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ECOLOGICAL ASSESSMENT FOR THE KANGRA COAL (PTY) LTD MAQUASA MINE PIPELINE DISPOSAL, WWTWS, DISCARD DUMP NEAR PIET RETIEF, MPUMALANGA PROVINCE

Draft Report

Version - 1

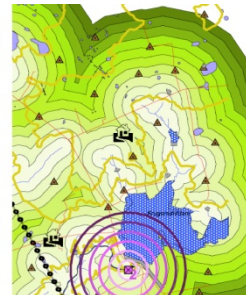
16 September 2024

Kangra Coal (Pty) Ltd

GCS Project Number: 22-0167

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KANGRA



GCS (Pty) Ltd. Reg No: 2004/000765/07 Est. 1987

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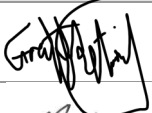



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Kangra Coal (Pty) Ltd

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	Name	Signature	Date
Author	Ronaldo Greeff-Retief		16/09/2024
Document Reviewer	Magnus van Rooyen		16/09/2024

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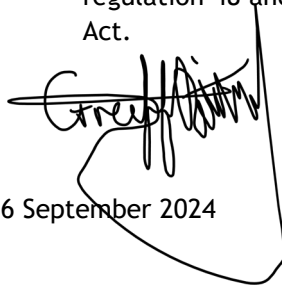
DECLARATION OF INDEPENDENCE

Specialist Name Nico-Ronaldo Greeff-Retief

Declaration of Independence I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Amended Environmental Impact Assessment (EIA) Regulations, 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 Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations, and all other applicable legislation.
- I have no, 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 furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature



Date

16 September 2024

EXECUTIVE SUMMARY

In the case of this study site, the grasslands have been altered through anthropogenic activities. The grasslands, however, were not flowering and trees without leaves.

- Anthropogenic impacts identified within the study site included alien vegetation encroachment, gravel roads, natural vegetation removal, hardening of surfaces to establish the mining infrastructure, fencing, grazing of animals and disturbances to the wetland systems around the site.
- The Terrestrial CBA of the site is mixed between transformed areas and ecological support areas (ESA).
- The study site still has a functional role to play in regional ecological functioning and biological functions at the site even though it has been influenced by human-related impacts.
- Ecological connectivity between the grasslands and drainage located towards the Heyshope Dam cannot be excluded in the overall study area.
- An alien invasive species plan must be developed, together with a maintenance management plan that covers termites.
- Monitoring dust at the site should be encouraged.
- Monitoring should be undertaken monthly for the discharge of the treated effluent from the mine into the Heyshope Dam and submitted to DWS>
- A search-and-rescue plan needs to be developed for any medicinal plants onsite. This has to be confirmed by a registered ecologist under SACNASP and during the flowering / summer season.
- Any protected trees must, however, be sampled and recorded and indicated to DAFF.

Concluded from the results presented in this document, the construction activities will impact on the low sensitive terrestrial biota. Mitigation measures should be implemented to mitigate to satisfactory standards if all mitigatory actions are implemented with due care. Alien eradication and rehabilitation must be encouraged through the development of an alien and invasive species plan. . Even though the site has low sensitivity, the mitigation measures provided may reduce the negative risks anticipated with the mining infrastructure construction.

Should all the mitigation measures be implemented and monitored against to ensure compliance and included in the Environmental Management Program the project may be favourably considered

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ABBREVIATIONS

DAFF:	Department of Agriculture, Forestry and Fisheries
DFFE:	Department of Forestry, Fisheries, and the Environment
DWS:	Department of Water and Sanitation
EA:	Environmental Authorisation
EAP:	Environmental Assessment Practitioner
EIA:	Environmental Impact Assessment
ER:	Employer’s Representative
ECO:	Environmental Control Officer
EMPr:	Environmental Management Program
GA:	General Authorisation
GCS:	Groundwater Consulting Services
NEMA	National Environmental Management Act

1 INTRODUCTION

1.1 Background

The purpose of the ecological assessment is to determine the state of the flora and fauna being affected by the proposed mining operations and expansions to the Kangra Coal Maquasa Mine and to determine whether sensitive areas are applicable and needs to be avoided.

1.2 Project Location

Kangra Coal (Pty) Ltd's (Kangra) Maquasa mining operation is located near Piet Retief within the Mpumalanga Province. The mining area is situated approximately 45km west of Piet Retief and just off the N2 national road on a secondary road leading towards the Heyshope Dam. The Maquasa mining operations is made of the following mining areas:

- Maquasa East
- Maquasa West; and
- Nooitgesien.

Refer to Figure 1-1 for a regional locality map.

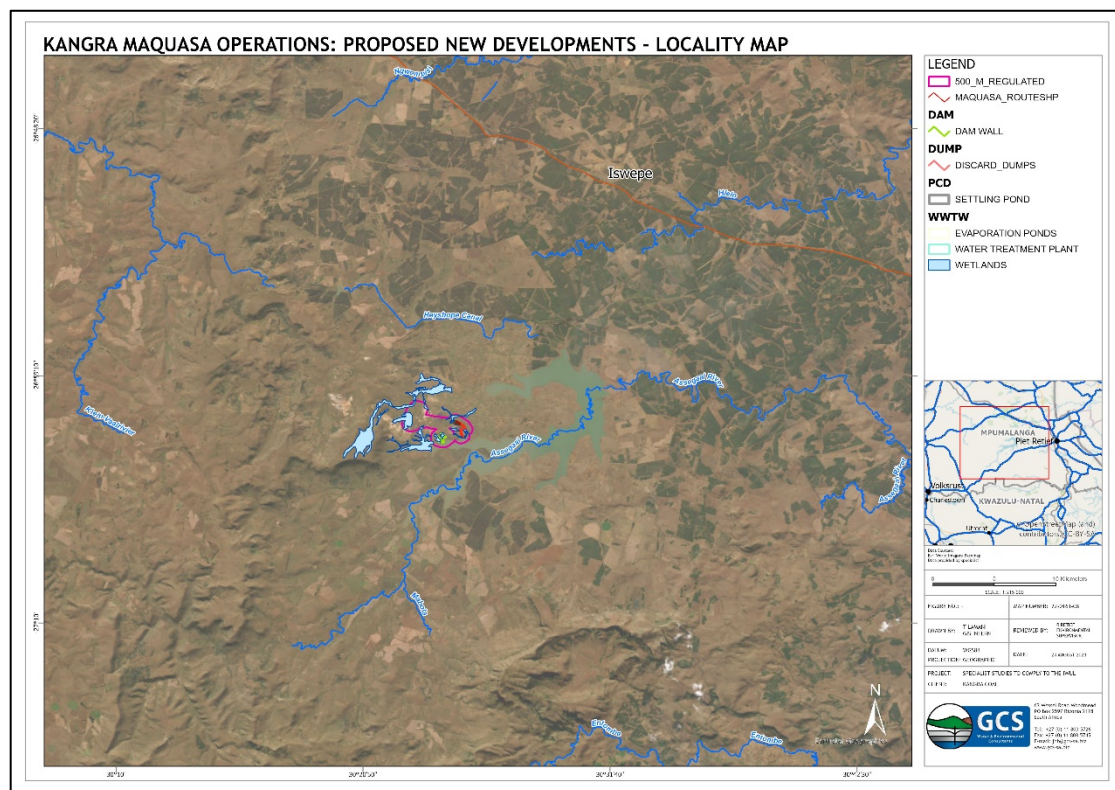


Figure 1-1: Locality Map

All these activities are undertaken and authorised under Mining Right (MR) MP30/5/1/23/2/1/133EM from the Department of Mineral Resources and Energy (DMRE).

All mining and project related infrastructure is located at Maquasa East (MQE) and includes a coal washing plant and associated infrastructure. This plant is used for the processing of all coal mined from Maquasa West and the Nooitgesien opencast mining area. No mining is taking place at Maquasa East as all the coal reserves have already been mined.

The following infrastructure is located at MQE:

- Offices;
- Workshop & ancillary buildings;
- Existing Discard Dump;
- Beneficiation Plant;
- ENPROTEC Plant;
- Diesel Storage Facilities;
- Dirty water containment facilities;
- Maquasa East Adit;
- Haul roads;
- Powerlines;
- Conveyors and associated service roads (transporting mined coal to the Maquasa East processing plant);
- Access Roads;
- Pipeline (transporting water to the Maquasa East underground storage area);
- Crushers;
- Washing and screening plant; and
- Overburden and stockpile (i.e. topsoil, run of mine ore, product) dumps.

Kangra intends to construct a wastewater treatment plant as well as a co-disposal facility, water pipeline for disposal and settling dams at their Maquasa East (MQE) Operations.

To enable the implementation of the proposed projects, Kangra Coal needs to acquire the necessary environmental approvals. GCS Water and Environment (Pty) Ltd (GCS) has been appointed as the independent Environmental Assessment Practitioner (EAP) to compile and submit the required documentation for the Integrated Environmental Application by Kangra Coal (Pty) Ltd.

To enable the implementation of the proposed project, Kangra Coal needs to acquire the necessary environmental approvals. It is in this regard that GCS Water and Environment (Pty) Ltd (GCS) was appointed to undertake the required environmental assessment processes, to determine the biophysical, social and economic impacts associated with undertaking the proposed projects. This wetland assessment forms part of this application.

1.3 Project Overview

An overview of the proposed projects is provided below:

Wastewater Treatment Plant and PCD

The purpose of the proposed wastewater treatment plant (WWTP) is to treat decant water as well as surplus contaminated water within the mining operations. MQE is currently decanting clear groundwater from old underground workings at an average rate of 1 800m³/d. The WWTP will employ 'active' treatment of the wastewater as it was found that passive treatment is not feasible nor possible due to decant point's location, the high flow rates and the discharge quality required. Brine resulting from the WWTP will be piped and stored in a new proposed brine pollution control dam (PCD).

Co-disposal Facility

The proposed co-disposal facility falls within the exact footprint of the previously authorized (MDARDLE Ref: 17/2/3/GS-240) MQE Discard Dump.

As a result of changing operational requirements, and the lapsing of the previous authorisation, there is now a need to license a new co-disposal facility at MQE.

The co-disposal facility will accommodate discard produces from the beneficiation plant, slurry/filter cake and potentially brine from the WWTP.

The co-disposal facility's design will be similar to the authorized discard dump: a three-compartment side hill-type facility with a footprint of approximately 65ha. A phased development approach, over a period of 20 years, is envisaged: Phase 1 - 7 years; Phase 2 - 7 years and Phase 3 - 6 years capacity.

To enable the implementation of the proposed projects, Kangra needs to acquire the necessary environmental approvals. GCS Water and Environment (Pty) Ltd (GCS) has been appointed as the independent Environmental Assessment Practitioner (EAP) to compile and submit the required documentation for the Integrated Environmental Application by Kangra Coal (Pty) Ltd for:

- An Integrated Environmental Authorisation (IEA) and Waste Management License (WML) through a Scoping and Environmental Impact Reporting (S&EIR) process and the compilation of an Environmental Management Programme (EMPr), in terms of the NEMA, NEMWA, and Environmental Impact Assessment (EIA) Regulations (2014, as amended) (IEA Application); and
- An Integrated Water Use License (IWUL), in terms of the NWA.

Water Pipeline:

A water pipeline is proposed to be constructed to carry runoff water from the mine operations after treatment and discharge directly into the Heyshope Dam.

1.4 Project Location

As mentioned previously, MQE Operations is located within the Mpumalanga Province and operates under one (consolidated) MR, within which the proposed projects are located. The MR area fall within the jurisdiction of the Mkhondo Local Municipality (MLM) and Pixley Ka Seme Local Municipality (PSLM) of the Gert Sibande District Municipality (GSDM).

Table 1-1 provide further information regarding the location of the proposed projects and their affected properties including the Surveyor-general (SG) 21-digit site information for the parent farms.

Table 1-1: Property, SG & Ownership details

Project	Property	SG Code	Local Municipality
Wastewater Treatment Plant	Remaining Extent (RE) of the farm Roodekraal 21HT	TOHT0000000002100000	Mkhondo LM
Co-disposal Facility	RE of the farm Rooikop 18HT	TOHT00000000001800000	Pixley Ka Seme LM
	RE of the farm Maquasa 19HT	TOHT00000000001900000	
WWTP Brine PCD	RE of the farm Roodekraal 21HT	TOHT0000000002100000	Mkhondo LM
Water pipeline	Remaining Extent (RE) of the farm Roodekraal 21HT	TOHT0000000002100000	Mkhondo LM

1.5 Overview of the Specialist

Mr. Nico-Ronaldo Greeff-Retief is a Registered EAP, water, ecological biodiversity, and visual specialist with emphasis on biodiversity and zoology. He has undertaken numerous mining related, environmental, and ecological assessments, wetland studies and water quality specialist studies as well as visual impact assessments. He is registered with the South African Council for Natural Scientific Professions (SACNASP). For more information, please refer to Table 1-2.

Table 1-2: Details of the Specialist

Specialist	Nico-Ronaldo Greeff-Retief
Qualifications:	M.Sc. Zoology (University of Johannesburg)
Experience:	Flora and Fauna Habitat Surveys Water Quality Assessments (Biomonitoring) Wetland Assessments Visual Impact Studies Aquatic Assessments and Biomonitoring Mining and water specialist 19 years' Experience

Affiliation/ Registration	SACNASP Professional Natural Scientist 005636
Address:	63 Wessel Road, Rivonia, Johannesburg, South Africa
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1.6 STRUCTURE OF THE REPORT

Appendix 6 of GN 706 of 13 July 2018 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this Table 1-3 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 1-3: Specialist Report Requirements.

Requirement from Appendix 6 of GN 326 of 7 April 2017	Chapter
(a) Details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Chapter 1 Appendix A
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	<i>Declaration of Independence</i>
(c) Indication of the scope of, and the purpose for which, the report was prepared	Chapter 1
(cA) An indication of the quality and age of base data used for the specialist report	Chapter 3, 4, 5 & 6
(cB) A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change.	Chapter 4, 8 & 9
(d) the Duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Chapter 5, 8 & 9
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used.	Chapter 5
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives	Chapter 8 & 9
(g) Identification of any areas to be avoided, including buffers	Chapter 8 & 9

Requirement from Appendix 6 of GN 326 of 7 April 2017	Chapter
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Chapter 8
(l) Description of any assumptions made and any uncertainties or gaps in knowledge	Chapter 6
(j) Description of the findings and potential implications of such findings on the impact of the proposed activity, or activities	Chapter 7 Chapter 8 Chapter 9
(k) Mitigation measures for inclusion in the EMPr	Chapter 8 & 9
(l) Conditions for inclusion in the environmental authorisation	Chapter 8 & 9
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Chapter 8 & 9
(n) Reasoned opinion- <ul style="list-style-type: none"> (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan 	Chapter 9
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Chapter 6
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto	Not Applicable
(q) Any other information requested by the competent authority	Not Applicable

2 SCOPE OF WORK

2.1 Ecological Assessment

2.1.1 Biodiversity Assessment

The proposed Scope of Work (SoW) aims to meet the minimum requirements of the Department of Forestry, Fisheries, and the Environment (DFFE) to conduct the relevant specialist assessments in support of a Biodiversity Baseline Assessment (BA). The following documents were considered in determining the SoW:

- Integrated Waste and Water Use License Application
- EIA and EMP; and
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation.

2.1.2 Specialist Studies

The selected baseline studies will aim to meet the requirements of DFFE to conduct a biodiversity assessment in the Mpumalanga Province. The following studies will be included in the biodiversity assessment:

- Fauna - Mammals (including bats), birds, reptiles, amphibians & invertebrates.
- Plants and vegetation (including alien vegetation).
- Habitat features - Caves and/or ridges.

Specifically, the Terms of Reference (ToR) included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment)
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity
- Identify 'significant' ecological, botanical, and faunal features within the proposed development areas
- Site visit to verify desktop information

- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application; and
- Provide a map to identifying sensitive receptors in the study area, based on available maps, database information & site visit verification.

3 LEGISLATIVE CONTEXT RELATED TO FAUNA AND FLORA

3.1 National Legislation

Table 3-1: Legislation in respect to fauna and flora

Biodiversity Act (No. 10 of 2004)	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith.
Conservation of Agricultural Resources Act 43 of 1983	The conservation of soil, water resources and vegetation is promoted. Management plans to eradicate weeds and invader plants must be established to benefit the integrity of indigenous life.
Constitution of the Republic of South Africa (Act 108 of 1996)	The Bill of Rights, in the Constitution of South Africa (No. 108 of 1996), states that everyone has a right to a non-threatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in NEMA and given further expression.
Convention on Biological Diversity, 1995	International legally binding treaty with three main goals; conserve biological diversity (or biodiversity); ensure sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources.
Convention on International Trade in Endangered Species of Wildlife and Fauna	International agreement between governments, drafted because of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 species of animals and plants.

Environment Conservation Act (No. 73 of 1989)	To provide for the effective protection and controlled utilization of the environment and for matters incidental thereto.
Mineral and Petroleum Resources Development Act (Act No.28 of 2002) (MPRDA)	Compilation of Environmental Impact Assessment (EIA) and Environmental Management Programme (Reports) (EMPR).
National Veld & Forest Fire Act (Act No. 101 of 1998)	To prevent and combat veld, forest and mountain fires throughout the Republic, to provide for a variety of institutions, methods and practices for achieving the purpose.
National Environmental Management Act (No. 107 of 1998)	Requires adherence to the principles of Integrated Environmental Management (IEA) in order to ensure sustainable development, which, in turn, aims to ensure that environmental consequences of development proposals be understood and adequately considered during all stages of the project cycle and that negative aspects be resolved or mitigated, and positive aspects enhanced.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	To provide for matters relating to threatened or protected species regulations
National Environmental Management Protected Areas Act (No. 57 of 2003)	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

<p>White Paper on Conservation and Sustainable Use of South Africa's Biological Diversity (July 1997)</p>	<p>Identifies several strategies to be developed to give effect to the specific policies, including the enhancement of the protected area network, development of specific strategies such as conservation and sustainable use of reptiles and amphibians. Promotes a “Prosperous, environmentally conscious nation, whose people are in harmonious co-existence with the natural environment, and which derives lasting benefits from the conservation and sustainable use of its rich biological diversity”</p>
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3.2 Provincial and Municipal Level

The Provincial Department responsible for environmental matters in the **Mpumalanga Province is the Department: Agriculture, Rural Development, Land and Environmental Affairs**. Relevant provincial legislation includes, but is not limited to:

- Town-Planning and Townships Ordinance No.15 of 1986
- Mpumalanga Nature Conservation Act 10 of 1998

3.3 International Legislation

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival;
- Convention on Biological Diversity (CBD, 1993)
- The United Nations Framework Convention on Climate Change (UNFCCC, 1994)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
- Nomination file 914, 1999
- Advisory Body Evaluation (IUCN), 1999
- Component Areas of the Nominated Site, 1998; and

- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

4 ENVIRONMENTAL CONTEXT OF STUDY AREA (DESKTOP REVIEW)

A desktop study was undertaken to gather background information regarding the site and its surrounding areas. This involves:

- Consulting maps, aerial photographs and digital satellite images in order to determine broad habitats and sensitive sites;
- A literature review concerning habitats, vegetation types, faunal and floral species distributions;
- Contacting all the relevant authorities regarding red data listed floral species; and
- Identifying the status of the land as well as conservation requirements and nearby conservation areas.

4.1 Location

The proposed Maquasa site is located on rural land approximately 45km due west of the town of Piet Retief in Mpumalanga Province. The site is adjacent to and upstream of Heyshope Dam. The Township of Driefontein is located approximately 5km to the east of the mining area.

4.2 Climate

Driefontein normally receives about 738mm of rain per year, with most rainfall occurring during summer. The lowest rainfall is received in June (2mm) and the highest in December (136mm). The average daily maximum temperatures range from 18.8°C in June to 25.9°C in January. The region is the coldest during June with temperatures of 2.4°C on average during the night (saexplorer, 2015).

Strongly seasonal summer rainfall, with very dry winters. Mean annual rainfall is between 690 - 900mm with the overall average of 726mm. There are about 13 - 42 days per year when frost is recorded, this increases with increased altitude.

4.3 Vegetation and Landscape

The mining area is located mainly in the Eastern Highveld Grassland (GM12) vegetation unit and is distributed along slightly, to moderately undulating plains, including some low hills and pan depressions, in Mpumalanga and Gauteng Provinces. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya*, etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra*, *Celtis Africana*, *Diospyros lyciodes* subsp. *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Rhus magalismontanum*).

The important taxa associated with this vegetation unit are:

Graminoids: *Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewisia biflora*, *Ctenium concinnum*, *Diheteropogon amplexans*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.

Herbs: *Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii*, *E. transvaalensis* subsp. *setilobus*, *Helichrysum aureonitens*, *H. caespitum*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Sencio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulate*.

Geophytic Herbs: *Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*.

Succulent Herb: *Aloe ecklonis*.

Low Shrubs: *Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumose*.

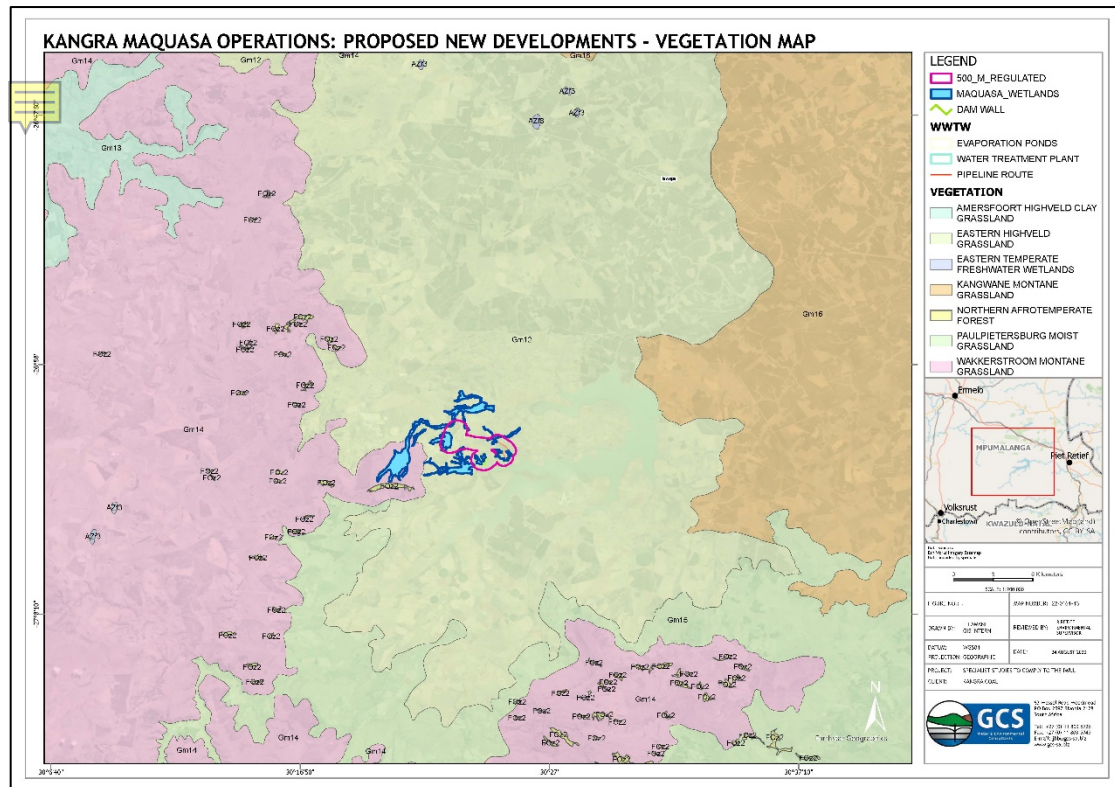


Figure 4-1: Vegetation Map

4.4 Land cover & Land use of the region

To this assessment, land cover is loosely categorised into classes that represent natural habitat and categories that contribute to habitat degradation and transformation on a local or regional scale. In terms of the importance for biodiversity, the assumption is that landscapes exhibiting high transformation levels are normally occupied by plant communities and faunal assemblages that do not necessarily reflect the original or pristine status. This is particularly important in the case of conservation important taxa as these plants and animals generally exhibit extremely low tolerance levels towards disturbances. This is one of the main reasons for the threatened status of these species. Changes in the natural environment available to these species are therefore likely to result in severe impacts on these species and, subsequently, their conservation status.

4.5 Declared areas of conservation

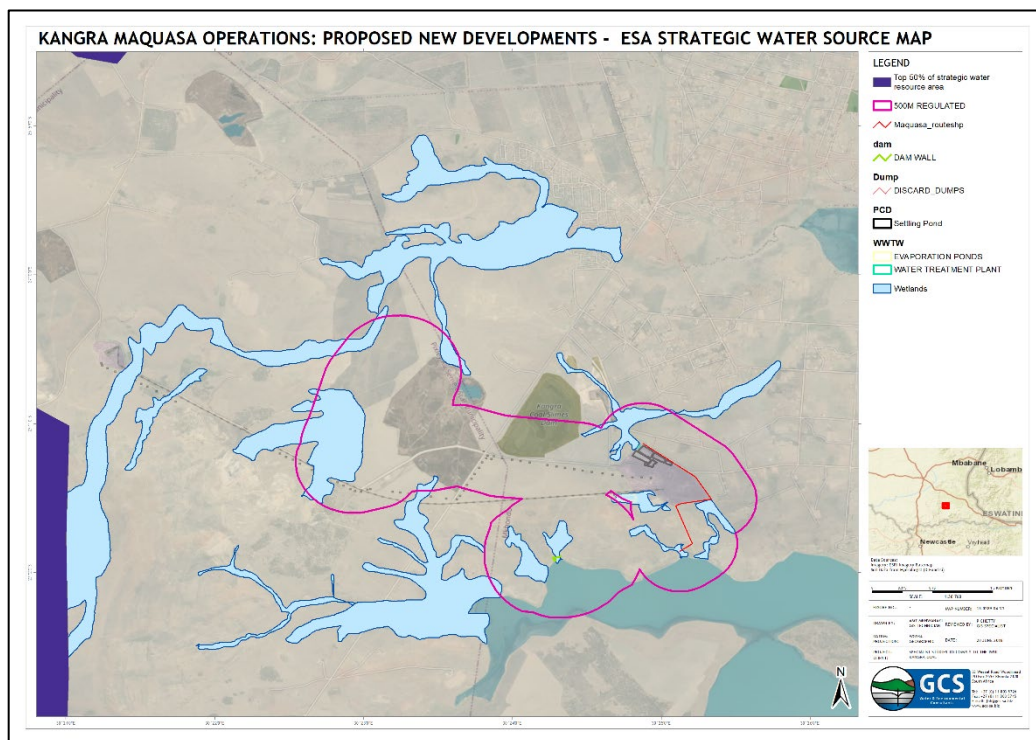
The conservation status of the Eastern Highveld Grassland vegetation is listed as Endangered. This vegetation type has a conservation target of 24%. Currently only a small fraction is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstroom). Some 44% is transformed primarily by clativation, plantations, mines, urbanization and by building dams. The second vegetation unit that is listed as threatened is the Wakkerstroom Montane Grassland. This vegetation is listed as least threatened with a conservation target of 27%. Currently less than 1% is statutorily protected in the Paardeplaats Nature Reserve. There are 10 South African Natural Heritage Sites in this unit, although very little of it is formally protected. Land use pressures from agriculture are low (5% cultivated) owing to the colder climate and shallow soils. The mining area has the following conservation areas within its vicinity:

4.5.1 Protected Areas:

- Paardeplaats Nature Reserve (approximately 6 km to the southeast);
- Pongola Bush Nature Reserve (approximately 8 km to the south); and
- Wakkerstroom Wetland Nature Reserve (approximately 13 km to the southwest).

4.5.2 National Protected Areas Expansion Strategy (NPAES) Focus Areas:

- Moist Escarpment Grasslands (distributed adjacent to mining area running from northwest through to southeast)



This area has a relatively high diversity of surface water. The project area lies to the Northwest and adjacent to the Heyshope Dam, this is a very large dam approximately 20km in length and 3km at its widest point. This dam could be seen as a very important water source and therefore extra care should be taken not to affect it. The Heyshope Dam has been built on the Assegai River which flows to the south of the project area in an easterly direction. There are many non-perennial streams that flow over the project area, discharging into the Assegai River.

Varied topography is recognised as a powerful influence contributing to the high biodiversity of southern Africa. Landscapes composed of spatially heterogeneous abiotic conditions provide a greater diversity of potential niches for plants and animals than do homogeneous landscapes. The species richness and biodiversity has been found to be significantly higher in areas of geomorphological heterogeneity. Ridges and rocky outcrops are characterised by high spatial variability due to the range of differing aspects, slopes and altitudes all resulting in differing soil (e.g. depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions. Temperature and humidity regimes of microsites vary on both a seasonal and daily basis. Moist cool aspects are more conducive to leaching of nutrients than warmer drier slopes.

Variation in aspect, soil drainage and elevation/altitude has been found to be especially important predictors of biodiversity. It follows that ridges will be characterized by a particularly high biodiversity. Many plant and animal species of conservation importance occupy ridges. Due to their threatened status, Red Data species require priority conservation efforts to ensure their future survival. Ridges may have a direct effect on temperature/radiation, surface airflow/wind, humidity, and soil types. Ridges also influence fire in the landscape, offering protection for those species that can be described as “fire-avoiders”. Because of the influence of topography on rainfall, many streams originate on ridges and control water input into wetlands.

The protection of the ridges in their natural state is therefore a first step in ensuring the normal functioning of ecosystem processes on a larger scale. In contrast, transformation of ridges will alter these major landscape processes. For example, water runoff into streams will increase, causing erosion.

The underlying sandstone weathers to form well-drained soils which allow the easy infiltration of rainwater and reduced run-off. An impermeable layer within the soil profile (i.e., ferricrete, sandstone or a soft plinthic layer) prevents deeper infiltration of the water into the soil, resulting in perched water tables within the soil profile. Where these perched water tables extend to within the rooting zone of the overlying vegetation (the top 500mm of the soil profile), the saturation of the soil for extended periods influences the vegetation community and results in the formation of wetlands.

The available published geological map of the area at a scale of 1:250 000 (2730 Vryheid, dated 1988) shows the site to be underlain by carbonaceous shale and sandstone of the Vryheid Formation of the Karoo Supergroup. Dolerite dykes trending northwest to southeast are generally encountered within isolated locations in the region.

4.8 Freshwater Ecosystems

The proposed development is situated in the Usutu to Mhlathuse Management Area, Sub water management area Upper Usutu. The Atlas of Freshwater Ecosystem Priority Areas (FEPA) in South Africa (Nel *et al*, 2011a) (The Atlas) which represents the culmination of the National Freshwater Ecosystem Priority Areas project (NFEPA), a partnership between SANBI, CSIR, WRC, DEA, DWA, WWF, SAIAB and SANParks, provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. Freshwater Ecosystem Priority Areas (FEPA's) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. The Atlas incorporates the National Wetland Inventory (SANBI, 2011) to provide information on the distribution and extent of wetland areas. An extract of the NFEPA database is illustrated in below.

The following important observations can be made:

- Flagship Rivers:
 - Hlelo River (11_P_L) (approximately 2 km northwest); and
 - Assegaa River (11_P_L) (approximately 2 km southeast).
- There are numerous natural and artificial wetlands in the surrounding area.

4.8.1 River FEPA

River FEPA's achieve biodiversity targets for river ecosystems and threatened/near threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). The FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. Kangra Waste Dump is located in two Sub - Quaternary Catchments. These have been classified as FEPA and FishFSA (W51B).

The goal of NFEPA is to keep further freshwater species from becoming threatened and to prevent those fish species that are already threatened from going extinct. In order to achieve this, there should be no further deterioration in river condition in fish sanctuaries and no new permits should be issued for stocking invasive alien fish in farm dams in the associated sub-quaternary catchment.

5 METHODOLOGY

5.1 Desktop assessment

The following information sources were considered for the desktop assessment:

- Information as presented by the South African National Biodiversity Institutes (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>)
- Aerial imagery (Google Earth Pro)
- Topographical watercourse data sets
- Land Type Data (Land Type Survey Staff, 1972 - 2006)
- The National Freshwater Ecosystem Priority Areas (Nel, *et al.*, 2011)
- Contour data (5 m).

5.2 Biodiversity Assessment Methodology

5.2.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software. Emphasis was placed on the following spatial datasets:

- Vegetation Map of South Africa, Lesotho, and Swaziland (Mucina *et al.*, 2006)
- Important Bird Areas 2015 - BirdLife South Africa (vector geospatial dataset); and
- Department of Environmental Affairs (DEA) National Land cover 2015.

Field surveys were conducted to confirm (or refute) the presence of species identified in the desktop assessment. The specialist disciplines completed for this study included:

- Botanical
- Fauna (mammals and avifauna); and
- Herpetology (reptiles and amphibians).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below.

5.2.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. The methodology included the following survey techniques:

- Sensitivity analysis based on structural and species diversity; and
- Identification of potential floral red-data species.

5.2.3 Literature Study

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2021) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wildflowers of the Highveld (Van Wyk & Malan, 1997)
- A Field Guide to Wildflowers (Pooley, 1998)
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999)
- Orchids of South Africa (Johnson & Bytebier, 2015)
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014)
- Medicinal Plants of South Africa (Van Wyk *et al.*, 2013)
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and

- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions, and distributions. (Fish *et al.*, 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2018)
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo *et al.*, 2009; SANBI, 2016).

5.2.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists
- Compilation of identified species lists
- Identification of any Red Data or SCC present or potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national, and international conservation importance.
- The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:
 - Visual observations; and
 - Identification of tracks and signs.
- Habitat types sampled included disturbed and semi-disturbed zones, drainage lines and wetlands.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005)
- Bats of Southern and Central Africa (Monadjem *et al.*, 2010)
- The 2016 Red List of Mammals of South Africa, Lesotho, and Swaziland (www.ewt.org.za) (EWT, 2016)
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2023) (mammalmap.adu.org.za); and
- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013).

5.2.5 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was also conducted. The herpetological field survey comprised the following techniques:

- Diurnal hand searches are used for reptile species that shelter in or under particular microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.)
- Visual searches - typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping.
- May include walking transects or using binoculars to view the species from a distance without the animal being disturbed
- Amphibians - many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques are often the best to detect the presence of amphibians as each species has a distinct call.
- Opportunistic sampling - reptiles, especially snakes, are incredibly elusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken in order to augment the standard sampling procedures described above.
- Herpetofauna distributional data was obtained from the following information sources:
 - South African Reptile Conservation Assessment (SARCA) (sarca.adu.org)
 - A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007)
 - Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998)
 - Atlas and Red list of Reptiles of South Africa, Lesotho, and Swaziland (Bates *et al.*, 2014)
 - A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009)
 - Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za)
 - Atlas and Red Data Book of Frogs of South Africa, Lesotho, and Swaziland (Mintner *et al.*, 2004); and
 - Ensuring a Future for South Africa's frogs (Measey, 2011).

5.3 Impact Assessment

The Environmental Impacts associated with the proposed Maquasa Developments were evaluated using Table 5.1.

Nature of Impact	
+: Positive (A benefit to the receiving environment)	
N: Neutral (No cost or benefit to the receiving environment)	
-: Negative (A cost to the receiving environment)	
Severity / Intensity	Duration
3: High	5: Permanent / Beyond life of the activity
2: Moderate	4: Long-term (more than 5 years)
1: Low	3: Medium-term (18 months - 5 years)
0: None	2: Short-term (6-18 months)
	1: Temporary (0-6 months)
Extent	Loss of Irreplaceable Resources
6: International	1: Yes
5: National	0: No
4: Regional	
3: Local	
2: Site	
1: Footprint	
Reversibility of impacts	Probability of impact
3: Low to non-reversible	2: Definite (75% to 100%)
2: Moderate	1: Probable (50% to 75%)
1: High	0: Improbable (0-less than 50%)
Mitigation Efficiency	Confidence
0: Not Applicable - 0%	0: Not Applicable - 0%
1: Very Low - 20% & below	1: Very Low - 20%
2: Low - 40 % & below	2: Low - 40 %
3: Medium - 60% & below	3: Medium - 60%
4: High - 80% & below	4: High - 80%
5: Very High - 100%	5: Very High
Nature	
	+
	-

The Environmental Effects are rated in the **Table 5.2** below.

The maximum value that can be achieved is 72 Significance Points (SP). Environmental effects were rated as follows:

Risk Rating	Significance	Colour Code
High (positive)	49 to 72	H
Medium (positive)	25 to 48	M
Low (positive)	1 to 24	L
Neutral	0	N
Low (negative)	-1 to -24	L
Medium (negative)	-25 to -48	M
High (negative)	-49 to -72	H

CONSEQUENCE = (Duration + Extent + Irreplaceable Loss) * Severity

SIGNIFICANCE = Consequence * Probability

5.3.1 Extent

The physical and spatial scale of the impact.

5.3.2 Duration

The lifetime of the impact is measured in relation to the lifetime of the proposed operation of the existing project.

5.3.3 Intensity

The assessment of the intensity of the impact is how intense the impact will be on the environment.

5.3.4 Probability

Probability describes the likelihood of the impact(s) occurring for any length of time during the lifecycle of the activity, and not at any given time.

5.3.5 Confidence

The level of knowledge or information that the specialist had in their judgement is rated and not given a numerical value.

5.3.6 Reversibility

Reversibility is the ability of the affected environment to recover from the impact, with or without mitigation. Note that this criterion is not given a numerical value.

5.3.7 Replicability

Replicability is an indication of the scarcity of the specific set of parameters that make up the affected environment. That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss. Note that this criterion is not given a numerical value.

5.3.8 Identification of Mitigation Measures

The purpose of mitigation measures is to reduce the significance level of the anticipated negative impact. Therefore, the reduction in the significance level after mitigation is directly related to the scores used in the impact assessment criteria. The effect of potential mitigation measures to reduce the overall significance level is also to be considered in each issues table (i.e., values with and without mitigation are presented).

5.3.9 Ascribing Significance to Cumulative Impacts

In ascribing significance to cumulative impacts, it should be noted that impacts cannot be assessed in isolation and an integrated approach requires that cumulative impacts will be included in the assessment of individual impacts. The nature of the impact will be described in such a way as to detail the potential cumulative impact of the activity if there is indeed a cumulative impact. For example, dust and air emissions cannot be assessed in isolation of the potential cumulative impact of increased emissions into the atmosphere. Similarly, if water quality is improved within the immediate surroundings of the proposed activities, this will most certainly have a ripple effect/ cumulative impact on the greater water quality in the area.

The impacts were assessed, and significance ratings allocated, after which the project was assessed on a holistic basis to determine the overall project impact on the receiving environment. This is a function of the individual impacts as well as the cumulative nature of combining all those impacts within a single context/ project.

6 ASSUMPTIONS AND LIMITATIONS

Consultation as part of the overall environmental authorization process is being undertaken by GCS (Pty) Ltd.

The following limitations with respect to the assessment of the property are applicable to this report:

- Sampling, by nature, implies that not all species in a study site will be recorded due to factors such as plant phenology as affected by seasonality, seasonal climatic conditions, microhabitats and both historical and current management practices.
- The site inspection was a single site visit and no specialist sampling techniques utilised.
- Sampling was undertaken during the autumn period and outside of the flowering period of the summer rainfall region.
- Field assessment notes are supplemented by making use of literature sources and existing data bases (SANBI, Reference books, Articles etc.); and
- The main ecological and floristic observations, forming the basis for recommendations, are, however, based on the field assessment observations.

7 FINDINGS AND RESULTS

7.1 Habitat and Vegetation Characteristics

An outline of the main landscape and habitat characteristics of the study site is provided in Table 7-1.

Table 7-1: Outline of main landscape and habitat characteristics of the site.

HABITAT FEATURE	DESCRIPTION
Topography	The topography of the study site comprises mostly, of undulating hills and plains.
Rockiness	Rockiness was observed near the Heyshope Dam and between Maquasa East and Maquasa West operations.
Presence of wetlands	The altitude ranges from 1300 to 1600 m and watercourses (perennial and non-perennial) and wetlands were often present in the troughs of the hills. Two NFEPA Wetlands
Overview of vegetation	Refer to the vegetation description below.

HABITAT FEATURE	DESCRIPTION
Signs of disturbances	Impacts identified within the sub-quaternary catchment included: transformed grasslands, wetland disturbances, runoff/effluent from urban areas, mining influences, urbanization, alien vegetation encroachment, illegal road crossings, indigenous vegetation removal, erosion, and overgrazing.
Connectivity of natural vegetation at the site and between the site and surrounding areas	Connectivity cannot be excluded. The vegetation and drainage may still fulfil an ecological function by sustaining biodiversity and ecological maintenance of downstream users as well as maintenance of ecological biodiversity drivers.

7.2 Assessment of Plant Species of Conservation Concern

No individuals of the endemic or biogeographically important plants were observed during the survey, although it may have previously been found in the larger area and due to the season of assessment.

Six red data species potentially occur in the QDS of the study area according to the SIBIS database. Potential habitat for species does exist, however, the verification for these species and habitat conditions must be reassessed during the summer period.

None of these threatened species were identified during the site inspection in May 2023.

A list of the Species of Concern is in Appendix B - Species lists based on the SANBI POSA site.

7.2.1 Protected Trees

In terms of the National Forests Act of 1998, certain tree species can be identified and declared as protected. 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. The protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under license granted by the Department of Water Affairs and Forestry (or a delegated authority).

The Real Yellowwood (Opregte-geelhout) [*Potocarpus latifolius*] was found in the QDS.

7.3 Identified Species Lists of Occurrence Within Sites Quarter Degree Square

7.3.1 Identified Mammal Species for QDS 2730 AB

The site has two listed threatened species identified to occur within the sites QDS. The results show there are 8 identified mammal species occurring within the QDS. These species have all been listed as South African endemics (Virtual Museum). Of the identified species there are 5 listed species, these being 3 **Near Threatened** and 2 **Endangered** species. The Endangered species identified are:

- **Oribi:** this species is listed as Least Concern globally, however within South Africa this species is listed as **Endangered**. This species is mainly threatened through habitat destruction (Loss and Fragmentation) due to commercial forestry, commercial farming, grassland degradation and mining. Illegal hunting is the biggest threat to the survival of this species.
- **Swinny's Horseshoe Bat:** this species is listed as Least Concern globally, however within South Africa this species is listed as **Endangered**. This species is threatened by deforestation and general habitat conversion.

Table 7-2: Mammal species identified to occur in QDS 2730AB

Family	Scientific name	Common name	Red list category
Bovidae	<i>Ourebia ourebi</i>	Oribi	Endangered
Felidae	<i>Felis nigripes</i>	Black-footed Cat	Vulnerable (2016)
Felidae	<i>Leptailurus serval</i>	Serval	Near Threatened (2016)
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	Least Concern
Muridae	<i>Aethomys ineptus</i>	Tete Veld Aethomys	Least Concern (2016)
Muridae	<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	Least Concern (2016)
Rhinolophidae	<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	Least Concern (2016)
Rhinolophidae	<i>Rhinolophus swinnyi</i>	Swinny's Horseshoe Bat	Vulnerable (2016)
Soricidae	<i>Crocidura cyanea</i>	Reddish-gray Musk Shrew	Least Concern (2016)
Soricidae	<i>Crocidura mariquensis</i>	Swamp Musk Shrew	Near Threatened (2016)
Vespertilionidae	<i>Miniopterus natalensis</i>	Natal Long-fingered Bat	Least Concern (2016)
Vespertilionidae	<i>Myotis tricolor</i>	Temminck's Myotis	Least Concern (2016)

None of these species were observed during the site visit, however, habitat for the Swamp Must Shrew, the Swinny Horseshoe Bat and black-footed cat exists around the site.

7.3.2 Identified Avifaunal Species for QDS 2730AB

In terms of the migrating and nesting birds in the quarter degree square a total of 107 different species occur in the area. Of these five species of birds were recorded on the Red List for birds in the quarter degree square. Blue Cranes were physically observed within the wetland area of HGM 9. Nesting sites and vulnerable areas should be minimally disturbed.

Table 7-3: Avifauna species identified to occur in QDS 2730AB

Ref	Common species	Common group	Genus	Species	RD (Regional, Global)
72	Hamerkop		<i>Scopus</i>	<i>umbretta</i>	
637	Neddicky		<i>Cisticola</i>	<i>fulvicapilla</i>	
844	Quailfinch		<i>Ortygospiza</i>	<i>atricollis</i>	
105	Secretarybird		<i>Sagittarius</i>	<i>serpentarius</i>	VU, EN
431	Black-collared	Barbet	<i>Lybius</i>	<i>torquatus</i>	
439	Crested	Barbet	<i>Trachyphonus</i>	<i>vaillantii</i>	
808	Southern Red	Bishop	<i>Euplectes</i>	<i>orix</i>	
810	Yellow	Bishop	<i>Euplectes</i>	<i>capensis</i>	
709	Southern	Boubou	<i>Laniarius</i>	<i>ferrugineus</i>	
545	Dark-capped	Bulbul	<i>Pycnonotus</i>	<i>tricolor</i>	
874	Golden-breasted	Bunting	<i>Emberiza</i>	<i>flaviventris</i>	
219	Denham's	Bustard	<i>Neotis</i>	<i>denhami</i>	NT, NT
222	White-bellied	Bustard	<i>Eupodotis</i>	<i>senegalensis</i>	
154	Common	Buzzard	<i>Buteo</i>	<i>buteo</i>	
155	Forest	Buzzard	<i>Buteo</i>	<i>trizonatus</i>	
152	Jackal	Buzzard	<i>Buteo</i>	<i>rufofuscus</i>	
860	Black-throated	Canary	<i>Crithagra</i>	<i>atroregularis</i>	
857	Cape	Canary	<i>Serinus</i>	<i>canicollis</i>	
859	Yellow-fronted	Canary	<i>Crithagra</i>	<i>mozambica</i>	
575	Ant-eating	Chat	<i>Myrmecocichla</i>	<i>formicivora</i>	
631	Cloud	Cisticola	<i>Cisticola</i>	<i>textrix</i>	
646	Levaillant's	Cisticola	<i>Cisticola</i>	<i>tinniens</i>	
634	Wing-snapping	Cisticola	<i>Cisticola</i>	<i>ayresii</i>	
629	Zitting	Cisticola	<i>Cisticola</i>	<i>juncidis</i>	
50	Reed	Cormorant	<i>Microcarbo</i>	<i>africanus</i>	
216	Blue	Crane	<i>Grus</i>	<i>paradisea</i>	NT, VU
214	Grey Crowned	Crane	<i>Balearica</i>	<i>regulorum</i>	EN, EN
523	Cape	Crow	<i>Corvus</i>	<i>capensis</i>	
352	Diederik	Cuckoo	<i>Chrysococcyx</i>	<i>caprius</i>	
316	Cape Turtle	Dove	<i>Streptopelia</i>	<i>capicola</i>	
317	Laughing	Dove	<i>Spilopelia</i>	<i>senegalensis</i>	
318	Namaqua	Dove	<i>Oena</i>	<i>capensis</i>	
314	Red-eyed	Dove	<i>Streptopelia</i>	<i>semitorquata</i>	
96	Yellow-billed	Duck	<i>Anas</i>	<i>undulata</i>	
60	Intermediate	Egret	<i>Ardea</i>	<i>intermedia</i>	
61	Western Cattle	Egret	<i>Bubulcus</i>	<i>ibis</i>	
119	Amur	Falcon	<i>Falco</i>	<i>amurensis</i>	

Ref	Common species	Common group	Genus	Species	RD (Regional, Global)
707	Southern	Fiscal	<i>Lanius</i>	<i>collaris</i>	
655	African Dusky	Flycatcher	<i>Muscicapa</i>	<i>adusta</i>	
682	African Paradise	Flycatcher	<i>Terpsiphone</i>	<i>viridis</i>	
173	Coqui	Francolin	<i>Peliperdix</i>	<i>coqui</i>	
89	Egyptian	Goose	<i>Alopochen</i>	<i>aegyptiaca</i>	
88	Spur-winged	Goose	<i>Plectropterus</i>	<i>gambensis</i>	
618	Cape	Grassbird	<i>Sphenoecus</i>	<i>afer</i>	
171	African	Harrier-Hawk	<i>Polyboroides</i>	<i>typus</i>	
55	Black-headed	Heron	<i>Ardea</i>	<i>melanocephala</i>	
54	Grey	Heron	<i>Ardea</i>	<i>cinerea</i>	
81	African Sacred	Ibis	<i>Threskiornis</i>	<i>aethiopicus</i>	
83	Glossy	Ibis	<i>Plegadis</i>	<i>falcinellus</i>	
84	Hadada	Ibis	<i>Bostrychia</i>	<i>hagedash</i>	
82	Southern Bald	Ibis	<i>Geronticus</i>	<i>calvus</i>	VU, VU
397	Malachite	Kingfisher	<i>Corythornis</i>	<i>cristatus</i>	
130	Black-winged	Kite	<i>Elanus</i>	<i>caeruleus</i>	
129	Yellow-billed	Kite	<i>Milvus</i>	<i>aegyptius</i>	
247	African Wattled	Lapwing	<i>Vanellus</i>	<i>senegallus</i>	
243	Black-winged	Lapwing	<i>Vanellus</i>	<i>melanopterus</i>	
245	Blacksmith	Lapwing	<i>Vanellus</i>	<i>armatus</i>	
242	Crowned	Lapwing	<i>Vanellus</i>	<i>coronatus</i>	
458	Rufous-naped	Lark	<i>Mirafra</i>	<i>africana</i>	
474	Spike-heeled	Lark	<i>Chersomanes</i>	<i>albofasciata</i>	
703	Cape	Longclaw	<i>Macronyx</i>	<i>capensis</i>	
510	Banded	Martin	<i>Riparia</i>	<i>cincta</i>	
509	Brown-throated	Martin	<i>Riparia</i>	<i>paludicola</i>	
390	Speckled	Mousebird	<i>Colius</i>	<i>striatus</i>	
521	Black-headed	Oriole	<i>Oriolus</i>	<i>larvatus</i>	
311	Speckled	Pigeon	<i>Columba</i>	<i>guinea</i>	
692	African	Pipit	<i>Anthus</i>	<i>cinnamomeus</i>	
238	Three-banded	Plover	<i>Charadrius</i>	<i>tricoloris</i>	
649	Tawny-flanked	Prinia	<i>Prinia</i>	<i>subflava</i>	
189	Common	Quail	<i>Coturnix</i>	<i>coturnix</i>	
581	Cape	Robin-Chat	<i>Cossypha</i>	<i>caffra</i>	
511	Black (Southern Africa)	Saw-wing	<i>Psalidoprocne</i>	<i>pristoptera holomelas</i>	
250	African	Snipe	<i>Gallinago</i>	<i>nigripennis</i>	
786	Cape	Sparrow	<i>Passer</i>	<i>melanurus</i>	
784	House	Sparrow	<i>Passer</i>	<i>domesticus</i>	
414 2	Southern Grey-headed	Sparrow	<i>Passer</i>	<i>diffusus</i>	
85	African	Spoonbill	<i>Platalea</i>	<i>alba</i>	
185	Swainson's	Spurfowl	<i>Pternistis</i>	<i>swainsonii</i>	
746	Pied	Starling	<i>Lamprotornis</i>	<i>bicolor</i>	
745	Red-winged	Starling	<i>Onychognathus</i>	<i>morio</i>	
736	Violet-backed	Starling	<i>Cinnyricinclus</i>	<i>leucogaster</i>	

Ref	Common species	Common group	Genus	Species	RD (Regional, Global)
576	African	Stonechat	<i>Saxicola</i>	<i>torquatus</i>	
751	Malachite	Sunbird	<i>Nectarinia</i>	<i>famosa</i>	
493	Barn	Swallow	<i>Hirundo</i>	<i>rustica</i>	
502	Greater Striped	Swallow	<i>Cecropis</i>	<i>cucullata</i>	
503	Lesser Striped	Swallow	<i>Cecropis</i>	<i>abyssinica</i>	
504	South African Cliff	Swallow	<i>Petrochelidon</i>	<i>spilodera</i>	
495	White-throated	Swallow	<i>Hirundo</i>	<i>albigularis</i>	
385	Little	Swift	<i>Apus</i>	<i>affinis</i>	
383	White-rumped	Swift	<i>Apus</i>	<i>caffer</i>	
305	Whiskered	Tern	<i>Chlidonias</i>	<i>hybrida</i>	
275	Spotted	Thick-knee	<i>Burhinus</i>	<i>capensis</i>	
110 5	Olive	Thrush	<i>Turdus</i>	<i>olivaceus</i>	
686	Cape	Wagtail	<i>Motacilla</i>	<i>capensis</i>	
666	African Yellow	Warbler	<i>Iduna</i>	<i>natalensis</i>	
843	Common	Waxbill	<i>Estrilda</i>	<i>astrild</i>	
838	Orange-breasted	Waxbill	<i>Amandava</i>	<i>subflava</i>	
799	Cape	Weaver	<i>Ploceus</i>	<i>capensis</i>	
803	Southern Masked	Weaver	<i>Ploceus</i>	<i>velatus</i>	
564 117 2	Mountain Cape	Wheatear White-eye	<i>Myrmecocichla</i> <i>Zosterops</i>	<i>monticola</i> <i>virens</i>	
846	Pin-tailed	Whydah	<i>Vidua</i>	<i>macroura</i>	
816	Fan-tailed	Widowbird	<i>Euplectes</i>	<i>axillaris</i>	
818	Long-tailed	Widowbird	<i>Euplectes</i>	<i>progne</i>	
814	White-winged	Widowbird	<i>Euplectes</i>	<i>albonotatus</i>	
445	Ground	Woodpecker	<i>Geocolaptes</i>	<i>olivaceus</i>	
452	Olive	Woodpecker	<i>Dendropicops</i>	<i>griseocephalus</i>	

7.3.3 Identified Reptile Species for QDS 2730 AB

In terms of the reptile species of concern in the area, a total of 20 species of reptiles was in the area. None of these were, however, on the IUCN red list. Suitable habitat for the least concerned reptile species is located around the mining operations for the species to occur.

Table 7-4: Reptile species identified to occur in QDS 2730AB

#	Family	Scientific name	Common name	Red list category
1	Agamidae	<i>Agama aculeata distanti</i>	Distant's Ground Agama	Least Concern (SARCA 2014)
2	Chamaeleonidae	<i>Chamaeleo dilepis</i>	Common Flap-neck Chameleon	Least Concern (SARCA 2014)
3	Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	Least Concern (SARCA 2014)

#	Family	Scientific name	Common name	Red list category
4	Cordylidae	<i>Chamaesaura anguina</i>	Cape Grass Lizard	Least Concern (SARCA 2014)
5	Cordylidae	<i>Cordylus vittifer</i>	Common Girdled Lizard	Least Concern (SARCA 2014)
6	Cordylidae	<i>Pseudocordylus melanotus melanotus</i>	Common Crag Lizard	Least Concern (SARCA 2014)
7	Elapidae	<i>Hemachatus haemachatus</i>	Rinkhals	Least Concern (SARCA 2014)
8	Gekkonidae	<i>Lygodactylus ocellatus</i>	Spotted Dwarf Gecko	Least Concern (SARCA 2014)
9	Gekkonidae	<i>Pachydactylus vansoni</i>	Van Son's Gecko	Least Concern (SARCA 2014)
10	Gerrhosauridae	<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
11	Lacertidae	<i>Pedioplanis burchelli</i>	Burchell's Sand Lizard	Least Concern (SARCA 2014)
12	Lamprophiidae	<i>Duberria lutrix lutrix</i>	South African Slug-eater	Least Concern (IUCN 2021, sp. level)
13	Lamprophiidae	<i>Lamprophis guttatus</i>	Spotted House Snake	Least Concern (SARCA 2014)
14	Lamprophiidae	<i>Lycophidion capense capense</i>	Cape Wolf Snake	Least Concern (SARCA 2014)
15	Lamprophiidae	<i>Psammophis brevirostris</i>	Short-snouted Grass Snake	Least Concern (SARCA 2014)
16	Lamprophiidae	<i>Psammophylax rhombeatus</i>	Spotted Grass Snake	Least Concern (SARCA 2014)
17	Scincidae	<i>Acontias wakerstroomensis</i>	Wakkerstroom Legless Skink	
18	Scincidae	<i>Trachylepis capensis</i>	Cape Skink	Least Concern (SARCA 2014)
19	Scincidae	<i>Trachylepis punctatissima</i>	Speckled Rock Skink	Least Concern (SARCA 2014)
20	Scincidae	<i>Trachylepis varia sensu lato</i>	Common Variable Skink Complex	Least Concern (SARCA 2014)

7.3.4 Identified Amphibian Species for QDS 2730AB

In terms of frog species of concern in the area, a total of 12 species of amphibians occurs in the area, and none are on the IUCN red list.

Table 7-5: Amphibian species identified to occur in QDS 2730AB

#	Species code	Family	Scientific name	Common name	Red list category
1	370	Bufo	<i>Sclerophrys capensis</i>	Raucous Toad	Least Concern
2	330	Bufo	<i>Sclerophrys gutturalis</i>	Guttural Toad	Least Concern (IUCN, 2016)
3	590	Hyperoliidae	<i>Hyperolius marmoratus</i>	Painted Reed Frog	Least Concern (IUCN ver 3.1, 2013)
4	660	Hyperoliidae	<i>Kassina senegalensis</i>	Bubbling Kassina	Least Concern
5	1050	Pipidae	<i>Xenopus laevis</i>	Common Platanna	Least Concern (IUCN 2020)
6	820	Ptychadenidae	<i>Ptychadena porosissima</i>	Striped Grass Frog	Least Concern
7	880	Pyxicephalidae	<i>Amietia delalandii</i>	Delalande's River Frog	Least Concern (2017)
8	890	Pyxicephalidae	<i>Amietia fuscigula</i>	Cape River Frog	Least Concern (2017)
9	400	Pyxicephalidae	<i>Cacosternum boettgeri</i>	Common Caco	Least Concern (2013)
10	940	Pyxicephalidae	<i>Strongylopus fasciatus</i>	Striped Stream Frog	Least Concern
11	950	Pyxicephalidae	<i>Strongylopus grayii</i>	Clicking Stream Frog	Least Concern
12	1030	Pyxicephalidae	<i>Tomopterna natalensis</i>	Natal Sand Frog	Least Concern

7.3.5 Assessment of Invertebrate Species of Conservation Concern

In terms of butterfly species of concern in the area, a total of 22 species of butterfly occurs in the area, and one, the Wakkerstroom Widow is listed on the IUCN red list as Near Threatened. Suitable vegetation and habitat for the species was observed and the possibility of the species occurring onsite, cannot be excluded.

Table 7-6: Butterfly species identified to occur in QDS 2730AB

#	Family	Scientific name	Common name	Red list category
1	HESPERIIDAE	Afrogegenes sp.		
2	LYCAENIDAE	Actizera lucida	Rayed blue	Least Concern (SABCA 2013)
3	LYCAENIDAE	Aloeides henningi	Hillside russet	Least Concern (SABCA 2013)
4	LYCAENIDAE	Aloeides merces	Wakkerstroom russet	Least Concern (SABCA 2013)
5	LYCAENIDAE	Aloeides oreas	Small mountain russet	Least Concern (SABCA 2013)
6	LYCAENIDAE	Aloeides titei	Mountain russet	Least Concern (SABCA 2013)
7	LYCAENIDAE	Capys alpheus extentus	Orange banded protea	Least Concern (SABCA 2013)
8	LYCAENIDAE	Chrysoritis aethon	Lydenburg opal	Least Concern (SABCA 2013)
9	LYCAENIDAE	Durbania amakosa ayresi	Amakoza rocksitter	Least Concern (SABCA 2013)
10	LYCAENIDAE	Orachrysops lacrimosa	Restless cupid	Least Concern (SABCA 2013)
11	NYMPHALIDAE	Acraea violarum	Speckled red acraea	Least Concern (SABCA 2013)
12	NYMPHALIDAE	Aeropetes tulbaghia	Table Mountain beauty	Least Concern (SABCA 2013)
13	NYMPHALIDAE	Danaus chrysippus orientis	African plain tiger	Least Concern (SABCA 2013)
14	NYMPHALIDAE	Dingana alaedeus	Wakkerstroom widow	Near Threatened (SABCA 2013)
15	NYMPHALIDAE	Junonia hierta cebrene	Yellow pansy	Least Concern (SABCA 2013)
16	NYMPHALIDAE	Pseudonympha magoides	False silver-bottom brown	Least Concern (SABCA 2013)
17	NYMPHALIDAE	Pseudonympha paludis	Marsh brown	Least Concern (SABCA 2013)
18	NYMPHALIDAE	Pseudonympha varii	Mountain marsh brown	Least Concern (SABCA 2013)
19	NYMPHALIDAE	Stygionympha curlei	Marsh hillside brown	Least Concern (SABCA 2013)
20	NYMPHALIDAE	Stygionympha wichgrafi williami	Wichgraf's hillside brown	Least Concern (SABCA 2013)
21	PIERIDAE	Eurema brigitta brigitta	Broad-bordered grass yellow	Least Concern (SABCA 2013)
22	PIERIDAE	Teracolus agoye bowkeri	Speckled sulphur tip	Least Concern (SABCA 2013)

7.3.6 Beetles of conservation priority

No beetles of conservation priority were recorded within the quarter degree square 2730AB. The likelihood of these species occurring within the quarter degree square cannot be excluded.

7.3.7 Mygalomorph spiders of conservation priority



None of the baboon spiders were recorded within the QSD 2730AB, however suitable habitat for spiders exists in the wetland and grassland areas.

7.3.8 Scorpions of conservation priority

None of the red listed scorpions were recorded within the QSD 2730AB. The chance-finding scorpions in the rocky and grassland areas cannot be excluded.

7.4 Photographic record

Table 7-7: Features identified at the site.

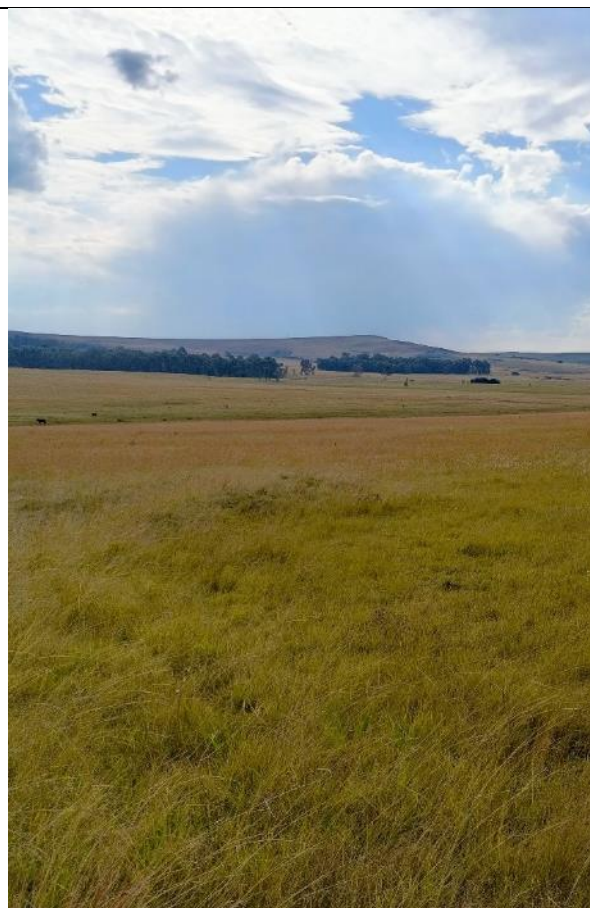
	
<p>View when looking north towards HGM 3.</p>	<p>View of the mountains and conveyor belt between Maquasa West and East operations.</p>



View towards HGM 10 and the Maquasa East operations



View of HGM 9 looking south.



The HGM 9 wetland just outside of the Maquasa East operations.

View looking at HGM 1 and HGM 2



View of HGM 4 looking west from Maquasa West



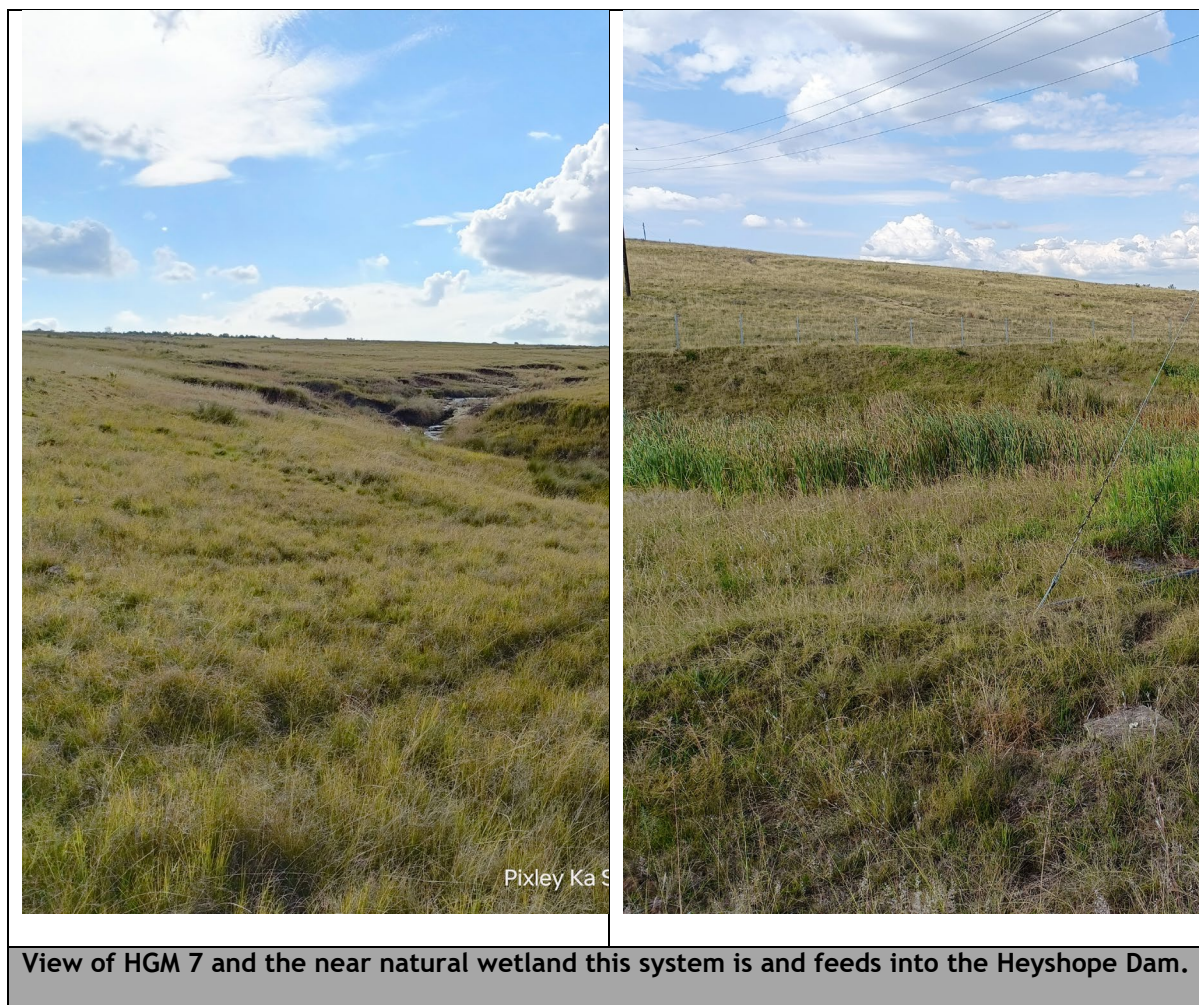
View of wetland vegetation and wet soil at HGM 7.



HGM 7 and the pump station



View towards HGM 10 and the Maquasa East operations



7.5 Site Sensitivity

Based on the findings above, the following maps depict the delineation of the study site and the overall ecological sensitivity on the study site. Sensitive features identified at the site are indicated in Figure 7-3.

Anthropogenic impacts identified within the sub-quaternary catchment included: transformed grasslands, wetland disturbances, runoff/effluent from urban areas, mining influences, urbanization, alien vegetation encroachment, illegal road crossings, indigenous vegetation removal, erosion, and overgrazing.

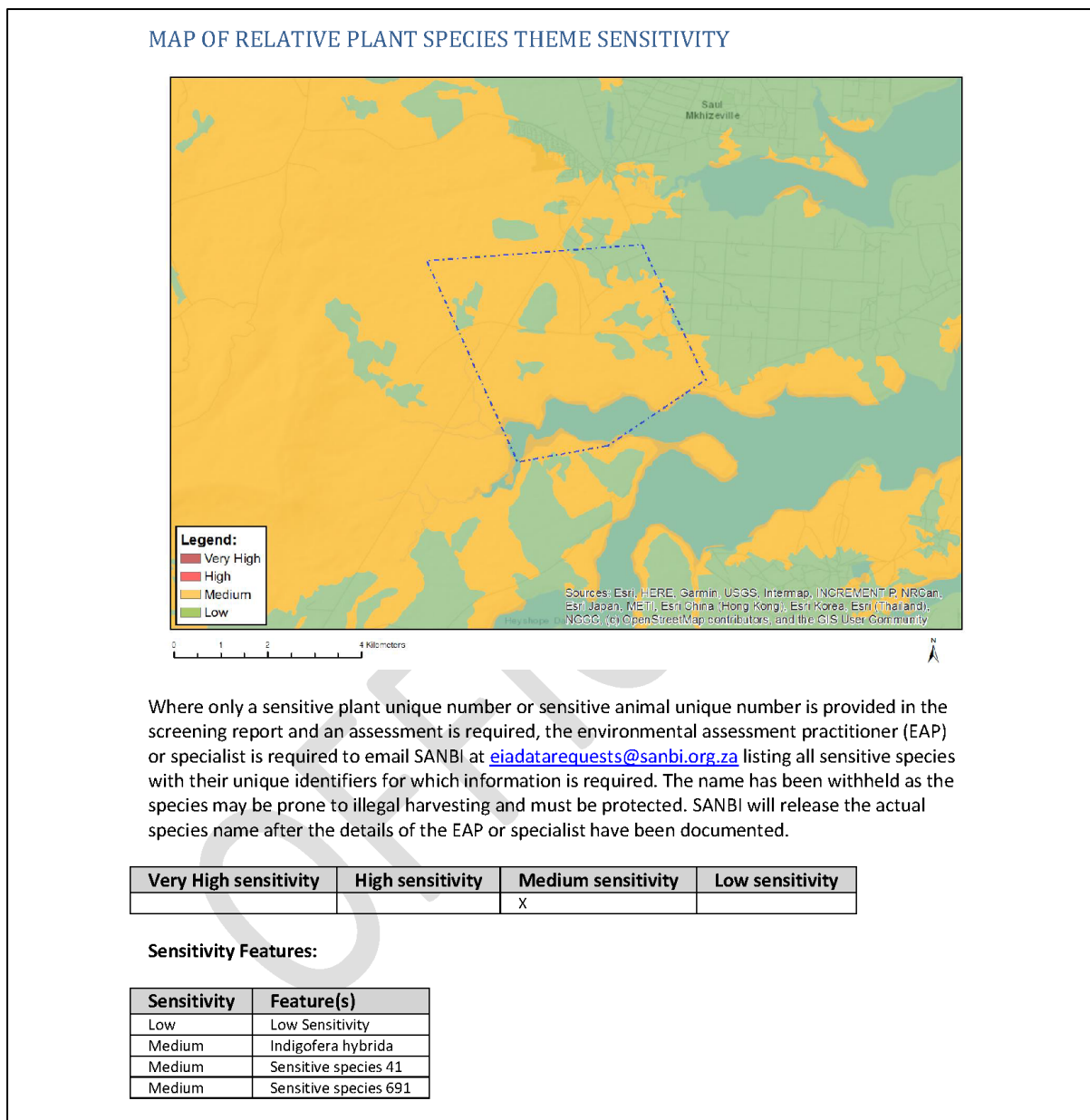


Figure 7-1: Plant species sensitivity as per the DFFE Screening Tool

Based on the DFFE Screening Tool and the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation the site falls within a medium plant species sensitivity. From the site visit it can be confirmed that the sensitivity of the site is low, however, it was concluded from the one site visit outside of the biodiversity sampling season.

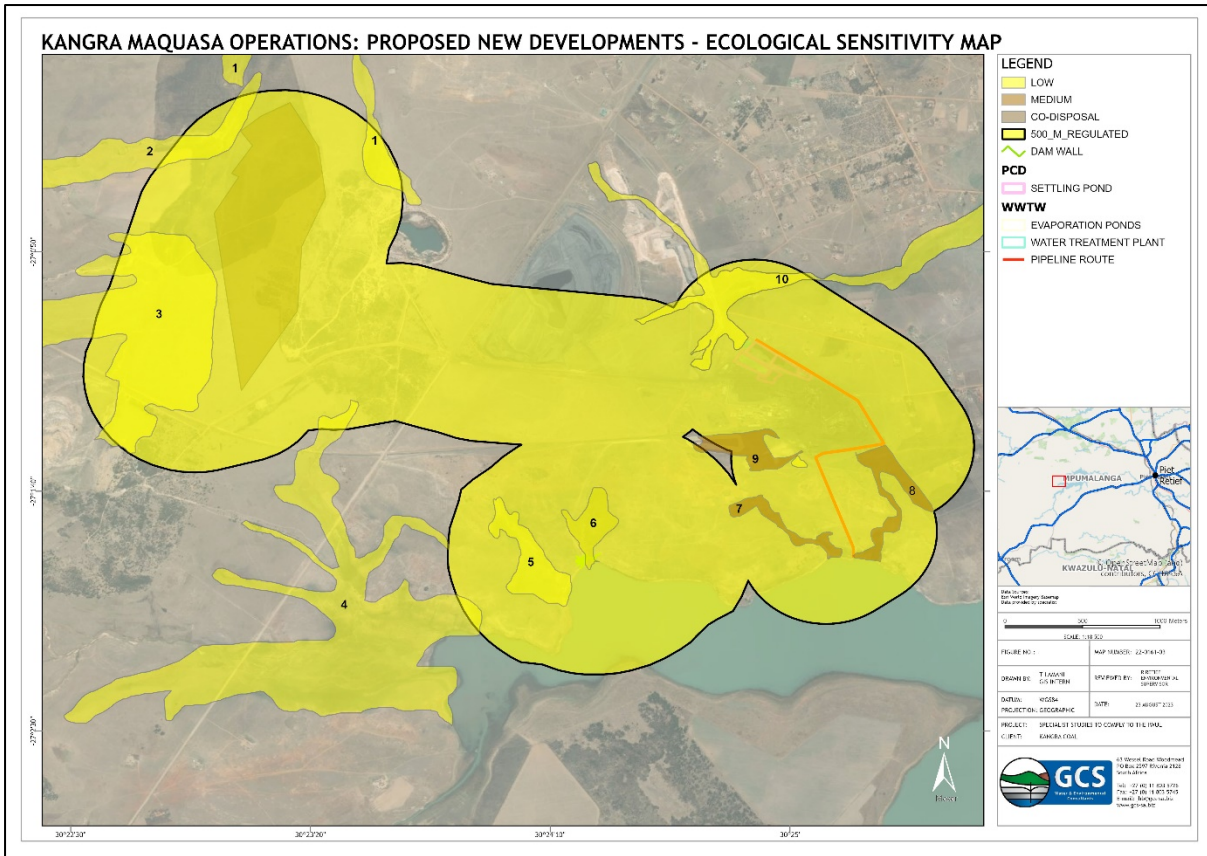


Figure 7-3: Terrestrial Sensitivities Map

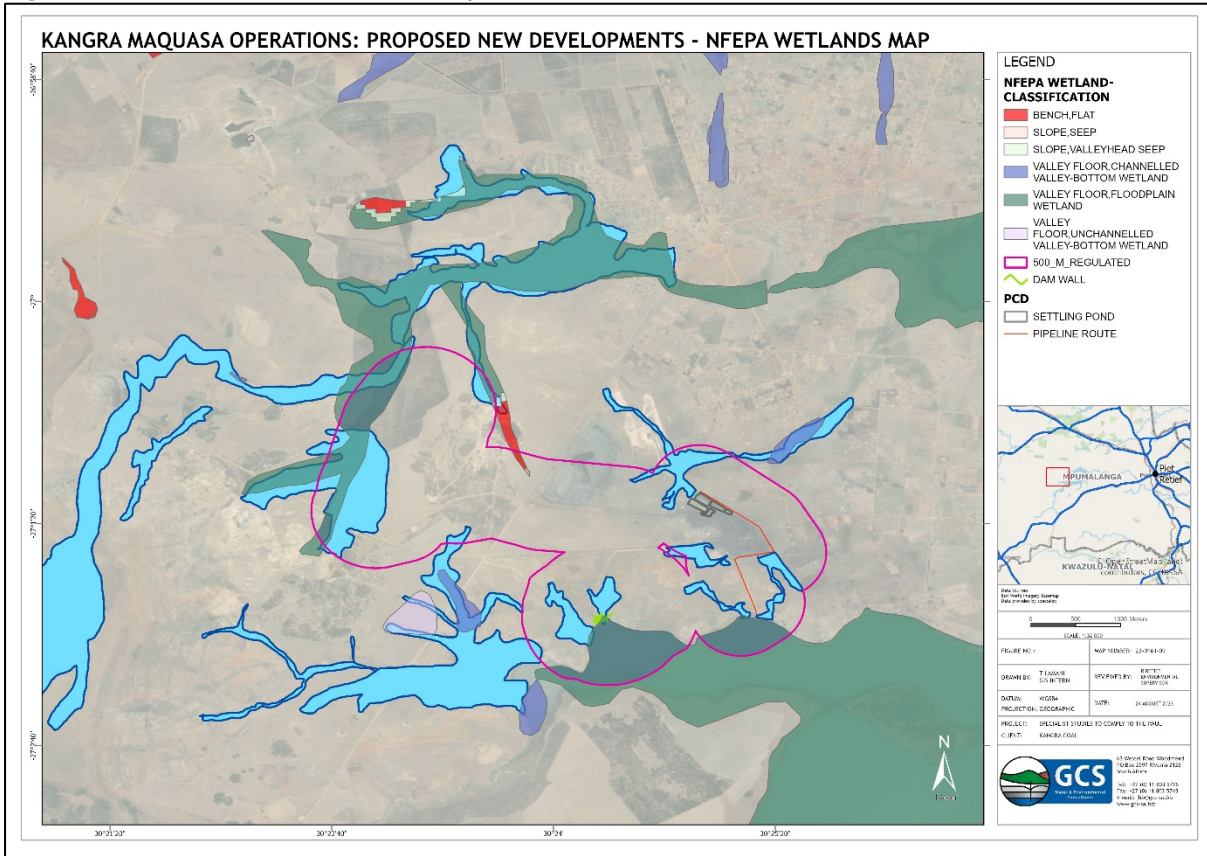


Figure 7-4: NFEPA Wetlands

8 IMPACT ASSESSMENT

8.1 IMPACT ASSESSMENT

The Mpumalanga Terrestrial Assessment Map has been developed as a tool to assist in identifying the threatened habitats, including the threatened species often associated with these habitat types. The plan also considers other important ecological principles such as connectivity, functioning, corridors / linkages as tools for determining delineations of areas. The aforementioned factors were then used to delineate Critical (CBA) and Ecologically (ESA) sensitive areas, which warrant special attention during impact assessments.

The study site falls within Ecological Support Areas. The study area has been influenced by anthropogenic activities ranging from transformation of the grasslands and alien infestation in the mining area, overgrazing, and hardening of surfaces including roads, structures. A high number medium sensitivity is expected as the area may provide nesting for birds, hiding spots for reptiles and observation points for mammalian species, however, certain wetlands have been rated medium. Potential ecological impacts resulting from the development would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

8.1.1 Biodiversity

The potential impacts associated with the various project stages are discussed below.

8.1.1.1 Construction Phase

The following potential impacts were considered on terrestrial vegetation communities:

- Destruction of, and fragmentation of, the remaining vegetation communities.

8.1.1.2 Operational Phase

The following potential impacts were considered on terrestrial vegetation communities:

- Routine maintenance in case of emergency leaks from stormwater infrastructure draining into the Heyshope Dam at HGM 7.
- No illegal dumping in drainages especially near the Heyshope Dam

8.1.2 Direct habitat destruction

8.1.2.1 Impacts on vegetation and protected tree species

Impacts on vegetation would occur due to the construction of the additional infrastructure at the mine.

8.1.2.2 Mitigation measures:

- Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.

- The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction. This must be confirmed by the Ecologist during the biodiversity season.
- Development would be likely to encourage alien plant invasion and measures to prevent and limit alien plant invasion should be implemented as part of the EMPr for the development.
- Any Protected trees should be tagged, and a permit obtained from the DAFF.

8.1.3 Increased Erosion risk

Increased erosion risk because of soil disturbance and loss of vegetation cover.

8.1.3.1 Mitigation measures:

- Minimise the development footprint so that only areas where infrastructure will be located are cleared.
- Post-construction revegetation of all bare areas with local species.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- An erosion management plan should be developed as part of the EMPr for the development.

8.1.4 Direct Fauna impacts

8.1.4.1 Description of impact:

Faunal habitat destruction, alteration, and physical disturbance.

8.1.4.2 Mitigation measures:

- The site should not be fenced with electric fencing which is near to the ground.
- Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.
- Fires should only be allowed within fire-safe demarcated areas.
- No fuelwood collection should be allowed on-site.
- No dogs should be allowed on site.
- If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- Staff present during the operational phase should receive environmental education to ensure that that no hunting, killing, or harvesting of plants and animals occurs.

8.1.5 Disruption of broad-scale ecological processes

8.1.5.1 Description of impact:

Disruption of the broad-scale ecological processes.

8.1.5.2 Mitigation measures:

- Areas of natural vegetation within the site should be managed in a manner which promotes or is at least compatible with the maintenance of biodiversity at the site.

8.1.6 Soil and water pollution

8.1.6.1 Description of impact:

Construction work of the magnitude contemplated for the proposed development will always carry a substantial risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages.

8.1.6.2 Mitigation measures:

- Water falling on areas polluted with oil/diesel or other hazardous substances must be contained.
- Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously.
- Dry chemicals to be stored on an impervious surface protected from rainfall and stormwater run-off.
- Ensure that refuelling stations on site are constructed to prevent spillage of fuel or oil onto the soil and put in place measures to ensure that any accidental spillages can be contained and cleaned up promptly.
- Sewage should either be treated in a suitable plant or removed from the site for treatment elsewhere.
- Spill kits should be on-hand to deal with spills immediately.
- Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance for instance the maintenance management plan.
- All construction vehicles should be inspected for oil and fuel leaks regularly and frequently.

8.1.7 Air pollution

8.1.7.1 Description of impact:

The environmental impacts of wind-borne dust, gases and particulates from the construction activities associated with the proposed development are primarily related to human health and ecosystem damage. The proposed development will typically comprise the following sources and associated air quality pollutants:

- Land clearing operations, building, and scraping.
- Stockpiling (particulate matter)

- Materials handling operations (truck loading & unloading, tipping, stockpiling)
- Vehicle entrainment on paved and unpaved roads
- Windblown dust-fugitive emissions (stockpiles).

Dust pollution will impact the most severe during the construction phase. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure.

8.1.7.2 *Mitigation measures:*

- Dust suppression must be undertaken in conjunction with a dust monitoring programme that places dust deposition gauges or receiving buckets, directional dust collection receptacles, high volume active air samplers or continuous particle monitors or even personal exposure samplers at generation sites, around the mine and in adjacent areas.
- Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.
- A speed limit (preferably 60 km/hour) should not be exceeded on dirt roads.

8.1.8 *Spread and establishment of alien invasive species*

8.1.8.1 *Description of impact:*

This is probably one of the most significant potential impacts from a terrestrial invertebrate perspective and may have very significant knock-on effects that could impact of virtually every aspect of the surrounding ecosystem. Vehicles often transport many seeds, and some may be of invader species, which may become established along the road, especially where the area is disturbed. Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project.

8.1.8.2 *Mitigation measures:*

- Institute strict control over materials brought onto site, which should be inspected for potential invasive invertebrate species and steps taken to eradicate these before transport to the site.
- Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.
- Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.
- Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.

8.2 IMPACT ASSESSMENT MATRIX

Table 8-1 indicate the impacts described above and specific ratings of significance the impact will potentially have on the ecological components of the study area during construction, while Table 8-2 indicates the operational impacts. Cumulative Impacts are shown in Table 8-3

Table 8-1: Impact assessment Matrix during Construction

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence		RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)
Loss of vegetation within development footprint	Loss of vegetation within development footprint	5	4	1	3	30	2	60	-	4: High - 80%	H	<ul style="list-style-type: none"> Limiting the impact area and construction activities to the proposed footprint area and the associated infrastructure servitude only. Existing roads/servitudes should be considered first option over the construction of new roads/servitudes and must only be made where necessary. Minimise the extent of vegetation clearing for the infrastructure. Areas to be cleared must be clearly/visibly demarcated to avoid unnecessary clearing. Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities. Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation 	4: High - 80% & below	4	3	1	2	16	2	32	-	4: High - 80%	M

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION															
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-		Confidence	RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)			
											material can be applied to other areas in need of stabilisation and vegetation cover.															
Introduction of alien species, especially plants	Degradation and loss of surrounding natural vegetation	4	3	1	2	16	2	32	-	3: Medium - 60%	M	<ul style="list-style-type: none"> • Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also prescribe a monitoring plan and be updated as/when new data is collated; • Remove organic waste from site weekly to prevent pest species from becoming a problem. A waste management plan must be compiled and implemented from the onset of the construction phase. The plan must designate collection 	4: High - 80% & below	3	2	1	2	12	2	24	-	4: High - 80%	L			

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION												
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-		Confidence	RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)
Displacement of faunal community due to habitat loss, direct mortalities and disturbance	Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution. Disturbance due to dust and noise pollution and vibration may disrupt behaviour.	5	4	1	2	20	2	40		3: Medium - 60%	M	<ul style="list-style-type: none"> • Signs must be put up stating that should any person be found poaching any species they will be fined. • Construction must take place in the winter months as much is feasible. • The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, access to these areas must be controlled. • Signs must be put up to enforce this. • Speed limits must be implemented on all roads. • Areas should be cleared and disturbed on a needs basis only, as opposed to clearing and disturbing a number of sites simultaneously. • Any holes/deep excavations must done in a progressive manner on a needs basis only. No holes/excavations may be left open overnight. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas. • Where possible, work should be restricted to one area at a time and be systematic. This is to reduce 	3: Medium - 60% & below	3	3	1	2	14	1	14	-	4: High - 80%	L

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION															
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-		Confidence	RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)			
										the number and extent of on-site activities, allowing fauna to move off as the project progresses. This will give the smaller mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories. <ul style="list-style-type: none"> • All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of SCC, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMP; • Prior to vegetation clearing activities, the area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance. • The timing between 																

Table 8-2: Impact assessment Matrix during Operation

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence		RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)
Continued fragmentation and degradation of habitats and ecosystems	Disturbance created during the construction phase will leave the project area vulnerable to erosion and IAP encroachment.	3	4	1	2	16	2	32	-	4: High - 80%	M	<ul style="list-style-type: none"> It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants. Implementation of an alien vegetation management plan. The area must be demarcated and no disturbance is to be allowed outside the direct development footprint. 	3: Medium - 60% & below	2	3	1	2	12	2	24	-	4: High - 80%	L
Proximity of infrastructure and human activity to the wetlands	This may lead to local disturbance of fauna and flora, through noise, light, trampling, etc. Fauna may move away from the site.	2	2	1	2	10	2	20	-	5: Very High	L	<ul style="list-style-type: none"> Lighting should face away from the wetlands. Workers should be discouraged from walking on the bed and banks of the wetlands. 	5: Very High - 100%	2	1	1	2	8	2	16	-	4: High - 80%	L

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence		RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)
Spread of alien and/or invasive species	Ongoing displacement and direct mortalities of faunal community due to disturbance	3	3	1	2	14	2	28	-	3: Medium - 60%	M	<ul style="list-style-type: none"> Lighting should be kept to a minimum to avoid disturbing crepuscular and nocturnal species. Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward, to minimize light pollution which could attract night migrating species. Lighting should be directed towards to footprint area and avoid unnecessary illumination of the adjacent undeveloped areas. Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas Avoid using any road during the night; Fences must have 30 x 30 cm holes in at the bottom at every 250m to allow for free movement of fauna. 	4: High - 80% & below	2	2	1	2	10	2	20	-	4: High - 80%	L

Table 8-3: Impact assessment Matrix (Cumulative Impacts)

ACTIVITY(S)	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence		RISK RATING (C x S)	Mitigation Efficiency	Duration	Extent	Irreplaceable Loss	Severity	CONSEQUENCE	Probability	SIGNIFICANCE	+/-	Confidence	RISK RATING (C x S)
The development of the proposed infrastructure will contribute to cumulative habitat loss and thereby impact the ecological processes in the region.	The development of the proposed infrastructure will contribute to cumulative habitat loss and thereby impact the ecological processes in the region.	3	3	1	2	14	2	28	-	4: High - 80%	M	<ul style="list-style-type: none"> Ensure that a rehabilitation plan and IAP management plan be compiled for each development and are effectively implemented. 	3: Medium - 60% & below	3	4	2	2	18	2	36	-	2: Low - 40%	M
Fragmentation of aquatic ecosystems, and loss of connectivity between aquatic ecosystems and the surrounding landscape	This may impact on the movement of fauna and flora in the area, and may alter the hydrology of this part of the catchment due to loss of infiltration capacity.	3	2	1	2	12	2	24	-	4: High - 80%	L	<ul style="list-style-type: none"> Where footprints cannot avoid sensitive aquatic ecosystems, ensure that subsurface movement of water is unhindered; Allow for natural corridors to remain for the movement of fauna and flora Crossings over wetlands and watercourses must be built in a manner that allows for free flow of surface and subsurface water. 	3: Medium - 60% & below	3	3	3	2	18	2	36	-	2: Low - 40%	M

9 CONCLUSION AND IMPACT STATEMENT

Based on the ecological assessment for the Maquasa Project Developments, the following is noted:

9.1 Design and Construction Phase for biodiversity:

The following mitigation and management measures should be implemented during the construction phase to minimise potential environmental impacts:

- To preserve these footprints, need to be demarcated and then adhered to.
- Construction activities should be limited to between 07:00 and 17:00 or in conjunction with the ECO. There will be nightworks during the construction period. In such cases, nearby landowners will be informed prior and appropriate lighting will be used.
- A complaints register should be available onsite whereby the public or community in close connection of the proposed development can issue their concerns, if need be.
- Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas.
- Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.
- Use existing ablutions or provide to a max of 10 per ablution.
- Induction awareness training should be undertaken.
- Onsite waste management and removal, waste not to sit longer than 7 days. Bins to have lids.
- Separation of waste should be encouraged.
- Erosion control measures should be in place.
- Any buffers identified should be maintained by the contractor.

9.1.1.1 Operation Phase for biodiversity:

The following mitigation and management measures should be implemented during the operation phase to minimise potential environmental impacts:

- Waste should be managed as not to be aesthetically appealing or attract pests or rodents.
- Control of alien invasive plants is encouraged.
- Rehabilitation and landscaping with indigenous vegetation within the development should be encouraged and made a condition within the Environmental Authorisation.
- Mitigation Measure Objectives for biodiversity impacts on flora and fauna should be encouraged. The EMPr has made further provision for this.

The focus of mitigation measures should be to reduce the significance of potential impacts associated with the proposed water pipeline and thereby to:

- Prevent the destruction of, and fragmentation, of the vegetation community.
- Prevent the loss of the faunal community associated with this vegetation community.

9.2 Mitigation Measures for Impacts on Vegetation Communities & CBAs

From an ecological perspective, the development is situated within an area, which has been disturbed. It is recommended that any alien plant species found during construction, be removed according to best practice guidelines and all efforts should be made to prevent further growth of other alien or invasive plant species. It is further recommended that an alien invasive species plan accompany the basic assessment report to the Department of Forestry, Fisheries, and the Environment.

9.2.1 *Recommended mitigation and rehabilitation measures for biodiversity:*

- As far as possible, the proposed development should be restricted to areas that have already been disturbed, and limited further loss of secondary vegetation, wetland areas, drainage lines should be permitted.
- It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon and preventing movement of workers into sensitive surrounding environments.
- Where possible, existing access routes and walking paths must be made use of, and new routes limited.
- All laydown, storage areas etc should be restricted to within the project area, not beyond the sensitive areas.
- All building materials should be mixed off site and no mixing should take place in sensitive areas.
- Prefabricated material must be used (or prioritised) to limit the fabrication and mixing on site; and
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.

9.2.1.1 *Mitigation Measures for Impacts on Faunal Communities*

Recommended mitigation and rehabilitation measures for faunal community's hinge largely on protecting their habitats and ensuring it remains intact.

9.2.1.2 *Specific mitigation measures for birds, mammals, and amphibians*

- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitably qualified ECO trained in the handling and relocation of animals.
- No trapping, killing, or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects, or mammals.

- All building materials should be mixed off site and no mixing should take place near the sensitive areas.
- Have action plans onsite, and training for contactors and employees in the event of spills, leaks, and other impacts to the surrounding environment.
- It is worth noting that by applying relevant mitigation measures to the system to ensure that the functionality of the watercourse not be lost will directly ensure that the surrounding system's functionality be retained and that impacts to the water resources be limited.
- Recommended mitigation measures for the project include the following:
 - The footprint area associated with the construction must be minimised, avoiding the wetland and drainage areas where possible. Areas earmarked for development must be marked to ensure a controlled disturbance footprint area to minimise negative impacts.
 - Erosion prevention and sediment control measures are imperative and need to be implemented throughout the entire project footprint area, access roads and temporary laydown / storage sites. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching.
 - Further, unstable, and exposed soil embankments should be protected from erosion with a combination of retainer wall bricks / blocks and vegetation.
 - The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil, or hazardous substance spills are cleaned-up and discarded correctly.
 - It is preferable that construction takes place during the dry season (as much as possible) to reduce the erosion potential of the exposed surfaces.
 - During construction activities, all rubble generated must be removed from the site and not dumped in the instream, within the wetland habitat towards the northwest of the site.
 - An alien invasive plant management plan needs to be compiled and implemented post construction to control current invaded areas and prevent the growth of invasive species on cleared areas.
 - A maintenance management plan should accompany the EIA to DFFE on how to prevent and contain the termites in future.

9.2.2 Overall Conclusion

- In the case of this study site, the grasslands have been altered through anthropogenic activities. The grasslands, however, were not flowering and trees without leaves.

- Anthropogenic impacts identified within the study site included alien vegetation encroachment, gravel roads, natural vegetation removal, hardening of surfaces to establish the mining infrastructure, fencing, grazing of animals and disturbances to the wetland systems around the site.
- The Terrestrial CBA of the site is mixed between transformed areas and ecological support areas (ESA).
- The study site still has a functional role to play in regional ecological functioning and biological functions at the site even though it has been influenced by human-related impacts.
- Ecological connectivity between the grasslands and drainage located towards the Heyshope Dam cannot be excluded in the overall study area.
- An alien invasive species plan must be developed, together with a maintenance management plan that covers termites.
- Monitoring dust at the site should be encouraged.
- Monitoring should be undertaken monthly for the discharge of the treated effluent from the mine into the Heyshope Dam and submitted to DWS>
- A search-and-rescue plan needs to be developed for any medicinal plants onsite. This has to be confirmed by a registered ecologist under SACNASP and during the flowering / summer season.
- Any protected trees must, however, be sampled and recorded and indicated to DAFF.
- Concluded from the results presented in this document, the construction activities will impact on the low sensitive terrestrial biota. Mitigation measures should be implemented to mitigate to satisfactory standards if all mitigatory actions are implemented with due care. Alien eradication and rehabilitation must be encouraged through the development of an alien and invasive species plan.

Even though the site has low sensitivity, the mitigation measures provided may reduce the negative risks anticipated with the mining infrastructure construction. Should all the mitigation measures be implemented and monitored against to ensure compliance and included in the Environmental Management Program the project may then be favourably considered.

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APPENDIX A -CURRICULUM VITAE OF SPECIALIST

NAME	Nico-Ronaldo Greeff-Retief
DATE OF BIRTH	07 February 1982
ID Number	8202075093082
Tel	072 666 6348
Email	ronaldoretief@gmail.com
PROFESSION/SPECIALISATION	Ecological specialist studies, Wetland specialist studies, Aquatic specialist studies; Mining specialist studies; Visual Impact specialist studies; Professional Environmental Assessment Practitioner
NATIONALITY	South African
YEARS' EXPERIENCE	19 years
<p>KEY QUALIFICATIONS: I have 19 years' experience in the environmental consulting industry. My key interest falls within the water and mining industry. I completed my Masters in Zoology in February 2007 and since August 2010 I have been registered as a Professional Natural Scientist in Zoological Science, Ecological Science & Environmental Science. I have considerable experience in the writing of EIA reports and have managed a variety of small- to large-scale EIA projects ranging from electrical power lines to housing developments. I have completed over 90 EIA projects, more than 50 Water Use License Applications, more than 20 mining related applications and more than 55 specialist input assessments.</p> <p>I have vast experience as an Environmental Assessment Practitioner with expertise in: Water Quality Management, GIS mapping (in particular, PlanetGIS and ArcGIS software packages) and Surface Water Management.</p> <p>I have valuable practical experience in the following EIA fields: bulk service infrastructure, water pipelines, sewage pipelines, road projects and upgrades; residential developments; renewable energy, mining applications and water use license applications. I am also proficient in conducting aquatic, wetland and ecological assessments. I have undertaken a variety of Visual Impact Assessments and utilise GIS and onsite first-hand experience when compiling the reports.</p> <p>I believe that I am a valuable asset in any environmental industry owing to my experience, knowledge and expertise. I have the ability to lead, train and inspire staff to be enthusiastic and goal orientated. I am self-motivated and maintain an organised efficient work habitat.</p> <p>I am registered as an environmental assessment practitioner with EAPASA 2019/181.</p> <p>My Career Specialist skills include:</p> <ul style="list-style-type: none"> • Biomonitoring; • EIA guidance; • Environmental Compliance Monitoring (ECO) • Ecological Assessments and environmental identification and mapping; • Drafting and Preparing Environmental Management Plans (EMPs); • Undertaking Public Participation; • Preparing Strategic guideline documents and training material; • Compiling EIA reports; • EIA guidance and recommendations; • Mentoring junior staff; • Project Procurement; • Project Invoicing and Billing; and • Water Quality Management; • Wetland Delineations; • GIS mapping and map production; • Environmental Impact Assessments; • Water Use License Applications; 	

<ul style="list-style-type: none"> • Mining applications and Guidance; • Water Quality Management; • Petroleum (Filling Stations) Groundwater Monitoring; • Filling Stations Gas Monitoring; • Aquatic Impact Assessments; • Visual Impact Assessments; • SASS5 & Biomonitoring; • Conduct and manage Environmental Impact Assessments (EIAs) and other environmental investigations according to the new EIA legislation. • Providing input for strategic assessment, policy development and reporting. • Interpreting and applying environmental legislation. • Develop, plan, co-ordinate and facilitate Public Participation Processes (PPP). • Client and authority liaison. • Compiling, reviewing and approving project proposals and environmental reports. • Developing and implementing Environmental Management Plans (EMP's). • Conducting environmental monitoring, reviews and audits. • Mentoring of junior staff. • Manage project budget and programme. • Provision of ongoing assistance and support to line managers and rest of the environmental team. 	
<u>EMPLOYMENT RECORD:</u>	
March 2020 - Currently	NCC Environmental Services - Professional EAP and Ecologist
June 2018-March 2020	Delta Built Environment Consultants - Professional Environmental Assessment Practitioner
December 2017 - June 2018	Bokamoso Landscape Architects and Environmental Consultants
May 2015 - November 2017	PRISM Environmental Management Services, Position
September 2014 - April 2015	DMT-Kai Batla
June 2014 - August 2014	Kantey and Templer
September 2013 - May 2014	GladAfrica Environmental Management
August 2012 - April 2013	African Innovative Solutions and Projects
May 2011 - July 2012	Lidwala Consulting Engineers
March 2010 - April 2011	Strategic Environmental Focus
May 2009 - February 2010	Savannah Environmental
April 2007 - April 2009	Nemai Consulting
<u>PROFESSIONAL EXPERIENCE:</u>	
<u>Environmental Impact Assessments: Electricity</u>	
<ul style="list-style-type: none"> • Eskom - Dunnottar 88kV substation and power lines - 2011; • Eskom - Koeberg Integration Project - 2009; • Eskom - Tshwane Strengthening Project. Report - 2009; • Mulilo - Wind Monitoring Masts - 2009; • Mulilo - Siting exercise for a solar energy facility - 2009; • Exxaro - Wind Monitoring Mast near Brand-se-Baai - 2009; • Biotherm - Wind monitoring masts on farms within the Overberg - 2009; • Eskom - Majuba Power Station Ash Dump Expansion project 2012; • Eskom - Tabor-Nzhelele 400kV power line between Polokwane and Musina - 2012; • Zimbabwe Power Company - expansion of the power station, Hwange - 2014 • Adams PV Facility BESS, Northern Cape, ENEL Green Power 2022 • Pulida PV Facility BESS, Free State, ENEL, 2022 • Suikerbekkie PV 1 and PV2, Western Cape, 2022, 23 • MCWAP2 Powerline and Substation, Limpopo, Eskom 2022, 23 	
<u>Environmental Impact Assessments: Mining</u>	
<ul style="list-style-type: none"> • Lonmin - Karee 4 Mine EMPR amendment - 2010; • Frankfort Mineral Resources - Priority East Prospecting Right Application - 2010; • BHP Billiton - Klipspruit Mining Colliery - 2010; 	

<ul style="list-style-type: none"> • Sound Mining Solutions - Proposed Prospecting in the Northern Cape near Kuruman - 2011; • Exarro Resources - Inyanda Coal Mine - 2012; • Sebilong - Sebilong Chrome Retreatment Works - 2013; 3 • Kumba Iron Ore - Sishen mine borehole monitoring for the DMR - 2012; • Northam Platinum Limited Production Works Expansion Zondereinde division for Northam Platinum - 2015; • Section 24G Rectification Application for the BP Wiggill Engineering Foundry in Boksburg North - 2016; • Maroeloesfontein AEL monitoring and audit report in Thabazimbi, Limpopo Province 2016;
<p><u>Environmental Impact Assessments: Residential / Commercial Infrastructure</u></p> <ul style="list-style-type: none"> • Highlands Estate - Mixed-Use Development - 2010; • Limpopo Department of Health - Limpopo Academic Hospital in Polokwane - 2010; • Mogale City Local Municipality - Munsieville Extension 6 Township Development - 2011; Olivier Construction - Kuruman Development - 2012; • Thaba Ya Batswana - Stone River's Arch Mixed-Use Development Klipriver Drive - 2014; World Bank - ASIDI Schools Development in Mthatha (Development of EMPs and ECO monitoring) - 2014; • Village Green Township Development - 2016; • Roodekrans Ext 26 Township Development - 2015; • Nederburg Mixed-use Development - 2016; • Greengate Ext 70 - 2016, 2017; • Greengate Ext 69 - 2016, 2017; • Greengate Ext 68 Curro School - 2016, 2017; • Olievenpoort Ext 47 Development - 2017; • Portion 96 Lindley Township Development - 2017; • Ptn 71 of Knopjeslaagte housing development, 2017; • Dr. Yusaf Dadoo Hospital Expansion, EIA, Ecological Reporting, 2017 • Wesgro Locale & Master Plan Cape Health Technology Park, Wesgro, 2018, • Review of Tubatse Business Plan, Limpopo Economic Development Agency, 2018 • JDA Central Fire Station Environmental, JDA, 2018, • West Rand Agro-Processing HUB, GIFA, 2018; • DBSA Town Planning Human Settlement, Wayo Consulting, 2018; • Umzimkhulu LM, Umzimkhulu LM, 2018; • EIA and Township Establishment for Musina Makhado SEZ, Limpopo Economic Development Agency; 2017; • DPW Oshoek Site Clearance; 2017; • Upgrading of Roads in Devon; 2017; • KZN DOHS Serviced Sites Programme - Bellair; 2016; • DPW Site Clearance DOJ Umlazi; 2016; • DPW Site Clearance DOJ Grassy Park; 2016; • EMM Roads and Stormwater Norkem Park; • DPW Site Clearance Sterrewag; 2015; • Lesotho Border Road; 2014; • Oshoek Road Upgrade, DPW, 2020 • Louis Fourie Mixed-Use Development, Mossel Bay 2021/2022
<p><u>Environmental Impact Assessments: Infrastructure</u></p> <ul style="list-style-type: none"> • Heartland Properties - Marlboro Road Extension (M60) - 2010; • Sanral - Road Upgrades - Hendrina along the N11 to Ermelo (Work Package 2); Amersfoort to Majuba Power Station (Work Package 3) & Bethal to D622 (Work Package 4) - 2012; Sanral - Notwane River Bridge upgrade between South Africa & Botswana - 2009; • City of Tshwane Metropolitan Municipality - Upgrade of Charles Street - 2008; • Gautrans - Upgrade of the R103 between van Dyk & Diana Roads - 2009

<ul style="list-style-type: none"> • Gautrans - Upgrade of Moore Street - 2009; • Passenger Rail Agency of Southern Africa - Doornfontein Railway Station - 2008; • Sanral - N11 Section 10 Road Rehabilitation and Upgrade between Middelburg and Loskop Dam - 2012; • City of Tshwane Metropolitan Municipality - Rehabilitation of the Apies River between Wonderboom junction and Rosslyn Road - 2014; • Onderstepoort Biological Products - DEC- Development of a vaccination plant at the existing Onderstepoort Veterinary plant - 2015; • Gautrans - Rose Interchange - 2016; • Boukorp (Pty) Ltd - Greengate Electrical Powerline - 2016; • Transnet Freight Rail, Erection of a fence around City Deep Terminal, Kascon Yard and Kaserne Marshall Yard, 2020.
<p><u>Environmental Impact Assessments: Bulk Services Infrastructure</u></p>
<ul style="list-style-type: none"> • Mogale City Local Municipality - Munsieville Bulk Sewer Pipeline - 2011; • Johannesburg Property Company - Pimville Golf Course - 2007; • Johannesburg City Parks and Zoo - Upgrade of Regional Parks within Soweto - 2008-09; • Rand Water - Zuikerbosch Central Sludge Pipeline - 2007; • Ekurhuleni Metropolitan Municipality - Kempton Park Eastern Outfall Sewer - 2008; • Ekurhuleni Metropolitan Municipality - Signal Hill Reservoir - 2008; • City of Johannesburg Metropolitan Municipality - Bruma Lake Desiltation - 2009; • Moses Kotane Local Municipality - Ledig Water Supply Project - 2008; Sun International - Sun City Recreational Dam - 2008; • Dr Ruth Segomotsi Mompati District Municipality - Pomfret and Bray Wastewater Treatment Works, Waste licenses, environmental licences and Water Use Licenses - 2013;
<p><u>Environmental Impact Assessments: Water Quality Guidelines</u></p>
<ul style="list-style-type: none"> • National Department of Health - Water Quality Monitoring Training and Training Manual Development for Domestic Use - 2012; • Strategic Environmental Focus - Environmental Opinion for the Mine Waste Solutions Reclamation Project - 2012; • Heartland Properties - Modderfontein Conservation Park - 2012; • Department of Water and Sanitation - Wise use of Wetlands. Compilation of a Wise Use of Wetlands and Best Practise Guideline for the Department of Water Affairs (DWA) - 2008; • Department of Water and Sanitation - Agricultural Research Project for Wineries. Preparation of posters, pamphlets and a T-Shirt for the research project. The topics for the project consisted of wineries, eutrophication, agricultural strategies and a communication framework in agriculture - 2008; • Department of Water and Sanitation - Resource Directed Measures. Preparation of user-friendly material for Resource Directed Measures including the Spatial and Time Series Information Modelling Software (SPATSIM), Groundwater Resources Directed Measures (GRDM) and Teacha (Tool for Ecological Aquatic Chemical Habitat Assessment) software packages. A layman's pocket guide and a poster were also prepared. This material was work-shopped throughout South Africa - 2007-08; • Department of Water and Sanitation - Resource Directed Management of Water Quality: Attended a workshop at the CSIR International Conference Centre where the training material, posters etc. were discussed. Amending the posters and pamphlets with Corel Draw Graphics suite - 2008. • Steyn City Water Quality Monitoring reports for in-situ and monthly water quality reporting, 2017;
<p><u>Environmental Impact Assessments: Ecological Assessments</u></p>
<ul style="list-style-type: none"> • Umgeni Water - Mhlabatshane Dam: Preparing a specialist study report as well as conducting a site visit on the feasibility of the site for the construction of the

- Mhlabatshane Dam. The report consisted of the feasibility and general characteristics of the area while also discussing the water quality of the site - 2008;
- City of Tshwane - Capital Park Feasibility study. Compiled a feasibility report for the proposed housing development in Capital Park. This was accomplished with the aid of PlanetGIS map overlays - 2008;
- Kumba Iron Ore - Sishen mine development of a Biodiversity Action plan, Ecological Baseline study and Monitoring protocol for the expansion of the mine towards the west from the current site 2012.
- Honeydew Grove Ext 15 development, Ecological Scan report to identify the sensitivity and importance of the proposed site's development, ongoing.
- Steyn City Water Quality Monitoring reports for in-situ and monthly water quality reporting, 2017;
- Randpark Ridge Water Quality monitoring reporting and assessment of the water quality onsite, 2017;
- Maroeloesfontein Mine, Air Quality monthly reporting and report development 2017;
- Dr Yusuf Dadoo Hospital Ecological Assessment, Phase 1, 2017;
- Olievenpoort Ext 47. Ecological Impact Assessment, 2017;
- Greengate Ext 70, 68 and 69 Ecological Assessments, 2017;
- Temple development along Malibongwe Road in Northgate area, Ecological Assessment, 2017;
- Erand Gardens Ext 15, Ecological Assessment and site inspection, 2017.
- Olympus AH 72 site inspection with search-and-rescue for orange listed and red listed plant species, Bronberg, Tshwane, 2017;
- Glenvista Fauna and Flora amendment assessment, 2017;
- Jukskei View Mixed-Use Development in Midrand Ecological Assessment and Scan (Waterfall Ridge), 2017;
- La Montagne Ecological Assessment, 2018;
- Kameeldrift Voere (Pty) Ltd, Alien Eradication Plan and Plant Species Map, 2018;
- Chamdor X4 Mixed Use Development Ecological Assessment, 2018;
- PWV18 Ecological Assessment, 2018;
- TUT Ga-Rankuwa Sports Precinct Ecological Assessment, 2018;
- Berea Park, City of Tshwane marking and tagging of oak trees, 2018;
- Knopjeslaagte x19 Ecological Assessment, 2018;
- Equestria residential development, ecological scan and wetland delineation, 2018;
- Carnival City Dalpark Ecological Assessment, 2018;
- Cayman Academy ecological assessment, 2018;
- Hazeldean Road ecological assessment, 2018;
- Faerie Glen Ecological Scan, 2018;
- Secunda filling station ecological opinion, 2018;
- Mooibosch development ecological opinion, 2018;
- Peach Tree x25 residential development ecological assessment, 2018
- SA Defence Force ecological opinion, 2018;
- Kudube rising main and pump station ecological assessment, 2018
- Kudube pump station ecological assessment, 2018;
- Tonga Retail ecological weed eradication plan, 2018;
- Welgedacht filling station ecological assessment, 2018;
- DPW Oshoek Site Clearance; 2019;
- Eastleigh Culvert Upgrade, 2019.
- Kliprivier Kleinboere (Pty) Ltd. Romansrivier, Western Cape, 2019
- Transnet Freight Rail City Deep Terminal, Kascon Yard and Kaserne Marshall Yard Fence, 2020.
- Centurion Aerospace Village, Water Pipeline 2020
- Ekurhuleni Metropolitan Municipality, Malvern East Pipelines, 2020,
- Thembalethu Ecological, 2021
- Amaoti Ecological, 2021
- eZulu Game Reserve, 2021
- OR Tambo SEZ Ecological, 2021

<ul style="list-style-type: none"> • Timbavati Road and Deviation, ecological and tree permit applications, Limpopo, 2020/21
<p><u>Environmental Impact Assessments: Wetland Assessments</u></p>
<ul style="list-style-type: none"> • Eskom - Majuba Power Station Ash Dump Expansion Project - Wetland Delineation and Functional Assessment 2012; • Lekwa-Teemane Municipality - Mamusa Bulk Pipeline Project between Bloemhof and Schweizer-Reneke - Wetland Delineation and Functional Assessment and Water Use License - 2012; • DPW Oshoek Site Clearance; 2019; • Eastleigh Culvert Upgrade Wetland Assessment, 2019 • Kliprivier Kleinboere (Pty) Ltd. Romansrivier, Western Cape, 2019 • Malvern East Pipelines, Ekurhuleni, 2020 • Suikerbosrand Nature Reserve, 2021 • OR Tambo SEZ ecological, 2021 • Modelkloof Ecological Assessment, KZN near Ladysmith, 2021
<p><u>Environmental Impact Assessments: Air Quality Assessments</u></p>
<ul style="list-style-type: none"> • Maroeloesfontein Mine, development of a Monitoring Programme based on the Approved Air Emissions License issued by LEDET, 2016, 2017 with dust monitoring reports.
<p><u>Environmental Impact Assessments: Waste / landfill site</u></p>
<ul style="list-style-type: none"> • Kgatelopele Municipality - Danielskuil Domestic Waste Site EIA - 2011;
<p><u>Environmental Impact Assessments: Filling Stations, Gas monitoring & Groundwater Monitoring</u></p>
<ul style="list-style-type: none"> • Engen Petroleum - 72 groundwater monitoring boreholes around Gauteng, Free State, North West and Mpumalanga - 2014; • Engen Petroleum - Removal of storage tanks at the Bellavista Service Station - 2014; • Engen Petroleum - Upgrade / removal of the fuel storage tanks at the Rustenburg Depot - 2014; • Engen Petroleum - Proposed installation of 1 x 5 000m³ aboveground fuel storage tank and associated handling infrastructure at Engen Rustenburg Depot - 2014; • Volkswagen SA - Borehole assessment report for Volkswagen SA, Port Elizabeth plant, Eastern Cape for Volkswagen SA, Port Elizabeth plant, Eastern Cape - 2014; • Volkswagen SA - Borehole assessment report for Volkswagen SA, Uitenhage plant, Eastern Cape for Volkswagen SA, Uitenhage plant, Eastern Cape - 2014; • Engen Petroleum - Tank removal, groundwater monitoring, gas testing, level 1 and 2 assessment and Permit to Work for 72 Engen Filling Stations around Gauteng, Mpumalanga, Free State and Northwest 2014. • Groblersdal filling station EIA and establishment, 2018; • Greenstone filling station EIA, 2018; • Dennehof filling station EIA, 2018; • Selby ext. 19 filling station EIA, 2018;
<p><u>Environmental Impact Assessments: Visual Impact Assessments:</u></p>
<ul style="list-style-type: none"> • Nkosi City Integrated Human Settlement, Mpumalanga province visual impact assessment, 2018; • Dalpark Ext 32 Mixed-Use Development visual impact assessment, 2018; • La Montage Reservoir and access road visual impact assessment, 2018; • Glenvista Residential Development visual impact assessment, 2018; • DPW Oshoek Site Clearance; 2017;
<p><u>Environmental Impact Assessments: Water Use License Applications & General Authorisations</u></p>
<ul style="list-style-type: none"> • Heartland Properties - Westlake View WULA. Compilation of this Integrated Water Use License Application for the proposed project - 2009; • Heartland Properties - Marlboro Road Extension (M60). Compilation of this Integrated Water Use License Application for the proposed project - 2009;

- Heartland Properties - Highlands Estate Ext 5, 6 & 7: Compilation of the Integrated Water Use License Application for this project - 2009;
- Mooinooi Chrome Processing Plant - Compilation of this Integrated Water Use License Application - 2011;
- Sanral - N14 WULA. Compilation of this Integrated Water Use License Application - 2009; Minco Mineral Holdings - Compilation of the Integrated Water Use License Application - 2009;
- Sebilong - Sebilong Chrome Retreatment Plant - 2012;
- Dr Ruth Municipality - Bray and Pomfret Waste Water Treatment Works - 2013;
- Franskraal Bowling Club - Water Use License - 2013;
- Transvaal Gold Mining - Tailings Water Use License - 2013;
- Tamboekiesfontein - Compilation of an Integrated Water Use License Application - 2015;
- Vista Park Extension 10 - Compilation of an Integrated Water Use License Application - 2015;
- SAFDEV SSDC (Pty) Ltd - K6 Road Upgrade - Compilation of an Integrated Water Use License Application - 2015;
- Summerset Ext. 25 - Compilation of an Integrated Water Use License Application - 2015;
- Rose Interchange - Compilation of an Integrated Water Use License Application - 2016;
- Randpark Ridge Extensions - Compilation of an Integrated Water Use License Application - 2015;
- Greengate Electrical line - Compilation of General Authorisation - 2016;
- Willowbrook Integrated Water Use License Application - 2016;
- Wilgeheuwel Ext 60 Water Use License Application - 2016;
- Nederburg Mixed-Use Development Water Use License Application - 2016, 2017;
- The Village X10 Residential Development - Water Use License Application - 2016, 2017;
- P39-1 (N14) Diepsloot Interchange - General Authorisation - 2017;
- Rietvlei Farm Village Sewage Treatment Works - Water Use License Application - 2018;
- Oshoek Land Port of Entry - Water Use License Application, 2019, 2020
- Louis Fourie Mixed-Use Development, Western Cape, 2022
- Suikerbekkie PV 1 and PV 2 WUL 2022

Environmental Impact Assessments: Aquatic Assessments

- Johannesburg Water - Biomonitoring on numerous urban rivers (including the Jukskei River, Harrington Spruit and Klip River) to obtain baseline data to detect disturbance and non-compliance of various construction activities on aquatic ecosystems. This includes the Northern Wastewater Treatment Works, Goudkoppies Wastewater Treatment Works, Bushkoppie Wastewater Treatment Works and Olifantsvlei Wastewater Treatment Works - 2008;
- Johannesburg Water - Zandspruit Sewage Spill: Investigation for the Northern Wastewater Treatment Works on foot from its effluent discharge point to the City of Johannesburg sampling point (J5). This was done to identify possible causes of higher dissolved oxygen levels at J5 compared to the control site DWJ27 in the Jukskei River - 2008
- Johannesburg Water - Zandspruit Pump Station Sewage Spill. Biomonitoring in the Klein Jukskei River above the pump station and below the pump station. Physical water quality variables were also taken while onsite - 2008;
- City of Johannesburg - Upper Klipspruit Catchment Framework: Determine any sources of pollution and to identify impacts or anthropogenic stresses on the upper Klipspruit system. This was done for improving both river systems for the 2010 Soccer World Cup. A comprehensive report was compiled called the "Sustainable Urban River Management Plan for the Upper Klipspruit Catchment". Co-author for the report and also compiled the water quality data - 2008;

<ul style="list-style-type: none"> City of Johannesburg - Bruma Lake Rehabilitation: Undertaking the biomonitoring of the Jukskei River at the inlet to the Bruma Lake at UJ5 (DWA water sampling point) and below Bruma Lake at the DWA sampling site UJ6. The results were included as a specialist study for an environmental Impact assessment for the Rehabilitation of Bruma Lake - 2009. CASIDRA - Klein Boere - Romansrivier Aquatic Assessment to assist with the basic assessment report for the Kleinboere Vereniging - 2019 	
<u>Environmental Impact Assessments: Amendment Applications;</u>	
<ul style="list-style-type: none"> Wilgeheuwel Ext 60 Amendment Application Phase 1 and Phase 2, GDARD, 2017; Strubensvallei x10 Amendment Application Phase 1, GDARD, 2017; TASEZ Tshwane SEZ, 2020-22 	
<u>Environmental Impact Assessments: International Projects</u>	
<ul style="list-style-type: none"> Upgrade of the Notwane river bridge crossing at the Swartkopfontein Border Post between South Africa and Botswana, EIA, 2009. Zimbabwe Power Company, Mining and EIA for the supply of coal to the Hwange Coal fired power station, 2014 	
<u>Carbon Footprint / Section 24g</u>	
<ul style="list-style-type: none"> Lanseria International Airport, Airport Carbon Accreditation, 2019 S24G rectification application for eZulu Game Reserve, Eastern Cape, 2020 to current 	
<u>EDUCATION:</u>	
Rand Afrikaans University (2001-2003)	B.Sc.
Rand Afrikaans University (2004)	B.Sc. Honours
University of Johannesburg (2005-2007)	M.Sc.
<u>CAREER ENHANCING COURSES:</u>	
GDARD - 14, 15 April 2008	Basic Wetlands
Lexis Nexis Sandton - 12 October 2009	Lexis Nexis
FET Water - Dept. Water Affairs 08 March 2010	Risk Management of Aquifers
Strategic Environmental Focus- 13 August 2010	NEMA Legislation 2010
Dept. Water Affairs - 08, 09 September 2010	Section 21 c & i
ProjectLink - 20 & 21 June 2011	Microsoft Project Professional
Prowalco 6-8 June 2014	Engen Permit to Work
2014:	Health and Safety (Level 1 & 2 First Aid)
2014:	Firefighting
2004:	Advanced 4 x 4 driving course
2019:	Mine Closure and Case Law Development Workshop 20 June 2019 by Imbewu
<u>PROFESSIONAL AFFILIATIONS:</u>	

Registration No: 005636	Professional Ecological, Environmental and Zoological Scientist: South African Council for Natural Scientific Professions		
N/A	Member of the Zoological Society of Southern Africa		
N/A	Member of the International Association for Impact Assessment South Africa		
N/A	Member of the Water Institute for Southern Africa (MWISA)		
Registration No: 2019/181	Professional Environmental Assessment Practitioner with Environmental Assessment Practitioners of South Africa (EAPASA)		
<u>LANGUAGE:</u>			
LANGUAGE	SPEAKING	READING	WRITING
English	Fluent	Fluent	Fluent
Afrikaans	Fluent	Fluent	Fluent
<u>PUBLICATIONS:</u>			
<ul style="list-style-type: none"> Retief, N.-R., Avenant-Oldewage, A., du Preez, H.H. 2006. The use of cestode parasites from the largemouth yellowfish, <i>Labeobarbus kimberleyensis</i> (Gilchrist and Thompson, 1913) in the Vaal Dam, South Africa as indicators of heavy metal bioaccumulation. <i>Physics and Chemistry of the Earth</i> 31, 840-847. Retief, N.-R., Avenant-Oldewage, A., du Preez, H.H. 2007. Ecological aspects of the occurrence of Asian tapeworm, <i>Bothriocephalus acheilognathi</i> Yamaguti, 1934 infection in the Largemouth yellowfish, <i>Labeobarbus kimberleyensis</i> Gilchrist and Thompson, 1913 in the Vaal Dam, South Africa. <i>Physics and Chemistry of the Earth</i> 32(15-18), 1384-1390. Retief, N.-R., Avenant-Oldewage, A., du Preez, H.H. 2009. Seasonal study on <i>Bothriocephalus</i> as indicator of metal pollution in yellowfish, South Africa. <i>Water SA</i> 35 (3) 315-322. 			

APPENDIX B - PLANT SPECIES LIST

Table 10-1: List of Least Concern Plant species within QDS 2730AB

Family	Taxon
Euphorbiaceae	<i>Acalypha depressinervia</i>
Euphorbiaceae	<i>Acalypha wilmsii</i>
Lamiaceae	<i>Acrotome hispida</i>
Asteraceae	<i>Adenanthellum osmitoides</i>
Asteraceae	<i>Afroaster hispidus</i>
	<i>Afroaster serrulatus</i>
Lamiaceae	<i>Ajuga ophrydis</i>
Asphodelaceae	<i>Aloe ecklonis</i>
Iridaceae	<i>Aristea torulosa</i>
Apocynaceae	<i>Asclepias aurea</i>
Apocynaceae	<i>Asclepias brevicuspis</i>
Apocynaceae	<i>Asclepias cucullata subsp. cucullata</i>
Apocynaceae	<i>Asclepias cultriformis</i>
Apocynaceae	<i>Asclepias eminens</i>
Apocynaceae	<i>Asclepias meyeriana</i>
Apocynaceae	<i>Asclepias multicaulis</i>
Asparagaceae	<i>Asparagus buehneri</i>
Asparagaceae	<i>Asparagus cooperi</i>
Asparagaceae	<i>Asparagus virgatus</i>
Apocynaceae	<i>Aspidoglossum dissimile</i>
Apocynaceae	<i>Aspidoglossum interruptum</i>
Apocynaceae	<i>Aspidoglossum ovalifolium</i>
Apocynaceae	<i>Aspidonepsis diploglossa</i>
Apocynaceae	<i>Aspidonepsis reenensis</i>
Aspleniaceae	<i>Asplenium adiantum-nigrum var. adiantum-nigrum</i>
Aspleniaceae	<i>Asplenium varians subsp. fimbriatum</i>
Asteraceae	<i>Berkheya echinacea subsp. echinacea</i>
Asteraceae	<i>Berkheya insignis</i>
Asteraceae	<i>Berkheya radula</i>
Asteraceae	<i>Berkheya rhapontica subsp. rhapontica</i>
Asteraceae	<i>Berkheya setifera</i>
Asteraceae	<i>Berkheya speciosa subsp. lanceolata</i>
Blechnaceae	<i>Blechnum australe subsp. australe</i>
Stilbaceae	<i>Bowkeria citrina</i>
Poaceae	<i>Brachiaria brizantha</i>
Scrophulariaceae	<i>Buddleja auriculata</i>
Cyperaceae	<i>Bulbostylis hispidula subsp. pyriformis</i>
Cyperaceae	<i>Bulbostylis humilis</i>
Fabaceae	<i>Calpurnia sericea</i>
Rubiaceae	<i>Cephalanthus natalensis</i>
Dipsacaceae	<i>Cephalaria zeyheriana</i>

Family	Taxon
Apocynaceae	<i>Ceropegia meyeri</i>
Pteridaceae	<i>Cheilanthes pentagona</i>
Pteridaceae	<i>Cheilanthes quadripinnata</i>
Pteridaceae	<i>Cheilanthes viridis</i> var. <i>glauca</i>
Pteridaceae	<i>Cheilanthes viridis</i> var. <i>viridis</i>
Agavaceae	<i>Chlorophytum fasciculatum</i>
Vitaceae	<i>Cissus diversilobata</i>
Cleomaceae	<i>Cleome monophylla</i>
Peraceae	<i>Clutia affinis</i>
Peraceae	<i>Clutia hirsuta</i> var. <i>hirsuta</i>
Peraceae	<i>Clutia monticola</i> var. <i>monticola</i>
Colchicaceae	<i>Colchicum melanthioides</i> subsp. <i>transvaalense</i>
Combretaceae	<i>Combretum kraussii</i>
Commelinaceae	<i>Commelina africana</i> var. <i>krebsiana</i>
Burseraceae	<i>Commiphora neglecta</i>
Campanulaceae	<i>Craterocapsa tarsodes</i>
Poaceae	<i>Ctenium concinnum</i>
Poaceae	<i>Ctenium concinnum</i>
Poaceae	<i>Ctenium concinnum</i>
Cucurbitaceae	<i>Cucumis hirsutus</i>
Cucurbitaceae	<i>Cucumis hirsutus</i>
Cucurbitaceae	<i>Cucumis hirsutus</i>
Commelinaceae	<i>Cyanotis lapidosa</i>
Commelinaceae	<i>Cyanotis speciosa</i>
Orobanchaceae	<i>Cycnium tubulosum</i> subsp. <i>tubulosum</i>
Boraginaceae	<i>Cynoglossum lanceolatum</i>
Cyperaceae	<i>Cyperus compressus</i>
Cyperaceae	<i>Cyperus congestus</i>
Cyperaceae	<i>Cyperus congestus</i>
Cyperaceae	<i>Cyperus denudatus</i>
Cyperaceae	<i>Cyperus denudatus</i>
Cyperaceae	<i>Cyperus difformis</i>
Cyperaceae	<i>Cyperus obtusiflorus</i> var. <i>obtusiflorus</i>
Lobeliaceae	<i>Cyphia elata</i>
Lobeliaceae	<i>Cyphia elata</i>
Amaryllidaceae	<i>Cyrtanthus breviflorus</i>
Thymelaeaceae	<i>Dais cotinifolia</i>
Caryophyllaceae	<i>Dianthus transvaalensis</i>
Scrophulariaceae	<i>Diclis rotundifolia</i>
Asteraceae	<i>Dicoma anomala</i> subsp. <i>anomala</i>
Asteraceae	<i>Dicoma anomala</i> subsp. <i>anomala</i>
Iridaceae	<i>Dierama insigne</i>
Iridaceae	<i>Dierama insigne</i>
Iridaceae	<i>Dierama pauciflorum</i>
Iridaceae	<i>Dietes iridioides</i>
Ebenaceae	<i>Diospyros austroafricana</i> var. <i>rubriflora</i>

Family	Taxon
Ebenaceae	<i>Diospyros lycioides</i> subsp. <i>guerkei</i>
Hyacinthaceae	<i>Dipcadi brevifolium</i>
Hyacinthaceae	<i>Dipcadi viride</i>
Fabaceae	<i>Dolichos linearis</i>
Dryopteridaceae	<i>Dryopteris athamantica</i>
Dryopteridaceae	<i>Dryopteris pentheri</i>
Cyperaceae	<i>Eleocharis limosa</i>
Gentianaceae	<i>Enicostema axillare</i> subsp. <i>axillare</i>
Equisetaceae	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>
Poaceae	<i>Eragrostis capensis</i>
Poaceae	<i>Eragrostis curvula</i>
Poaceae	<i>Eragrostis racemosa</i>
Ericaceae	<i>Erica caffrorum</i> var. <i>caffrorum</i>
Ericaceae	<i>Erica reenensis</i>
Eriocaulaceae	<i>Eriocaulon sonderianum</i>
Fabaceae	<i>Eriosema distinctum</i>
Fabaceae	<i>Eriosema kraussianum</i>
Poaceae	<i>Eulalia villosa</i>
Orchidaceae	<i>Eulophia hians</i> var. <i>nutans</i>
Euphorbiaceae	<i>Euphorbia clavarioides</i>
Euphorbiaceae	<i>Euphorbia natalensis</i>
Asteraceae	<i>Euryops gilfillanii</i>
Asteraceae	<i>Euryops transvaalensis</i> subsp. <i>setilobus</i>
Asteraceae	<i>Euryops transvaalensis</i> subsp. <i>transvaalensis</i>
Poaceae	<i>Festuca scabra</i>
Cyperaceae	<i>Fimbristylis complanata</i>
Iridaceae	<i>Freesia laxa</i> subsp. <i>laxa</i>
Asteraceae	<i>Garuleum woodii</i>
Asteraceae	<i>Gerbera viridifolia</i>
Iridaceae	<i>Gladiolus appendiculatus</i>
Iridaceae	<i>Gladiolus crassifolius</i>
Colchicaceae	<i>Gloriosa modesta</i>
Melanthaceae	<i>Greyia radlkoferi</i>
Melanthaceae	<i>Greyia sutherlandii</i>
Asteraceae	<i>Gymnanthemum corymbosum</i>
Celastraceae	<i>Gymnosporia buxifolia</i>
Orchidaceae	<i>Habenaria dregeana</i>
Orchidaceae	<i>Habenaria epipactidea</i>
Asteraceae	<i>Helichrysum adenocarpum</i> subsp. <i>adenocarpum</i>
Asteraceae	<i>Helichrysum athrixiifolium</i>
Asteraceae	<i>Helichrysum auronitens</i>
Asteraceae	<i>Helichrysum callicomum</i>
Asteraceae	<i>Helichrysum dregeanum</i>
Asteraceae	<i>Helichrysum herbaceum</i>
Asteraceae	<i>Helichrysum melanacme</i>
Asteraceae	<i>Helichrysum monticola</i>

Family	Taxon
Asteraceae	<i>Helichrysum nudifolium</i> var. <i>nudifolium</i>
Asteraceae	<i>Helichrysum opacum</i>
Malvaceae	<i>Hermannia cristata</i>
Malvaceae	<i>Hermannia depressa</i>
Malvaceae	<i>Hermannia oblongifolia</i>
Iridaceae	<i>Hesperantha coccinea</i>
Asteraceae	<i>Heteromma krookii</i>
Malvaceae	<i>Hibiscus aethiopicus</i> var. <i>ovatus</i>
Malvaceae	<i>Hibiscus microcarpus</i>
Asteraceae	<i>Hilliardiella aristata</i>
Asteraceae	<i>Hilliardiella hirsuta</i>
Asteraceae	<i>Hilliardiella nudicaulis</i>
Poaceae	<i>Hyparrhenia anamesa</i>
Poaceae	<i>Hyparrhenia filipendula</i> var. <i>filipendula</i>
Hypericaceae	<i>Hypericum aethiopicum</i> subsp. <i>aethiopicum</i>
Hypericaceae	<i>Hypericum aethiopicum</i> subsp. <i>sonderi</i>
Acanthaceae	<i>Hypoestes aristata</i> var. <i>alba</i>
Acanthaceae	<i>Hypoestes forskaolii</i>
Hypoxidaceae	<i>Hypoxis acuminata</i>
Hypoxidaceae	<i>Hypoxis filiformis</i>
Hypoxidaceae	<i>Hypoxis rigidula</i> var. <i>rigidula</i>
Convolvulaceae	<i>Ipomoea crassipes</i> var. <i>crassipes</i>
Convolvulaceae	<i>Ipomoea oblongata</i>
Cyperaceae	<i>Isolepis sepulcralis</i>
Scrophulariaceae	<i>Jamesbrittenia silenoides</i>
Juncaceae	<i>Juncus dregeanus</i> subsp. <i>dregeanus</i>
Juncaceae	<i>Juncus oxycarpus</i>
Acanthaceae	<i>Justicia anagalloides</i>
Asphodelaceae	<i>Kniphofia albescens</i>
Asphodelaceae	<i>Kniphofia laxiflora</i>
Asphodelaceae	<i>Kniphofia linearifolia</i>
Poaceae	<i>Koeleria capensis</i>
Cyperaceae	<i>Kyllinga erecta</i> var. <i>erecta</i>
Thymelaeaceae	<i>Lasiosiphon burchellii</i>
Thymelaeaceae	<i>Lasiosiphon capitatus</i>
Hyacinthaceae	<i>Ledebouria cooperi</i>
Hyacinthaceae	<i>Ledebouria marginata</i>
Hyacinthaceae	<i>Ledebouria monophylla</i>
Hyacinthaceae	<i>Ledebouria revoluta</i>
Hyacinthaceae	<i>Ledebouria sandersonii</i>
Cyperaceae	<i>Lipocarpha nana</i>
Boraginaceae	<i>Lithospermum cinereum</i>
Poaceae	<i>Lophacme digitata</i>
Asteraceae	<i>Lopholaena segmentata</i>
Asteraceae	<i>Macledium zeyheri</i> subsp. <i>zeyheri</i>
Celastraceae	<i>Maytenus acuminata</i> var. <i>acuminata</i>

Family	Taxon
Celastraceae	<i>Maytenus undata</i>
Melianthaceae	<i>Melianthus dregeanus</i> subsp. <i>insignis</i>
Fabaceae	<i>Melolobium aethiopicum</i>
Fabaceae	<i>Melolobium obcordatum</i>
Apocynaceae	<i>Miraglossum pulchellum</i>
Poaceae	<i>Miscanthus junceus</i>
Anemiaceae	<i>Mohria vestita</i>
Geraniaceae	<i>Monsonia angustifolia</i>
Iridaceae	<i>Moraea moggii</i> subsp. <i>albescens</i>
Polygalaceae	<i>Muraltia saxicola</i>
Scrophulariaceae	<i>Nemesia caerulea</i>
Asteraceae	<i>Nidorella anomala</i>
Asteraceae	<i>Nolletia rarifolia</i>
Stilbaceae	<i>Nuxia congesta</i>
Ochnaceae	<i>Ochna serrulata</i>
Hyacinthaceae	<i>Ornithogalum paludosum</i>
Orchidaceae	<i>Orthochilus welwitschii</i>
Fabaceae	<i>Otholobium nigricans</i>
Oxalidaceae	<i>Oxalis obliquifolia</i>
Apocynaceae	<i>Pachycarpus campanulatus</i> var. <i>campanulatus</i>
Apocynaceae	<i>Pachycarpus scaber</i>
Poaceae	<i>Panicum aequinerve</i>
Poaceae	<i>Panicum ecklonii</i>
Poaceae	<i>Paspalum distichum</i>
Rubiaceae	<i>Pavetta gardeniifolia</i> var. <i>gardeniifolia</i>
Malvaceae	<i>Pavonia columella</i>
Fabaceae	<i>Pearsonia grandifolia</i> subsp. <i>grandifolia</i>
Fabaceae	<i>Pearsonia sessilifolia</i> subsp. <i>sessilifolia</i>
Geraniaceae	<i>Pelargonium luridum</i>
Pteridaceae	<i>Pellaea calomelanos</i> var. <i>calomelanos</i>
Phyllanthaceae	<i>Phyllanthus glaucophyllus</i>
Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>
Apiaceae	<i>Pimpinella caffra</i>
Podocarpaceae	<i>Podocarpus latifolius</i>
Poaceae	<i>Pogonarthria squarrosa</i>
Caryophyllaceae	<i>Pollichia campestris</i>
Asteraceae	<i>Polydora angustifolia</i>
Polygalaceae	<i>Polygala gracilentia</i>
Polygalaceae	<i>Polygala hottentotta</i>
Proteaceae	<i>Protea subvestita</i>
Rubiaceae	<i>Psydrax obovata</i> subsp. <i>obovata</i>
Pteridaceae	<i>Pteris cretica</i>
Celastraceae	<i>Pterocelastrus echinatus</i>
Orchidaceae	<i>Pterygodium dracomontanum</i>
Lamiaceae	<i>Pycnostachys reticulata</i>
Cyperaceae	<i>Pycrus flavescens</i>

Family	Taxon
Cyperaceae	<i>Pycnus nitidus</i>
Ranunculaceae	<i>Ranunculus multifidus</i>
Apocynaceae	<i>Raphionacme galpinii</i>
Poaceae	<i>Rendlia altera</i>
Hypoxidaceae	<i>Rhodohypoxis baurii</i> var. <i>baurii</i>
Fabaceae	<i>Rhynchosia monophylla</i>
Cyperaceae	<i>Rhynchospora brownii</i>
Poaceae	<i>Rottboellia cochinchinensis</i>
Rosaceae	<i>Rubus rigidus</i>
Polygonaceae	<i>Rumex sagittatus</i>
Polygonaceae	<i>Rumex woodii</i>
Lamiaceae	<i>Salvia runcinata</i>
Colchicaceae	<i>Sandersonia aurantiaca</i>
Orchidaceae	<i>Satyrium cristatum</i> var. <i>longilabiatum</i>
Orchidaceae	<i>Satyrium hallackii</i> subsp. <i>ocellatum</i>
Orchidaceae	<i>Satyrium neglectum</i> subsp. <i>neglectum</i> var. <i>neglectum</i>
Dipsacaceae	<i>Scabiosa columbaria</i>
Apocynaceae	<i>Schizoglossum atropurpureum</i> subsp. <i>atropurpureum</i>
Cyperaceae	<i>Schoenoplectus brachyceras</i>
Cyperaceae	<i>Schoenoplectus decipiens</i>
Cyperaceae	<i>Schoenoplectus paludicola</i>
Anacardiaceae	<i>Searsia dentata</i>
Anacardiaceae	<i>Searsia discolor</i>
Anacardiaceae	<i>Searsia pyroides</i> var. <i>pyroides</i>
Anacardiaceae	<i>Searsia tomentosa</i>
Anacardiaceae	<i>Searsia transvaalensis</i>
Gentianaceae	<i>Sebaea leiostyla</i>
Gentianaceae	<i>Sebaea natalensis</i>
Selaginellaceae	<i>Selaginella mittenii</i>
Asteraceae	<i>Senecio achilleifolius</i>
Asteraceae	<i>Senecio affinis</i>
Asteraceae	<i>Senecio barbatus</i>
Asteraceae	<i>Senecio deltoideus</i>
Asteraceae	<i>Senecio glaberrimus</i>
Asteraceae	<i>Senecio glanduloso-pilosus</i>
Asteraceae	<i>Senecio inaequidens</i>
Asteraceae	<i>Senecio lydenburgensis</i>
Asteraceae	<i>Senecio madagascariensis</i>
Asteraceae	<i>Senecio oxyriifolius</i> subsp. <i>oxyriifolius</i>
Asteraceae	<i>Senecio polyodon</i> var. <i>polyodon</i>
Asteraceae	<i>Senecio scitus</i>
Malvaceae	<i>Sida alba</i>
Malvaceae	<i>Sida dregei</i>
Caryophyllaceae	<i>Silene undulata</i> subsp. <i>undulata</i>
Apocynaceae	<i>Sisyranthus huttoniae</i>
Apocynaceae	<i>Sisyranthus imberbis</i>

Family	Taxon
Solanaceae	<i>Solanum lichtensteinii</i>
Asteraceae	<i>Sonchus nanus</i>
Lamiaceae	<i>Stachys natalensis</i> var. <i>natalensis</i>
Lamiaceae	<i>Stachys sessilis</i>
Gesneriaceae	<i>Streptocarpus pentherianus</i>
Lamiaceae	<i>Syncolostemon concinnus</i>
Lamiaceae	<i>Syncolostemon parviflorus</i> var. <i>parviflorus</i>
Lamiaceae	<i>Syncolostemon pretoriae</i>
Fabaceae	<i>Tephrosia multijuga</i>
Fabaceae	<i>Tephrosia natalensis</i> subsp. <i>natalensis</i>
Santalaceae	<i>Thesium costatum</i> var. <i>costatum</i>
Santalaceae	<i>Thesium racemosum</i>
Acanthaceae	<i>Thunbergia atriplicifolia</i>
Asphodelaceae	<i>Trachyandra saltii</i> var. <i>saltii</i>
Juncaginaceae	<i>Triglochin milnei</i>
Iridaceae	<i>Tritonia disticha</i> subsp. <i>rubrolucens</i>
Asteraceae	<i>Ursinia alpina</i>
Fabaceae	<i>Vachellia karroo</i>
Valerianaceae	<i>Valeriana capensis</i> var. <i>capensis</i>
Rubiaceae	<i>Vangueria macrocalyx</i>
Rubiaceae	<i>Vangueria thamnus</i>
Fabaceae	<i>Vigna oblongifolia</i> var. <i>oblongifolia</i>
Campanulaceae	<i>Wahlenbergia huttonii</i>
Iridaceae	<i>Watsonia pulchra</i>
Iridaceae	<i>Watsonia watsonioides</i>
Woodsiaceae	<i>Woodsia angolensis</i>
Woodsiaceae	<i>Woodsia burgessiana</i>
Xyridaceae	<i>Xyris obscura</i>
Apocynaceae	<i>Xysmalobium involucreatum</i>
Apocynaceae	<i>Xysmalobium parviflorum</i>
Scrophulariaceae	<i>Zaluzianskya elongata</i>
Rhamnaceae	<i>Ziziphus zeyheriana</i>
Fabaceae	<i>Zornia milneana</i>

Table 10-2: List of Vulnerable Red Listed Plant Species under QDS 2730AB

Family	Taxon
Asphodelaceae	<i>Aloe kniphofioides</i>
Araceae	<i>Zantedeschia pentlandii</i>
Fabaceae	<i>Indigofera hybrida</i>

Table 10-3: List of Near Threatened Red Listed Plant Species under QDS 2730AB

Family	Taxon
Proteaceae	<i>Protea parvula</i>
Hyacinthaceae	<i>Merwillia plumbea</i>