availability as well as the prey availability for *P. natalensis*, further compounding conservation efforts for this species.

Invertebrates

No invertebrate SCC were observed in both surveys. Although several are expected to occur within the Quarter Degree Square (QDS) including *Taurhina splendens* (Splendid fruit chafer), *Charaxes marieps* (Marieps Charaxes butterfly), *Trichostetha fascicularis* (Protea beetle) and *Ischnestoma ficqui* (Fruit eating beetles)

Arachnids

Ceratogyrus darling (Horned Baboon Spider) was identified within the study area, this species is restricted to the eastern regions of South Africa, Mozambique and Zimbabwe. It is recommended that consideration be given to a rescue and relocation program for this species prior to any mining activities taking place.

Opinion and discussion

The perceived impact significance of the proposed mining activities prior to mitigation affecting faunal and floral habitat, diversity and SCC are very high to high, particularly in the construction and operational phases of mining. If effective mitigation takes place, some of the impacts may be reduced to a mostly medium high significance rating in the construction and operational phases while impacts in the decommissioning and closure phase is medium low, largely since severe impacts would have already taken place leaving little to still impact. Impact mitigation is thus expected to be limited in its ability to minimise the impacts on the biodiversity of the area. It is thus deemed essential that a cogently developed, documented and managed biodiversity management plan be implemented and maintained throughout the life of the proposed mine. Moreover, the study area falls within the Vhembe Biosphere Reserve and, albeit within the transitional zone thereof, the area should aim to both conserve the uniquely biodiverse environment, while simultaneously supporting and promoting sustainable development – of which mining is not deemed a compatible land use (Limpopo C-Plan).

Of secondary concern is the potential for this project to add to cumulative impacts due to mining in this ecologically sensitive area. Mining within this area is contradictory to the Mining and Biodiversity Guidelines and the Limpopo C-Plan database categories for the subject property. This precedent could lead to future cumulative impacts in the region which could affect local and regional conservation initiatives significantly.

Mitigation recommendations

It is recommended that mining-related activities should be reconsidered within sensitive areas as far as possible and feasible. However, were the proposed activities to proceed, the below recommendations are made to minimise the impact on floral and faunal species within all habitat units. Detailed mitigation measures that are specific to each habitat unit are listed within Section B and C.

- The footprint areas of all surface infrastructure must be minimised to what is absolutely essential;



- To minimise the need for additional vegetation clearance, existing access roads are to be used to gain access to the proposed infrastructure as far as possible;
- Proposed infrastructure located within steep slopes of ridges or hills should be restricted to the lower slopes due to the high risk of erosion and the consequential need for extensive rehabilitation activities later down the line;
- An Alien and Invasive Plant (AIP) Control Plan and Erosion Control Plan must be developed and implemented during all phases of development to lower the risk of erosion and the potential proliferation of AIPs within the study area;
- Due to several floral SCC being recorded within the study area, permits should be obtained from LEDET and DAFF to remove, cut or destroy any protected species before construction of infrastructure takes place. Consequently, before any construction activities can occur a detailed walk down of the area must take place, preferably within the flowering or fruiting season, during which all protected species, or species of conservation concern, should be marked;
- Exceptionally strict monitoring throughout the life of the mine and post-closure is required in order to ensure the health and functioning of the terrestrial ecosystems is retained, and monitoring data must be utilised to proactively manage any identified emerging issues in a well-managed and overseen Biodiversity Action Plan (BAP), which must be implemented through an automated Environmental Management System (EMS); and
- The rehabilitation of the infrastructure during closure of the mine must take place in such a way as to ensure that the post closure land use objectives are met and that adjacent land uses and land potential is supported and with particular mention of the support of the Nzhelele Nature Reserve. In order to meet this objective, rehabilitation will need to be well planned and a suitably qualified ecologist must form part of the management team through the entire life cycle of the project and to guide the rehabilitation (including concurrent rehabilitation) and closure objectives of the mine.

Conclusion

The objective of this study was to provide sufficient information on the ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the EAP and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the country.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement IEM and to ensure that the best long-term use of the resources on the subject property will be made in support of the principle of sustainable development.



DOCUMENT GUIDE

The Document Guide below is for reference to the procedural requirements for environmental authorisation applications in accordance to GN267 of 24 March 2017, as it pertains to NEMA.

No.	Requirement	Section in report
a)	Details of -	
(i)	The specialist who prepared the report	Appendix E
(ii)	The expertise of that specialist to compile a specialist report including a curriculum vitae	Appendix E
b)	A declaration that the specialist is independent	Appendix E
c)	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
cA)	An indication of the quality and age of base data used for the specialist report	Section 2 and 3
cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section B and C
d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 2.1
e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section B and C
f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section B and C
g)	An identification of any areas to be avoided, including buffers	Section B and C
h)	A map superimposing the activity including the associated structure and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section B and C
i)	A description of any assumptions made and any uncertainties or gaps in knowledge	Section 1.3
j)	A description the findings and potential implication\ of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities	Section B and C
k)	Any mitigation measures for inclusion in the EMPr	Section B and C
l)	Any conditions for inclusion in the environmental authorisation	Section B and C
m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section B and C
n)	A reasoned opinion -	
(i)	As to whether the proposed activity, activities or portions thereof should be authorised	Section B and C
(iA)	Regarding the acceptability of the proposed activity or activities	Section B and C
(ii)	If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section B and C
o)	A description of any consultation process that was undertaken during the course of preparing the specialist report	N/A
p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q)	Any other information requested by the competent authority	N/A



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ACRONYMS

BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
GIS	Geographic Information System
IBA	Important Bird Area
LEDET	Limpopo Department of Economic Development and Tourism
LEMA	Limpopo Environmental Management Act
MAB	Man and the Biosphere
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NPAES	National Protected Areas Expansion Strategy
PRECIS	Pretoria Computer Information System
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Area Database
SACAD	South African Conservation Areas Database
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
TSP	Threatened Species Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VBR	Vhembe Biosphere Reserve



GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or 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.
Biome	A broad ecological unit representing major life zones of large natural areas – defined mainly by vegetation structure and climate.
Biosphere Reserve	Areas identified either on terrestrial or marine ecosystems (or both) that are internationally recognized under the framework of UNESCO's Man and Biosphere (MAB) programme. Spatial zonation of a Biosphere Reserve: <ul style="list-style-type: none"> • Core zone/s - these are areas that must have a legal/long term protection status in terms of national laws; • Buffer zone/s – these areas usually surround or adjoin the core zones; and • Transition zone – is the area which contains diversity of sustainable activities.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
IBA (Important Bird and Biodiversity Area)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in (NEMA))	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Invasive species	Means any species whose establishment and spread outside of its natural distribution range; they threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and may result in economic or environmental harm or harm to human health
Least Threatened	Least threatened ecosystems are still largely intact.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.



1 INTRODUCTION

Scientific Terrestrial Services (STS) was to conduct a faunal and floral ecological assessment as part of the Environmental Assessment and Authorisation process for a proposed coal mine on the remaining extent of the farm The Duel 186 MT, Limpopo Province, hereafter referred to as “study area” (Figure 1 - 2).

The N1 between Musina, west from the study area, meets the R525 regional road that reaches the village of Tshipise, north of the study area. The Nzhelele Nature Reserve is situated west of the study area. The land coverage in the vicinity and within the study area is mixed between rural settlement, hunting and ecotourism. Some of the properties in the area are also focused on mixed farming, with a mixture of livestock, game and irrigated agriculture. Hunting, game trading and eco-tourism is an established socio-economic driver in the area. There are a number of properties utilised for trophy (for local and foreign tourists) and biltong hunting with ecotourism spin-off activities.

The purpose of this report is to define the terrestrial ecology of the study area from a desktop conservation database perspective. The detailed information within this report is further intended to guide the fieldwork components of both the floral and faunal assessments, thereby ensuring that all relevant ecological aspects were considered prior to performing the field assessments. This report, together with the floral and faunal reports (Sections B and C), after consideration and description of the ecological integrity of the mining right application area and mining footprint area, must guide the Environmental Assessment Practitioner (EAP), authorities and proponent, by means of a presentation and analyses of the data collected as well as a reasoned opinion and presentation of management and mitigation recommendations, as to the suitability of the proposed mining development from an biodiversity resource management point of view and in line with best practice principles and the concept of sustainable development.



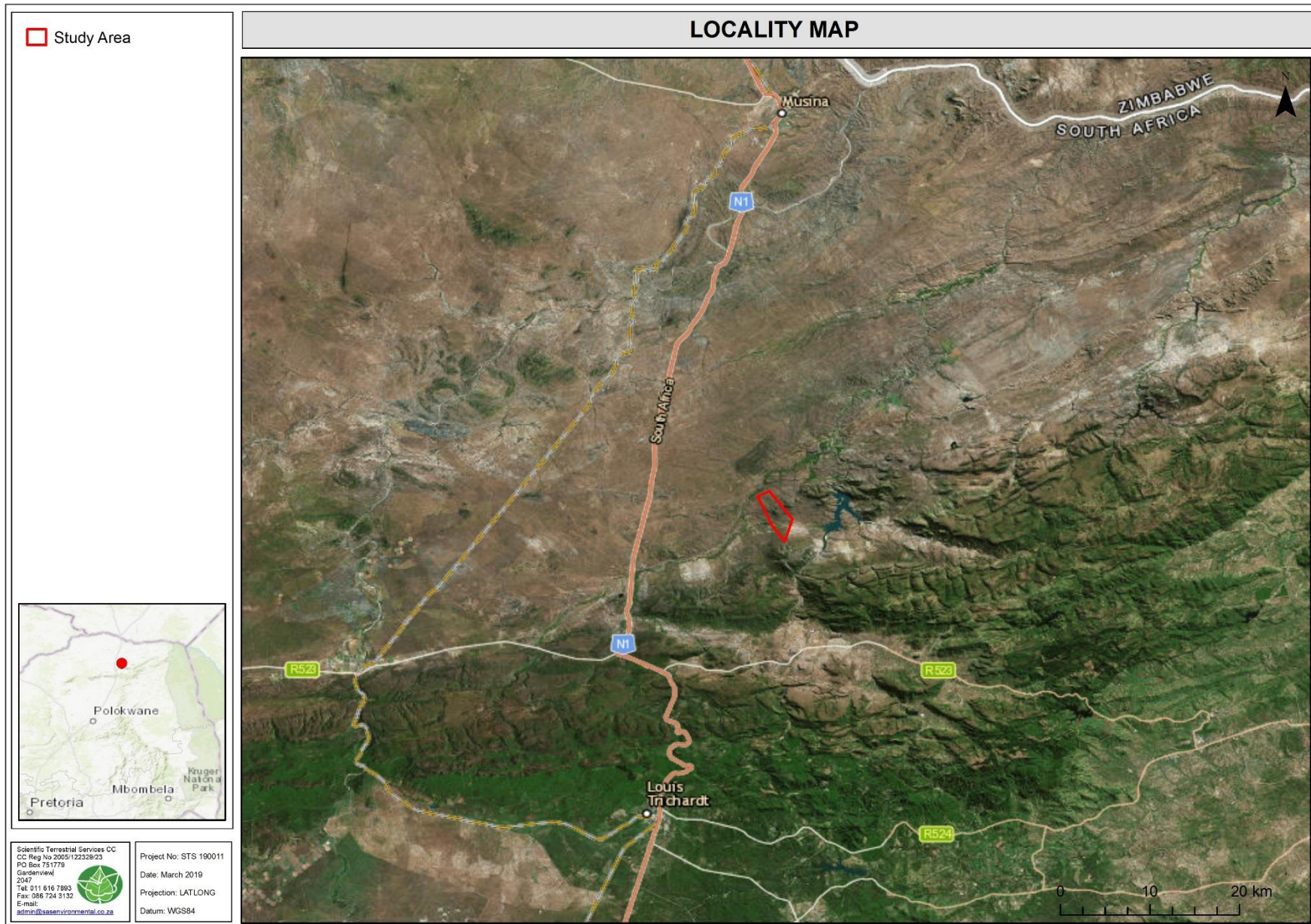


Figure 1: Digital Satellite image depicting the location of the study area in relation to surrounding areas.



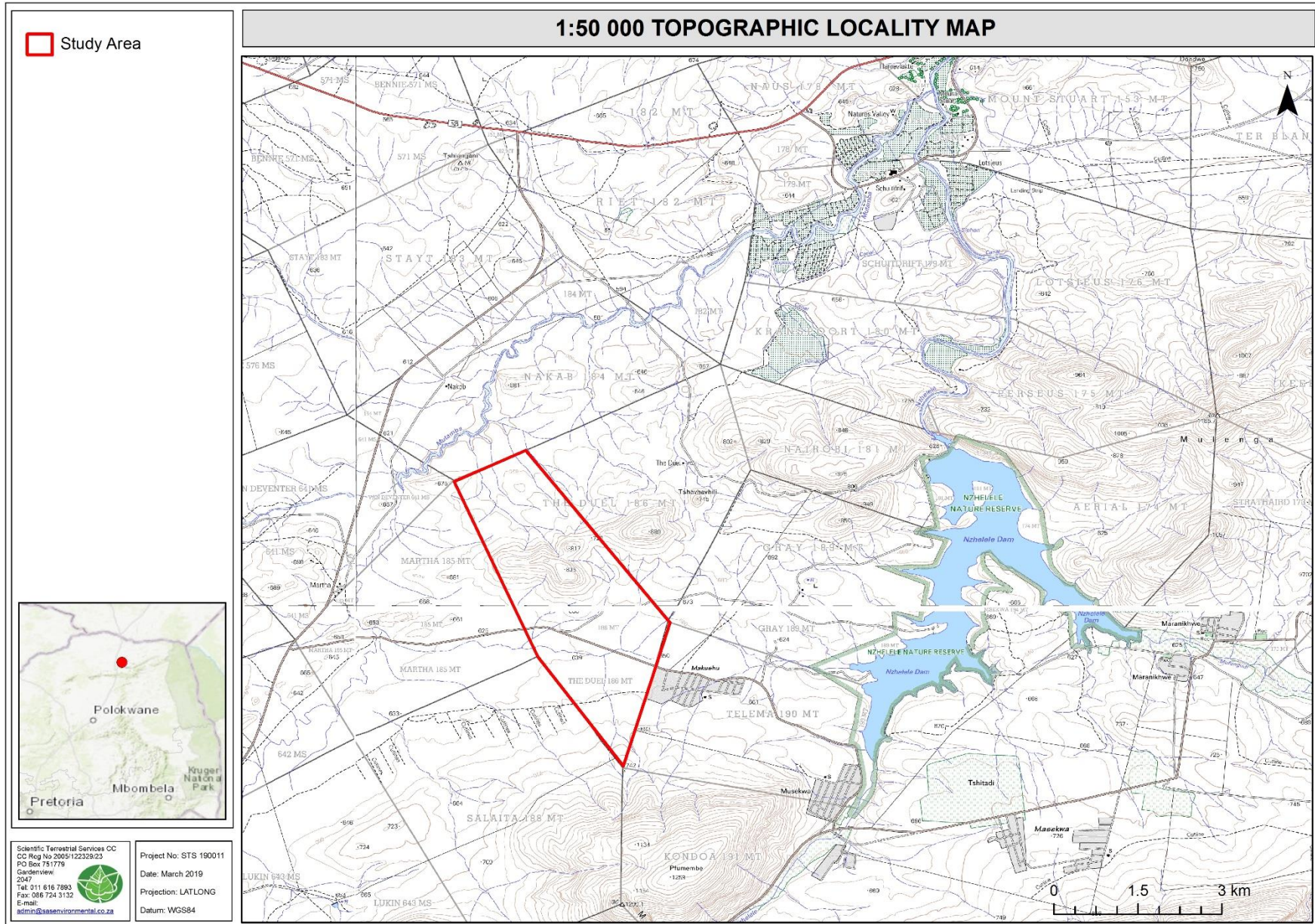


Figure 2: Study area depicted on a 1:50 000 topographical map in relation to its surrounding area.



1.1 Project Description¹

Subiflex (Pty) Ltd holds a Prospecting Right on the farms Lotsieus 176 MT, Kranspoort 180 MT, Nairobi 181 MT and The Duel 186 MT. The proposed project is for the mining of coal on the Remaining Extent of The Duel 186 MT (i.e. the study area) using a combination of underground (long-wall methodology²) and open cast (conventional drill and blast operation with truck and shovel, load and haul) mining methods. The expected life of mine (LoM) is 24 years.

Mining of the Open Pit (Figure 3) will form part of the first operations, whereas the underground mining is planned to commence from year 10, continuing for five years. Selected positions within the Open Pit will be used to gain access for underground mine activities and upon completion all access points will be closed. The Open Pit will be rehabilitated.

The proposed infrastructure to be developed includes (Figure 3):

- Coal Handling Processing Plant;
- Overburden Waste Dump;
- Temporary Discard Dump;
- Haul roads;
- Pollution Control Dams;
- Raw water storage facility and distribution systems;
- Access road; and
- Auxiliary infrastructure including a workshop and store, office and change house, electrical power supply and security fencing.

The final discard material from the plant will be disposed of in the mined-out open pit. If the pit is unavailable due to existing mining activities, the discard material will be placed on an interim surface discard dump, from where it will be reclaimed and dumped into the mined-out open pit towards the end of the mine life as part of the rehabilitation of the mining site.

¹ 05-03-2015 The Duel Coal Project BID final approved.

² "Long-wall mining recovers and extracts a high percentage of the coal and can be very costly. It involves the full extraction of coal from a section of the seam or face using mechanical shearers (WCI, 2009)." Shongwe Bonisile Nolwando Master's Thesis (2018): The Impact of Coal Mining on the Environment and Community Quality of Life: A Case Study Investigation of the Impacts and Conflicts Associated with Coal Mining in the Mpumalanga Province, South Africa.



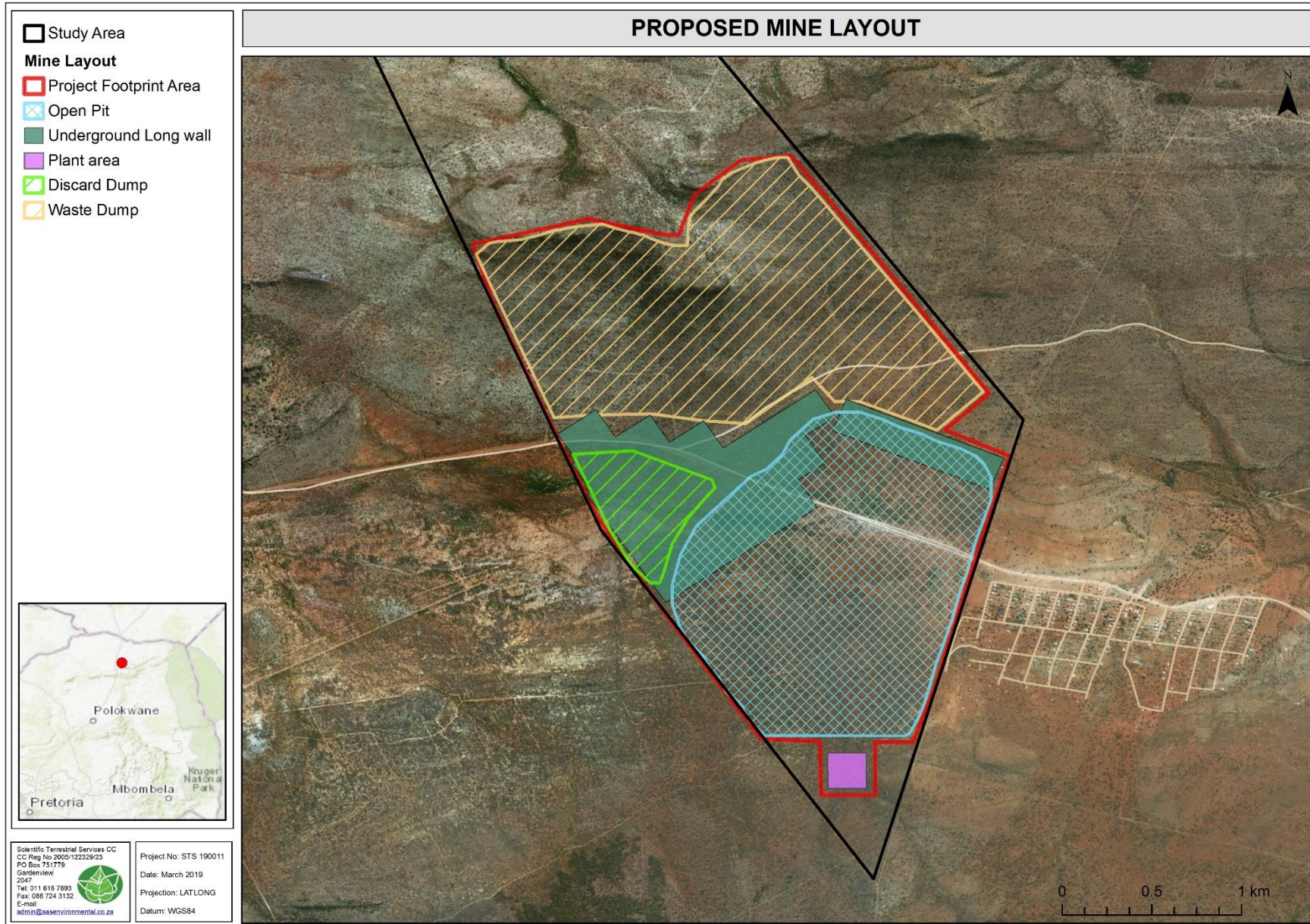


Figure 3: The proposed mine layout for the study area.



1.2 Scope of Work

Specific outcomes in terms of the report are as follows:

- Compile a desktop study 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>), including the Limpopo Conservation Plan Version 2 (2013), to gain background information on the physical habitat and potential floral and faunal biodiversity associated with the study area;
- To state the indemnity and terms of use of this report (Appendix A) as well as to provide the details of the specialist who prepared the report (Appendix E);
- To outline the legislative requirements that were considered for the assessment (Appendix B); and
- To provide the methodologies followed relating to the impact assessment and development of the mitigation measures that was utilised in the floral and faunal reports (Appendix D).

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The terrestrial ecological desktop assessment is confined to the study area and does not include detailed results of the neighbouring and adjacent properties; although the sensitivity of surrounding areas is included on the respective maps;
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics within the study area at the scale required to inform the Environmental Impact Assessment (EIA) process. However, this information is considered to be useful as background information to the study and, based on the desktop results, sufficient decision making can take place with regards to the development activities; and
- As part of the assessment update, a second field investigation was undertaken from the 26th to the 28th of February 2019, to determine the current ecological status of the study area, to build on the data already collected during the initial assessments, and to “ground-truth” the results of the desktop assessment.



1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- Constitution of the Republic of South Africa, 1996 (Act 108 of 1996);
- National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA);
- Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA);
- The National Forest Act, 1998 (Act 84 of 1998, as amended in September 2011) (NFA);
and
- Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA).

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

2 ASSESSMENT APPROACH

2.1 General Approach

In order to accurately determine the Present Ecological State (PES) of the study area and capture comprehensive data with respect to faunal and floral taxa, the following methodology was used:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the study area was made to confirm the assumptions made during the consultation of the maps; and
- Relevant databases considered during the assessment of the study area included the South African National Biodiversity Institute (SANBI) Threatened Species Programme (TSP), the Limpopo Conservation Plan version 2 (2013), Mucina and Rutherford (2012), National Biodiversity Assessment (2011), Important Bird Areas in conjunction with the South African Bird Atlas Project (SABAP 2) (2015), International Union for Conservation of Nature (IUCN), and Pretoria National Herbarium Computer Information Systems (PRECIS).



3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Study Area based on National and Provincial Datasets

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



Table 1: Summary of the terrestrial conservation characteristics for the study area (QDS 2230CC and 2230CA).

DETAILS OF THE focus AREA IN TERMS OF MUCINA & RUTHERFORD (2012) – FIGURE 4		DESCRIPTION OF THE VEGETATION TYPES ACCORDING TO MUCINA AND RUTHERFORD (2006, 2012)										
Biome	The study area is situated within the Savanna Biome .	Vegetation Type	Musina Mopane Bushveld (SVmp 1)					Soutpansberg Mountain Bushveld (SVcb 21)				
Bioregion	The study area is located within the Mopane Bioregion and the Central Bushveld Bioregion .	Climate	Summer rainfall with very dry winters including the shoulder months of May and September. Generally frost-free unit.					Summer rainfall with dry winters.				
Vegetation Type	The study area is situated within the Musina Mopane Bushveld and the Soutpansberg Mountain Bushveld vegetation types.		MAP* (mm)	MAP* (mm)	MAP* (mm)	MAP* (mm)	MAP* (mm)	MAP* (mm)	MAT* (°C)	MFD* (Days)	MAPE* (mm)	MASM S* (%)
			1194	16.7	3	1779	62	716	18.9	2	2092	76
LIMPOPO CONSERVATION PLAN VERSION 2 (C-PLAN, 2013) (FIGURE 5)		Altitude (m)	760 m - 1 640 m					600 - 1 500 m				
The study area falls within Critically Biodiversity Areas (CBAs) 1 and 2 (see below). No other areas of conservation concern are located within the study area; however, the eastern-most portion of the study area borders a protected area (see below sections for details on protected areas in the area). Furthermore, the south-eastern border of the study area borders an Ecological Support Area (ESA) 2.		Distribution	Limpopo Province: Undulating plains from around Baines Drift and Alldays in the west, remaining north of the Soutpansberg and south of the Limpopo River (but also occurring to the north in Zimbabwe), through Musina and Tshipise to Malongavlake					Limpopo Province: Occurs on the slopes of the Soutpansberg Mountain, and Blouberg and Lerataupje Mountains in the west. Extends eastward on lower ridges including Khaphamali and Makonde Mountains.				
CBA 1	The entire project footprint area falls within a CBA 1 . These are Irreplaceable Sites required to meet biodiversity pattern and / or ecological processes targets. <u>Land Management Recommendations:</u> Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land use. <u>Incompatible Land-Use:</u> Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines).	Conservation	Least threatened. Target 19%. Only 2% statutorily conserved mainly in the Mapungubwe National Park as well as in Nwanedi and Honnet Nature Reserves. Additionally, about 1% conserved in the Baobab Tree Reserve. Roughly 3% transformed, mainly by cultivation. Erosion is high to moderate.					Vulnerable. Target 24%. Just over 2% statutorily conserved in the Blouberg, Happy Rest and Nwanedi Nature Reserves. A smaller area is conserved in other reserves. Some 21% transformed, with about 14% cultivated and 6% plantations. High rural human population densities in some of the lower lying parts of the eastern section of the unit. Erosion is very low to moderate.				
	The remaining extent of the study area, i.e. all areas excluding the footprint area, falls within a CBA 2 . These are Best Design Selected Sites that are selected to meet biodiversity pattern and / or ecological processes targets. Alternative sites may be available to meet targets. <u>Land Management Recommendations:</u> Avoid conversion of Agricultural land to more intensive	Geology and Soils	Most of the area is underlain by the Archaean Beit Bridge Complex, except where it is covered by much younger Karoo sandstones and basalts. The Beit Bridge Complex consists of gneisses and metasediments and is structurally very complex. Variable soils from deep red/brown clays, moderately deep, dark, heavy clays to deep, freely drained sandy soils to shallower types including skeletal Glenrosa and Mispah soil forms. Land types mainly Ae, Ah, Fc and Db.					Reddish or brown, sandstone and quartzite, conglomerate, basalt, tuff, shale and siltstone of the Soutpansberg Group (including the Wyllie's Poort, Fundudzi and Nzhelele Formations), Mokolian Erathem. Rocky areas with miscellaneous soils including acidic dystrophic to mesotrophic sandy to loamy soil. Glenrosa and Mispah soil forms are common. Land types mainly lb, Ab, Fa, Fb, Ae and Ia.				



	<p>land uses, which may have a negative impact on threatened species or ecological processes. Incompatible Land-Use: Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). Note: <i>Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to CBA2. Alternative areas may need to be identified to ensure the CBA network still meets the required targets.</i></p>	<p>Vegetation & landscape features</p>	<p>Undulating to very irregular plains, with some hills. In the western section, open woodland to moderately closed shrubveld dominated by <i>Colophospermum mopane</i> on clayey bottomlands and <i>Combretum apiculatum</i> on hills. In the eastern section on basalt, moderately closed to open shrubveld is dominated by <i>Colophospermum mopane</i> and <i>Terminalia prunioides</i>.</p>	<p>Low to high mountains, highest in the west, splitting into increasing number of lower mountain ridges towards the east. Dense tree layer and poorly developed grassy layer. The topography of the east-west-orientated ridges of the mountain changes drastically over short distances, resulting in orographic rain on the southern ridges, and a rainshadow effect on the northern ridges. Because of this topographic diversity, the Soutpansberg Mountain Bushveld comprises a complex mosaic of sharply contrasting kinds of vegetation within limited areas. The main vegetation variations within the Soutpansberg Mountain Bushveld are subtropical moist thickets (mainly along the lower-lying southern slopes, on steep clayey soils of volcanic origin), mistbelt bush clumps (within the mistbelt of the southern and central ridges of the mountain, on rugged quartzitic outcrops with shallow sandy soils), relatively open savanna sandveld (on both deep and shallow quartzitic sands along the relatively dry middle and northern slopes of the mountain), and arid mountain bushveld (along the very arid northern ridges of the mountain).</p>
<p>Limpopo Fauna and Flora (Figure 6)</p>	<p>The entire study area falls within an area referred to in the Limpopo C-Plan as a Special Habitat Location and is considered to be an important area for the Crested Guinea Fowl (<i>Guttera pucherani</i>), a protected species under the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). Moreover, the entire study area falls within Habitat of Threatened / Rare Species, considered important for Red Data floral Species.</p>		<p>Remarks</p>	<p>The unit is the most diverse mopaneveld type in South Africa. The Musina region has the highest species richness—also relative to <i>Colophospermum mopane</i>-dominated areas in Namibia and the Save River Valley in Zimbabwe (F. Siebert et al. 2003). The relationship of this unit with the adjacent and often fragmented parts of SVmp 2 Limpopo Ridge Bushveld is spatially complex. It is very dependent on scale and has not been fully captured on the map.</p>
<p>MINING AND BIODIVERSITY GUIDELINES (2013)</p>		<p>Highest Biodiversity Importance (Figure 7)</p>		<p>According to the Mining and Biodiversity Guideline the majority of the project footprint area is located within an area considered to be of Highest Biodiversity Importance (Figure 7). Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that, due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning), mining projects will be significantly constrained or may not receive the necessary authorisations. The white areas are areas for which no importance is indicated.</p>



CONSERVATION DETAILS PERTAINING TO THE STUDY AREA (VARIOUS DATABASES) – Figure 8		
<p>NBA (2011)</p>	<p>The study area falls within an area that is currently poorly protected. Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act and compared with the biodiversity target for that ecosystem type. If less than 50% of the ecosystem’s biodiversity target is met, it is classified it as Poorly Protected.</p>	
<p>National Threatened Ecosystems (2011)</p>	<p>According to the National List of Threatened Terrestrial Ecosystems (2011) the study area does not fall into any threatened ecosystems.</p>	
<p>NPAES (2009); SACAD (2018); SAPAD (2018) (Figure 4)</p>	<p>The National Protected Areas Expansion Strategy (NPAES, 2009) database and the South Africa Protected Areas Database (SAPAD, 2018 Q4) do not indicate that any formally or informally protected areas are located within the study area or within 10 km thereof. Moreover, the study area does not fall within a focus area as per the NPAES (2009), and as such is not earmarked for conservation within the near future. The study area is, however, located within an international conservation area, i.e. the Vhembe Biosphere Reserve³, according to the South Africa Conservation Area Database (SACAD, 2018 Q4). However, the study area falls within the transitional zone of the Vhembe Biosphere Reserve⁴ and is thus outside of the core area. Only the core area requires legal protection and hence can correspond to an existing protected area such as a nature reserve or a national park.</p>	<p>IBA (2015)</p> <p>The study area falls within the Soutpansberg Important Bird and Biodiversity Area (IBA 003), which is presented in Figure 3. The Soutpansberg is an east–west trending mountain range that stretches c. 130 km from 10 km west of Thohoyandou in the east to Vivo in the west. The mountains hold the catchments of several important Limpopo Province rivers, including the Sand, Mutamba, Nzhelele, Nwanedzi, Mutale and Luvuvhu.</p> <p>Birds: The Soutpansberg supports one colony of Cape Vulture (<i>Gyps coprotheres</i>). The thick forest vegetation in the valleys and basins holds Crowned Eagle (<i>Stephanoaetus coronatus</i>), Forest Buzzard (<i>Buteo trizonatus</i>), Knysna Turaco (<i>Tauraco corythaix</i>), Chorister Robin-Chat (<i>Cossypha dichroa</i>), Narina Trogon (<i>Apaloderma narina</i>), Grey Cuckooshrike (<i>Coracina caesia</i>), Olive Bush-Shrike (<i>Chlorophoneus olivaceus</i>), Black-fronted Bush-Shrike (<i>C. nigrifrons</i>), Green Twinspot (<i>Mandingoa nitidula</i>) and Forest Canary (<i>Crithagra scotops</i>). The bushveld on the slopes supports Gorgeous Bush-Shrike (<i>Chlorophoneus viridis</i>), White-throated Robin-Chat (<i>Cossypha humeralis</i>) and Burnt-necked Eremomela (<i>Eremomela usticollis</i>). The grasslands at the summit of the Soutpansberg hold protea woodland suitable for Gurney’s Sugarbird (<i>Promerops gurneyi</i>). In the rivers that flow from the catchment area towards the Lowveld there are small populations of African Finfoot (<i>Podica senegalensis</i>) and White-backed Night Heron (<i>Gorsachius leuconotus</i>). African Broadbill (<i>Smithornis capensis</i>) breeds in the natural forests.</p> <p>IBA trigger species: Cape Vulture (300 individuals and 147 breeding pairs) and Crowned Eagle are the globally threatened species in this IBA. Regionally threatened species are Black Stork (<i>Ciconia nigra</i>) and Orange Ground Thrush (<i>Zoothera gurneyi</i>). Common biome-restricted and restricted-range species are Knysna Turaco, Gurney’s Sugarbird, White-starred Robin (<i>Pogonocichla stellate</i>), White-throated Robin-Chat, Chorister Robin-Chat, Kurrichane Thrush <i>Turdus libonyanus</i>, Barred Wren-Warbler (<i>Calamonastes fasciolatus</i>), Gorgeous Bush-Shrike, White-bellied Sunbird (<i>Cinnyris talatala</i>) and Swee Waxbill (<i>Coccopygia melanotis</i>). Uncommon species in these categories are Grey Cuckooshrike, Yellow-throated Woodland Warbler (<i>Phylloscopus ruficapilla</i>), Forest Canary, Orange Ground Thrush, Kalahari Scrub Robin (<i>Erythropygia paena</i>) and Barratt’s Warbler (<i>Bradypterus barratti</i>).</p>

CBA = Critical Biodiversity Area, ESA = Ecological Support Area, IBA = Important Bird and Biodiversity Area, MAP = Mean Annual Precipitation, MAT = Mean Annual Temperature, MFD = Mean Frost Days, MAPE = Mean Annual Potential for Evaporation, MASMS = Mean Annual Soil Moisture Stress, NBA = National Biodiversity Assessment, NPAES = National Protected Areas Expansion Strategy, SACAD = South African Conservation Areas Database, SAPAD = South African Protected Areas Database.

³ Biosphere reserves are sites established by countries and recognized under UNESCO’s Man and the Biosphere (MAB) Programme to promote sustainable development based on local community efforts and sound science.

⁴ Biosphere reserves consist of three zones of protection, i.e. **core zones** with legal protection (restricted to research activities only), **buffer zones** that typically surround the core zones (some restriction on activities occurring in this zone) and **transitional zones** (various sustainable activities allowed). (Presentation: Status of Biosphere Reserves in South Africa By Tendamudzimu Munyai)



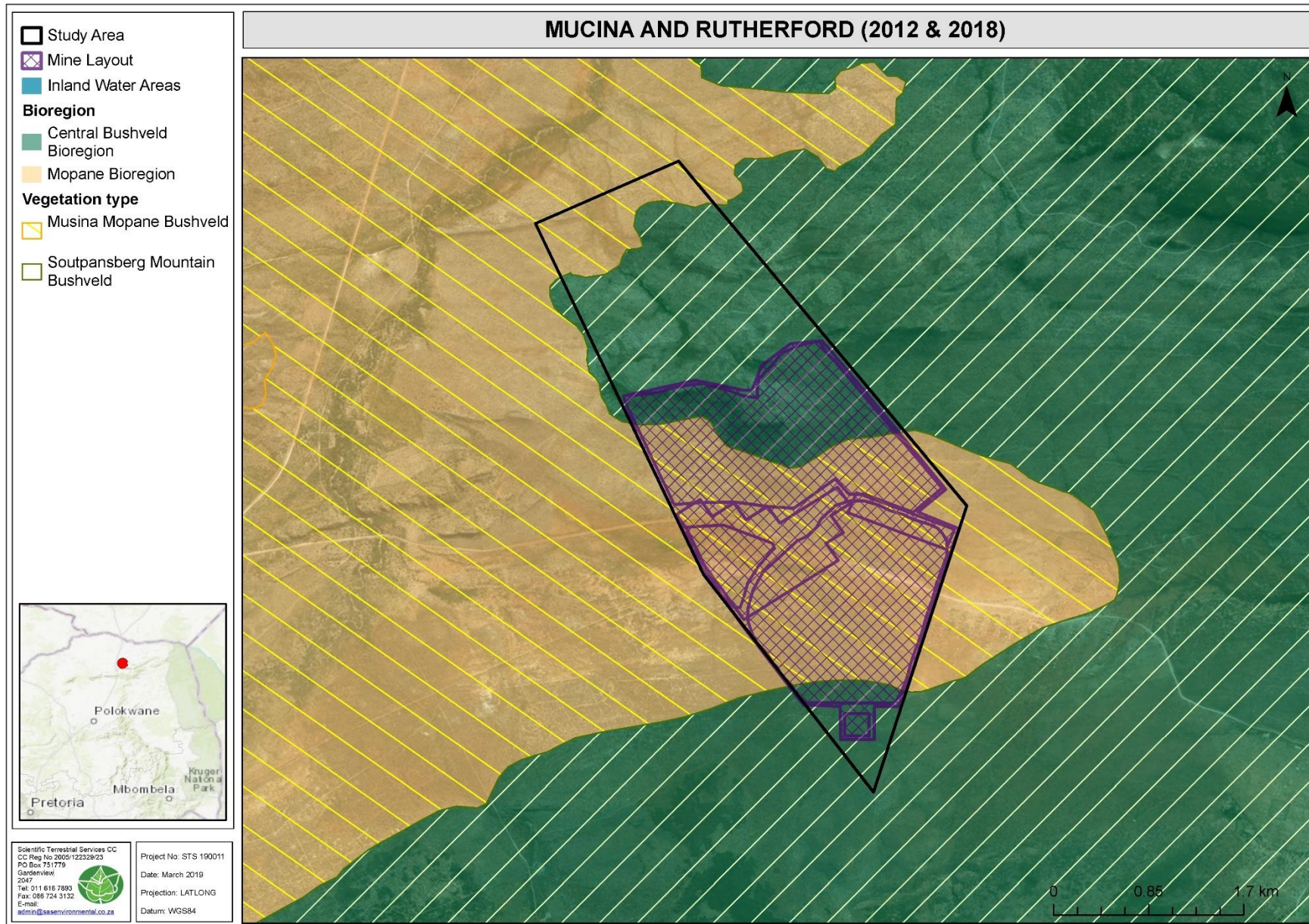


Figure 4: Bioregions and Vegetation types associated with the study area, according to Mucina and Rutherford (2012, 2018).



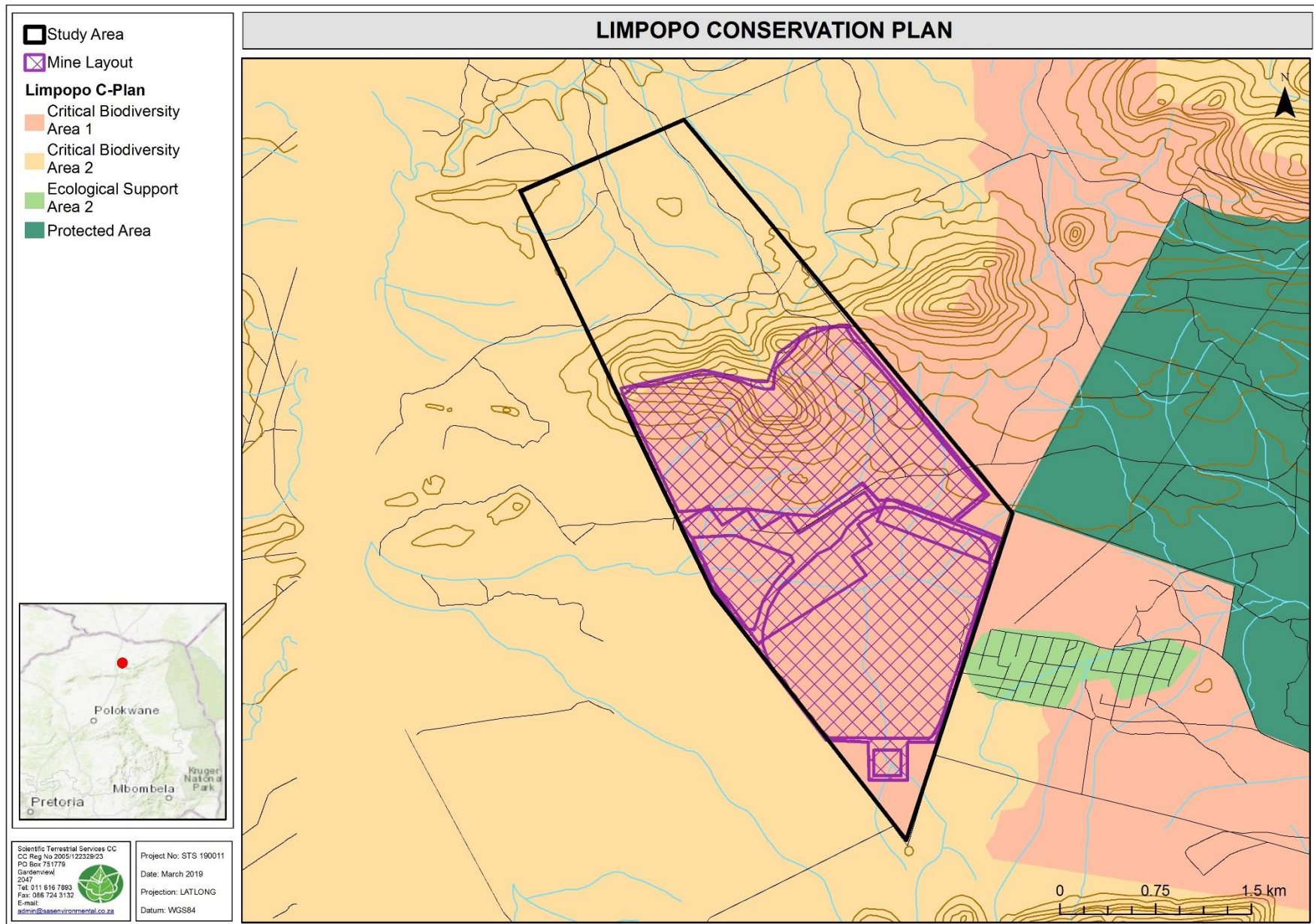


Figure 5: CBA 1 and 2, ESA 2 and protected areas associated with the study are, according to the Limpopo Conservation Plan V2 (2013).



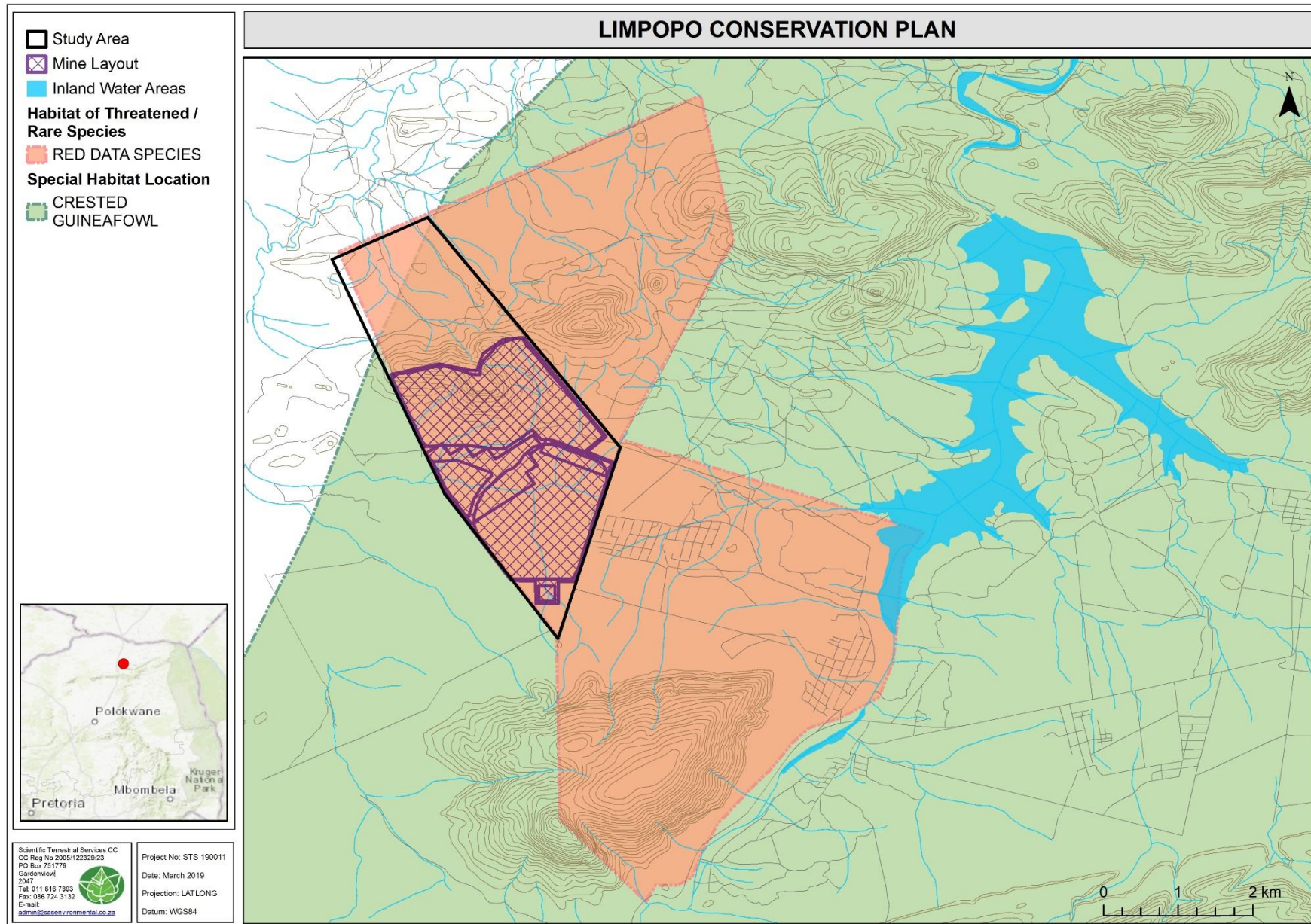


Figure 6: Special Habitat Location for the Crested Guinea Fowl and Habitat for Threatened / Rare Red Data Listed floral species (Limpopo C-Plan).



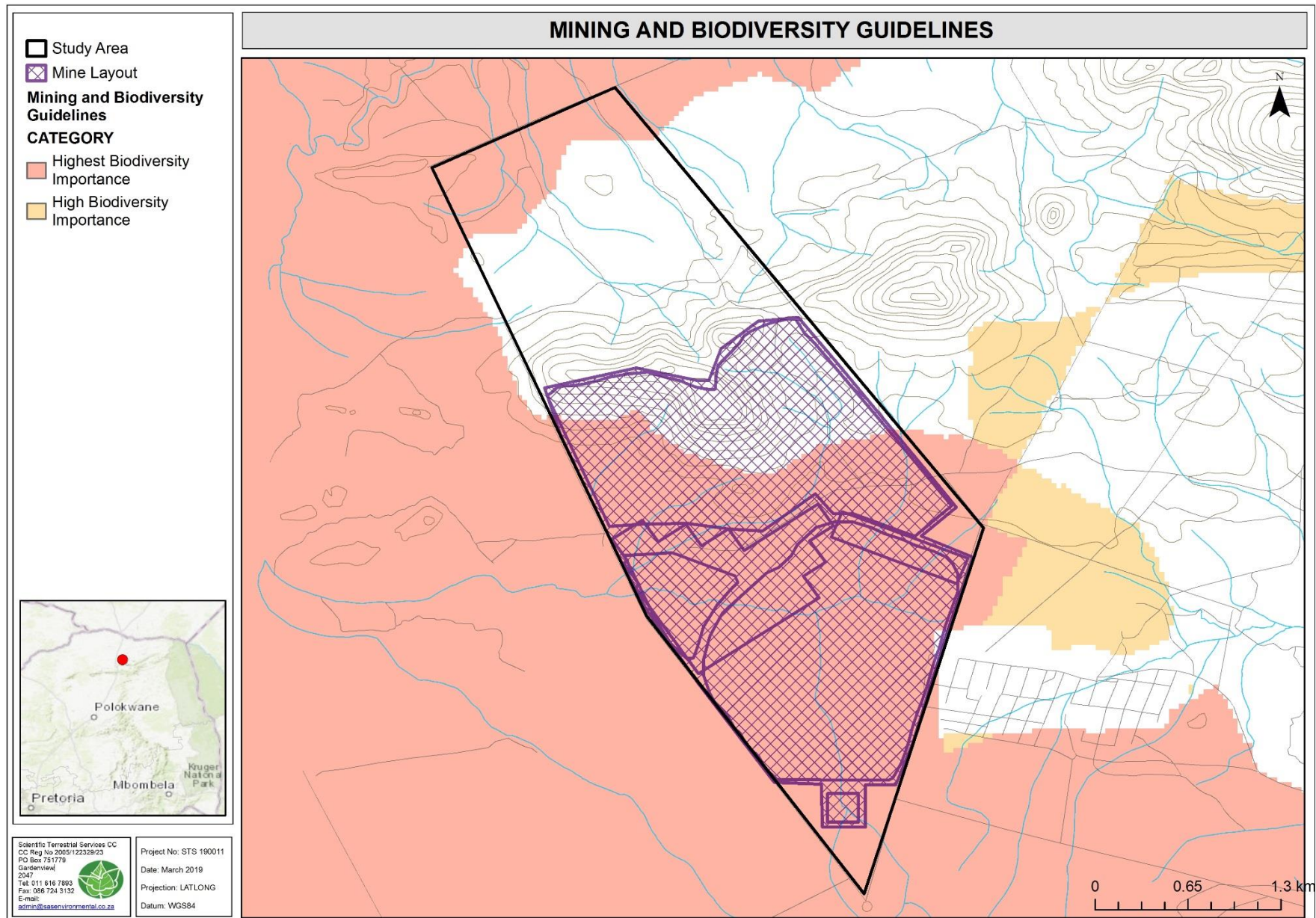


Figure 7: Importance of the study area according to the Mining and Biodiversity Guidelines (2013).



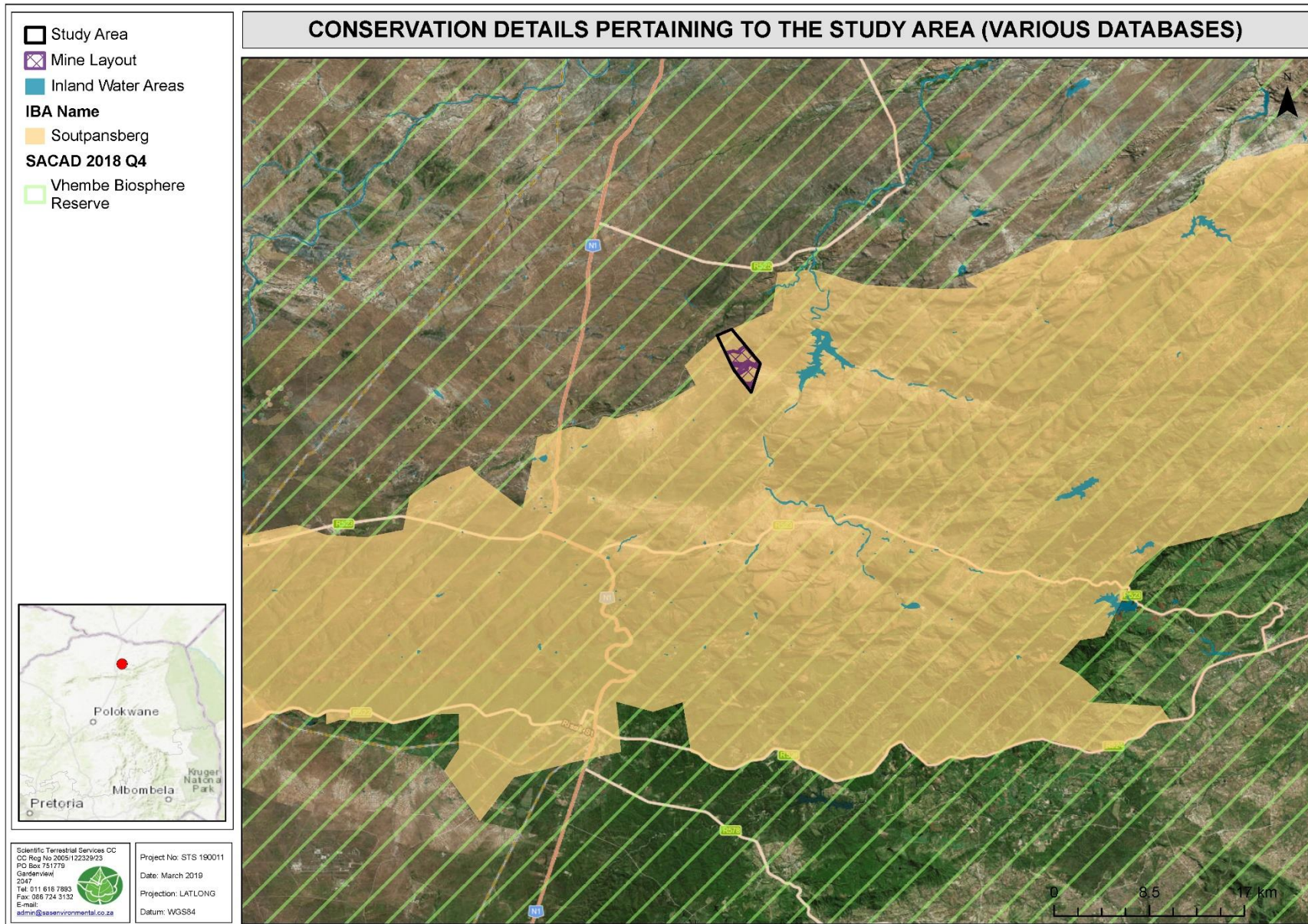


Figure 8: The study area in relation to the Soutpansberg Important Bird and Biodiversity Area (IBA, 2015) as well as the Vhembe Biosphere Reserve (SACAD, 2018 Q4).



4 STRUCTURE OF THE REPORT

Section A of this report served to provide an introduction to the study area, as well as the general approach to the study. Section 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.

Section B addresses all the findings pertaining to the assessment of the floral ecology of the study area.

Section C addresses all the findings pertaining to the assessment of the faunal ecology of the study area.



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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 time and budgetary constraints relevant to the type and level of investigation undertaken and STS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation and at the discretion of the authors.

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 make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.



APPENDIX B: LEGISLATIVE REQUIREMENTS

Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

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

National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA)

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

Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA)

The obtaining of a New Order Mining Right (NOMR) is governed by the MPRDA. The MPRDA requires the applicant to apply to the DMR for a NOMR which triggers a process of compliance with the various applicable sections of the MPRDA. The NOMR process requires environmental authorisation in terms of the MPRDA Regulations and specifically requires the preparation of a Scoping Report, an Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP), and a Public Participation Process (PPP).

National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA)

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

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

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

Furthermore, a person may not carry out a restricted activity involving either:



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

National Environmental Management Biodiversity Act (NEMBA) (Alien and Invasive Species Regulations, Notice number 864 of 29 July 2017 in Government Gazette 40166)

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

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

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

- (a) A species that is not an indigenous species; or
- (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

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

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

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

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

Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA)

The objectives of this Act are:

- to manage and protect the environment in the Province;
- to secure ecologically sustainable development and responsible use of natural resources in the Province;
- generally, to contribute to the progressive realisation of the fundamental rights contained in section 24 of the Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996), and
- to give effect to international agreements effecting environmental management which are binding on the Province.

This Act must be interpreted and applied in accordance with the national environmental management principles set out in Section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).



**The National Forest Act, 1998 (Act 84 of 1998, as amended in September 2011)
(NFA)**

Principles to guide decisions affecting forestry resources applicable to land development management are contained in the following principle:

Principle 3

3) The principles are that—

(a) natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits;

(b) a minimum area of each woodland type should be conserved, and forests must be developed and managed to -

(i) conserve biological diversity, ecosystems and habitats;

(ii) sustain the potential yield of their economic, social and environmental benefits.

This section of the Act alludes to the fact that the conservation status of all vegetation types needs to be considered when any development is taking place to ensure that the adequate conservation of all vegetation types is ensured.

Principle 6

(6) Criteria and indicators may include but are not limited to, those for determining—
the level of maintenance and development of—

(i) forest resources:

(ii) biological diversity in forests:

(iii) the health and vitality of forests:

(iv) the productive functions of forests:

(v) the protective and environmental functions of forests; and

(vi) the social functions of forests.



APPENDIX C: IMPACT ASSESSMENT METHODOLOGY

Ecological Impact Assessment Method

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

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

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an ‘element of an organizations activities, products and services which can interact with the environment’⁵. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; the sensitivity of the receptor to a stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table D1. The purpose of the rating is to develop a clear understanding of the influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary⁶.

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

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa’s National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information, by

⁵ The definition has been aligned with that used in the ISO 14001 Standard.

⁶ Some risks/impacts that have low significance will however still require mitigation.



increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table B1: Criteria for assessing the significance of impacts

LIKELIHOOD DESCRIPTORS

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

CONSEQUENCE DESCRIPTORS

Severity of impact	RATING
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	RATING
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	RATING
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



Table B2: Significance Rating Matrix.

		CONSEQUENCE (Severity + Spatial Scope + Duration)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIKELIHOOD (Frequency of activity + Frequency of impact)	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	2	4	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	3	6	9	12	16	20	24	28	32	36	40	44	48	52	56	60
	4	8	12	16	20	25	30	35	40	45	50	55	60	65	70	75
	5	10	15	20	25	30	36	42	48	54	60	66	72	78	84	90
	6	12	18	24	30	36	42	49	56	63	70	77	84	91	98	105
	7	14	21	28	35	42	49	56	64	72	80	88	96	104	112	120
	8	16	24	32	40	48	56	64	72	81	90	99	108	117	126	135
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160

Table B3: Positive/Negative Mitigation Ratings.

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

The following points were considered when undertaking the assessment:

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



Mitigation measure development

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

- *Mitigation and performance improvement measures* and actions that address the risks and impacts⁷ are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.
- Desired outcomes are defined, and have been developed in such a way as to be *measurable events with performance indicators, targets and acceptable criteria* that can be tracked over *defined periods*, with estimates of the *resources* (including human resource and training requirements) *and responsibilities for implementation*.

Recommendations

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

⁷ *Mitigation measures should address both positive and negative impacts*



APPENDIX D: VEGETATION TYPES

SVmp 1 Musina Mopane Bushveld

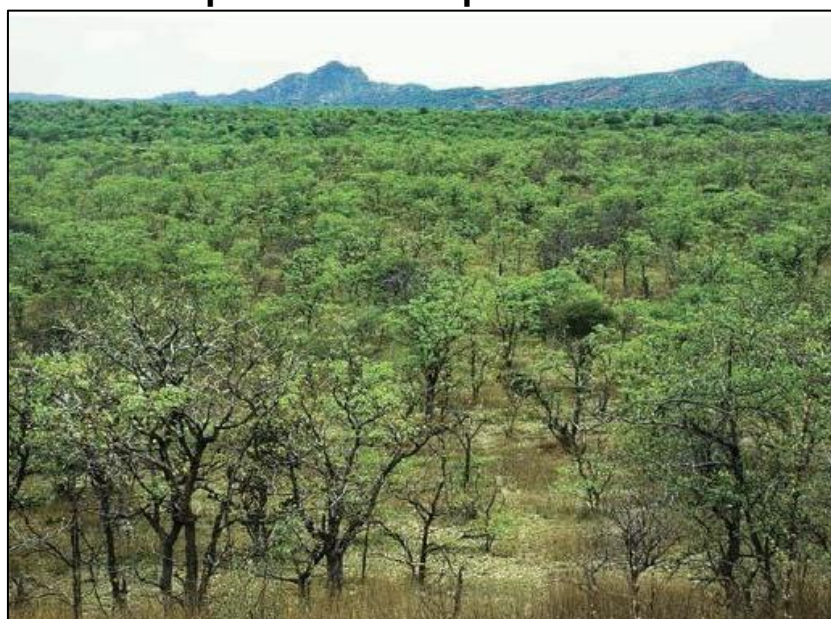


Figure C1: SVmp 1 Musina Mopane Bushveld dominated by *Colophospermum mopane* in the Honnet Nature Reserve near Tshipise (Musina District, Limpopo Province). Mucina and Rutherford (2006) page 483.

Dominant and typical floristic species of the Musina Mopane Bushveld (Mucina & Rutherford, 2006). The table contains the important taxa associated with the vegetation type.

Woody Layer	
Tall Trees	<i>Adansonia digitata</i> , <i>Sclerocarya birrea</i> subsp. <i>caffra</i> , <i>Senegalia nigrescens</i>
Small Trees	<i>Colophospermum mopane</i> (d), <i>Combretum apiculatum</i> (d), <i>Boscia albitrunca</i> , <i>Boscia foetida</i> subsp. <i>rehmanniana</i> , <i>Commiphora glandulosa</i> , <i>Commiphora tenuipetiolata</i> , <i>Commiphora viminea</i> , <i>Senegalia senegal</i> var. <i>leiorhachis</i> , <i>Sterculia rogersii</i> , <i>Vachellia tortilis</i> subsp. <i>heteracantha</i> , <i>Terminalia prunioides</i> , <i>Terminalia sericea</i> , <i>Ximenia americana</i>
Tall Shrubs	<i>Grewia flava</i> (d), <i>Sesamothamnus lugardii</i> (d), <i>Commiphora pyracanthoides</i> , <i>Gardenia volkensii</i> , <i>Grewia bicolor</i> , <i>Maerua parvifolia</i> , <i>Rhigozum zambesiaceum</i> , <i>Tephrosia polystachya</i> .
Low Shrubs	<i>Acalypha indica</i> , <i>Aptosimum lineare</i> , <i>Barleria senensis</i> , <i>Dicoma tomentosa</i> , <i>Felicia clavipilosa</i> subsp. <i>transvaalensis</i> , <i>Gossypium herbaceum</i> subsp. <i>africanum</i> , <i>Hermannia glanduligera</i> , <i>Neuracanthus africanus</i> , <i>Pechuel-Loeschea leubnitziae</i> , <i>Ptychlobium contortum</i> , <i>Seddera suffruticosa</i> .
Succulent Shrub	<i>Hoodia currorii</i> subsp. <i>lugardii</i> .
Forb layer	
Herbaceous Climber	<i>Momordica balsamina</i>
Herbs	<i>Acrotome inflata</i> , <i>Becium filamentosum</i> , <i>Harpagophytum procumbens</i> subsp. <i>transvaalense</i> , <i>Heliotropium steudneri</i> , <i>Hermbstaedtia odorata</i> , <i>Oxygonum delagoense</i> .
Succulent Herbs	<i>Stapelia gettliffei</i> , <i>Stapelia kwebensis</i> .
Grass layer	
Graminoids	<i>Schmidtia pappophoroides</i> (d), <i>Aristida adscensionis</i> , <i>A. congesta</i> , <i>Bothriochloa insculpta</i> , <i>Brachiaria deflexa</i> , <i>Cenchrus ciliaris</i> , <i>Digitaria eriantha</i> subsp. <i>eriantha</i> , <i>Enneapogon cenchroides</i> , <i>Eragrostis lehmanniana</i> , <i>E. pallens</i> , <i>Fingerhuthia africana</i> , <i>Heteropogon contortus</i> , <i>Sporobolus nitens</i> , <i>Stipagrostis hirtigluma</i> subsp. <i>patula</i> , <i>S. uniplumis</i> , <i>Tetrapogon tenellus</i> , <i>Urochloa mosambicensis</i> .

(d) = dominant species



SVcb 21 Soutpansberg Mountain Bushveld

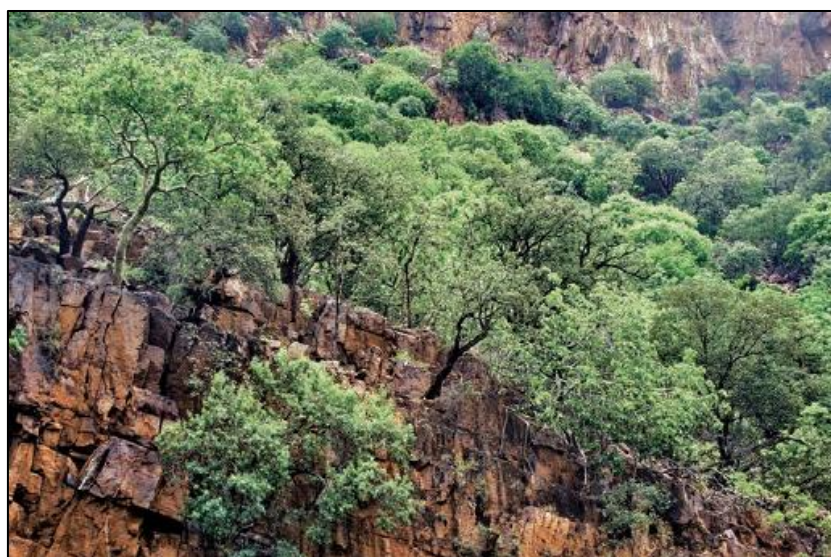


Figure C2: SVcb 21 Soutpansberg Mountain Bushveld: Sour bushveld on steep slopes of the Soutpansberg in the Wylie's Poort north of Makhado, Limpopo Province. Mucina and Rutherford (2006) page 475.

Table C1: The table contains the Biogeographically Important Taxa (Soutpansberg endemics) associated with the Soutpansberg Mountain Bushveld vegetation type.

Forb layer	
Succulent herbs	<i>Aloe vossii</i> , <i>Huernia whitesloaneana</i> , <i>Orbea conjuncta</i> , <i>Stapelia clavicorona</i> .

Table C2: The table contains the Endemic Taxa associated with the Soutpansberg Mountain Bushveld vegetation type.

Woody Layer	
Tall Shrubs	<i>Combretum vendae</i> , <i>Vangueria soutpansbergensis</i> .
Low Shrubs	<i>Blepharis spinipes</i> , <i>Dicoma montana</i> , <i>Justicia montis-salinarum</i> , <i>Tylophora coddii</i> .
Succulent Shrub	<i>Kalanchoe crundallii</i> .
Forb layer	
Herbs	<i>Streptocarpus caeruleus</i> .
Herbaceous climber	<i>Ipomoea bisavium</i> .
Succulent herbs	<i>Aloe swynnertonii</i> , <i>Huernia nouhuysii</i> .
Grass layer	
Graminoids	<i>Panicum dewinteri</i> .



Table C3: Dominant and typical floristic species of the Soutpansberg Mountain Bushveld (Mucina & Rutherford, 2006). The table contains the important taxa associated with Subtropical moist thickets, Mistbelt bush clumps, Open savanna sandveld and the Arid mountain bushveld.

SUBTROPICAL MOIST THICKETS	
Woody Layer	
Small Trees	<i>Catha edulis</i> (d), <i>Vachellia karroo</i> , <i>Berchemia zeyheri</i> , <i>Bridelia mollis</i> , <i>Combretum molle</i> , <i>Dombeya rotundifolia</i> , <i>Dovyalis zeyheri</i> , <i>Kirkia acuminata</i> , <i>Mystroxyton aethiopicum</i> subsp. <i>schlechteri</i> , <i>Plectroniella armata</i> , <i>Zanthoxylum capense</i> , <i>Ziziphus mucronata</i> .
Tall Shrubs	<i>Flueggea virosa</i> (d), <i>Carissa edulis</i> , <i>Grewia occidentalis</i> , <i>Rhus pentheri</i> .
Low Shrubs	<i>Pavonia burchellii</i> .
MISTBELT BUSH CLUMPS	
Woody Layer	
Small Trees	<i>Englerophytum magalismsontanum</i> (d), <i>Mimusops zeyheri</i> (d), <i>Syzygium legatii</i> (d), <i>Apodytes dimidiata</i> subsp. <i>dimidiata</i> , <i>Combretum molle</i> , <i>Heteropyxis natalensis</i> , <i>Maytenus undata</i> .
Tall Shrubs	<i>Coddia rudis</i> , <i>Combretum moggii</i> , <i>Euclea linearis</i> , <i>Hyperacanthus amoenus</i> , <i>Olea capensis</i> subsp. <i>enervis</i> , <i>Vitex rehmannii</i> .
Low Shrubs	<i>Searsia magalismsontana</i> subsp. <i>coddii</i> (d), <i>Helichrysum kraussii</i> , <i>Heteromorpha stenophylla</i> var. <i>transvaalensis</i> , <i>Myrothamnus flabellifolius</i> .
Geoxylic Suffrutex	<i>Parinari capensis</i> subsp. <i>capensis</i> (d).
Succulent Shrub	<i>Aloe arborescens</i> , <i>Kalanchoe sexangularis</i> .
Forb layer	
Herbs	<i>Fadogia homblei</i> (d), <i>Dicoma anomala</i> , <i>Felicia mossamedensis</i> , <i>Gerbera viridifolia</i> , <i>Vernonia natalensis</i> .
Succulent Herbs	<i>Crassula swaziensis</i> , <i>Plectranthus cylindraceus</i> .
Grass layer	
Graminoids	<i>Coleochloa setifera</i> (d), <i>Setaria sphacelata</i> (d), <i>Melinis nerviglumis</i> , <i>Trachypogon spicatus</i> .
OPEN SAVANNA SANDVELD	
Woody Layer	
Small Trees	<i>Burkea africana</i> (d), <i>Ochna pulchra</i> (d), <i>Combretum apiculatum</i> , <i>Ochna pretoriensis</i> , <i>Pseudolachnostylis maprouneifolia</i> , <i>Terminalia sericea</i> .
Tall Shrubs	<i>Corchorus kirkii</i> , <i>Diplorhynchus condylocarpon</i> , <i>Elephantorrhiza burkei</i> , <i>Strychnos madagascariensis</i> .
Forb layer	
Herbs	<i>Xerophyta retinervis</i> (d).
Grass layer	
Graminoids	<i>Centropodia glauca</i> (d), <i>Enneapogon cenchroides</i> .
ARID MOUNTAIN BUSHVELD	
Woody Layer	
Tall Trees	<i>Senegalia nigrescens</i> , <i>Adansonia digitata</i> .
Small Trees	<i>Combretum apiculatum</i> , <i>Commiphora glandulosa</i> , <i>Commiphora mollis</i> .
Tall Shrubs	<i>Tinnea rhodesiana</i> .
Low Shrubs	<i>Blepharis diversispina</i> , <i>Gossypium herbaceum</i> subsp. <i>africanum</i> .
Woody climber	<i>Senegalia ataxacatha</i> .
Forb layer	
Herbs	<i>Hibiscus meyeri</i> subsp. <i>transvaalensis</i> .
Succulent Herbs	<i>Kleinia fulgens</i> .

(d) = dominant species



APPENDIX E: DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

Stephen van Staden	MSc Environmental Management (University of Johannesburg)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Christien Steyn	MSc Plant Science (University of Pretoria)
Jacobus Johannes du Plessis	B(Hons) Zoology (University of Johannesburg)

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

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

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



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

I, Stephen van Staden, declare that -

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

I, Nelanie Cloete, declare that -

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

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 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

I, Jacobus Johannes du Plessis, 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





SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **STEPHEN VAN STADEN**

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

COUNTRIES OF WORK EXPERIENCE

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

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

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

REFERENCES

- Terry Calmeyer (Former Chairperson of IAIA SA)
 Director: ILISO Consulting Environmental Management (Pty) Ltd
 Tel: +27 (0) 11 465 2163
 Email: terryc@icem.co.za
- Alex Pheiffer
 African Environmental Management Operations Manager
 SLR Consulting
 Tel: +27 11 467 0945
 Email: apheiffer@slrconsulting.com
- Marietjie Eksteen
 Managing Director: Jacana Environmental
 Tel: 015 291 4015





SCIENTIFIC TERRESTRIAL SERVICES (STS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

Position in Company	Senior Scientist Botanical Science and Terrestrial Ecology
Date of Birth	6 June 1983
Nationality	South African
Languages	English, Afrikaans

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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)
 Member of the Botanical Society of South Africa (BotSoc)

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

COUNTRIES 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)

SELECTED PROJECT EXAMPLES

Floral Assessments

- Floral assessment as part of the environmental assessment and authorisation process for the proposed Mzimvubu water project at Maclear, Eastern Cape.
- Floral assessment as part of the environmental authorisation process for the proposed Assmang Iron Ore Black Rock, Northern Cape Province.
- Floral assessment as part of the environmental authorisation process for the proposed Bloemwater Knellpoort water project pipeline assessment, Free State Province.
- Terrestrial ecological scan as part of the environmental authorisation process for the proposed Sappi Pipeline, Gauteng.
- Floral assessment as part of the proposed Setlagole Mall development, North West Province.
- Floral assessment as part of the coastal habitat changes in the Brand-se Baai area, Western Cape.

Environmental and Ecological Management Plans

- Biodiversity Action plans for African Exploration, Mining and Finance Corporation in line with the NEMBA requirements.
- Biodiversity Action plans for Twickenham Platinum mining operations in line with the NEMBA requirements, Limpopo Province.
- Biodiversity Action plans for Bokoni Platinum mining operations in line with the NEMBA requirements, Limpopo Province.
- Maintenance and Management Plan for the Gamagara River, Northern Cape.
- Development of the Limpopo Province Environmental Outlook Report.

Permit applications for protected tree and floral species



- Permit application for the removal and propagation of protected tree species for the Open Cast Operations within Bokoni Platinum Mine in the Limpopo Province.
- Permit application for the removal of protected tree species for Modikwa Mine within the Limpopo Province.
- Permit application for the removal of protected tree species for the Umfolozi Power line within the Kwa-Zulu Natal Province.
- Permit application for the removal of protected tree species for the expansion activities at Black Rock Mining Operations, Northern Cape Province.
- Permit application for the removal of protected tree species for the expansion activities at Assmang Dwars Rivier Mine, Limpopo Province.





SCIENTIFIC TERRESTRIAL SERVICES (STS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF CHRISTIEN STEYN

PERSONAL DETAILS

Position in Company	Junior Field Biologist
Date of Birth	20 September 1991
Nationality	South African
Languages	English, Afrikaans
Other Business	NA

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Association of Botanists (SAAB)

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

COUNTRIES OF WORK EXPERIENCE

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

PROJECT EXPERIENCE
Specialist studies

- Terrestrial Ecological and Biodiversity Screening and Scoping Assessments
- Floral Specialist Assessments for mining projects, residential developments and industrial developments
- Terrestrial Rehabilitation Plans with the focus on the re-establishment of vegetation
- Protective Tree identification and marking for Plant Removal Permit Applications
- Floral Rescue and Relocation Plans
- Alien and Invasive Plant Management Plans
- Training: Alien and Invasive Plant Identification
- Botanical Advisory Services
- Vegetation Verifications

Desktop Studies, Mapping and Background Information Research for

- Freshwater and Terrestrial Ecological Assessments
- Baseline Biodiversity Assessments
- Terrestrial Ecological Sensitivity Scans
- Ecological status quo determination and ecological input into the design masterplan for the proposed developments
- Buffer Analyses for Threatened Ecosystems, Protected Areas and floral species of conservations concern

PREVIOUS WORK EXPERIENCE

Alien and invasive plant species surveying and collection for the measurement of their plant functional traits on Marion Island (April/May of 2015 & 2016) as part of South African National Antarctic Programme scientific research goals:

- Greve, M., R. Mathakutha, C. Steyn, and S. L. Chown. 2017. Terrestrial invasions on sub-Antarctic Marion and Prince Edward Islands. *Bothalia*, v.47, n.2, p.21. Available at: <https://abcjournal.org/index.php/abc/article/view/2143>

Alien plant species monitoring along the Sani Pass in January 2013/2014, as part of a long-term research initiative by:

- C. Steyn, M. Greve, M.P. Robertson, J.M. Kalwij, P.C. le Roux 2016. Alien plant species that invade high elevations are generalists: support for the directional ecological filtering hypothesis. *J Veg Sci*, 28: 337–346. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/jvs.12477/abstract>; and
- J.M. Kalwij, C. Steyn, P.C. le Roux 2014. Repeated monitoring as an effective early detection means: first records of naturalised *Solidago gigantea* Aiton (Asteraceae) in southern Africa. *South African Journal of Botany*. Available at: <https://www.sciencedirect.com/science/article/pii/S025462991400088X>





SCIENTIFIC TERRESTRIAL SERVICES (STS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF JACOBUS JOHANNES DU PLESSIS

PERSONAL DETAILS

Position in Company	Ecologist
Date of Birth	7 August 1991
Nationality	South African
Languages	English, Afrikaans

EDUCATION

Qualifications

BSc Zoology and Botany (University of South Africa)	2015
BHons Zoology (University of Johannesburg)	2017

COUNTRIES OF WORK EXPERIENCE

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

SELECTED PROJECT EXAMPLES

Faunal Assessments

- Biodiversity assessment for the proposed R101 interchange, the on-ramp C fencing area and the D3519 additional reserve, Mokopane, Limpopo;
- Vegetation screening and baseline ecological assessment for rural road upgrades in Hluhluwe, Kwazulu-Natal;
- Desktop biodiversity assessment for a proposed desalination plant, Elysium, Kwazulu-Natal;
- Baseline Biodiversity Assessment for the upgrade of Retention Dams, Germiston, Gauteng;
- Baseline Biodiversity Assessment for a proposed 100-hectare photovoltaic power plant, Mariental, Namibia;
- Desktop Biodiversity Assessment for a Commercial Office Park, Lusaka, Zambia;
- Baseline Biodiversity Assessment for Polokwane Smelter, Polokwane, Limpopo;
- Baseline Biodiversity Assessment for Mortimer Smelter, Rustenburg, North-West; and
- Baseline Biodiversity Assessment for the Pecanwood Estates, Hartebeespoort, North-West.

Previous Work Experience

- Head of Aquatics – Environmental Assurance (October 2017- September 2018);
- Intern at The Biodiversity Company (January 2016 – July 2017);
- Demonstrator for first years at the University of Johannesburg (2015)
- Assessor/ Trainer at the South African Wildlife College (7 contracts during 2012-2014).

