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**BIODIVERSITY ASSESSMENT AS PART OF THE
ENVIRONMENTAL IMPACT ASSESSMENT AND
AUTHORISATION PROCESS FOR THE PROPOSED
SURFACE INFRASTRUCTURE DEVELOPMENT AT THE
ANGLO AMERICAN RBMP PLANT, NORTH WEST
PROVINCE**

Prepared for

SRK Consulting (Pty) Ltd.

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (STS) was appointed to conduct a biodiversity assessment as part of the Environmental Impact and Authorisation process for the proposed acid tank relocation on the remaining extent of the farm Waterfal 303, North West Province, henceforth referred to as the “study area”. The proposed development footprint is approximately 5.4 hectares (ha).

During the field assessment, three floral habitat units were identified within the study area, namely the Transformed Habitat, Degraded Thornveld Habitat and Degraded Grassland Habitat. These habitat units are considered a single unit for the fauna, namely, Degraded Habitat. The study area is situated within an area that comprises peri-urban development with mining infrastructure surrounding the study area. Only a small corridor to the north exists which is fenced from other natural areas. Within the study area the habitat has been exposed to various historic disturbances, resulting in degraded habitat with generally low floral and faunal abundance and diversity. Much of the study area is dominated by species associated with disturbance, including alien and invasive plants (AIPs). Faunal assemblages within the area composed of commonly occurring and widespread species that have adapted to the peri-urban surroundings.

During the field assessment no floral or faunal Species of Conservation Concern (SCC) were noted and none are expected to occur within the study area. There are several floral SCC which have a low probability of occurring on the site. These species are provincially important and if found should be rescued and relocated to similar habitat within the study area before any construction commences. The rescue and relocation must be under the supervision of a qualified specialist and relocation should be to suitable, similar habitat near its original location, but outside of the development footprint. No faunal SCC were encountered during the field assessment within the study area. It is furthermore considered unlikely that any faunal SCC will permanently utilise the study area, due to the location of the study area within a peri-urban setting and the limited habitat and food resources necessary to support expected faunal SCC.

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

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



DOCUMENT GUIDE

The following table indicates the requirements for Specialist Studies as per Appendix 6 of Government Notice 326 as published in Government Notice 40772 of 2017, amendments to the Environmental Impact Assessment (EIA) Regulations, 2014 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirements	Section in report/Notes
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist	Appendix J
2.2	Description of the preferred development site, including the following aspects-	
2.2.1	<i>A description of the ecological drivers/processes of the system and how the proposed development will impact these;</i>	Section 4
2.2.2	<i>Ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the proposed development site;</i>	Section 4
2.2.3	<i>The ecological corridors that the development would impede including migration and movement of flora and fauna;</i>	Section 4
2.2.4	<i>The description of any significant landscape features (including rare or important flora/faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Areas (FEPA) sub catchments;</i>	Section 4
2.2.5	<i>A description of terrestrial biodiversity and ecosystems on the proposed development site, including – a) Main vegetation types; b) Threatened ecosystems, including Listed Ecosystems as well as locally important habitat types identified; c) Ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) Species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified.</i>	Section 3 (desktop analysis)
2.3	Identify any alternative development footprints within the preferred development site which would be of a “low” sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification.	Not Applicable
2.4	The Terrestrial Biodiversity Impact Assessment must be based on the results of a site inspection undertaken on the preferred development site and must identify:	
2.5	Terrestrial Critical Biodiversity Areas (CBAs), including: 2.5.1 <i>The reasons why an area has been identified as a CBA;</i> 2.5.2 <i>An indication of whether or not the development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;</i> 2.5.3 <i>The impact on species composition and structure of vegetation with an indication of the extent of clearing activities;</i> 2.5.4 <i>The impact on ecosystem threat status;</i> 2.5.5 <i>The impact on explicit subtypes in the vegetation;</i> 2.5.6 <i>The impact on overall species and ecosystem diversity of the site; and</i> 2.5.7 <i>The impact on populations of species of special concern in the CBA.</i>	Section 3 (desktop analysis) and 4
2.6	Terrestrial Ecological Support Areas, including; 2.6.1 <i>The impact on the ecological processes that operate within or across the site;</i> 2.6.2 <i>The extent the development will impact on the functionality of the ESA; and</i> 2.6.3 <i>Loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridor or introducing barriers that impede migration and movement of flora and fauna.</i>	
2.7	Protected Areas as defined by the National Environmental Management: Protected Areas Act, 2004 (Act No. 57 of 2004) including an opinion on whether the proposed development aligns with the objectives/purpose of the Protected Area and the zoning as per the Protected Area Management Plan.	Section 3 (desktop analysis)



2.8	Priority Areas for Protected Area Expansion, including: The way in which in which the development will compromise or contribute to the expansion of the protected area network.	Section 3 (desktop analysis)
2.9	Strategic Water Source Areas (SWSA) including: 2.9.1 <i>The impact(s) on the terrestrial habitat of a Strategic Water Source Area;</i> <i>and</i> 2.9.2 <i>The impacts of the development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses)</i>	Not Applicable
2.10	Freshwater Ecosystem Priority Area (FEPA) sub catchments, including the impacts of the development on habitat condition and/or species in the FEPA sub catchment.	Not Applicable
2.11	Indigenous Forests, including: 2.11.1 <i>Impact on the ecological integrity of the forest;</i> 2.11.2 <i>Extent of natural or near natural indigenous forest area lost.</i>	Not Applicable
3.	The report must contain as a minimum the following information:	
3.1	Contact detail of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Appendix I
3.2	A signed statement of independence by the specialist.	Appendix I
3.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 1.3
3.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant.	Section 2.1 Appendices B, C & D
3.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data.	Section 1.3
3.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.	Section 6
3.7	Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts.	Section 7
3.8	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 7
3.9	A motivation must be provided if there were development footprints identified as per paragraph 2.3 in this table were not considered stating reasons why.	Not Applicable
3.10	A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, and any conditions to which the statement is subjected.	Section 6 & 7



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GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson et al. (2011), Hui and Richardson (2017) and Wilson et al. (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004), and the associated Alien and Invasive Species (A&I) Regulations, 2014].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act;
Bush encroachment	The increase in density of (usually native) woody plants so that the natural equilibrium of the woody plant layer (trees and shrubs) and herbaceous (grass and forb) layer densities is shifted in favour of trees and shrubs.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
IBA (Important Bird and Biodiversity Area)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.



Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), Alien and Invasive Species (A&IS) Regulations, 2016.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g. species are still native if they increase their range as a result of watered gardens, but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
RDL (Red Data listed) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	<p>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.</p> <p>Specifically related to flora: A list of floral SCC recorded within the QDS 2527CB was obtained from The Botanical Database of Southern Africa (BODATSA) to obtain plant names and floristic details (http://posa.sanbi.org/) for species of conservation concern within a selected boundary. Additional datasets and sources that were also taken into consideration as part of the POC assessment included:</p> <ul style="list-style-type: none"> - The List of Protected Tree Species (GN 809 of 2014) under the National Forest Act (Act 84 of 1998). <p>Specifically related to fauna: A list of faunal SCC recorded within the QDS 2527CB was obtained from the North West Biodiversity Sector Plan (NW BSP), comprising SANBI Red Data Listed species. Additional datasets and sources that were also taken into consideration as part of the POC assessment included:</p> <ul style="list-style-type: none"> - The National Environmental Management: Biodiversity Act (Act No.10 of 2004) (NEMBA) Threatened or Protected Species (TOPS) list (NEMBA, Notice 389 of 2013); - The International Union for Conservation of Nature (IUCN) Red List of Threatened Species; and - The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland; - The Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland.



LIST OF ACRONYMS

AIP	Alien Invasive Plant
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Area
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment (2011)
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
NWDEDECT	North West Department: Economic Development, Environment, Conservation and Tourism
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RBMR	Rustenburg Base Metal Refiners
RDL	Red Data List
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Area Database
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services CC
TSP	Threatened Species Programme
VU	Vulnerable
WRD	Waste Rock Dump



1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a biodiversity assessment as part of the Environmental Impact and Authorisation process for the proposed infrastructure development at the Anglo American Rustenburg Base Metal Refiners (RBMR) Plant, located near Rustenburg, North West Province, henceforth referred to as the “study area”. The proposed area for development is in the Rustenburg Local Municipality which is an administrative area in the Bojanala Platinum Municipality of the North West Province.

The study area is situated approximately 6km southeast from the town of Rustenburg, 1.7km southwest of the town of Bokamoso, and 2.66km northeast of the town of Waterkloof. The study area is located approximately 4.45km southwest of the R104 and 5.65km North of the N4 motorway. The location and extent thereof are indicated in Figures 1 and 2.

Current infrastructure used to store hazardous acids within the mine has failed and is leaking into the immediate environment. Thus, RBMR proposes to develop the following infrastructure to ensure no further chemical spillage into the local environment:

- Construction of a weighbridge;
- Construction of truck loading bays;
- Relocation and construction of chemical storage tanks; and
- Tarring of the existing dirt road that leads into the study area.

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

1.2 Project Scope

Specific outcomes in terms of this report are outlined below:

- To define the Present Ecological State (PES) of the biodiversity of the study area;
- To determine and describe habitats, communities and the ecological state of the study area;
- To conduct a faunal and floral Species of Conservation Concern (SCC) assessment, including the potential of suitable habitat to occur within the study area for SCC;



- To identify and consider all sensitive landscapes including rocky ridges, wetlands and any other ecologically important features, if present;
- To determine the environmental impacts that the construction of the proposed development might have on the biodiversity associated with the study area; and
- To develop mitigation and management measures for all phases of the development.



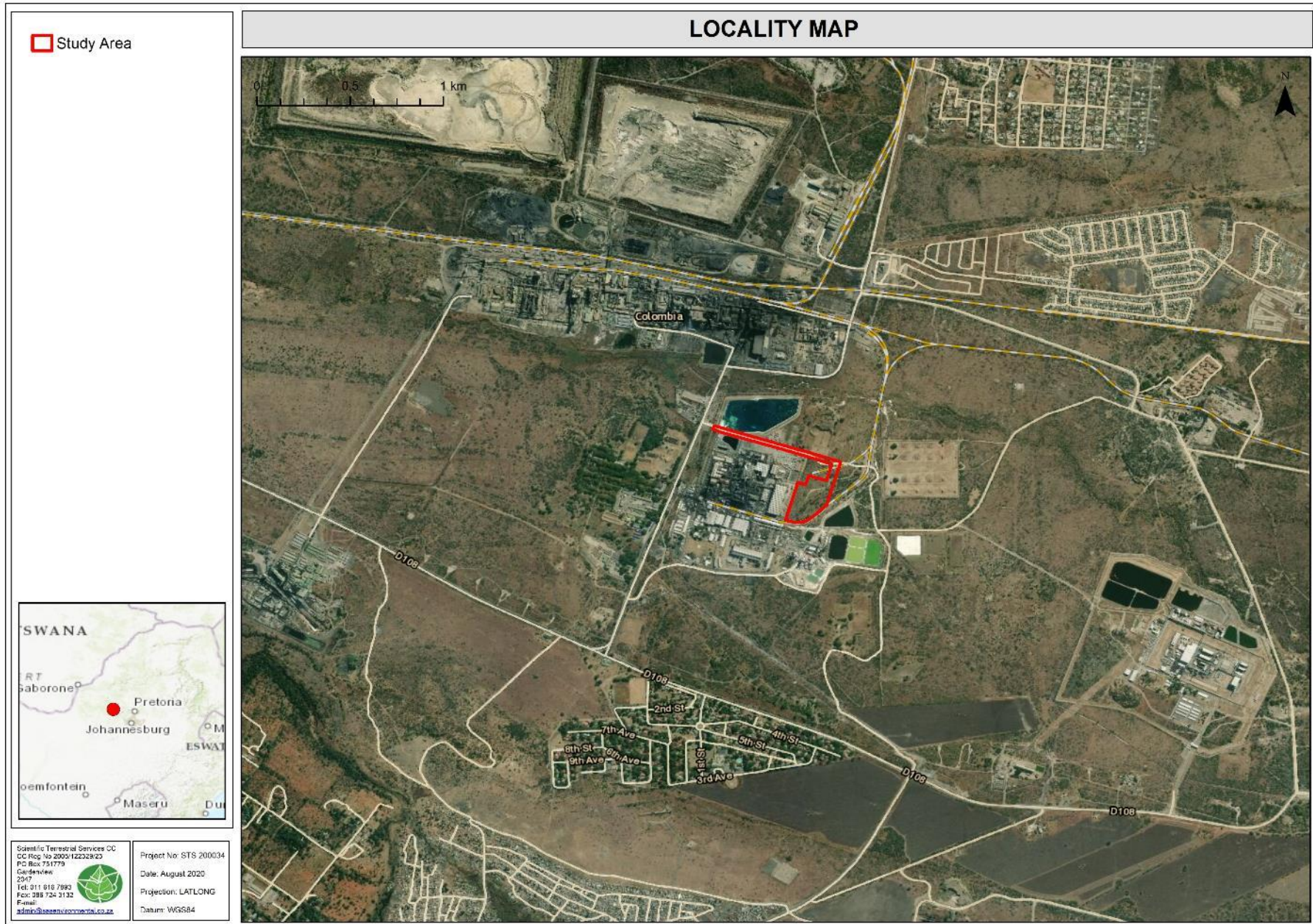


Figure 1: Satellite image depicting the location of the study area in relation to surrounding areas.



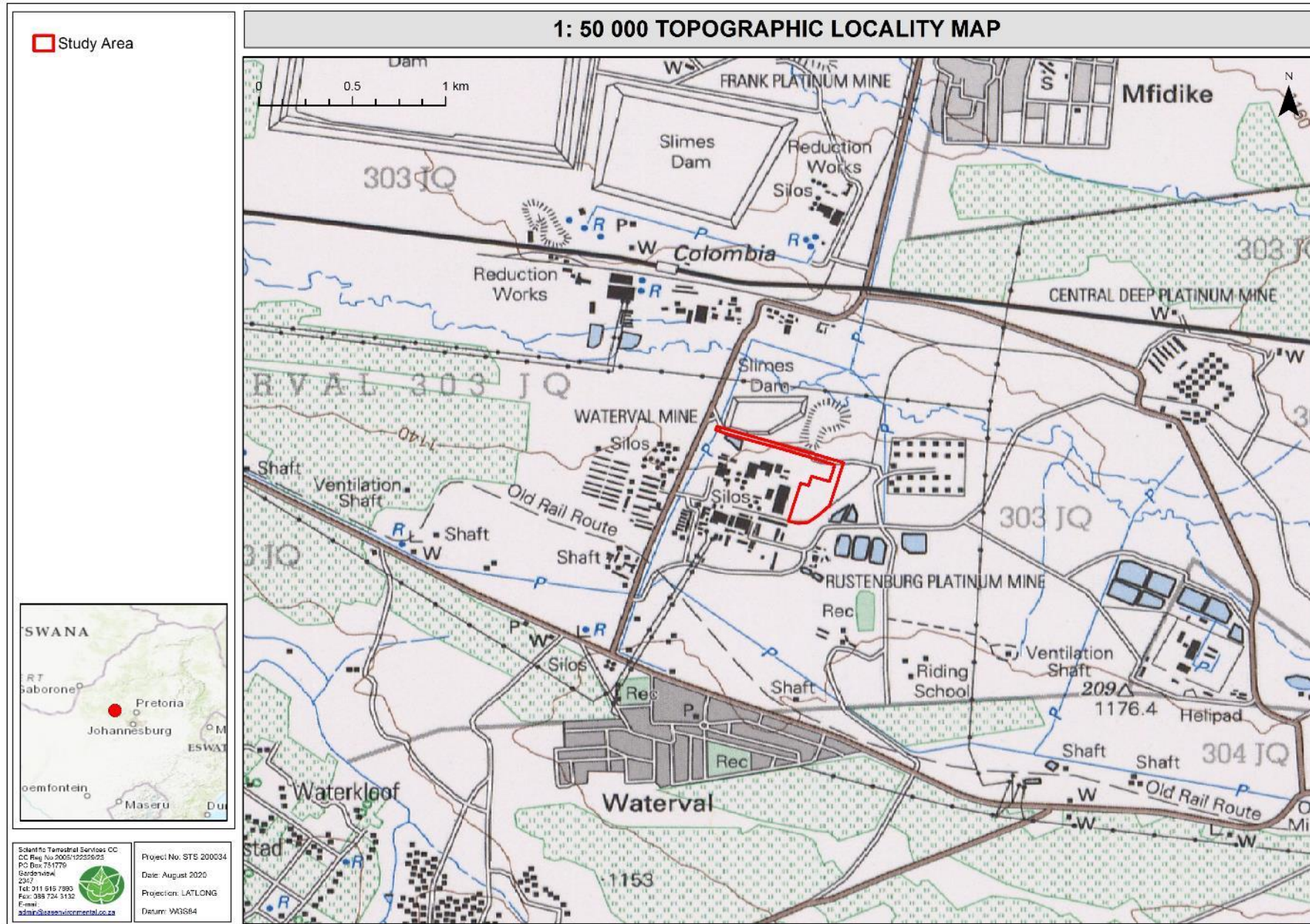


Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.



1.3 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- The biodiversity assessment was confined to the study area and did not include the neighbouring and adjacent properties. These were considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. The assessment occurred late in July and thus several floral species (especially grasses) were no longer in flower, making identification of these species difficult. Furthermore, many of the underground forbs which could potentially occur within the study area had yet to re-sprout. It is, however, expected that most floral and faunal communities were accurately assessed and considered, with all relevant online sources and background information utilised to improve on the overall understanding of the study area's ecology;
- Due to the nature and habits of most faunal taxa, it is unlikely that all species would have been observed during a field assessment of limited duration. Due to the locality of the study area within a peri-urban landscape where continuous anthropogenic activities occur, the cyclical nature of many species' life stages, as well as the season of the assessment, resulted in very few faunal species being observed. As such, background data (desktop) and literature studies (previous studies undertaken in the immediate area) were used to further infer faunal species composition and sensitivities in relation to the available habitat;
- Sampling, by its nature, means that not all individuals are assessed and identified. Some species and taxa associated with the study area may have been missed during the assessment; and
- The data presented in this report are based on one site visit, undertaken on the 24th of July 2020 (winter). A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was augmented with all available desktop data. Together with project experience in the area, the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area.



1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996¹;
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)
- Government Notice R598 Alien and Invasive Species Regulations as published in the Government Gazette 37885 dated 1 August 2014 as it relates to the National Environmental Management Biodiversity Act, 1998 (Act 107 of 1998);
- The Conservation of Agricultural Resource Act, 1983 (Act 43 of 1983) (CARA);
- Government Notice 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 84 of 1998); and
- North West Biodiversity Management Act, 2016 (Act No. 4 of 2016).

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

2. ASSESSMENT APPROACH

2.1 General Approach

An on-site visual assessment of the study area was conducted on the 24th of July 2020 in order to confirm the assumptions made during the consultation of the maps and to determine the ecological status of the habitat associated with the study area. A thorough ‘walk through’ on foot was undertaken in order to identify the occurrence of the dominant floral and faunal species and faunal and floral habitat diversities.

To accurately determine the PES of the biodiversity significance of the study area and capture comprehensive data with respect to the biodiversity, the following methodology was used:

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



- Background data and digital satellite images were consulted prior to the field assessment in order to distinguish broad habitats, vegetation types and potentially sensitive sites. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where target specific investigations were required;
- Relevant databases considered during the assessment of the study area included the South African National Biodiversity Institute (SANBI) Threatened Species Programme (TSP), the North West Biodiversity Sector Plan (2015), Mucina and Rutherford (2018), National Biodiversity Assessment (NBA, 2018), Important Bird and Biodiversity Areas (IBA, 2015) in conjunction with the South African Bird Atlas Project (SABAP2), South African Protected and Conservation Areas Databases (SAPAD & SACAD, Quarter 4, 2019), National Protected Areas Expansion Strategy (NPAES, 2011), and International Union for Conservation of Nature (IUCN);
- Specific methodologies for the assessment, in terms of the field assessment and data analysis of faunal and floral ecological assemblages, will be presented in Appendices B and C; and
- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix D of this report.

2.2 Sensitivity Mapping

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

3. RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics associated with the Study Area

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



Table 1: Summary of the biodiversity conservation characteristics for the study area.

CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)		DETAILS OF THE AREA OF INTEREST IN TERMS OF MUCINA & RUTHERFORD (2006, 2018, 2012)					
<p>NATIONAL BIODIVERSITY ASSESSMENT (NBA): Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (act no. 57 of 2003) (NEMPAA), and compared with the biodiversity target for that ecosystem type. the ecosystem protection level status is assigned using the following criteria:</p> <ul style="list-style-type: none"> I. if an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either a or b, it is classified as well protected, II. when less than 100% of the biodiversity target is met in formal a or b protected areas it is classified it as moderately protected, III. if less than 50% of the biodiversity target is met, it is classified it as poorly protected, and IV. if less than 5% it is hardly protected. 		Biome	The area of interest is situated within the Savanna Biome.				
		Bioregion	The area of interest is located within the Central Bushveld Bioregion .				
		Vegetation Type Figure 3	The study area is situated within the Vulnerable (VU) Marikana Thornveld .				
		Climate	Summer rainfall with very dry winters. Frost frequent during the winter months.				
			MAP* (mm)	MAT* (°C)	MFD* (Days)	MAPE* (mm)	MASMS* (%)
			654	17.6	21	2284	76
<p>NBA (2018):</p> <ul style="list-style-type: none"> 1) Ecosystem Threat Status 2) Ecosystem Protection Level 	<p><u>NBA 2018 dataset (Figure 3):</u> The study area falls within the Marikana Thornveld which is considered a Vulnerable ecosystem and is currently Poorly Protected.</p>	Altitude (m)	1 050–1 450				
		Distribution	North-West and Gauteng Provinces: Occurs on plains from the Rustenburg area in the west, through Marikana and Brits to the Pretoria area in the east				
		Conservation	Endangered . Target 19%. Less than 1% statutorily conserved in, for example, Magaliesberg Nature Area. More conserved in addition in other reserves, mainly in De Onderstepoort Nature Reserve. Considerably impacted, with 48% transformed, mainly cultivated and urban or built-up areas. Most agricultural development of this unit is in the western regions towards Rustenburg, while in the east (near Pretoria) industrial development is a greater threat of land transformation. Erosion is very low to moderate. Alien invasive plants occur localised in high densities, especially along the drainage lines.				
<p>National Threatened Ecosystems (2011) Figure 3</p>	<p>The study area falls within an ecosystem that is currently considered to be Vulnerable. Vulnerable (V) ecosystems have most of their original extent in good ecological condition but have lost some structure and functioning.</p> <p>For Environmental Impact Assessments (EIAs), the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA</p>	Geology & Soils	Most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils. Land types mainly Ea, Ba and Ae.				



	Regulations published under the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA).	Vegetation & landscape features	Open <i>Acacia karroo</i> woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire.
IBA (2015) Figure 4	The study area falls within a 10km radius of the Magaliesberg Important Bird Area . This area is home to some 450 species including <i>Gyps coprotheres</i> (Cape vulture) and <i>Gorsachius leuconotus</i> (White-backed night heron)		
SAPAD (2019, Q3); SACAD (2019, Q3); NPAES (2009). Figure 5	The South African Protected Areas Database (SAPAD, 2019), the South African Conservation Areas Database (SACAD, 2019), and the National Protected Areas Expansion Strategy (NPAES, 2009) indicates that the Kgaswane Mountain Nature Reserve and the Magaliesberg Biosphere Reserve both fall within a 10km zone from the study area.		
NORTH WEST BIODIVERSITY SECTOR PLAN (2015)			
Terrestrial Ecosystems	The study area did not fall within any Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), or Other Natural Areas.		
NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (2020)			
The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. this assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas			
Terrestrial Biodiversity Theme	For the terrestrial biodiversity theme, the study area is considered to have a very high sensitivity . The triggered sensitivity features include a Vulnerable ecosystem (i.e. the Marikana Thornveld as per the NBA, 2018).		
Plant Species Theme	For the plant species theme, the entire study area is considered to have a low sensitivity .		
Animal Species Theme	For the animal species theme, the entire study area is considered to have a low sensitivity .		
IMPORTANCE OF THE STUDY AREA TO THE MINING AND BIODIVERSITY GUIDELINES (2013)			
MODERATE BIODIVERSITY IMPORTANCE Figure 6	<p>The study area falls within an area of Moderate Biodiversity Importance, according to the Mining and Biodiversity Guidelines (2012). These areas are of moderate biodiversity value.</p> <p>Risk for mining: Moderate risk for mining.</p> <p>Implications for mining: EIA's and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.</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.



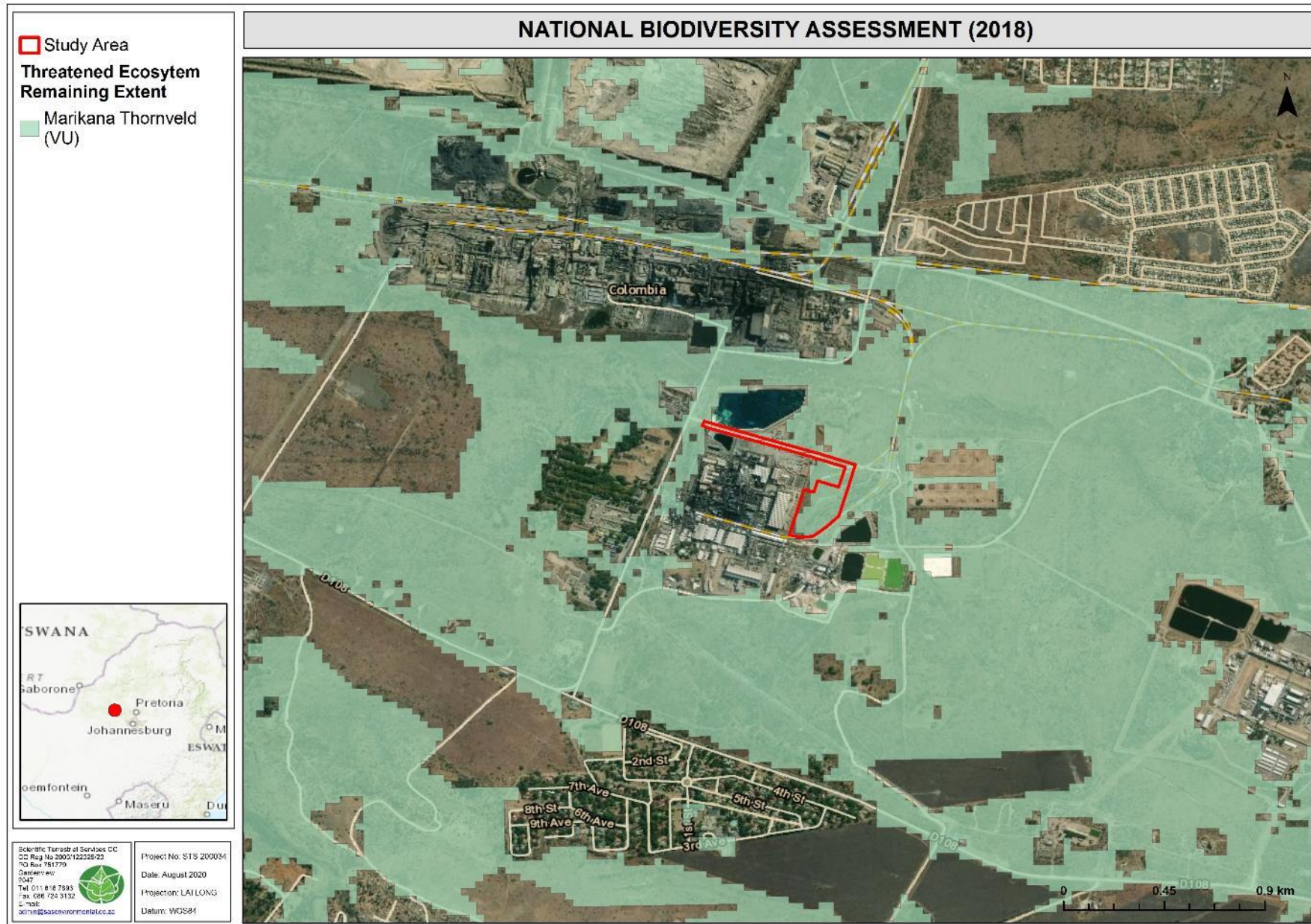


Figure 3: The remaining extent of the vulnerable Marikana Thornveld, according to the National Biodiversity Assessment (NBA, 2018).



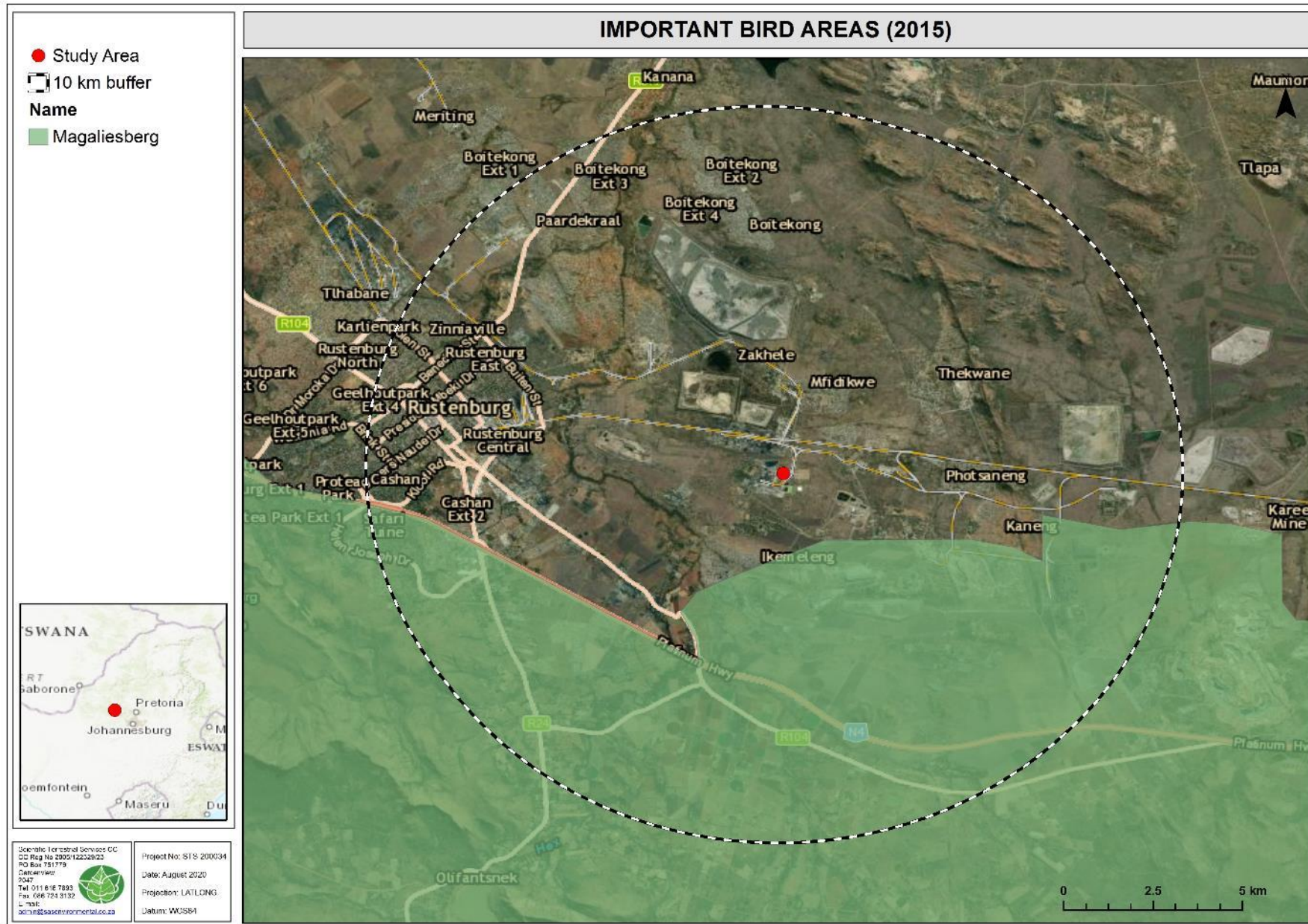


Figure 4: Important Bird Areas (IBAs) within a 10km radius of the study area.



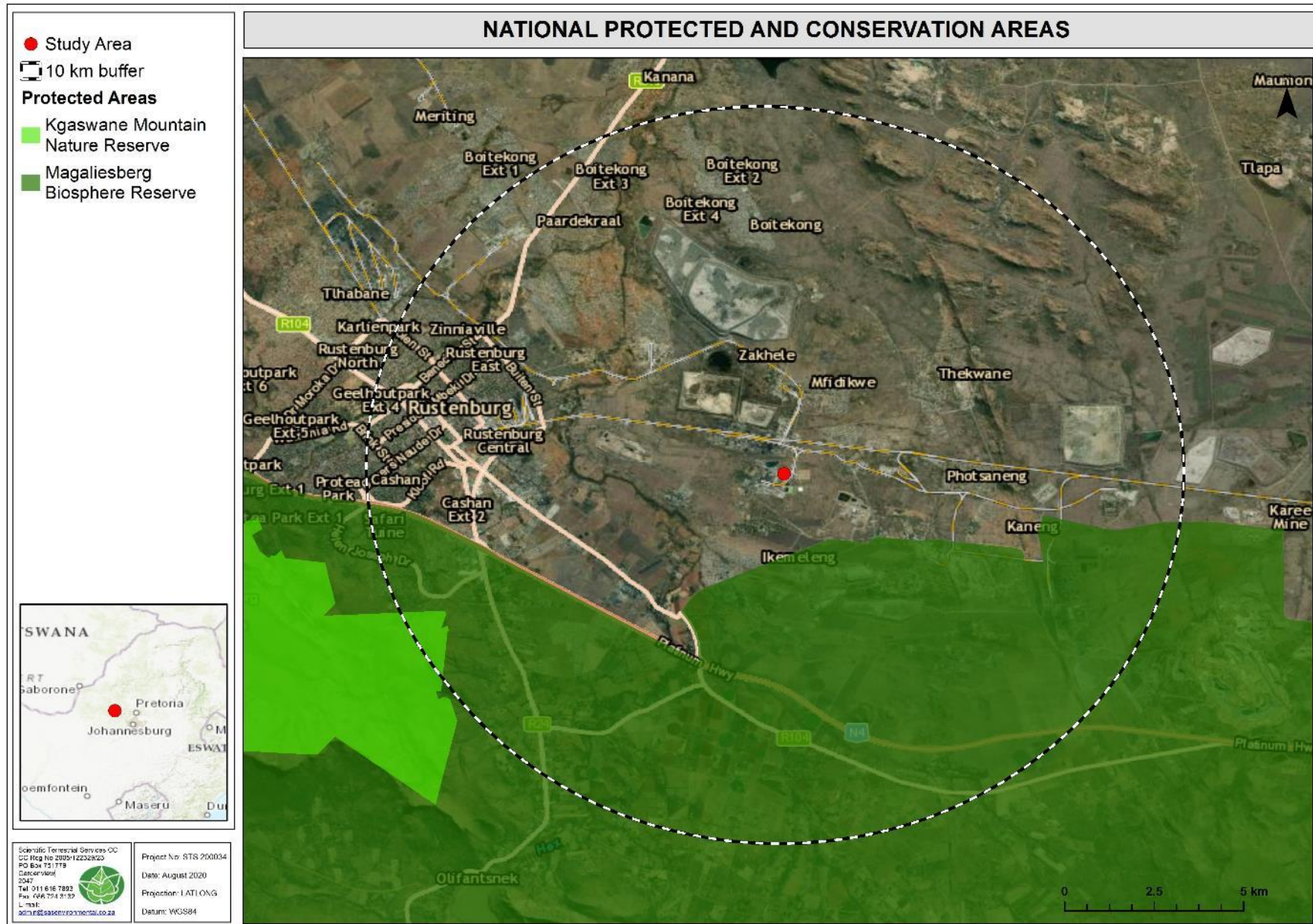


Figure 5: Protected areas within a 10km radius of the study area, according to SAPAD (Q4, 2019), SACAD (Q4, 2019) and NPAES (2009).



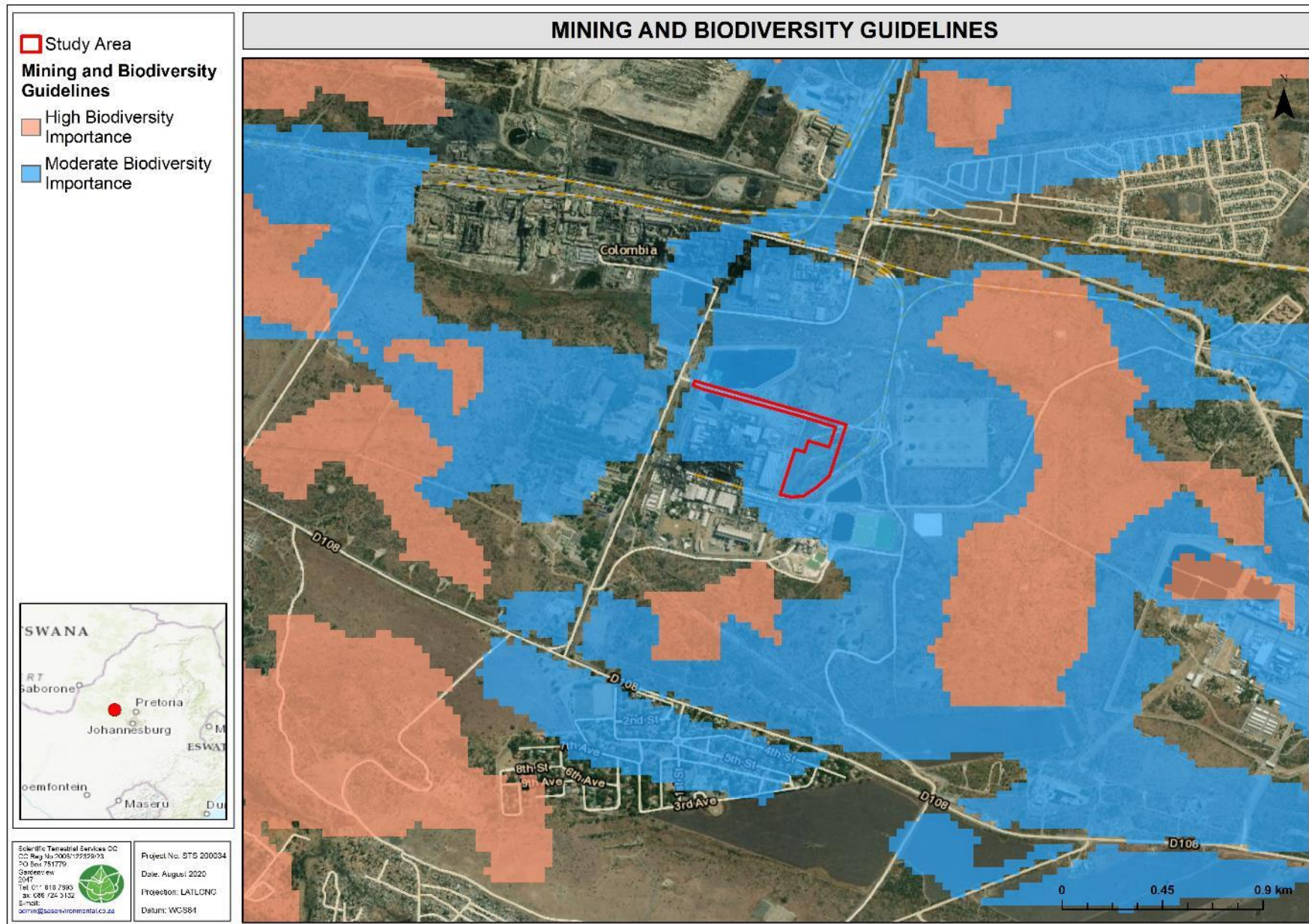


Figure 6: Importance of the study area according to the Mining and Biodiversity Guidelines (2012).



4. ASSESSMENT RESULTS

Overall, the habitat within which the study area is located is typical of an peri-urban setting and includes built-up areas (industrial, commercial and for human settlement), degraded areas that support a high abundance of alien and invasive plant (AIP) species, agricultural fields, and some patches of natural veld. These anthropogenic areas reduce the potential for important landscape processes, such as fire and migration, to operate. The study area itself comprises of what appears to be an old waste rock dump (WRD), established 1975, and is moderately vegetated by medium-height microphyllus (i.e. fine-leaved) acacias. Adjacent to the WRD is an open grassland with stormwater infrastructure interspersed which was installed to manage drainage in 2011. The study area can thus be defined as degraded habitat with three subunits, namely Degraded Grassland, Degraded Thornveld and Transformed Habitat. A depiction of these habitat units within the study area is presented in Figure 9. The Transformed Habitat will not be discussed as it offers almost no habitat for fauna or flora due to the nature of the habitat being hardened gravel road surface.

The study area falls within the Marikana Thornveld vegetation type (listed as endangered in Mucina and Rutherford, 2006), i.e. the reference state. Mucina and Rutherford (2006) describe the Marikana Thornveld as Open *Vachellia karroo* woodland, occurring in valleys and slightly undulating plains, and some lowland hills. The remaining patches of natural veld within the study area have, however, been exposed to various historic and ongoing impacts/disturbances (outlined below), rendering the remaining savanna a poor representative of the reference state.

Existing impacts on the biodiversity associated with the study area include the following (see Figures 7 and 8):

- Clearing of vegetation on several separate occasions but notable transformation occurred throughout the study area (e.g. see below satellite imagery from 1975 and 1983 below);
- Waste Rock Dump established in 1975;
- Historic alteration of the degraded grassland through earthworks and stormwater infrastructure establishment;
- Encroachment of woody species (both indigenous and alien); and
- Long-term fragmentation of the study area from source populations necessary for proper re-establishment of vegetation and of animal species. This fragmentation comprises the construction of buildings and major roads around the study area.





Figure 7: Left - Looking onto the historic WRD, composed of Degraded Thornveld, from the Degraded Grassland subunit. Right – Standing on top of the WRD in the southern portion of the study area looking north.

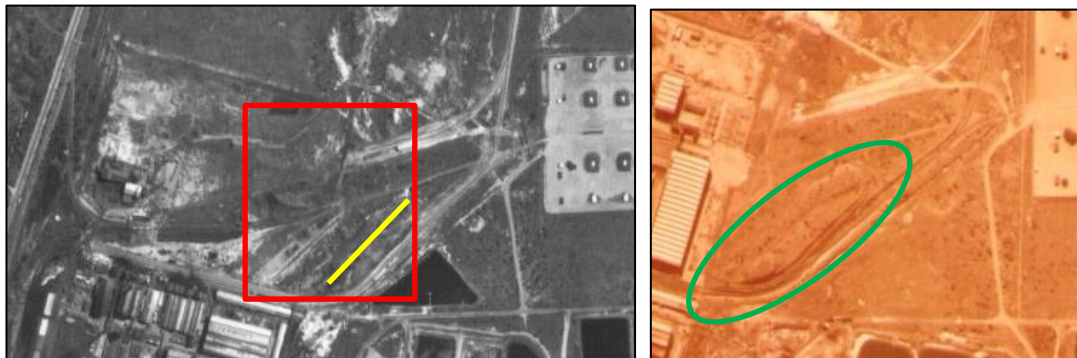


Figure 8: Left - Historical imagery from 1975 indicates large scale earthworks occurred within the study area. Yellow line indicates the area where the WRD was established. Right – The contours of the existing waste rock dump can visibly be seen in historical imagery from 1983 (Green oval circles the waste rock dump).

Within the anthropogenically altered landscape, conditions for fauna and flora are suboptimal due to a lack of suitable habitat and habitat fragmentation. Ongoing anthropogenic activities within and around this habitat unit have pushed out populations of species that would normally be expected to occur in such an area.

Additional discussions on the faunal and floral biodiversity associated with the study area, including information on SCC, are described in section 4.1 to 4.4.



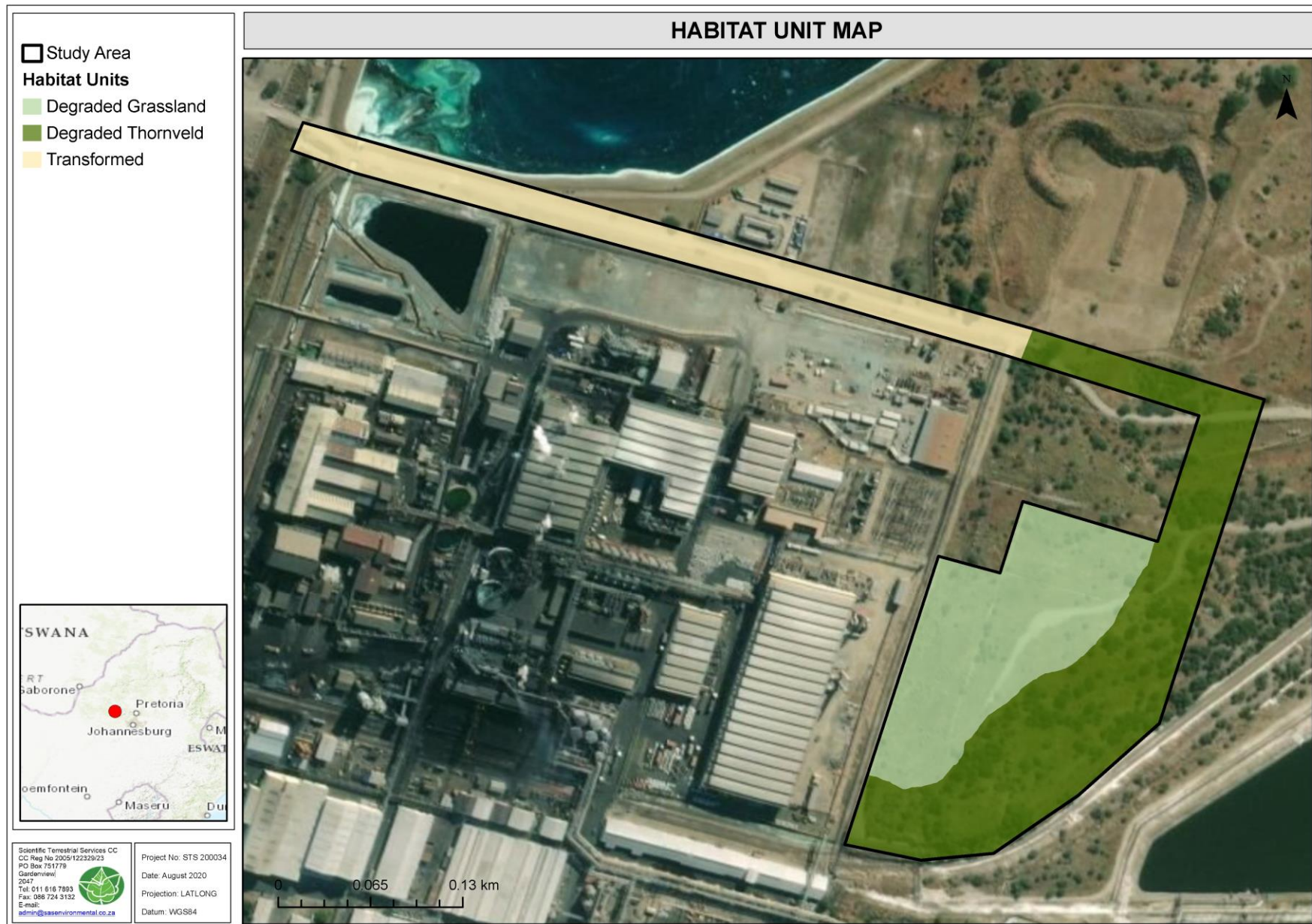
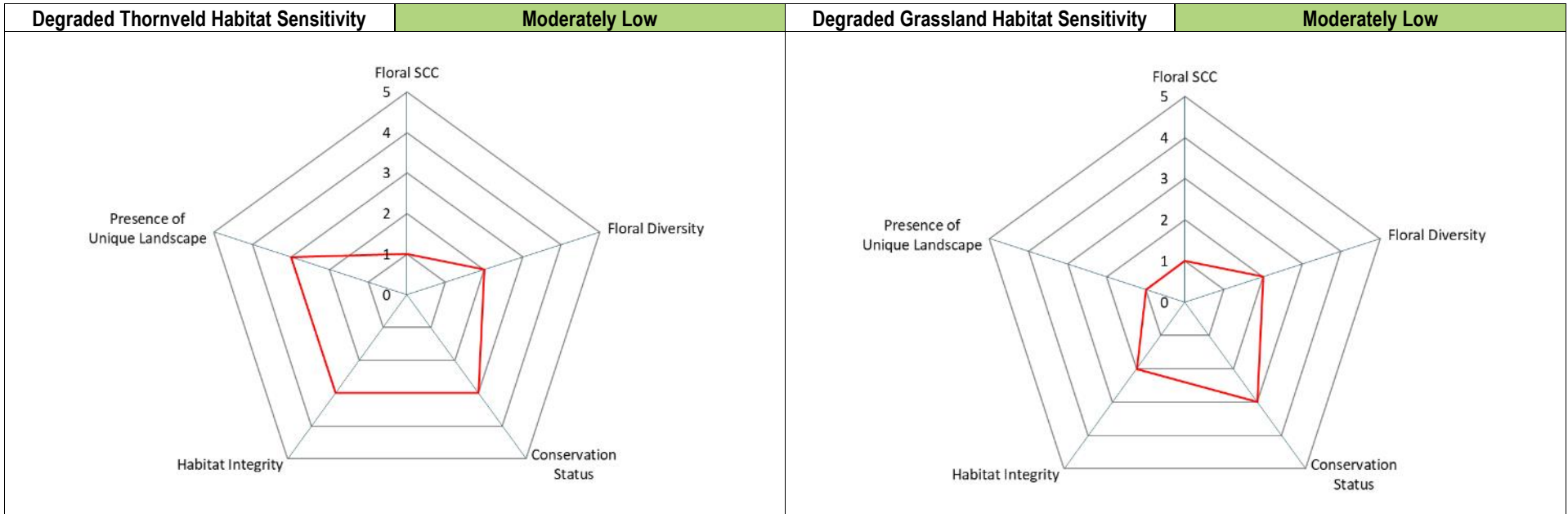


Figure 9: Habitat units associated with the study area.



4.1 Floral Assessment



REPRESENTATIVE PHOTOGRAPHS AND SENSITIVITIES OF THE GRASSLAND HABITAT WITHIN THE STUDY AREA



Representative Photos:



Left: Degraded Thornveld and areas encroached by *Dichrostachys cinerea* (Sickle bush). Right: Photos representative of the degraded grassland. Hardened surfaces can be seen.

SCC Discussion

During the field assessment, no floral SCC were recorded within the study area. Activities associated with earthmoving, railway construction, WRD establishment and water management installation has potentially destroyed potential habitat for the establishment and persistence of SCC on the site. The absence of suitable dispersal corridors, as a result of peri-urban development, together with the removal of many dispersal agents has significantly reduced the potential of SCC re-establishment and persistence. Habitat for floral species within the anthropogenically modified landscape has been modified to the extent where the likelihood of SCC establishment is low. Refer to Section 4.3 for a more complete discussion on SCC associated with the study area.

Ecological Discussion

From a floral perspective, the Degraded Grassland Habitat and Degraded Thornveld Habitat Unit have been exposed to several historic disturbances resulting in sub-optimal habitat conditions, decreased habitat integrity and a low species diversity. This is evident when comparing the identified habitat units to reference vegetation type, which is expected to be species rich. The degraded nature of the study area thus supports species that favour disturbed conditions, e.g. alien and invasive species such as *Melia azedarach* (NEMBA Category 1b), *Tecoma stans* (NEMBA Category 1b), *Tipuana tipu* (NEMBA Category 3), *Agave sisalana* (NEMBA Category 2), *Cereus jamacaru* (NEMBA Category 1b), *Argemone ochroleuca* (NEMBA Category 1b), *Flaveria bidentis*, as well as native weedy species such as *Tagetes minuta* and *Sesbania bispinosa* which have established within the study area. Although the study area supports a small number of indigenous trees, the habitat units are mostly homogenous throughout supporting an overall low species richness of indigenous species.

The proposed development is likely to have an impact on the overall functioning of the system. The major mechanisms which drive the development and maintenance of savanna's are fire and herbivory, the suppression of these factors on the surrounding vegetation will impact the overall functioning of the system. Furthermore, the fragmented nature of the study area and the absence of suitable dispersal corridors and reduced abundance of faunal dispersal agents will limit the rate at which vegetation re-establishes within the study area.

Business Case and Conclusion:

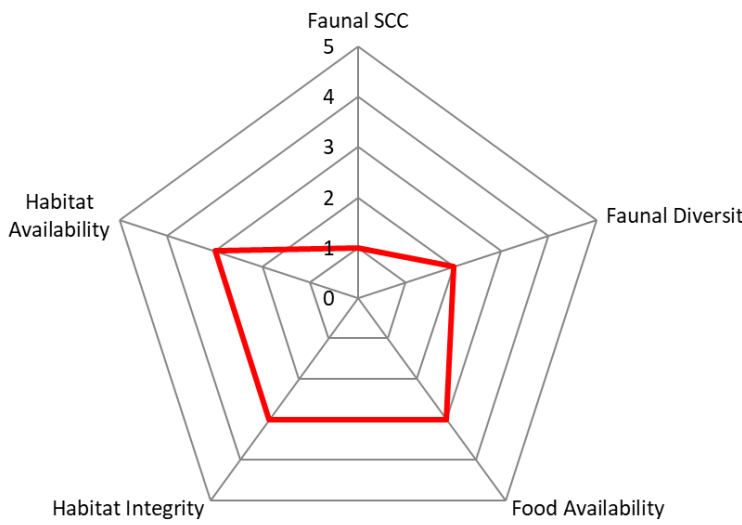






The overall sensitivity of the floral habitat units are moderately low. Anthropogenic activities and proliferation of alien plant species have resulted in the degradation of the available habitat and the proposed development is not deemed likely to have significant negative impacts on the species poor floral assemblages. Although habitat modifications have occurred vegetation has re-established relatively well although species diversity remains low. Regardless, it is imperative that the development footprint be restricted to the approved demarcated area, and edge effects strictly managed so as to limit the impact on the surrounding natural vegetation.

Important considerations:

- Several AIPs occur within the study area of which some species are listed as NEMBA category 1b and NEMBA category 3. The NEMBA regulations do not require that Category 3 species be removed but rather that further planting, propagation or trade of these species is prohibited. It is still recommended that these species be monitored to ensure they do not spread to adjacent areas where they do not yet occur. Category 1b species require compulsory control;
- The proposed development is unlikely to significantly impact SCC species as none were found in the study area, however species may disperse and establish within the study area. It is therefore recommended that if any SCC (as identified in section 4.3) are found within the footprint area they should be rescued and relocated by a suitably qualified specialist and either relocated to suitable habitat (outside the development footprint) within the study area, or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI); and
- According to the North West Biodiversity Sector Plan the study area is not considered to be of importance and no conservation status has been issued.



4.2 Faunal Assessment

Degraded Habitat Sensitivity	Moderately Low	FAUNAL SPECIES OBSERVED DURING THE FIELD ASSESSMENT		
				
		<p>Left - Evidence of a rodent feeding on a tuber. Middle - <i>Pleceus velatus</i> (Southern Masked Weaver) nests and Right - <i>Lepus saxatilis</i> (Scrub Hare) dropping</p>		
				
		<p>Left - <i>Cisticola lais</i> (Wailing Cisticola). Middle - <i>Pachydactylus affinis capensis</i> (Thick-Toed Gecko) and Right - Hairy Darkling Beetle (Tenebrionidae).</p>		
SCC Discussion				
<p>No faunal SCC were encountered during the field assessment, and the probability of any such species utilising the study area is highly unlikely as habitat within the study area is historically transformed and currently degraded and highly fragmented providing unsuitable habitat to support faunal SCC. The study area is almost completely fenced-off from the surrounding natural areas where suitable habitat for SCC could occur, thereby limiting the potential for these species to utilise the study area.</p>				
<p>Refer to Section 4.4 for a more complete discussion on SCC associated with the study area.</p>				



Ecological Discussion

Faunal species diversity within the study area was moderately low due to the highly fragmented nature of the habitat and the large-scale transformation which surrounds the area. Species observed were limited to common and widely occurring species known to survive in areas of decreased sensitivity that have integrated well into peri-urban environments. Limited potential for important landscape processes such as fire and herbivory to occur exists due to this peri-urban setting, nor is this location considered an ecological support area. This area lacks potential as a location for faunal conservation due to its degraded nature.

The habitat within the study area is fragmented and isolated (fenced-off) from surrounding natural habitat via man-made barriers such as railway tracks, built-up areas and wired fences. These barriers influence the presence of expected fauna – although this applies mostly to larger mammal species. Smaller mammals can move through fences to inhabit the study area, e.g. the burrows of rodents were observed on site. Mammal species also likely to utilise the study area for foraging include *Herpestes sanguinea* (Slender Mongoose), whilst species such as *Lemniscomys rosalia* (Single-striped Grass Mouse) and *Mus musculus* (House mouse) are likely to permanently reside and forage within the study area.

The Degraded Grassland Habitat is more suitable for granivorous species as the dense, patchy graminoid layer produces an abundance of seed. The Degraded Thornveld would have been favoured by mammals and avifauna as the more complex structure offers both opportunity for foraging and shelter. Rocky areas where boulders were stacked along the WRD offer reptiles suitable shelter and basking areas. The Degraded Grassland Habitat is also expected to harbour a low diversity of common reptilian species. Reptile species that may occur within the study area are likely to be the more common, non-threatened species that are mobile enough to migrate to more suitable refugia within areas surrounding the study area or which are well adapted to inhabiting human dominated and developed areas. No amphibian species were encountered during the field assessment and due to the lack of any wetland, riparian or suitable water habitat within the study area it is unlikely that any notable amphibians occupy the study area.

Business Case and Conclusion:

The overall sensitivity of the faunal habitat associated with the study area was considered moderately low, based on habitat and food availability. The faunal habitat has been altered as a result of historic and ongoing mining activities and the establishment of a railway line adjacent the site. The impact that the proposed development will have on faunal habitat, diversity and SCC, is not considered detrimental, due to the lack of sensitive species and/or habitat to harbour sensitive and range-restricted species.

Several sections within the study area have been compromised by the proliferation of AIPs. To prevent further habitat loss for fauna in any adjacent natural areas, it is recommended that an alien and invasive control plan be implemented for the study area during construction activities. It is important that cleared alien plants not be dumped within the adjacent habitat.



4.3 Floral Species of Conservation Concern Assessment

Threatened/protected species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is a threatened species. SCC are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare and Declining. A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).

The SCC assessment not only considers floral SCC recorded on site during the field assessment but also includes a Potential of Occurrence (POC) assessment where the assessment takes suitable habitat to support any such species into consideration. Thus, for the POC assessment, a list of Red Data Listed (RDL) species previously recorded within the QDS 2527CB was obtained from the Botanical Database of Southern Africa (BODATSA; <http://posa.sanbi.org/>) within a selected boundary (see Appendix B for details).

Of the tabulated SCC below, none received a POC score of "confirmed" or "high" due to the degraded nature of the habitat. The conditions on site were not deemed suitable and the species listed above are unlikely to occur within the study area.

For the species within the remainder of the QDS 2527CB, as provided by BODATSA, their Probability of Occurrence (POC) ratings are tabulated in Appendix B. Table 2 below represents those species that may potentially be recorded on site.

Table 2: Floral SCC expected to occur within the QDS 2527CB in which the study area is located. A full list of POC ratings is presented in Appendix B. National status definitions is presented in Appendix G.

Family	Species	National status	Habitat	POC
Aizoaceae	<i>Delosperma leendertziae</i>	NT	Range: Magaliesberg, Roodepoort Ridge and Suikerbosrand. Major habitats: Gold Reef Mountain Bushveld, Dwarsberg-Swartruggens Mountain Bushveld, Loskop Mountain Bushveld, Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld Description: Steep, south-facing slopes of quartzite in mountain grassland. Population trend: Decreasing	Low
Apocynaceae	<i>Stenostelma umbelluliferum</i>	NT	Range: Pretoria North and adjacent areas in North West Province. Major habitats: Savanna Description: Deep black turf in open woodland mainly in the vicinity of drainage lines.	Medium



Family	Species	National status	Habitat	POC
			Population trend: Decreasing	
Asphodelaceae	<i>Kniphofia typhoides</i>	NT	Range: Parys to Lydenburg to Paulpietersburg to Newcastle. Major habitats: Grassland Description: Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands. Population trend: Decreasing	Low
Crassulaceae	<i>Adromischus umbraticola</i>	NT	Range: Potchefstroom and Zeerust to Cullinan. Major habitats: Savanna Description: South-facing rock crevices on ridges, restricted to Gold Reef Mountain Bushveld in the northern parts of its range, and Andesite Mountain Bushveld in the south. Population trend: Decreasing	Low
Fabaceae	<i>Melolobium subspicatum</i>	VU	Range: Krugersdorp to Pretoria. Major habitats: Soweto Highveld Grassland, Egoli Granite Grassland, Carletonville Dolomite Grassland Description: Grassland Population trend: Stable	Low
Orchidaceae	<i>Habenaria mossii</i>	EN	Range: Johannesburg, Pretoria and Krugersdorp. Major habitats: Andesite Mountain Bushveld, Carletonville Dolomite Grassland Description: Open grassland on dolomite or in black, sandy soil. Population trend: Decreasing	Low

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

During the field investigation no floral SCCs were found and the chances that the species above re-establish themselves on the site is medium to low. Should any floral SCC be encountered during any phase of the proposed development, these species should be rescued and relocated by a suitably qualified specialist and either relocated to suitable habitat within the study area outside of the development footprint, utilised within the landscaping plan of the project, or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Any other floral SCC encountered during the construction phase of the proposed development should also be relocated by a suitably qualified specialist and, where required, the necessary permits should be applied for.

4.4 Faunal Species of Conservation Concern Assessment

During the field assessment, it is not always feasible to identify or observe all species within the study area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix H, whose known distribution ranges and habitat preferences include the study area, were taken into consideration.



Due to the modified and disturbed landscape of the study area, limited suitable habitat and food sources available, and the area being surrounded by both a fence and transformed areas with little natural areas where suitable habitat could be available, it is deemed unlikely that any faunal SCC will occur within the study area.

None of the species listed in Appendix H obtained a POC of 60% or more. No faunal SCC or evidence (such as spoor, scat, shelters or feathers) thereof were identified on site and it can thus be deduced that the proposed development is unlikely to affect faunal SCC or the conservation thereof in the region. The proposed development is also unlikely to affect any migratory corridors for any possible faunal SCC.

If in the unlikely event that faunal SCC as listed in Appendix H of this report are encountered during the construction of the proposed development, a biodiversity specialist must be consulted in order to ascertain the best way forward.



5. SENSITIVITY MAPPING

The figure below (Figure 10) conceptually illustrates the area's ecological sensitivity – depicting a combined fauna-flora sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity.

Table 3 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

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

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Degraded Thornveld and Degraded Grassland Habitats	Moderately Low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	This habitat unit is of moderately low ecological importance and sensitivity due to the level of historic habitat modification and the high degree of fragmentation limiting the potential for fauna and flora to augment the habitat. The likelihood of an high abundance and diversity of faunal species utilising these areas is low, with the potential for indigenous plants to flourish also being low. Lastly, no floral or faunal SCC are expected to occur on the site. Development within the anthropogenically altered landscapes will have a low impact on native faunal and floral biodiversity; however, were development to proceed, edge effects would need to be mitigated – most notably the spread of AIP species. It is advised that an AIP management plan be implemented to control the spread of listed invaders.
Transformed	Low	Optimise development potential.	This habitat unit is of low ecological importance and sensitivity and development related activities are unlikely to have any significant impact on the faunal community. This portion of the study area is an existing road and road verge which offer little value in terms of faunal habitat and do not provide important ecoservices or functions.



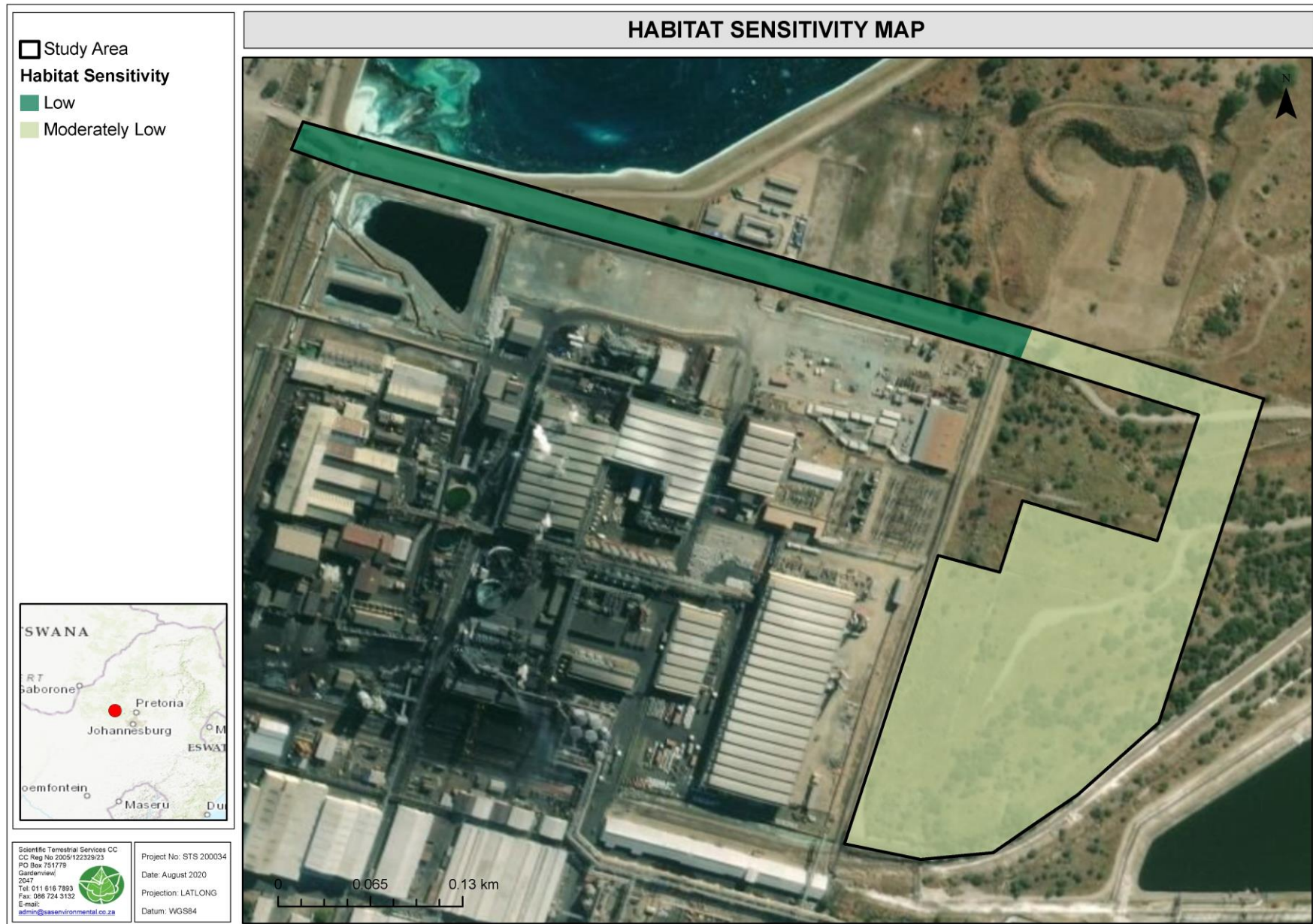


Figure 10: Habitat sensitivity map for the study area.



6. IMPACT ASSESSMENT

The proposed RBMR Plant infrastructure development includes the construction of a weighbridge and truck un/loading bays, the relocation and construction of chemical storage tanks, and lastly, tarring of the existing dirt road that leads into the study area. The study area, and thus area of development, covers an area of approximately 5.3 ha.

The sections below provide the significance of perceived impacts on the floral and faunal ecology of the study area. An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 6.1 (flora) and Section 6.2 (fauna). All mitigatory measures required to minimise the perceived impacts are presented in Section 6.3.

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

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

ACTIVITIES AND ASPECTS REGISTER	
Pre-Construction Phase	
-	Potential failure to relocate floral SCC to suitable habitat outside the development footprint.
-	Impact: Permanent loss of floral SCC from the study area.
-	Potential failure to design and implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat.
-	Impact: Spreads of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
Construction Phase	
-	Site clearing and the removal of vegetation.
-	Impact: Loss of faunal and floral habitat, diversity and the possible loss of floral SCC.
-	Potential failure to monitor the success of relocated floral SCC if any are located.
-	Impact: Loss of SCC individuals.
-	Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat.
-	Impact: Loss of favourable faunal and floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of faunal and floral SCC.
-	Dumping of construction material within areas where no construction is planned, thereby leading to further habitat disturbance – allowing the establishment and spread of AIPs.
-	Impact: Loss of preferred faunal and floral habitat, diversity and SCC as AIPs outcome and replace these species.
-	Potential overexploitation through the trapping and/or hunting of faunal species, including faunal SCC, beyond the direct footprint area.
-	Impact: Local loss of faunal abundance and diversity.
-	Potentially poorly managed edge effects: <ul style="list-style-type: none"> • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and • Compaction of soils outside of the study area due to indiscriminate driving of construction vehicles through natural vegetation.
-	Impact: Loss of floral habitat, diversity and potential SCC within the direct footprint of the proposed development. Loss of surrounding floral diversity and floral SCC through the displacement of indigenous flora by AIP species – especially in response to disturbance in natural areas.



ACTIVITIES AND ASPECTS REGISTER	
<ul style="list-style-type: none"> - Possible increased fire frequency during construction. - Impact: Loss or alteration of floral and faunal habitat and species diversity. 	
<ul style="list-style-type: none"> - Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants² and potentially further decreasing optimal growing/re-establishing conditions. - Impact: Declines in plant functioning leading to loss of floral species and habitat for optimal growth. 	
Operational and Maintenance Phases	
<ul style="list-style-type: none"> - Potential failure to monitor the success of relocated floral SCC (if applicable). - Impact: Loss of SCC individuals. 	
<ul style="list-style-type: none"> - Higher levels of traffic within the study area will increase the potential for collision of vehicles with fauna. - Impact: Loss of fauna. 	
<ul style="list-style-type: none"> - Increased introduction and proliferation of alien plant species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the footprint area. - Impact: Ongoing or permanent loss of faunal and floral habitat, diversity and potential SCC. 	
<ul style="list-style-type: none"> - Increased human presence in the area once operational, potentially leading to the persecution of fauna in the adjacent natural habitat, or an increased risk of fire frequency impacting on floral and faunal communities outside of the development footprint. - Impact: Loss of faunal and floral habitat, medicinal flora and SCC, as well as overall species diversity within the local area. 	
<ul style="list-style-type: none"> - Potential acid spill due to a critical failure in the storage infrastructure. - Impact: Loss and degradation of faunal and flora habitat and faunal and floral species and the potential for contaminants to enter the groundwater and the resulting cascade of impacts. 	

6.1 Floral Impact Assessment

6.1.1 Floral Impact Assessment Results

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

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



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

Habitat Unit	UNMANAGED							Significance	MANAGED							Significance
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence		Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	
PRE-CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Degraded Thornveld	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Very low
Degraded Grassland	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Very low
Impact on Floral SCC																
Study Area	1	1	2	2	2	2	6	12 Very low	1	1	1	1	2	2	4	24 Very low
CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
Degraded Thornveld	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Very low
Degraded Grassland	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Very low
Impact on Floral SCC																
Study Area	1	1	2	2	2	2	6	12 Very low	1	1	1	1	2	2	4	8 Low
OPERATIONAL AND MAINTENANCE PHASE																
Impact of floral Habitat and Diversity																
Degraded Thornveld	5	2	2	2	3	7	7	49 Low	4	2	1	1	3	6	5	30 Low
Degraded Grassland	5	2	2	2	3	7	7	49 Low	4	2	1	1	3	6	5	30 Low
Impact on Floral SCC																
Study Area	1	1	2	2	3	2	7	14 Very low	1	1	1	1	3	2	4	8 Very low



6.1.2 Impact Discussion

The direct impact of the proposed acid plant relocation on the floral ecology of the study area is not anticipated to be detrimental, with impact significance varying between low and very-low for the Degraded Habitats prior to mitigation measures being implemented. If mitigation measures are implemented very low and low impact significance are anticipated for the study area. Very-low level impact on floral SCC are anticipated due to the unfavourable habitat and their observed absence from the study area.

Due to the study area being surrounded by man-made barriers such as roads, mining infrastructure, railways and other developments, the surrounding natural vegetation within the local region is unlikely to be impacted upon by the proposed development. Locally the long term loss of habitat will incur the greatest impact as the site will be transformed into infrastructure. As part of the rehabilitation actions, disturbed areas not within the development footprint must be rehabilitated appropriately and AIP establishment controlled within such areas.

6.1.2.1 Impact on Floral Habitat and Diversity

The historic disturbances within the study area, i.e. the transformation of vegetation communities during earthmoving for stormwater management, road and railway construction, the establishment of the WRD, and fragmentation from the surrounding natural vegetation communities has resulted in both decreased habitat integrity and floral communities that are indicative of disturbance events. Recovery and revegetation of the study area has occurred where these historical activities occurred, however, the remaining habitat within the study area is no longer representative of the reference vegetation type, i.e. the Marikana Thornveld. AIP proliferation within the study area is moderate, leading to an ongoing decline in preferred habitat for native floral species. The proposed development will result in the loss of common indigenous species, but the impact will be localised within the footprint area and no regional impacts on floral communities are anticipated.

6.1.2.2 Impacts on Floral SCC

During the field assessment no SCC were observed, and it is unlikely that any exist within the study area due to the historic earthmoving, stormwater management infrastructure and railroad infrastructure construction. Thus the impact on floral SCC can only be considered of a very-low significance level.



6.1.2.3 Probable Residual Impacts

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

- Further loss of floral habitat outside of the footprint area;
- Loss and alteration of floral species diversity outside of the footprint area; and
- Continued AIP proliferation to adjacent natural vegetation communities.

6.1.2.4 Cumulative Impacts

The greatest threat to the floral ecology within the study area is the continued proliferation of AIP species, resulting in the overall loss of native floral communities within the local area. The proposed development will also increase the movement of humans within the area and could lead to increased harvesting of floral SCC in adjacent natural area of vegetation and/ or the degradation of floral habitat due to continued exposure to anthropogenic disturbances.

6.2 Faunal Impact Assessment

6.2.1 Faunal Impact Assessment Results

The table below summarises the findings indicating the significance of the impact before and after mitigation. In the consideration of mitigation, it is assumed that a high level of mitigation takes place, but which does not lead to prohibitive costs. From the tables, it is evident that prior to mitigation, the impacts on faunal SCC, habitat and diversity are low and very-low level impacts. If effective mitigation takes place, most impacts may be reduced to a lower level impacts. Impacts will have reduced severity; duration and the scale of the footprint will be minimised.



Table 6: Impact on the faunal habitat, diversity and SCC arising from the proposed development activities.

Habitat Unit	UNMANAGED							Significance	MANAGED							Significance
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence		Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	
PRE-CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Degraded Thornveld and Grassland	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Very low
Impact on Faunal SCC																
Degraded Thornveld and Grassland	1	1	2	2	2	2	6	12 Very low	1	1	1	1	2	2	4	8 Very low
CONSTRUCTION PHASE																
Impact of Faunal Habitat and Diversity																
Degraded Thornveld and Grassland	5	2	2	2	2	7	6	42 Low	4	2	1	1	2	6	4	24 Low
Impact on Faunal SCC																
Degraded Thornveld and Grassland	1	1	2	2	2	2	6	12 Very low	1	1	1	1	2	2	4	8 Very low
OPERATIONAL AND MAINTENANCE PHASE																
Impact of Faunal Habitat and Diversity																
Degraded Thornveld and Grassland	5	2	2	2	3	7	7	49 Low	4	2	1	1	3	6	6	36 Low
Impact on Faunal SCC																
Degraded Thornveld and Grassland	1	1	2	2	3	2	7	14 Very low	1	1	1	1	3	2	6	12 Very low



6.2.2 Impact Discussion

The proposed development footprint is approximately 5.4 ha and is anticipated to have a limited impact on faunal communities. The habitat integrity of majority of the study area has been degraded and completely altered from its natural state, and only a few commonly occurring faunal species were observed utilising the habitat. With mitigation measures implemented, the direct and indirect impacts on the floral ecology can be reduced to low and very-low levels.

The study area is surrounded by man-made barriers such as roads, railways, fences and other developments, and it is thus also not anticipated any migratory routes for faunal species will be impacted by the proposed development. As part of the rehabilitation actions, disturbed areas not within the development footprint must be rehabilitated appropriately and AIP establishment controlled within such areas.

6.2.2.1 Loss of Faunal Habitat and Ecological Structure

The proposed development will result in a loss of faunal habitat from the area; however, the study area is associated with a moderately low diversity of fauna and no SCC were recorded. The proposed development is thus not likely to have a significant negative impact on faunal communities.

Despite the fragmented habitat and levels of habitat transformation and disturbance, the study area still provides habitat for common and widespread faunal species that have integrated well within the peri-urban setting. Overall, the Degraded Habitat is associated with only a moderately low diversity and abundance of faunal species. The major impact will result of the long term alteration of habitat from a disturbed and degraded natural landscape inhabited by common faunal species into a human modified location storing dangerous chemicals.

Mitigation efforts should be aimed at limiting edge effects from construction activities to the surrounding area and implementing an AIP management plan.

6.2.2.2 Impact on Important Faunal Species of Conservation Concern

No faunal SCC were observed within the study area. The peri-urban setting, historic anthropogenic activities, lack of suitable available habitat and the level of transformation within study area has resulted in the exclusion of faunal SCC from the study area. Although it is unlikely that any faunal SCC will permanently reside within the study area, it is possible that such species are present within the surrounding natural habitat – albeit only temporarily for



foraging purposes. The proposed development will result in higher levels of anthropogenic activities and could increase disturbance in the area.

The impact significance on faunal SCC within the study area is considered to be very low but could be higher for surrounding natural areas outside of the study area where more suitable habitat is available.

6.2.2.3 Probable Residual Impacts

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

- Continued loss of faunal habitat; and
- Continued loss of and altered faunal species diversity.

6.2.2.4 Possible cumulative Impacts

The study area has already been disturbed and fragmented from nearby natural habitat and is associated with high levels of anthropogenic activities that occur on mines. The proposed development will result in the clearance of vegetated areas and the displacement of faunal species within the local area due to the proposed acid tank relocation and associated infrastructure. Furthermore, ineffective control and monitoring of edge effects can result in the spread of AIP species to the surrounding natural areas, which will further alter faunal habitat and subsequently faunal diversity within this area. The proposed new infrastructure should be monitored in the long term to ensure no leaks occur into the receiving environment and its atmosphere as they are extremely hazardous to fauna.

Due to the limited size of the development footprint and the peri-urban landscape of the study area, it is highly unlikely that the proposed development will impact conservation targets for sensitive faunal species.

6.3 Integrated Impact Mitigation

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

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



Table 7: A summary of the mitigatory requirements for the biodiversity associated with the study area.

Project phase	Planning Phase
Impact Summary	Loss of floral and faunal habitat, species and SCC
Proposed mitigation and management measures:	
Floral and Faunal Habitat and Diversity	
<ul style="list-style-type: none"> • Minimise loss of indigenous vegetation where possible through planning and where necessary by avoiding vegetation removal and incorporating the recommendations of the biodiversity report as well as other specialist studies; and • Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: <ul style="list-style-type: none"> - Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the study area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread, or soils contaminated with AIP seeds during the construction phase; and - An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional. 	
Floral SCC	
<ul style="list-style-type: none"> • Any floral SCC that will be affected by the construction activities, must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. Permits might be required from the relevant authority. Further consultation with the relevant authority (NWDEDECT - North West Department: Economic Development, Environment, Conservation and Tourism) will be required to determine whether a permit process needs to be followed. 	
Project phase	Construction Phase
Impact Summary	Loss of floral and faunal habitat, species and SCC
Proposed mitigation and management measures:	
Development footprint	
<ul style="list-style-type: none"> • The construction footprint must be kept as small as possible in order to minimise impact on the surrounding environment (edge effect management); • Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint. Where possible / feasible, any remaining natural areas should be utilised as part of the landscaping of the proposed development; • Smaller species that are not as readily able to move out of an area ahead of ground clearing activities such as scorpions and reptiles will be less mobile during rainfall events and cold days (winter). As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own; • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal; • No collection of floral SCC must be allowed by construction personnel; • No hunting or trapping of faunal species is to be allowed by construction personnel; • Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: <ul style="list-style-type: none"> - Demarcating all footprint areas during construction activities; - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; - All soils compacted as a result of construction activities outside of the final operational area should be ripped, profiled and reseeded; - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made to Category 1b species identified within the development footprint areas (refer to Appendix F of this report); • No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the 	



<p>construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility;</p> <ul style="list-style-type: none"> • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and • Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area. 	
<p>Alien Vegetation</p> <ul style="list-style-type: none"> • Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2016), in line with the NEMBA Alien and Invasive Species Regulations (2014) (Appendix F of this report); • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the construction and operational phase of the development, and a 30m buffer surrounding the study area should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas; and • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards. 	
<p>Floral and Faunal SCC</p> <ul style="list-style-type: none"> • The relocation success of floral SCC, if any, should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful; • No collection of floral SCC or medicinal floral species must be allowed by construction personnel; • Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area; • No trapping or hunting of fauna whatsoever must be allowed; • It is recommended that the perimeter fence allows for movement of small mammals, such as palisade fencing, as opposed to solid constructions such as walls. Should the perimeter be walled in, it is recommended that small openings be left to allow for continuous movement of small mammal species. Such openings must be continuously monitored and cleared of debris to ensure continued movement is possible; and • Should the presence of any faunal SCC be noted, or their breeding sites be located, within the development footprint a suitably qualified specialist should be consulted on the best way to proceed. 	
<p>Fire</p> <ul style="list-style-type: none"> • Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed; 	
<p>Rehabilitation</p> <ul style="list-style-type: none"> • Any areas that have been left bare as a result of the construction activities should be rehabilitated using indigenous species. 	
Project phase	Operational Phase
Impact Summary	Loss of floral and faunal habitat, species and SCC
<p>Proposed mitigation and management measures:</p>	
<p>Development footprint</p> <ul style="list-style-type: none"> • Continuous monitoring of the infrastructure should be carried out to avoid chemical spills in the future; • As part of any landscaping plans, the re-creation of habitat for faunal species such as small lizards, arachnids, small mammals and birds should be considered. Creation of rock gardens, using dead logs and fallen trees in landscape areas should also be considered, as these will provide areas of niche habitat and refuge for small faunal species. Trees can be planted to provide nesting and roosting sites for avifauna; and • No dumping of litter or garden refuse must be allowed on-site. As such it is advised that vegetation cuttings from landscaped areas be carefully collected and disposed of at a separate waste facility. 	
<p>Alien Vegetation</p> <ul style="list-style-type: none"> • Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2016), in line with the NEMBA Alien and Invasive Species Regulations (2014) (Appendix F of this report); 	



- Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards.

Floral and Faunal SCC

- Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations; and
- Should the presence of any faunal SCC be noted, or their breeding sites be located within the operational footprint, a suitably qualified specialist should be consulted on the best way to proceed.

7. CONCLUSION

The floral habitat units and faunal habitat unit are considered to be of moderately low ecological sensitivity and importance due the extent of fragmentation and previous landscape alteration experienced by the study area. Development activities within these habitat units will likely not have a significant impact³ on the floral and faunal communities found within the study area or beyond.

During the field assessment no floral SCC were encountered and it is unlikely that any occur within the study area. No faunal SCC were encountered during the field assessment within the study area. It is furthermore considered unlikely that any faunal SCC will permanently utilise the study area due to the location of the study area within a peri-urban setting and the limited habitat, food resources and movement corridors necessary to support expected faunal SCC.

Following the ecological assessment of the biodiversity within the study area, the impacts associated with the proposed development activities were determined. The impacts on the floral and faunal habitat, diversity and SCC are considered to range from very low to low significance impacts prior to the implementation of mitigation measures. With mitigation fully implemented all impacts can be reduced to low to very-low significance impacts. No significant impacts⁴ on the biodiversity associated with the study area are anticipated for the proposed development.

³ **Significant impact:** An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets (DEA *et. al*, 2017).

⁴ **Significant impact:** An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets (DEA *et. Al*, 2017).



The objective of this study was to provide sufficient information on the biodiversity significance of the area, together with other studies on the physical and socio-cultural environment for the EAP and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The need 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 sustainable economic development of the country.

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



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APPENDIX A - Legislative Requirements and Indemnity

The Constitution of the Republic of South Africa, 1996

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

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

The National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the impact.

The 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).

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

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

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



- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

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

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

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

Government Notice 598 Alien and Invasive Species Regulations (2014), including the Government Notice 864 Alien Invasive Species List as published in the Government Gazette 40166 of 2016, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004)

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

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

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

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

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

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

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

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



Government Notice 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 84 of 1998)

According to the department of Agriculture, Land Reform and Rural Development (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (<https://www.daff.gov.za/daffweb3/>): "In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization."

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

Section 12:

Declaration of trees as protected

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

Section 15(1):

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

Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being.

For the latest list of protected trees refer to: Government Notice 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018.

North West Biodiversity Management Act, 2016 (Act No. 4 of 2016)

To provide for the management and conservation of the North West Province's biophysical environment and protected areas within the framework of the National Environmental Management Act, 1998 (Act No 107 of 1998); to provide for the protection of species and ecological- systems that warrant provincial protection; to provide for the sustainable use of indigenous biological resources; and to provide for matters connected therein.



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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.

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APPENDIX B - Floral Method of Assessment

Floral Species of Conservational Concern Assessment

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

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the study area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, “*low*”, “*medium*”, “*high*” and “*very high*” sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g. for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below⁵:

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

BRAHMS Online Website

⁵ More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

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



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

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

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

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

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

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

Vegetation Surveys

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

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

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a study area equally and thus increase the potential to miss floral SCC. Random sampling methods also tend to require more time in the field to locate the amount of SCC that can be detected using subjective sampling methods - In the context of an EIA where time constraints are often restrictive, priority needs to be given to collecting data in the shortest time possible without compromising the efficiency of locating SCC (SANBI, 2020).

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological



integrity, importance and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

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

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

Table A1: Floral habitat sensitivity rankings and associated land-use objectives.

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



APPENDIX C - Faunal Method of Assessment

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

Mammals

Mammal species were recorded during the field assessment with the use of visual identification, spoor, call and dung. Specific attention was paid to mammal SCC as listed by the IUCN, 2015.

Avifauna

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

Reptiles

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

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the study area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Invertebrates

Whilst conducting transects through the study area, all insect species visually observed were identified, and where possible photographs taken. Due to the terrain, and shallow/ rocky soil structure pitfall traps were not utilised during the site assessment.

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



Arachnids

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

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The accuracy of the calculation is based on the available knowledge about the species in question. Therefore, it is important that the literature available is also considered during the calculation.

Each factor contributes an equal value to the calculation.

Scoring Guideline				
Habitat availability				
No Habitat	Very low	Low	Moderate	High
1	2	3	4	5
Food availability				
No food available	Very low	Low	Moderate	High
1	2	3	4	5
Habitat disturbance				
Very High	High	Moderate	Low	Very Low
1	2	3	4	5
Distribution/Range				
Not Recorded		Historically Recorded		Recently Recorded
1		3		5
[Habitat availability + Food availability + Habitat disturbance + Distribution/Range] / 20 x 100 = POC%				

Faunal Habitat Sensitivity

The sensitivity of the study area for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

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



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

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

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



APPENDIX D - Impact Assessment Methodology

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

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

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'⁶. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table 3. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary⁷.

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

⁶ The definition has been aligned with that used in the ISO 14001 Standard.

⁷ Some risks/impacts that have low significance will however still require mitigation.



Environmental Management Act 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table D1: Criteria for assessing significance of impacts

LIKELIHOOD DESCRIPTORS

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

CONSEQUENCE DESCRIPTORS

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



Table D2: Significance Rating Matrix.

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

Table D3: Positive/Negative Mitigation Ratings.

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

The following points were considered when undertaking the assessment:

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



Mitigation measure development

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

- *Mitigation and performance improvement measures* and actions that address the risks and impacts⁸ are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.
- Desired outcomes are defined, and have been developed in such a way as to be *measurable events with performance indicators, targets and acceptable criteria* that can be tracked over *defined periods*, with estimates of the *resources* (including human resource and training requirements) *and responsibilities for implementation*.

Recommendations

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

⁸ Mitigation measures should address both positive and negative impacts



APPENDIX E - Vegetation Type

Marikana Thornveld (SVcb6)



Figure E1: SVcb 6 Marikana Thornveld: *Vachellia nilotica*-dominated clay thornveld north of Pretoria (Ga-Rankuwa, Gauteng), after a recent fire. Image by L. mucina.

Table E1: Floristic species of *Marikana Thornveld* (Mucina & Rutherford, 2012).

Plant Community	Species
Dominant and typical floristic species	
Woody Layer	
Trees	Tall Tree: <i>Acacia burkei</i> . Small Trees: <i>Acacia caffra</i> , <i>A. gerrardii</i> , <i>A. karroo</i> , <i>Combretum molle</i> , <i>Rhus lancea</i> , <i>Ziziphus mucronata</i> , <i>Acacia nilotica</i> , <i>A. tortilis</i> subsp. <i>heteracantha</i> , <i>Celtis africana</i> , <i>Dombeya rotundifolia</i> , <i>Pappea capensis</i> , <i>Peltophorum africanum</i> , <i>Terminalia sericea</i> .
Low Shrubs	<i>Asparagus cooperi</i> , <i>Rhynchosia nitens</i> , <i>Indigofera zeyheri</i> , <i>Justicia flava</i> . Woody Climbers: <i>Clematis brachiata</i> , <i>Helinus integrifolius</i> .
Forb layer	
Herbs	<i>Hermannia depressa</i> , <i>Ipomoea obscura</i> , <i>Barleria macrostegia</i> , <i>Dianthus mooiensis</i> subsp. <i>mooiensis</i> , <i>Ipomoea oblongata</i> , <i>Vernonia oligocephala</i>
Geophytic Herbs	<i>Ledebouria revoluta</i> , <i>Ornithogalum tenuifolium</i> , <i>Sansevieria aethiopica</i>
Gramminoid layer	
Graminoids	<i>Elionurus muticus</i> , <i>Eragrostis lehmanniana</i> , <i>Setaria sphacelata</i> , <i>Themeda triandra</i> , <i>Aristida scabrivalvis</i> subsp. <i>scabrivalvis</i> , <i>Fingerhuthia africana</i> , <i>Heteropogon contortus</i> , <i>Hyperthelia dissoluta</i> , <i>Melinis nerviglumis</i> , <i>Pogonarthria squarrosa</i>



APPENDIX F - Species Lists

Floral Species List

Table F1: Dominant floral species encountered during the field assessment. Alien species are indicated with an asterisk (*). Also indicated are species falling within an alien invasive category as per the National Environmental Management: Biodiversity Act (Act 10 of 2004): Alien and Invasive Species Regulations, 2016.

Species Name	Degraded Grassland Habitat	Degraded Thornveld Habitat
WOODY SPECIES		
<i>Dichrostachys cinerea</i>		X
<i>Gymnosporia buxifolia</i>		X
* <i>Melia azedarach</i> (NEMBA Category 1b)		X
<i>Searsia lancea</i>		X
<i>Searsia leptodictya</i>		X
<i>Senegalia erubescens</i>		X
* <i>Tecoma stans</i> (NEMBA Category 1b)		X
* <i>Tipuana tipu</i> (NEMBA Category 3)		X
<i>Vachellia karroo</i>		X
<i>Vachellia nilotica subsp. kraussiana</i>		X
<i>Vachellia xanthophloea</i>	X	X
<i>Ziziphus mucronate</i>	X	X
SUCCULENT SPECIES		
<i>Agave sisalana</i> (NEMBA Category 2)	X	
<i>Aloe davyana</i>	X	X
* <i>Cereus jamacaru</i> (NEMBA Category 1b)	X	
SHRUBS & HERBS		
* <i>Araujia cf. sericifera</i> (NEMBA 1b)		X
* <i>Argemone ochroleuca</i> (NEMBA Category 1b)	X	
<i>Asparagus larinus</i>		X
<i>Asparagus suaveolens</i>	X	X
* <i>Flaveria bidentis</i> (NEMBA Category 1b)	X	
<i>Gomphocarpus fruticosus</i>	X	
* <i>Tagetes minuta</i> (Not listed)	X	
<i>Rhynchosia monophylla</i>	X	
* <i>Sesbania bispinosa</i> (Not listed)	X	
<i>Solanum panduriforme</i>	X	X
GRAMINOIDS		
<i>Cenchrus setaceus</i>	X	
<i>Cynodon dactylon</i>	X	X
<i>Heteropogon contortus</i>	X	X
<i>Tricholaena cf. monachne</i>	X	X

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

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

2: Category 2 – Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.

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



Faunal Species List

At the time of the assessment, a limited number of faunal species were observed, most likely due to prevalent rainy conditions. Faunal species is however considered to be limited to common species adapted to increased levels of anthropogenic activities.

Table F2: Mammal species likely to be associated with the study area.

Scientific Name	Common Name	IUCN
<i>Lepus saxitalis</i>	Scrub hare	LC

LC = Least Concern

Table F3: Avifaunal species observed within the study area.

Scientific Name	Common Name	IUCN
<i>Acridotheres tristis</i>	Indian Myna	NEMBA Category 3 alien species
<i>Bostrychia hagedash</i>	Hadada Ibis	LC
<i>Corvus albus</i>	Pied Crow	LC
<i>Corythaixoides concolor</i>	Grey Go-Away-Bird	LC
<i>Cisticola lais</i>	Wailing Cisticola	LC
<i>Passer melanurus</i>	Cape Sparrow	LC
<i>Ploceus velatus</i>	Southern Masked Weaver	LC
<i>Chroicocephalus cirrocephalus</i>	Grey-headed Gull	LC
<i>Colius striatus</i>	Speckled Mousebird	LC
<i>Pycnonotus barbatus</i>	Common Bulbul	LC
<i>Streptopelia capicola</i>	Cape Turtle Dove	LC
<i>Streptopelia senegalensis</i>	Laughing Dove	LC
<i>Vanellus coronatus</i>	Crowned Lapwing	LC

LC = Least Concern

Table F4: Insect species observed or likely to be associated with the study area

Scientific Name	Common Name	IUCN
COLEOPTERA		
Tenebrionidae	Darkling Beetle	NYBA
<i>Lycus ampliatus</i>	Tail Net-winged Beetle	NYBA
HYMENOPTERA		
<i>Apis mellifera</i>	Honey bee	DD
LEPIDOPTERA		
<i>Danaus chrysippus</i>	African Monarch	LC
<i>Cynthia cardui</i>	Painted Lady	NTBA
ORTHOPTERA		
<i>Batrochotetrix stollii</i>	Toad Grasshopper	NYBA
<i>Truxalis</i> sp.	Short-horned Grasshopper	NYBA
<i>Gryllus bimaculatus</i>	Garden Cricket	NYBA

LC = Least concerned, NYBA = Not yet been assessed by the IUCN, DD = Data deficient

Table F5: Reptile species observed within the study area.

Scientific Name	Common Name	IUCN
<i>Pachydactylus affinis capensis</i>	Thick-Toed Gecko	LC

LC = Least concerned

Table F6: Arachnid species observed within the study area.

Scientific Name	Common Name	IUCN
<i>Olurunia ocellata</i>	Grass funnel-web spider	NYBA

NYBA = Not yet been assessed by the IUCN



APPENDIX G - Floral SCC

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

Definitions of the national Red List categories

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

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



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

Floral Species of Conservation Concern (SCC) that were assessed for the study area are listed within the table 2 in section 4.3 of the report.



APPENDIX H - Faunal SCC

Table G1: Mammal species of conservation concern in the North West Province (NW BSP, 2015).

Scientific Name	Common Name	Friedmann & Daly (2004)	IUCN Status
<i>Acinonyx jubatus</i>	Cheetah	VU	VU
<i>Atelerix frontalis</i>	African Hedgehog	NT	LC
<i>Ceratotherium simum</i>	White Rhino	LC	NT
<i>Chrysothalax villosus</i> *	Rough-haired golden mole*	CR	VU
<i>Cloeotis percivali</i>	Short-eared trident bat	CR	LC
<i>Crocuta</i>	Spotted Hyena	NT	LC
<i>Damaliscus lunatus</i>	Tsessebe	EN	LC
<i>Dasyurus incomtus</i>	African Marsh Rat	NT	LC
<i>Diceros bicornis minor</i>	Black Rhinoceros	CR	CR
<i>Eidolon helvum</i>	Straw-Coloured Fruit Bat	NT	NT
<i>Felis nigripes</i>	Black-Footed Cat	LC	VU
<i>Felis silvestris</i>	African Wild Cat	LC	LC
<i>Hippopotamus amphibius</i>	Hippo	LC	VU
<i>Hippotragus equinus</i>	Roan Antelope	VU	LC
<i>Hippotragus niger</i>	Sable Antelope	VU	LC
<i>Hyaena brunnea</i>	Brown Hyena	NT	NT
<i>Leptailurus seval</i>	Serval	NT	LC
<i>Loxodonta africana</i>	African Savanna Elephant	LC	VU
<i>Lutra (Hydrictris) maculicollis</i>	Spotted-necked otter	NT	NT
<i>Lycaon pictus</i>	African Wild dog	EN	EN
<i>Mellivora capensis</i>	Honey Badger	NT	LC
<i>Miniopterus schreibersii</i>	Shreibers' Long-Fingered Bat	NT	NT
<i>Myotis tricolor</i>	Temminck's Hairy Bat	NT	LC
<i>Mystromys albicaudatus</i>	White-tailed mouse	EN	EN
<i>Ourebia ourebi</i>	Oribi	EN	LC
<i>Panthera leo</i>	Lion	LC	VU
<i>Panthera pardus</i>	Leopard	LC	VU
<i>Pelea capreolus</i>	Grey Rhebok	LC	LC
<i>Pipistrellus rusticus</i>	Rusty Pipistrelle	NT	LC
<i>Poecilogale albinucha</i>	African Striped Weasel	DD	LC
<i>Redunca arundinum</i>	Southern reedbuck	LC	LC
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	NT	LC
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	NT	LC
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat	NT	LC
<i>Smutsia temminckii</i>	Ground Pangolin	VU	VU
<i>Thallomys nigricauda</i>	Black-Tailed Tree Rat	LC	LC

CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, DD = Data Deficient; LC = Least Concern

* This species was previously listed in the North West Province Environmental Outlook Report of 2008 (NW DACE, 2008). The NW BSP states that an on the ground effort is required to determine whether any golden moles are present within the province.



Table G2: Avifaunal species of conservation concern in the North West Province (NW BSP, 2015).

Scientific name	Common name	Provincial (2012)	National (Taylor et al., 2015)	IUCN Status
<i>Alcedo semitorquata</i>	Half-collared Kingfisher	NT	NT	LC
<i>Anastomus lamelligerus</i>	African Openbill Stork	NT	LC	LC
<i>Anthropoides paradiseus</i>	Blue Crane	VU	NT	VU
<i>Aquila rapax</i>	Tawny Eagle	VU	EN	LC
<i>Ardeotis kori</i>	Kori Bustard	VU	NT	NT
<i>Buphagus erythrorhynchus</i>	Red-billed Oxpecker	NT	LC	LC
<i>Certhilauda chuana</i>	Short-clawed Lark	NT	NT	LC
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	NT
<i>Ciconia nigra</i>	Black Stork	NT	VU	LC
<i>Circus macrourus</i>	Pallid Harrier	NT	NT	NT
<i>Circus maurus</i>	Black Harrier	NT	EN	VU
<i>Circus ranivorus</i>	African Marsh Harrier	VU	EN	LC
<i>Ephippiorhynchus senegalensis</i>	Saddle-billed Stork	EN	EN	LC
<i>Eupodotis cafra (senegalensis)</i>	White-bellied Korhaan	VU	VU	LC
<i>Falco biarmicus</i>	Lanner Falcon	NT	VU	LC
<i>Falco naumanni</i>	Lesser kestrel	VU	LC	LC
<i>Falco peregrinus</i>	Peregrine Falcon	NT	LC	LC
<i>Glareola nordmanni</i>	Black-winged Pratincole	NT	NT	NT
<i>Gorsachius leuconotus</i>	White-backed Night Heron	VU	VU	LC
<i>Gyps africanus</i>	African White-backed Vulture	VU	CR	CR
<i>Gyps coprotheres</i>	Cape Vulture	VU	EN	EN
<i>Hieraaetus ayresii</i>	Ayres's Eagle	NT	LC	LC
<i>Leptoptilos crumeniferus</i>	Marabou Stork	NT	NT	LC
<i>Mirafra cheniana</i>	Melodious Lark	NT	LC	NT
<i>Mycteria ibis</i>	Yellow-billed Stork.	NT	EN	LC
<i>Neotis denhami</i>	Denhams Bustard	VU	VU	NT
<i>Pelecanus onocrotalus</i>	Great White Pelican	NT	VU	LC
<i>Pelicanus rufescens</i>	Pink-backed Pelican	VU	VU	LC
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT	NT
<i>Phoenicopterus ruber</i>	Greater Flamingo	NT	NT	LC
<i>Podica senegalensis</i>	African Finfoot	VU	VU	LC
<i>Polemaetus bellicosus</i>	Martial Eagle	VU	EN	VU
<i>Pterocles gutturalis</i>	Yellow-throated Sandgrouse	NT	NT	LC
<i>Rostratula benghalensis</i>	Greater Painted Snipe	NT	NT	LC
<i>Rynchops flavirostris</i>	African Skimmer	Regionally EX		NT
<i>Sagittarius serpentarius</i>	Secretarybird	NT	VU	VU
<i>Sterna caspia</i>	Caspian Tern	NT	VU	LC
<i>Terathopius ecaudatus</i>	Bataleur	VU	EN	NT
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	VU	EN	EN



<i>Tyto capensis</i>	African Grass Owl	VU	VU	LC
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CR = Critically endangered; EN = Endangered; VU = Vulnerable, NT = Near Threatened, EX = Extinct, LC = Least concern,

Table G3: Reptile species of conservation concern in the North West Province (NW BSP, 2015).

Scientific name	Common name	Power & Verbugt (2014)	IUCN Status
<i>Chamaesaura aenea</i>	Coppery Grass Lizard	NT	NYBA
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC
<i>Homoroselaps dorsalis</i>	Striped Harlequin snake	NT	NT
<i>Python natalensis</i>	Southern African Python	LC	NYBA

NT = Near Threatened, VU = Vulnerable; NYBA= Not Yet Been Assessed, LC = Least Concern

Table G4: Amphibian species of conservation concern in the North West Province (NW BSP, 2015).

Scientific Name	Common Name	Power & Verbugt (2014)	IUCN Status
<i>Pyxicephalus adspersus</i>	African Giant Bullfrog	NT	LC

NT = Near Threatened, LC = Least Concern

Table G5: Arachnid species of conservation concern in the North West Province (NW BSP, 2015).

Scientific name	Common Name	IUCN Status
<i>Aelurillus cristatopalpus</i>	Jumping Spiders	NYBA
<i>Afromarengo bimaculata</i>	Jumping Spiders	NYBA
<i>Ariadna similis</i>	Jack-in-a-box Spiders	NYBA
<i>Austrachelas merwei</i>	Corrinid Sac Spider	NYBA
<i>Cyatholipus isolatus</i>	Spotted Tree Sheet-web Spiders	NYBA
<i>Diores femoralis</i>	Zodariid Ground Spiders	NYBA
<i>Diphya simoni</i>	Long-jawed Orb Weavers	NYBA
<i>Eusparassus borakalalo</i>	Huntsman Spiders	NYBA
<i>Evarcha flagellaris</i>	Jumping Spiders	NYBA
<i>Galeosoma coronatum</i>	Armoured Trapdoor Spiders	NYBA
<i>Galeosoma crinitum</i>	Armoured Trapdoor Spiders	NYBA
<i>Galeosoma scutatatum</i>	Armoured Trapdoor Spiders	NYBA
<i>Idiops pallus</i>	Armoured Trapdoor Spiders	NYBA
<i>Langona manicata</i>	Jumping Spiders	NYBA
<i>Pseudicius gracilis</i>	Jumping Spiders	NYBA
<i>Rhene konradi</i>	Jumping Spiders	NYBA
<i>Setaphis sexmaculata</i>	Ground Spiders	NYBA

Table G6: Threatened invertebrate species of North West Province (NW DACE, 2008).

Scientific name	Common Name	NW Status 2008	IUCN Status
<i>Metisella meninx</i>	Marsh Sylph	VU	NYBA
<i>Lepidochrysops praeterita</i>	Highveld Blue	EN	NYBA
<i>Platylesches dolomitica</i>	Hilltop Hopper	VU	NYBA
<i>Lepidochrysops hypopolia</i>	Morant's blue	EX	EX

EN = Endangered, VU = Vulnerable, EX=Extinct, NYBA= Not Yet Been Assessed



Table H5: Avifaunal Species for the pentad 2540_2715.

Pentads	Link to pentad summary on the South African Bird Atlas Project 2 web page
2540_2715	http://sabap2.birdmap.africa/coverage/pentad/2540_2715



APPENDIX I - Specialist information

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

Daryl van der Merwe	MSc (Conservation Biology) (University of Cape Town)
Samantha-Leigh Daniels	PhD Candidate (Plant Science) (University of Pretoria)
Nelanie Cloete	MSc (Environmental Management) (University of Johannesburg)
Chris Hooton	BTech Nature Conservation (Tshwane University of Technology)

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)		



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

I, Daryl van der Merwe, declare that -

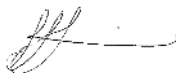
- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity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



Signature of the Specialist

I, Samantha-Leigh Daniels, declare that -

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



Signature of the Specialist



I, Nelanie Cloete, declare that -

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



Signature of the Specialist

I, Christopher Hooton, declare that -

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



Signature of the Specialist





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **DARYL VAN DER MERWE**

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Legislative Requirements, Processes and Assessments

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





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

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

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

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal

KEY SPECIALIST DISCIPLINES

Experience

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

Training

- Plant species identification
- Herbarium usage and protocols





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

Short Courses

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

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Eastern Cape, Free State
Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

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

Legislative Requirements, Processes and Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

Short Courses

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

