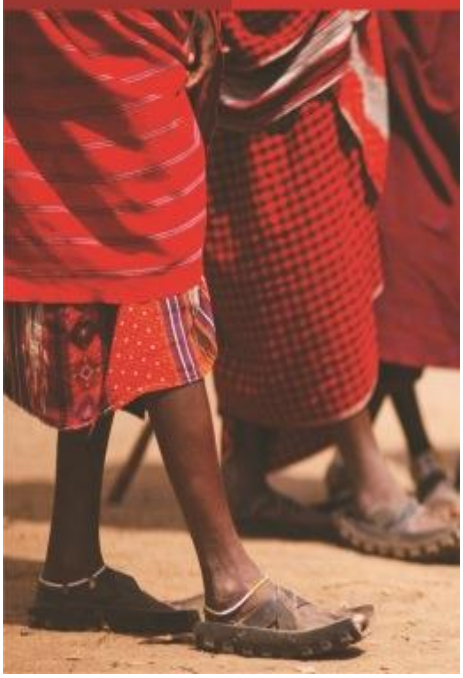

DIGBY WELLS
ENVIRONMENTAL

Environmental Impact Reporting Process for the Musina-Makhado Energy and Metallurgy Special Economic Zone Development

Fauna and Flora Impact Assessment

Project Number:

LEA5517

Prepared for:

Limpopo Economic Development Agency (LEDA)

August 2019

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Fauna and Flora Impact Assessment**
Project Name:	**Environmental Impact Reporting Process for the Musina-Makhado Energy and Metallurgy Special Economic Zone Development**
Project Code:	**LEA5517**

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EXECUTIVE SUMMARY

Digby Wells Environmental (hereinafter Digby Wells) has been requested by the Limpopo Economic Development Agency (hereinafter LEDA) to complete a biodiversity impact assessment (fauna and flora) as part of the Scoping and Environmental Impact Reporting process for the Musina-Makhado Energy and Metallurgy Special Economic Zone (SEZ) Development.

Musina-Makhado SEZ will be specifically designated to focus on energy and metallurgical processing, agro-processing, petrochemical, and logistics. This SEZ will compromise of a connected pipeline of a minimum of eight catalytic projects.

This proposed SEZ will be located across the Musina and Makhado local municipalities which fall under the Vhembe District Municipality in the Limpopo Province. The nearest towns are Makhado (located 31 km south) and Musina (located 36 km north) of the proposed SEZ site. It will be established across eight farms. The total farm sizes add up to approximately 8000 ha of which 6000 ha will be used for the SEZ.

The proposed project will compromise of an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical components will initially comprise of power, steel, stainless steel, coking, ferrochrome, ferromanganese, ferrosilicon, pig iron metallurgy and lime plants amongst other things.

The EIA regulations No. 324, 325, 326 and 327 (of April 2017), promulgated in terms of section 24(5) of the National Environmental Management Act, (No. 107 of 1998) determine that an EIA process should be followed for certain listed activities (which might have a detrimental impact on the environment) and applications submitted to the competent authority for consideration. The following activities pertaining to the fauna and flora specialist report with special reference to proposed activities listed in EIA Regulations were considered:

Activity 27 of GNR 327 LN 1: Cumulative removal of indigenous vegetation, for the development of infrastructure and cultivated areas, will account for more than 20 ha.

Activity 12 of GNR 324 LN 3: The vegetation of the proposed development site meets the definition of indigenous vegetation, as contained in the EIA Regulations, 2014 (as amended).

Removal of indigenous vegetation, in an area that traverses a Limpopo Conservation Plan v2 (LCPv2) Critical Biodiversity Area (CBA) 2 for the development of the 18 day storage Dam will account for more than 300 m^2.

This specialist component serves to undertake a flora and fauna assessment of the proposed SEZ project, comprising of scoping and impact assessment reports. This document specifically aims to address the environmental impact assessment requirements. Upon the completion of a field survey by a suitably qualified Digby Wells specialist, the respective ecosystems were delineated, and the current ecological status or health of the delineated systems characterized.

The project is located in areas classified as Musina Mopane Bushveld (SVmp 1) on the plains and Limpopo Ridge Bushveld (SVmp 2) on the scattered ridges and outcrops.

The area earmarked for the SEZ is not located within either a formal or informal protected area and is listed as a least threatened ecosystem and not protected.

The project area traverses large transects of areas designated as Ecological Support Areas 1 (ESA1). Furthermore, certain portions of the site traverse an area designated as CBA2.

During the infield assessment a total of four species of conservation concern were identified, including one species listed as a schedule 12 Threatened Plant Species, in terms of LEMA (2014) and four species listed as Protected according to the National Forest Act (National Forest Act, 1998). In addition, ten alien invasive plant species were recorded, of which five fall under category 1b of NEM: BA. Five indigenous plant species, which tend to become a problem in terms of encroachment, were recorded during the infield assessment.

Seventeen mammal species were identified during the infield assessment, representing a diverse community. This includes three species listed according to the IUCN Red List of Threatened species, and one species with regional status. A total of 26 avifauna species were identified, of which none are protected. Of the12 herpetofauna species identified, none are SSC. Nineteen invertebrate species were recorded including the Rear Horned Baboon Spider which is commercially protected.

Within the planned infrastructure areas there are sensitive features and habitats as well as numerous listed and protected species and it is anticipated that these will be impacted. The Impact ratings are included in the table below.

Issues and impacts	Construction Phase		Operational Phase		Decommissioning Phase	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Impact 1.1: Loss of Natural Habitat and SSC						
1: Loss of Mopane Bushveld	Major	Moderate	N/A	N/A	N/A	N/A
2: Loss of Ridge Bushveld	Major	Moderate	N/A	N/A	N/A	N/A
3: Loss of Riparian Vegetation	Major	Moderate	N/A	N/A	N/A	N/A
4: Loss of Floral SSC	Major	Moderate	N/A	N/A	N/A	N/A
5: Loss of Faunal SSC	Major	Moderate	N/A	N/A	N/A	N/A
Impact 1.2: Loss of Loss of Ecological services						
6: Loss of Wetlands and Riparian Habitat services	Moderate	Moderate	N/A	N/A	N/A	N/A
Impact 1.3: Indirect Impact to Natural Areas						
7: Road deaths of animals, dust creation.	Moderate	Moderate	N/A	N/A	N/A	N/A
Impact 2.1: Habitat loss and continual pressure on the ecosystem and species						
8: Impacts on remaining species	N/A	N/A	Moderate	Minor	N/A	N/A
Impact 2.2: Pollution and Waste Generation	N/A	N/A	Moderate	Minor	N/A	N/A
Impact 2.3: AIP infestation						
9: Further reduction of natural Habitat	N/A	N/A	Moderate	Minor		
Impact 3.1: Habitat loss and continual pressure on the ecosystem and species						
10: Clearing of infrastructure	N/A	N/A	N/A	N/A	Moderate	Minor
11: Road deaths	N/A	N/A	N/A	N/A	Moderate	Minor
Impact 3.2: Impacts due to correct rehabilitation practices						
Improvement of Natural Habitat	N/A	N/A	N/A	N/A	Positive	Positive

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1 Introduction

Biodiversity is defined as "*the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems*" according the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2014) (NEMBA). The NEMBA legislation upholds the country's commitment to the protection of South Africa's biological resources and it is imperative that development takes place in a sustainable way to achieve this. South Africa is an exceptionally diverse country, one of the most biologically diverse in the world, which is largely due to the species diversity and endemism of the vegetation.

Designated by the Department of Trade and Industry in July 2016, the Musina-Makhado Special Economic Zone (SEZ) comprises two sites. The southern site is a greenfield site earmarked for the development of an energy and metallurgical cluster for the production of high-grade steel. This southern site is located on eight farms overlapping the border between the Makhado and Musina local municipalities, within the Vhembe District Municipality, and is the subject of this report.

An SEZ refers to an economic development tool to promote national economic growth and export by using dedicated support measures that are strategically placed to attract targeted foreign and domestic investment (Republic of South Africa, 2014:8). To this end, Digby Wells has been appointed by the Limpopo Economic Development Agency (LEDA) to carry out a biodiversity assessment (fauna and flora) of the site as part of the environmental impact assessment (EIA) process.

The aim of this specialist study is to characterize and describe the terrestrial environment, habitats, and species that are present on site and provide an assessment of the likely impacts of the development at the site.

The high-level terms of reference (ToR), is to complete an assessment to comply with the national legislative process in support of the EA process, for this assessment include the following aspects:

- To assess and detail the potential impacts of the proposed development on the fauna and flora at the site;
- To identify and rate the significant impacts and cumulative impacts of the proposed development;
- To outline the mitigation measures and other procedures that would reduce the potential impacts of the proposed development and propose additional management guidelines.

The detailed ToR will be discussed below.

1.1 Project Background

The proposed Musina-Makhado SEZ will be specifically designated to focus on energy and metallurgical processing, agro-processing, petrochemical, and logistics. This SEZ will compromise of a connected pipeline of a minimum of eight catalytic projects.

It will be established across eight farms. The total farm sizes add up to approximately 8000 ha of which 6000 ha will be used for the SEZ.

The proposed project will comprise of an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical complex will initially comprise of power, steel, stainless steel, coking, ferrochrome, ferromanganese, ferrosilicon, pig iron metallurgy and lime plants amongst other things. The project components are listed in Table 1-1 and displayed in Figure 1-1 below. The exact location of each of these components were not known at the time of completing the field work component for this report.

Table 1-1: Project Components

Project Component	Area (ha)	Capacity (Mtpa)
Power Plant	300	3
Coke Plant	500	5
Ferrochromium Plant	500	3
Ferromanganese Plant	100	1
Pig Iron Plant	600	6
Carbon Steel Plant	200	2
Stainless Steel Plant	500	4
Lime Plant	500	8
Silicon-Manganese Plant	100	0.5
Metal Silicon Plant	50	0.3
Calcium Carbide Plant	50	0.3
Infrastructure	2600	
Total	**6000**	

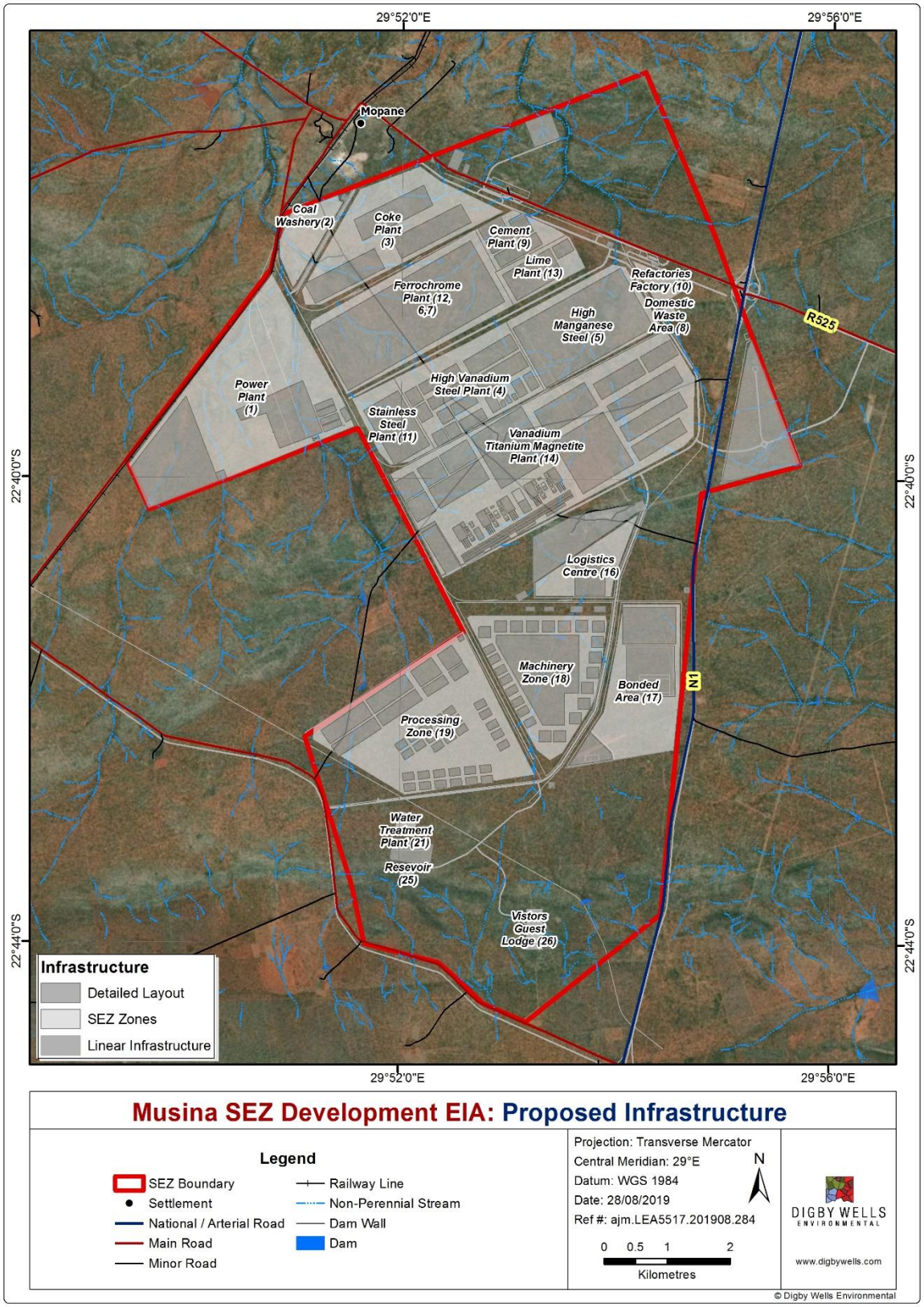

Figure 1-1: Proposed Infrastructure Plan

2 Terms of Reference

Digby Wells was commissioned by LEDA to complete a biodiversity impact assessment (fauna and flora) as part of the Scoping and Environmental Impact Reporting process for the Musina-Makhado Energy and Metallurgy SEZ Development. This study addresses and adheres to the following regulations and regulatory procedures of the Department of Environmental Affairs:

- Section 21 of the Environment Conservation Act (Act 73, 1989);
- Section 24 of the Constitution – Environment (Act 108 of 1996);
- The National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA);
- The National Environmental Management Act (Act 107 of 1998);
- The National Environmental Management: Protected Areas Act (Act 57 of 2003)
- Limpopo Environmental Management Act (Act No. 7 of 2003) (LEMA); and
- Limpopo Conservation Plan Version 2 (2013).

This specialist component serves to undertake a flora and fauna assessment of the proposed SEZ project site, comprising of scoping[1] and impact assessment[2] reports. This document specifically aims to address the environmental impact assessment requirements after detailed field work was completed. The field surveys allowed for the respective ecosystems to be delineated and the current ecological status or health of the delineated systems to be characterised. In addition, to be able to describe the terrestrial environment, habitats, and species that are present on site and an assessment of the likely impacts of the development at the site provided.

To achieve these objectives, the following components are included:

- Delineate various ecosystems;
- Determine vegetation types and community structures;
- Determine faunal communities;
- Identify Red Data Species occurring or possibly occurring within the vegetation types present in the project area;

[1] The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision-making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

2 Issues that cannot be resolved during scoping and that require further investigation are taken forward into the impact assessment. Depending on the amount of available information, specialists may be required to assess the nature, extent, duration, intensity or magnitude, probability and significance of the potential impacts; define the level of confidence in the assessment; and propose management actions and monitoring programs.

- Identify and describe habitat/landscape patterns;
- Produce maps depicting all biophysical attributes recorded;
- Identify and describe the significance of potential impacts as well as impact mitigations; and
- Determine the conservation value and regional significance of the area.

3 Listed Activities

The EIA Regulations (GN R 982 as amended by GN R 326 of April 2017), promulgated in terms of Section 24(5) of the NEMA determines what Environmental Authorisation (EA) process should be followed for certain listed activities (which might have a detrimental impact on the environment, and applications submitted to the competent authority for consideration). According to GN R 327, the purpose is to "*regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing, and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto*". Activities pertaining to the fauna and flora specialist report, with special reference to the proposed activities that are listed in the EIA Regulations, are summarized in Table 3-1.

Table 3-1: The following activities pertaining to the fauna and flora specialist report, with special reference to the proposed activities, are listed in the EIA Regulations

Notice No	Listing No.	Activity No.	Activity Description	Describe each listed activity as per project description
GNR 327	Notice 1	28	Industrial developments where such land was used for agriculture, game farming. (ii) will occur outside and urban area, where the total land to be developed is larger than 1 ha.	Cumulative removal of indigenous vegetation, for the development of infrastructure, will account for more than 1 ha.
GNR 324	Notice 3	12	The clearance of an area of 300 m^2 or more of indigenous vegetation, except where such clearance is required for maintenance purposes, are undertaken in accordance with a maintenance plan. e. Limpopo ii. Critical biodiversity areas (CBA 2)	The vegetation of the proposed development site meets the definition of indigenous vegetation, as contained in the EIA Regulations, 2014 (as amended). Removal of indigenous vegetation, in an area that traverses a Limpopo Conservation Plan (2013) CBA Critical Biodiversity Area 2, for the development of the project does account for more than 300 $m^{2.}$ Thus, this activity will be triggered and require authorization.

4 Legal and Regulatory Framework

South Africa has a number of different sets of legislation in place for the protection of the environment and conservation of biodiversity. The process of any development outside of particular zoned areas is regulated by this legislation and will be considered in terms of its impact on this particular development. This legislation is summarized in Table 4-1.

Table 4-1: Legislation of relevance to this study

Legislation	Applicable legislation requirements	Relevance to the applicant
Constitution of the Republic of South Africa (Act No.108 of 1996)	Section 24: Environmental Rights for All	Everyone has the right: ■ To an environment that is not harmful to their health or well-being; and ■ To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – ■ Prevent pollution and ecological degradation; ■ Promote conservation; and ■ Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Section 24 of the constitution enshrines environmental rights in South Africa as a whole and the Limpopo Economic Development Agency should note the protection of the environment in the Bill of Rights, especially in relation to justifiable economic and social development.
	Section 32: Access to information	Everyone has the right of access to: ■ Any information held by the state (unless it is information that is explicitly excluded by the Promotion of Access to Information Act, 2000 (Act 2 of 2000); ■ Any information held by another person and that is required for the exercise or protection of any rights.

Legislation	Applicable legislation requirements	Relevance to the applicant
		This is further extended by NEMA, Section 2(4)(k) of the NEMA specifically provides that "decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law". The Limpopo Economic Development Agency will make all information required to the public when required
	Section 33: Administrative Justice	Everyone has the right to administrative action that is lawful, reasonable and procedurally fair. Everyone whose rights have been adversely affected by administrative action has the right to be given written reasons. National legislation must be enacted to give effect to these rights, and must - (a) provide for the review of administrative action by a court or, where appropriate, an independent and impartial tribunal; (b) impose a duty on the state to give effect to the rights in subsections (1) and (2); and (c) promote an efficient administration This section of the Constitution guarantees that administrative action will be reasonable, lawful and procedurally fair, and it makes sure that people have the right to ask for written reasons if and when administrative action has a negative impact on them, thus the Applicant. The provisions of NEMA and its Regulations dictate the manner in which environmental authorization processes are undertaken and decisions are made. These are applicable to the current application.
	Section 38 Enforcement of Rights and	Section 38 of the Constitution promotes the enforcement all constitutional rights, including the section 24 environmental right.

Legislation	Applicable legislation requirements	Relevance to the applicant
	Administrative Review	In the context of this report the section 38 provisions on *locus standi* have been extended by section 32 of NEMA which states that :'Any person or group of persons may seek appropriate relief in respect of any breach or threatened breach of any provision of this Act, including a principle contained in Chapter 1, or any other statutory provision concerned with the protection of the environment or the use of natural resources".
NEMA Environmental Impact Assessment (EIA) Regulations of 2014		The EIA Regulations, GNR 982 of 4 December 2014, Regulation 21-26, and Regulation 39-44 set out the process required to undertake the Scoping and EIA Process including the public participation process to be undertaken as part of the EIA. As part of this project, a Scoping and EIA Study is being followed in terms of the EIA Regulations. This report forms part of the scoping phase of the EIA being undertaken. This document serves as the Scoping Phase Report for the EIA process
National Environmental Management Act (NEMA) (Act No. 107 of 1998)	Section 2: Chapter 1	Chapter 1 contains a set of principles that guide development and state that environmental management must place people and their needs at the forefront of its concern and serve their physical, psychological, developmental, cultural and social interests equitably. Sustainable development must consider relevant factors such as the following: ■ That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ■ That the development, use, and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardized;

Legislation	Applicable legislation requirements	Relevance to the applicant
		■ That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and ■ That negative impacts on the environment and on people's environmental rights are anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.
	Section 2: Chapter 5	Chapter 5 specifically deals with integrated Environmental Management and addresses the authorisation of activities that are likely to be detrimental to the environment (activities listed in the Environmental Impact Assessments (EIA) Regulations, 2014). These authorisations are considered on the basis of EIA procedures. Biodiversity impact assessment is a sub-discipline of the EIA that is utilized to identify, quantify and evaluate the impacts of a project to biodiversity. The principles of NEMA have been considered. This Scoping Report aims to scope the potential environmental impacts that need to be investigated as part of the environmental impact assessment and is prepared in compliance with NEMA.
National Environmental Management Biodiversity Act (NEM:BA) (Act No. 10 of 2004)		Although NEM:BA makes no express reference to the CBD, this Act's objectives mirror those of the Convention on Biological Diversity and its provisions seek to implement CBD objectives at a national level by providing for the following: ■ Management and conservation of South Africa's biodiversity within NEMA's framework; ■ Usage of indigenous biological resources in a sustainable manner; ■ Fair and equitable sharing among stakeholders of the benefits arising from bio-prospecting involving indigenous biodiversity;

Legislation	Applicable legislation requirements	Relevance to the applicant
		■ Protection of species and ecosystems that warrant national protection; and ■ Establishment and functions of the South African National Biodiversity Institute (SANBI). NEM:BA restricts activities on protected species via its associated Threatened or Protected Species Regulations (TOPS) and also provides for any activity (which must be identified in terms of this Act) which may impact on these species. In addition to this the Alien and Invasive Species Regulations (GNR 506 of 2013), promulgated in terms of Section 97(1) of NEM:BA apply as well as Alien Invasive Regulations (2014) and the Invasive Species List (2018). A biodiversity survey was undertaken for the project area. This survey recorded protected species present and determined the impact of the project on ecology. Disturbance of the protected species identified within the proposed project area requires a license to disturb protected flora and will be obtained from the Limpopo Economic Development, Environment and Tourism (LEDET). Protected flora outside of the areas to be disturbed will be marked and left intact as far as possible.
National Forests Act (NFA) (Act No. 84 of 1998)		The National Forests Act (NFA) (Act No. 84 of 1998) provides for the protection of particular trees, a particular group of trees, particular woodland or trees belonging to a particular species by way of a declaration by the Minister of the Department of Agriculture, Forestry and Fisheries (“DAFF”) – which is the custodian of all natural forest resources within the borders of the Republic of South Africa. According to Section 15 of the NFA, the effect of this declaration means that no individual or persons may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport purchase, sell, donate any protected tree, unless under a license or in terms of an exemption.

Legislation	Applicable legislation requirements	Relevance to the applicant
		The project construction activities would avoid removal of protected trees as far as possible. In instances where it cannot be avoided, a permit for removal will be obtained from DAFF.
National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA)	Section 50(5)	Section 50(5) of NEM: PAA states that no development may be permitted in a nature reserve or World Heritage Site without the prior written consent and approval of the management authority. The project area does not traverse a nature reserve, but it is in proximity to the Avarel private nature reserve.
Limpopo Environmental Management Act (Act no. 7 of 2003)(LEMA)	Schedule 8, 11 and 12	The Limpopo Environmental Management Act (LEMA) was compiled to consolidate and amend the environmental management of the Limpopo Province. This act includes regulations which call for the protection of indigenous plants and animals which require a permit from the provincial authority for its picking, selling, removal, donation, and/or export in the province. The list of protected plants and animals are itemised under Schedule 8, 11 and 12. A terrestrial biodiversity survey was undertaken to determine if any of the listed species are located within the project area. As these are present, removal permits will have to be submitted to LEDET.

4.1.1 Species Legislation

Red Data Books or RDBs, are lists of threatened plants and animals specific to a certain region. They are a vital source of information in guiding conservation decisions. South Africa has produced five RDBs dealing with each of the following: birds, land mammals, fish (freshwater and estuarine only), reptiles and amphibians, and butterflies.

The conservation status of a plant or animal species is described by the following terms:

- EXTINCT: a species for which there is a historical record, but which no longer exists in the area under review;
- ENDANGERED: a species in danger of extinction, and whose survival is unlikely if the factors causing its decline continue;
- VULNERABLE: a species which it is believed will move into the endangered category if the factors causing its decline continue; and
- RARE: a species with small populations, which are not yet vulnerable or endangered, but which are at risk.

The term **THREATENED** is commonly used as a collective description for species which are endangered, vulnerable or rare.

Some species are **ENDEMIC,** i.e. they are restricted to one region and occur nowhere else. A threatened endemic is a conservation priority.

Of special concern were protected plant and animal species. Listed species of flora and fauna are regarded as species whose representation in the wild has declined to such an extent that drastic action is needed to ensure their survival. Under anthropogenic pressure, the number of these species has reached levels where preservation management is needed, and conservation management will no longer be effective. The listing of these species under either International Union for the Conservation of Nature (IUCN) or CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), is regarded as a valuable starting point to initiate legally sanctioned management practices to bring the numbers of these species back to within acceptable numbers.

4.1.1.1 IUCN

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered, and Vulnerable). The IUCN Red List also includes information on plants and animals that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient); and on plants and animals that are either close to meeting the threatened thresholds or that would be threatened

were it not for an ongoing taxon-specific conservation programme (i.e., are Near Threatened). Abbreviations and descriptions of each IUCN category are summarized in Table 4-2 below.

Plants and animals that have been evaluated to have a low risk of extinction are classified as Least Concern (IUCN.org) (Figure 4-1)

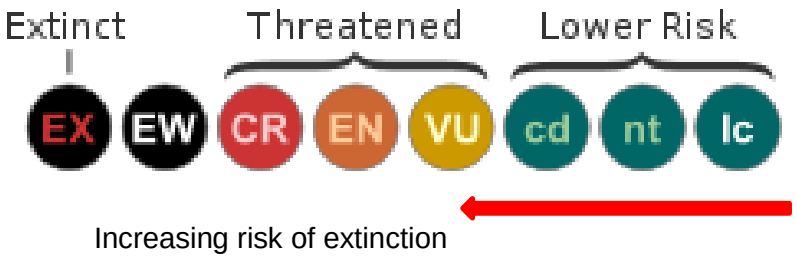

Figure 4-1: IUCN categories

The figure above shows the Current IUCN Red List categories. These categories include categories Critically Endangered (CR), Endangered (EN), and Vulnerable (VU), which are collectively known as the Threatened category, Conservation Dependent (CD), Near Threatened (NT), and Least Concern (LC) which are collectively known as Lower Risk.

Table 4-2: Description of IUCN Categories

IUCN Category	Abbreviation	Description
Extinct	EX	No surviving individuals of the species
Extinct in The Wild	EW	Known only to survive in captivity, or as a naturalized population outside its historic range.
Critically Endangered	CR	At a very high risk of extinction.
Endangered	EN	High risk of extinction in the wild.
Vulnerable	VU	High risk of endangerment in the wild.
Near Threatened	NT	Likely to become endangered in the near future.
Least Concern	LC	Lowest risk. Does not qualify for a more at-risk category
Data Deficient	DD	Not enough data to make an assessment of its risk of extinction.

IUCN Category	Abbreviation	Description
Not evaluated	NE	Has not yet been evaluated against the criteria.

4.1.1.2 CITES

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) 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 (CITES.org).

CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export, and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species (CITES.org). Specimens are divided into the following appendices according to the restriction on trade.

Appendices I, II and III

- Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances;
- Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival; and
- Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade. Changes to Appendix III follow a distinct procedure from changes to Appendices I and II, as each Party is entitled to make unilateral amendments to it.

4.1.1.3 TOPS Regulations

The Threatened or Protected Species Regulations 152 of 2007 ("TOPS Regulations") and the Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (TOPS Lists) were published in 2007, in terms of the NEM: BA (South Africa, 2007(a) and (b)).and have been amended a couple of times since then. These regulations through NEM: BA Chapter 4 provides for the protection and sustainable use of listed Threatened or Protected Species (TOPS) species. NEM: BA restricts activities that may be carried out in respect of Threatened or Protected Species (TOPS).

Chapter 4, part 2 of NEM: BA provides for the listing of fauna and flora as Threatened or Protected Species. If a species has been listed as being threatened it is further classified as

Critically Endangered, Endangered, or Vulnerable. In terms of section 56 of chapter 4 part 2 of NEM:BA:

- The Minister may, by notice in the Gazette, publish a list of-
  - **Critically Endangered species**, being any indigenous species facing an extremely high risk of extinction in the wild in the immediate future;
  - **Endangered species**, being any indigenous species facing a high risk of extinction in the wild in the near future, although they are not a critically endangered species;
  - **Vulnerable species**, being any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future, although they are not a critically endangered species or an endangered species; and
  - **Protected species**, being any species which are of high conservation value or national importance or require regulation in order to ensure that the species are managed in an ecologically sustainable manner.

In terms of Section 57(1):

- A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species (TOPS) without a permit. Restricted activities include those activities that have a direct impact on listed species such as:
  - hunt;
  - catch;
  - collect;
  - pick;
  - chop off;
  - damage or destroy;
  - import to or export from Republic;
  - possess, keep or exercise physical control over; breed or propagate; convey or translocate; import, export, sell or buy, receive or donate; or
  - any other prescribed activity involving a specimen of a listed threatened or protected species.

Provincial authorities are responsible for permit applications as required by TOPS.

5 Details of the Specialist

This Specialist Report has been compiled by the following specialists:

- **Rudi Greffrath** is Digby Wells' terrestrial biodiversity (fauna and flora) manager. He has a National diploma and B-tech in Nature Conservation from Nelson Mandela Metropolitan University's George Campus and is affiliated to the South African Council for Natural Scientific Professions as a Professional Natural Scientist in the field of practice Conservation Science, registration number is 400018/17. Rudi has several years' experience in the environmental consulting field specifically in the terrestrial ecology within the Highveld grasslands and Savanna regions of southern and central Africa and the forest regions of central and west Africa. He specialises in fauna and flora surveys, biodiversity surveys, environmental management plans, environmental monitoring, and rehabilitation for projects in accordance with the International Finance Corporation (IFC) and World Bank. Rudi has gained experience working throughout Africa specifically Sierra Leone, Ghana, Mali, Botswana, DRC Congo, Namibia, and Cote D'Ivoire.

Table 5-1: Details of the Specialist(s) who prepared this Report

Responsibility	**Report Writer**
Full Name of Specialist	Rudi Greffrath
Highest Qualification	B-Tech Environmental Conservation

5.1 Declaration of the Specialists

I, Rudi Grefratth, as the appointed environmental assessment practitioner ("EAP"), hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I, in terms of the general requirement to be independent:

- am independent, and other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity;
- am fully aware of and meet all the requirements of Regulation 13, and that failure to comply with any the requirements may result in disqualification;
- have reviewed/will review all the work undertaken by the EAP;
- have disclosed/will disclose, to the applicant, the EAP, the specialist (if any), the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offense in terms of regulation 48 of the 2014 NEMA EIA Regulations

Signature of the specialist

Rudi Greffrath

Full Name and Surname of the specialist

Digby Wells Environmental

Name of company

17-08-2019

Date

6 Methodology and Scope of Work

6.1 Desktop Assessment

Desktop studies relating to the vegetation (trees, shrubs, grasses, and forbs as well as exotic and invader species) were completed to gather and assess all available literature and information for the study area. The purpose of the literature study was to gather and summarize all relevant information regarding the natural environment to identify areas or species of possible concern that could be present on site and would necessitate focused effort. In addition, the available information was used to understand the broad environmental setting of the proposed project area. At the time of the desktop assessment, no data detailing the location of any infrastructure was available.

6.2 Vegetation Survey

A single season targeted field assessment was conducted by a suitably qualified Digby Wells fauna and flora specialist during the flowering season (February). This was carried out to assess the status of biodiversity and provide an actual indication of species present within selected releve's completed on site which is discussed in the context of plant communities within the ecosystem of the area.

During the infield vegetation assessment, trees, shrubs, grasses, and herbs (forbs) were recorded using the Braun-Blanquette method (Braun-Blanquette 1964).

A floristic survey was conducted during the growing season (the rainy season when most plants are in flower or seeding) to determine the species composition of the area of interest. This gave an indication of the actual species present on site and these are discussed in the context of plant communities within the ecosystem of the project area. The plant communities are described according to their size (ha) and relative sensitivity. All good condition natural vegetation is indicated as sensitive.

The protected, endemic, exotic, alien invasive and culturally significant species are discussed as separate issues and related back to relevant legal requirements. These attributes are also discussed in the context of plant communities.

The field work methodology was used was used and the following to be compiled:

- Vegetation classification regarding plant communities within the area and sub communities and variations of these;
- Species list for each plant community, including diagnostic and dominant species;
- Invasive species (if present) for each plant community;
- Exotic species (if present) for each plant community;
- Protected and/or endemic species for each plant community; and
- Culturally significant plant species within each community.

The quantity and location of sampling sites or plots were finalised prior to field work commencing. Sampling points were stratified according to soil form, terrain type, land type and aspect. These physical features provide a diversified habitat, which is responsible for the differentiation of vegetation types into homogenous units. The physical size of the stratified vegetation sample plots was 20 m x 20 m, which is the accepted size for a savannah biome sample plot. The quantity of vegetation sampling plots is a product of the physical size of the homogenous units identified, with large units containing proportionally more sampling points than small units.

6.3 Vegetation Mapping

Using the vegetation types as defined by the analyses as well as the aerial imagery, the vegetation of the site was mapped.

6.4 Faunal Survey

One in-depth study of faunal species (both vertebrate and invertebrate) was conducted concurrently with vegetation surveys. In support of this, a detailed desktop study was also conducted for all faunal species previously recorded on site. This information can be found in the relevant scoping report. All fauna species encountered on site were identified and recorded.

6.4.1 Mammals

Small mammals were sampled through Sherman trapping, opportunistic sightings, tracks, dung and refuge examination. Large mammals were recorded using motion sensitive cameras, scats, tracks, and nesting or breeding sites such as burrows and dens. Scats and tracks found during active searches were photographed alongside a scale and identified. For identification purposes, the field guides used include Smither's Mammals of Southern Africa (Apps, 2012), The Mammals of the Southern African Sub-region (Skinner and Chimimba, 2005), and the Red Data Book of the Mammals of South Africa (Friedman and Daly 2004).

All wetland and riverine areas were surveyed for Rough-haired Golden Mole (*Chrysospalax villosus*), Spotted Necked Otter (*Lutra maculicollis)* and African Marsh Rat (*Dasmys incomtus)*.

Targeted surveys were completed for Juliana's Golden Mole (*Neamblysomus julianae*), with the purpose of identifying any individuals that could be present as well as their preferred habitat.

The presence of bat roosting sites was investigated through a search for caves, crevices and other suitable habitat types.

6.4.2 Avifauna

Transect surveys and random point surveys were the principal ornithological field survey techniques used. Transect surveys were planned based on representative sites of different avifauna habitat, such as pans, dams, wetlands, agricultural fields, woodlands and open

grassland by simply following available roads and paths that transect over these habitat types. Transect procedures involve slow attentive walks along transects during which any bird seen or heard is identified and recorded. This was completed during diurnal surveys only.

The following was recorded:

- All birds encountered or noted during the survey;
- All birds observed by people residing in the study area; and
- A list of rare and endangered species expected and encountered.

Visual identification of birds was used to confirm bird calls where possible. Bird species were confirmed using Roberts Bird Guide of Southern Africa, second edition (Chittenden, 2016).

Assessments incorporated suitable habitat in and around the proposed development site, to a distance that is appropriate to the spatial requirements and movement patterns of potential SSC. Where distribution and habitat availability suggest a high probability of one or more priority and Red List bird species occurring on site, the suitable habitat was mapped and probability of individuals occurring here was calculated.

6.4.3 Herpetofauna (Reptiles and Amphibians)

Herpetofauna includes reptile and amphibian species. Trapping was completed within preferred habitat present in the project area and included drift arrays and pitfall traps. Direct/opportunistic observations were conducted along trails or paths within the study area. Any herpetofauna species seen or heard along such paths or trails within the study area were identified and recorded. Another method used was refuge examinations using visual scanning of terrains to record smaller herpetofauna species that often conceal themselves under rocks, in fallen logs, rotten tree stumps, in leaf litter, rodent burrows, ponds, old termite mounds.

6.4.4 Invertebrates

Invertebrates were caught using sweep netting. Direct/opportunistic observations were conducted along trails or paths within the study area. Identification of any recorded macro-invertebrates was completed to the lowest taxonomic levels using current macroinvertebrate identification keys based on the methods of Picker *et al.* (2002), with slight modifications.

6.4.5 Red Data Faunal Assessment

Using baseline data available for the site (SEZ) as well as data from the Animal Demographic Unit (ADU) Virtual Museum database (http://vmus.adu.org.za) at a desktop level, a list of Red Data faunal species that could potentially occur on site was compiled during the scoping phase. This was used to aid identification and confirm the presence of these species during the infield assessment. The IUCN Red Data categories (2019) were used for the status identification of mammals, birds, reptiles, amphibians and invertebrates globally.

6.5 Sensitive Areas

All sensitive areas, as described by the provincial and national legislation, were identified. The locality and extent, as well as species composition of sensitive areas such as the wetlands or pans, streams, rivers, and rocky outcrops, were investigated in order to identify and map all such sensitive areas present. Sensitive ecosystems as listed by NEM:BA (2004) and ratified by the minister in December 2011, were identified and delineated where present.

Ridges were specifically sought out to describe the fauna and flora present. The impact expected on the ridges was assessed and all ridges were designated as ecologically sensitive.

7 Impact Assessment Methodology

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts have been identified, a numerical environmental significance rating process will be undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental impact.

The severity of an impact is determined by taking the spatial extent, the duration, and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures will be incorporated into the EMP.

Details of the impact assessment methodology used to determine the significance of physical, biophysical, and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration, and probability are each rated out of seven as indicated in Table 7-2. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation has been applied. The post-mitigation impact is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 7-3).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 7-1: Impact assessment parameter ratings

Rating	Intensity/ Irreplaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and/or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur.>65 but <80% probability.

Rating	Intensity/ Irreplaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational lifespan of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/items of cultural significance.	Average to intense natural and/or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/ Irreplaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local including the site and its immediate surrounding area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited extending only as far as the development site area.	Short term: Less than 1 year and is reversible.	Rare/improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/ Irreplaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and/or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 7-2: Probability/consequence matrix

Significance																																						
-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

Table 7-3: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in a positive medium to the long-term effect on the natural and/or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short-term effects on the natural and/or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development from being approved. These impacts will result in a negative medium to short-term effects on the natural and/or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in a negative medium to the long-term effect on the natural and/or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

8 Assumptions and Limitations

Whilst every effort is made to cover as much of the site as possible, representative sampling is completed and by its nature, it is possible that some plant and animal species that are present on site were not recorded during the field investigations.

The properties adjacent to the project area farms were investigated from a sensitivity perspective as far as was possible within the 200 m buffer zone. These efforts were hampered due to access issues to certain properties.

9 Existing Environment

One of the central precepts of ecology is striving for a concise understanding of the factors driving community composition patterns and variations across various spatial scales and along environmental gradients (Arellano et al., 2016; Kraft *et al*., 2011). This understanding is of critical importance for appropriate land management that promotes biodiversity to be affected. The general consensus in the ecological community is that vegetation distribution is determined by climate at regional scales, land use and soil type at landscape scales, and soil type and biotic interactions at the site scale (Pearson and Dawson 2003). The variation in species as a whole comes about primarily as the result of a wide range of climatic conditions, pedology, geology and topographic variation, which give rise to relatively distinctive biomes, each with characteristic plant and animal species.

9.1 Locality

This proposed SEZ will be located across the Musina and Makhado local municipalities which fall under the Vhembe District Municipality in the Limpopo Province. The nearest towns are Makhado (located 31 km south) and Musina (located 36 km north) of the proposed SEZ site. Refer to Figure 9-1 and Figure 9-2 for the regional and local settings.

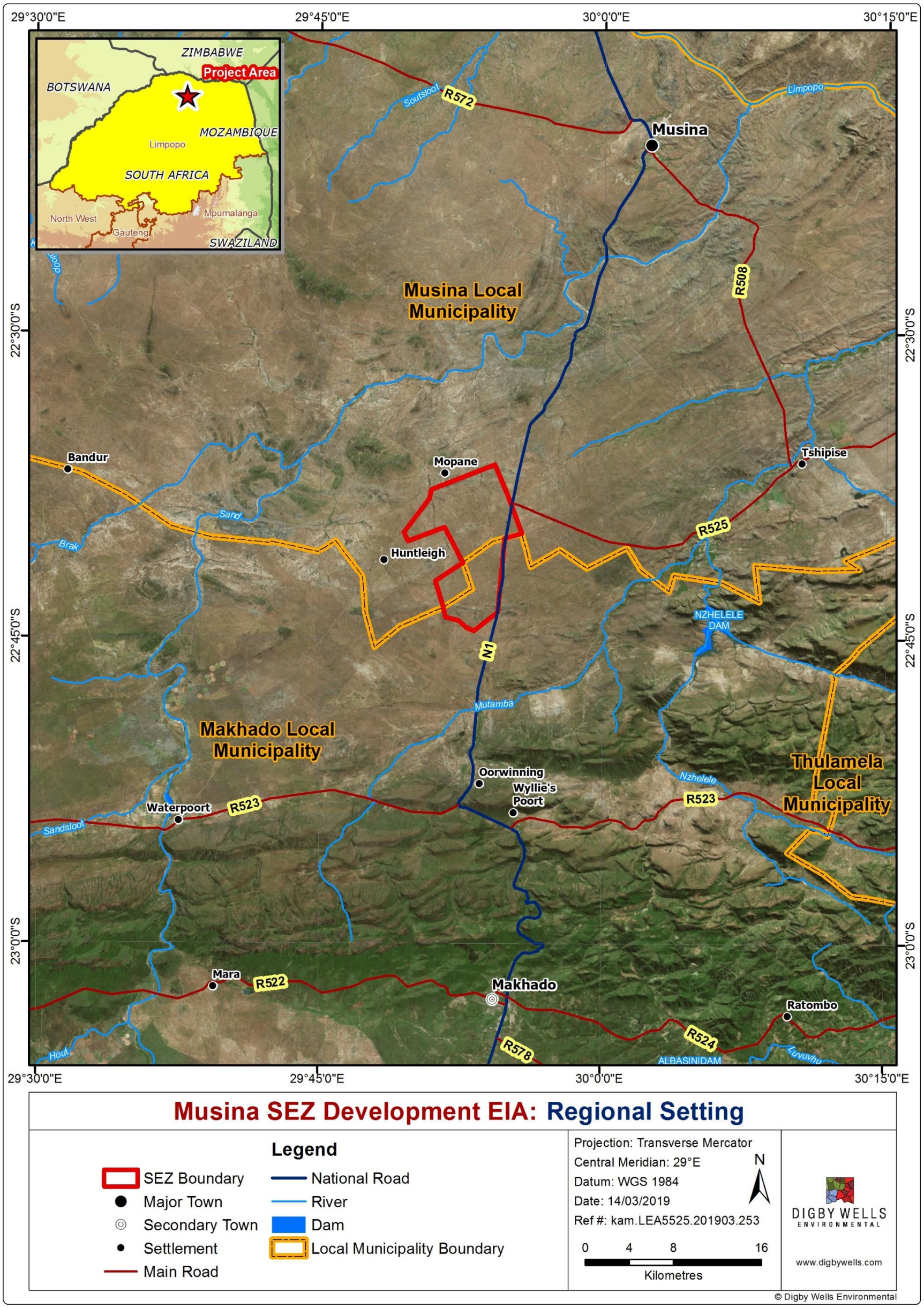

Figure 9-1: Musina-Makhado SEZ Regional Setting

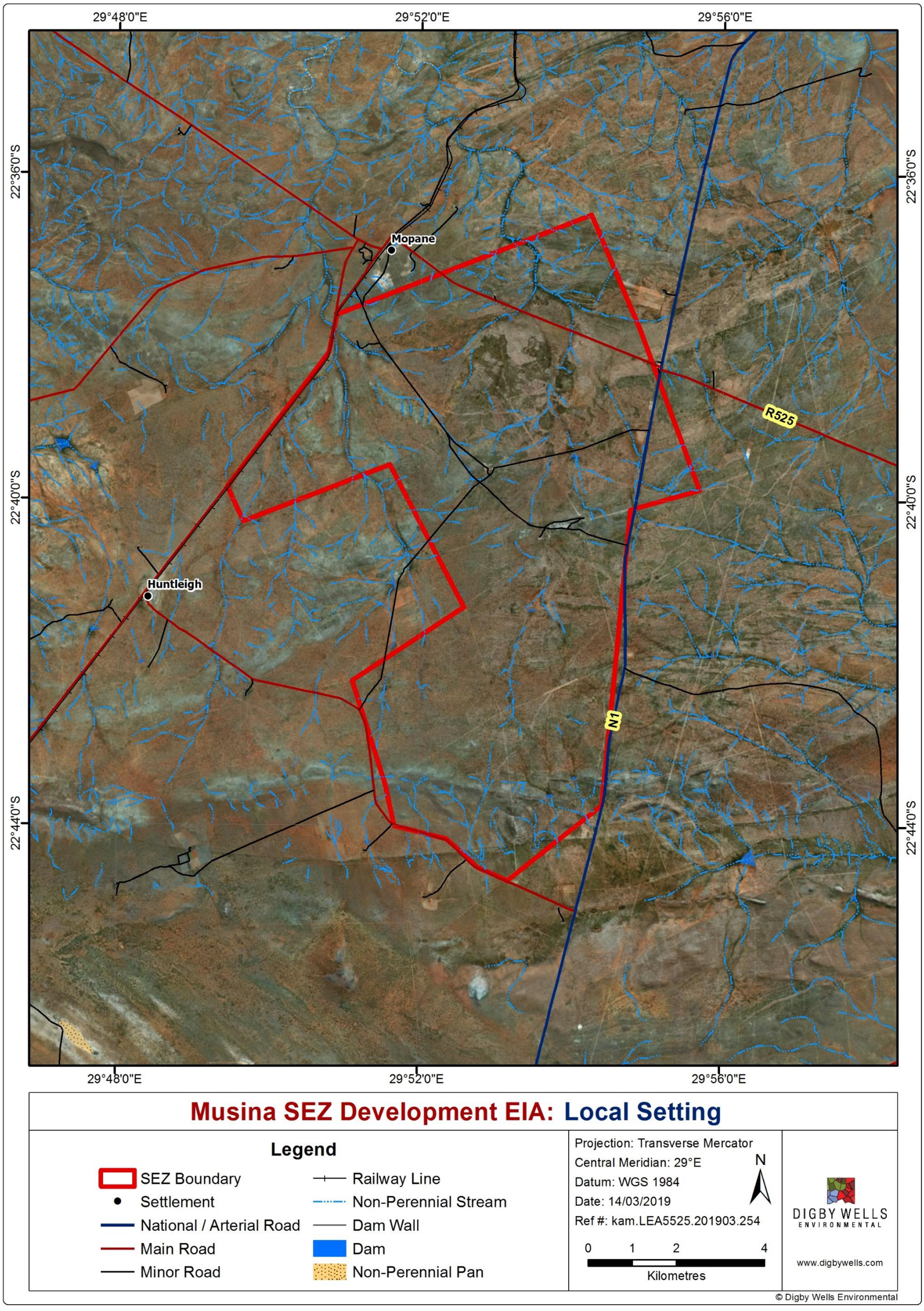

Figure 9-2: Musina-Makhado SEZ Local Setting

9.2 Topography

The project area is characterised by irregular plains, with ridges and hills. Altitude varies from 300 m to 700 m. Drainage occurs in the north-easterly direction with non-perennial drainage lines located to the east and west (Figure 9-3).

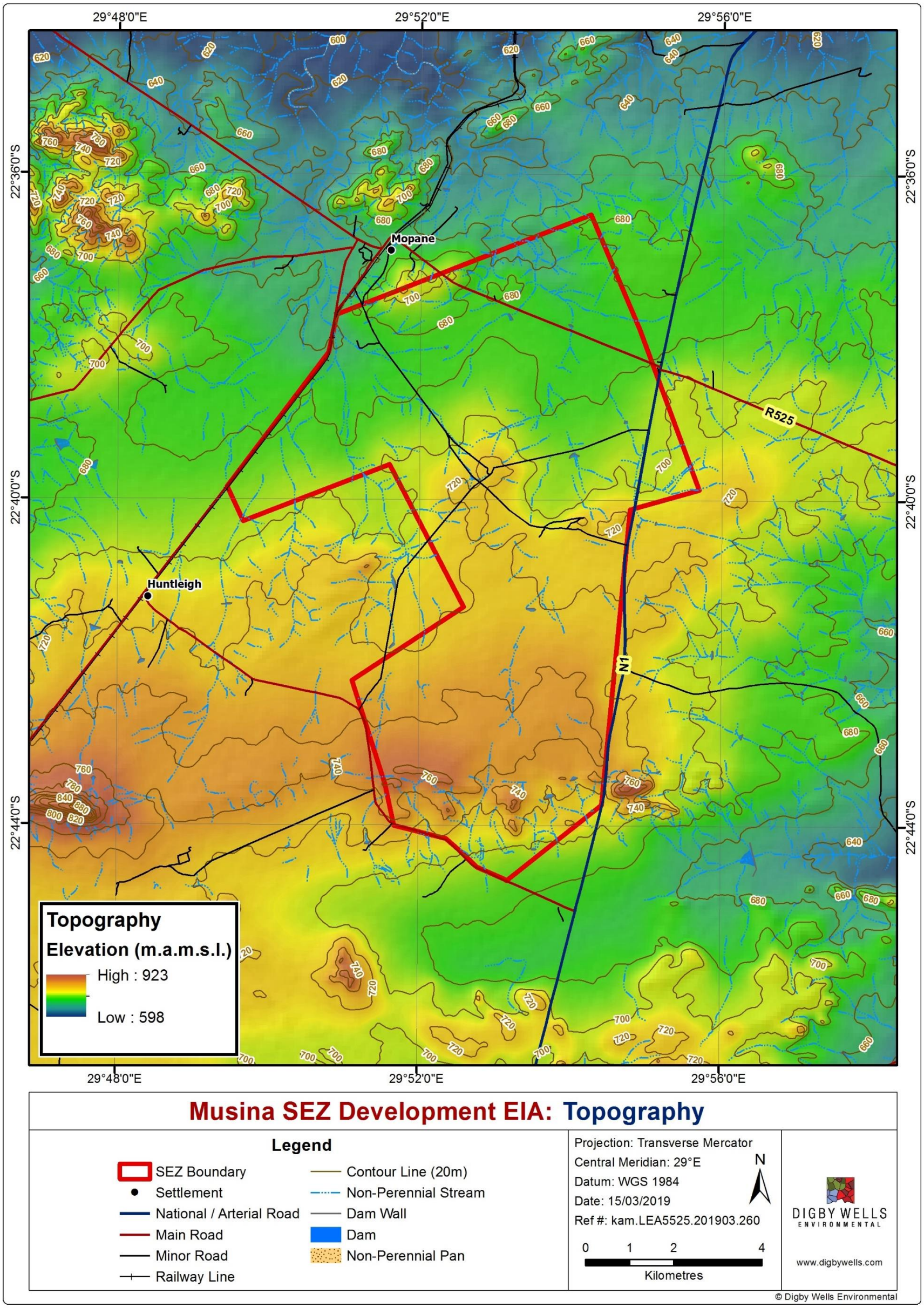

Figure 9-3: The surface topography of Mucina Makhado SEZ

9.3 Flora

9.3.1 Regional Vegetation

According to Mucina and Rutherford (2012), the proposed SEZ is located in areas classified as Musina Mopane Bushveld (SVmp 1) on the plains and Limpopo Ridge Bushveld (SVmp 2) on the scattered ridges and outcrops. A visual depiction of the project area in relation these vegetation types is presented in Figure 9-4.

9.3.1.1 Musina Mopane Bushveld (SVmp 1)

This is the largest vegetation unit occurring within the proposed project area. The Musina Mopane Bushveld occurs on undulating plains around Baines Drift and Alldays, remaining north of the Southspansberg and south of the Limpopo River, through Tshipise to Malongavlakte, Masisi, and Banyini Pan in the east. This vegetation type is typically characterised by undulating plains with some hills at an altitude of approximately 600 m. In the undisturbed state, on areas with deep sandy soils, the *Kirkia acuminata* (White Seringa) is one of the most dominant woody species along with *Colospermum mopane* (Mopane), *Combretum apiculatum* (Red Bushwillow) and *Grewia* spp. (Raisin bushes). In the Mopane Bushveld, the herbaceous layer is poorly developed, especially in areas where mopane occurs in dense stands. This vegetation unit is classified as Least Threatened and is poorly protected with only 2 % statutorily conserved in the Mapungubwe National Park, as well as the Nzele, Nwanedi, Musina and Honnet Nature Reserves. Approximately 3 % is transformed mainly by cultivation, and soil erosion is moderate to high (Mucina and Rutherford, 2012).

9.3.1.2 Limpopo Ridge Bushveld (SVmp2)

The Limpopo Ridge Bushveld is found within the irregular hills and ridges of much of the area in the vicinity of the Limpopo River such as Madiapala. The topography of this vegetation unit is characterised by extremely irregular plains with ridges and hills, with altitude that varies from 300 m to 700 m in the east and some hills reaching 1000 m in the west. The vegetation structure is moderately open savannah with a poorly developed ground layer. *Kirkia acuminata* (White Seringa) is prominent on many of the ridges along with *A. digitata* (Baobab). On shallow calcareous gravel and calc-silicate soils, the shrub *Catophractes alexandri* is dominant. Areas of sandstone of the Clarens Formation are prominent in places such as Mapungubwe National Park. Although not as prominent as at Mapungubwe National Park, sandstone ridges also occur in the study area. This vegetation unit is classified as Least threatened and is poorly protected with only 18 % statutorily conserved in the Mapungubwe and Kruger National Parks. Only about 1% is transformed, mainly by cultivation and mining (Mucina and Rutherford, 2012).

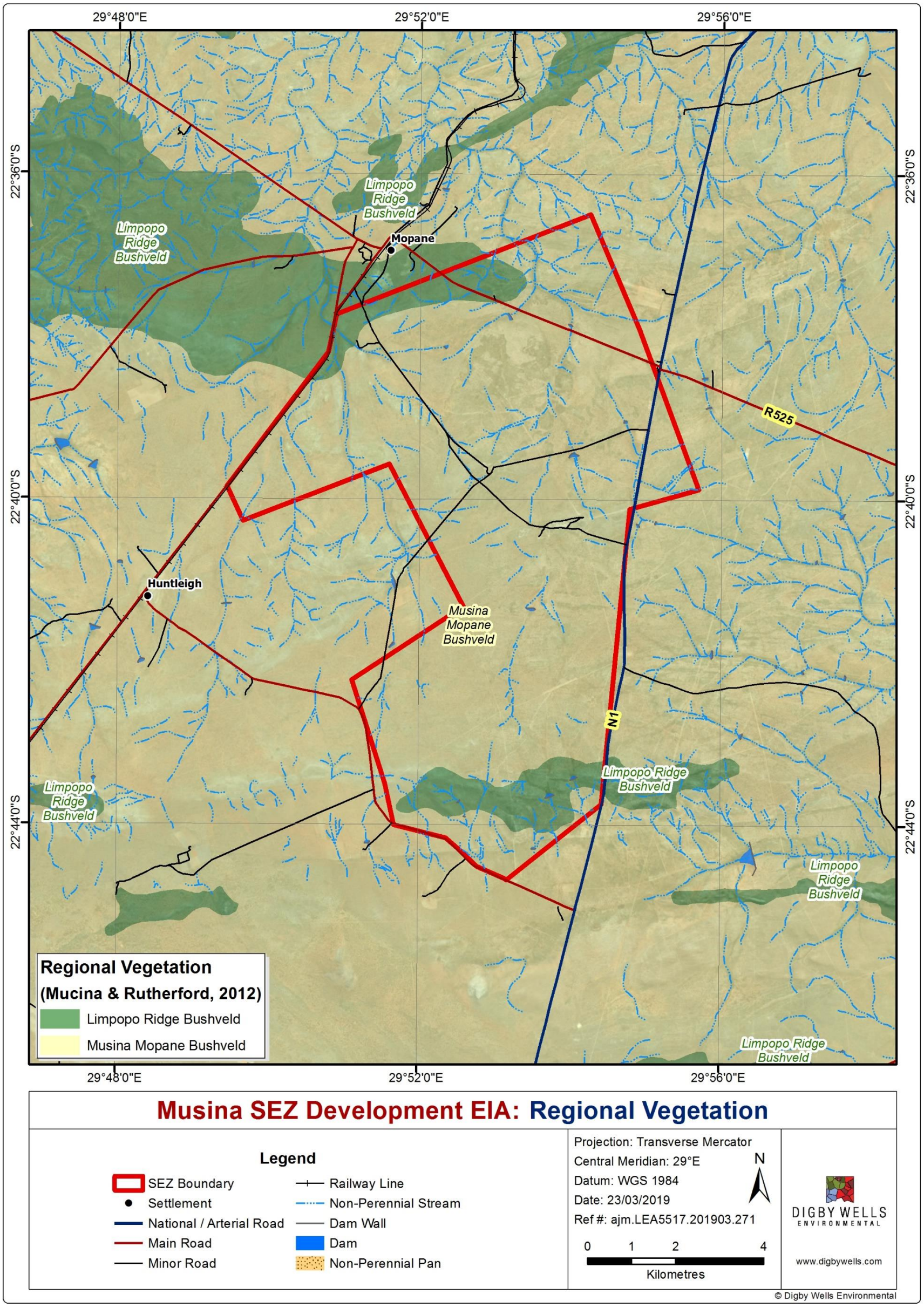

Figure 9-4: Regional vegetation types

9.3.2 Species of Special Concern

During the infield assessment a total of four SSC concern were identified, including one species listed as a schedule 12 (Threatened Plant Species, LEMA (2014)) and four species listed as Protected according to the NFA (1998). A list of these species is included in Table 9-1. No species of global conservation concern were identified. Protected trees in South Africa are regulated in terms of section 15(1) of the National Forests Act, 1998 (Act No. 84 of 1998). In this Act, the definition of a 'tree 'is any tree seedling, sapling, transplant or coppice shoot of any age and any root, branch or other part of it. The Minister of Agriculture, Forestry and Fisheries has published a list of all protected trees belonging to different species under section 12(1)(d) of the above mentioned NFA, as set out in the schedule to this notice. The effect of this declaration is that in terms of section 15(1) no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister and relevant authorities.

The LEMA was compiled to consolidate and amend the environmental management of the Limpopo Province. This act includes regulations which call for the protection of indigenous plants and animals which require a permit from the provincial authority for its picking, selling, removal, donation, and/or export in the province. Schedule 12 (Protected plant species) have relevance to this section of the report.

Table 9-1: Flora (Tree) species of special conservation concern (SCC) identified during the infield assessment

Scientific Name	Common Name	NFA 1998	LEMA	SANBI Red List	IUCN 2019
Adansonia digitata	Baobab	Protected tree	Protected, Schedule 12	LC	Not Listed
Boscia albitrunca	Sheppard's Tree	Protected tree	-	LC	Not Listed
Combretum imberbe	Leadwood	Protected tree	-	LC	Not Listed
Sclerocarya birrea	Marula tree	Protected tree	-	LC	Not Listed

9.3.3 Alien vegetation

Alien invasive plant species (AIPs) pose a major threat to biodiversity and threaten the ecological and economic well-being of society all across the globe. These plant species share a number of functional traits related to physiology, biomass allocation, growth rate, size and fitness which tends to promote their invasiveness.

Alien plant species in South Africa have been classified according to Alien and Invasive Species Lists (GN R599 in GG 37886 of 1 August 2014) of the NEM:BA. Each of the categories listed in this act has different legal obligations and conditions as indicated below:

- Category 1a: Species requiring compulsory control;
- Category 1b: Invasive speciess controlled by an Alien Invasive Species Management Program;
- Category 2: Invasive species controlled by area; and
- Category 3: Invasive species controlled by activity.

During the infield assessment a total of ten AIP species were recorded, of which five fell under category 1b of NEM:BA. A total of five species which are indigenous but tend to become problems in terms of encroachment were also recorded during the infield assessment. A list of all the abovementioned species is provided in Table 9-2 below.

Table 9-2: Alien invasive species, exotic and bush encroachers identified during the infield assessment

Common Name	Scientific Name	NEM: BA Category
Red Spikethorn	*Gymnosporia senegalensis*	Bush encroachment indicator
Flame thorn	*Senegalia ataxacantha*	Bush encroachment indicator
Three-hook Thorn	*Senegalia senegal*	Bush encroachment indicator
Sickle Bush	*Dichrostachys cinerea*	Bush encroachment indicator
Wild asparagus	*Asparagus laricinus*	Bush encroachment indicator
Common lantana	*Lantana camara*	Category 1b
Sweet prickly pear	*Opuntia ficus-indica*	Category 1b
Thorn-Apple	*Solanum incanum*	Category 1b
Purple top	*Verbena bonariensis*	Category 1b
Spiny cocklebur	*Xanthium spinosum*	Category 1b

9.3.4 Delineated Plant Habitat Communities

The project area is predominantly semi-arid, dry and hot and is influenced by the Soutpansberg mountain range that acts as a barrier between the Indian Ocean south-eastern maritime climate and the northern continental climate. The topography can be described as a relatively flat to slightly undulating landscape, with an overall shallow gradient in an approximate south-north orientation. Higher elevations in the area are predominantly associated with rock outcrops that form ridges in approximate west-east and west-southwest

to east-northeast orientations. The predominant vegetation type found at the site is that of the Musina Mopane Bushveld.

The study area is dominated by tree and shrub forms of *Colophospermum mopane*, *Terminalia prunoides, Commiphora spp., Grewia spp. and Senegalis spp.* The herbaceous layer was not well developed, this was due to low rainfall and overgrazing and consists mostly of grasses such as *Aristida congesta subsp. congesta, Aristida adscensionis, Tragus berteronianus, Brachiaria brizantha, Melinis repens and Enneapogon cenchroides.*

The size of the project area and the different land use and soil types were found to be instrumental in the development of different vegetation types. Different plant communities develop as a result of differences in climate, geology, topography, rockiness, drainage, soil texture, soil depth, slope, and historic management. Each plant community usually represents a different habitat, has its own inherent grazing and browsing capacity and represents a specific habitat for certain types of fauna species.

To identify the various vegetation communities on site various communities have been separated into homogenous units which are discussed in this level. The following communities have been identified (Figure 9-5):

- Mopane Bushveld unit, and sub types;
- Riparian habitat unit and sub types;
- Ridge Bushveld; and
- Transformed habitat unit.

9.3.4.1 Mopane Bushveld

The Mopane Bushveld habitat unit is characterized by the Mopane Bushveld vegetation type and undulating to very irregular plains with some hills at an altitude of around 600 m. On areas with deep sandy soils, the *Kirkia acuminata* (White Seringa) is one of the dominant tree species along with *Colopospermum mopane* (Mopane), *Combretum*. *apiculatum* (Red Bushwillow) and *Grewia spp*. (Raisin bushes). The herbaceous layer is poorly developed, especially where mopane occurs in dense stands.

The grass layer was poor in this area with on average 35% bare ground present. *Aristida* spp were present, which are predominantly hardy grasses typical of overgrazed veld, with *Panicum* spp present in the protected shady areas and on occasion *Brachiara deflexa* (False Panicum) was found. The soils of this area are moderately deep to shallow sandy soils. The predominant land use is cattle farming and it is apparent that the area is being overutilized. The habitat is also being utilised by naturally occurring ungulate species.

Within the general Mopane Bushveld a number of bushveld community's variations occur on the level plains, each with distinct species assemblages which can be differentiated within the study area. These communities were found to be highly fragmented and associated with slight variations in the underlying soils. Whilst it is possible to differentiate the communities using

ordination techniques, they are difficult to distinctly map as the boundaries are not usually distinct and vary along a continuum. These are discussed below in more detail.

9.3.4.1.1 Combretum Thorny Bushveld sub type

This habitat is characterised by *Combretum apiculatum* and *C. hereroense*, with additional upper storey species such as *Vachellia karroo* and *Dichrostachys cinerea*. *Terminalia prunioides, Colopospermum mopane, Commiphora viminea* and *Gymnosporia senegalensis* also occur here but are relatively small and non-dominant. Scrambling bushes such as *Grewia flava, G. flavescens* and *Gymnosporia senegalensis* were common throughout. The grass layer was very poor in this area with Aristida spp. present, which are predominantly hardy grasses that are typical of overgrazed veld, and Panicum spp. were present in the protected shady areas under trees and shrubs. Understory forbs and succulents included: Cotyledon spp., *Eriosema salignum, Hermbstaedtia fleckii*. Species diversity was generally low with the presence of unique species including *Boscia albitrunca, Sclerocarya birrea and Combretum imberbe*. The soils of this habitat were moderately deep soils that are predominantly composed of fine sandy material. This varies towards the riparian habitat where the soils show wetness and calcrete is exposed at the surface. This vegetation type is impacted by cattle grazing that is practiced on the farm by the landowner. Ground cover was often below 30 %, which contributes to the susceptibility of the soil to erosion.

9.3.4.1.2 Terminalia Bushveld sub type

This habitat type is comprised of the co-dominance of *Terminalia prunioides*, *Colopospermum mopane* and *Sclerocarya birrea*. Typical shrub species present included *Senegalia caffra*, *Grewia flavescens* and *Sida cordifolia*. The grasses observed in this area were predominantly comprised of *Aristida congesta subsp. congesta*, *Brachiaria brizantha*, *Hyparrhenia filipendula* and *Enneapogon cenchroides*. The presence of unique species including *Adansonia digitata* was recorded.

The soils varied between moderately deep and shallow according to the changes in the topography. The land use associated with this vegetation type was cattle farming and agricultural practices. Some of the areas were not able to be assessed in the field due to limited access. Desktop extrapolation was done for these areas.

9.3.4.1.3 Kirkia acuminata open Bushveld sub type

This habitat type is comprised of the co-dominance of *Kirkia acuminata* and *Colopospermum mopane*. Typical shrub species present included *Gymnosporia senegalensis*. The grasses observed in this area were predominantly comprised of *Aristida congesta subsp. congesta*, *Eragrostis trichophora*, *Hyparrhenia filipendula* and *Chloris virgata*. The presence of unique species including *Colopospermum mopane* was recorded.

9.3.4.2 Riparian habitat unit

Based on the findings of the field assessment, it is evident that the wetlands and freshwater features within the project area consist mostly of pans, ephemeral drainage lines and artificial

impoundments. The pan or depression wetland HydroGeomorphic Unit (HGM) setting is described as a basin shaped area with a closed elevation contour that usually is not connected to the drainage network (Ellery *et al*, 2009). Pans can receive water both from surface and groundwater flows, which then accumulates in the depression owing to a generally impervious underlying layer, which prevents the water draining away (Goudie and Thomas, 1985; Marshall and Harmse, 1992). Ephemeral drainage systems were also extensive in this unit. These systems are fed by surface flows and only flow at certain times of the year. Additionally, a number of artificial impoundments were observed within drainage lines. These were attributed to the nature of the land use, as they are required for game farming and cattle grazing practices in such an arid environment.

9.3.4.2.1 Pans

A total of 17 pans, covering a total area of 1.3 ha were observed within the proposed project area at the time of the assessment. Pans were observed to be largely homogenous within the project area and were relatively small in size. Variances were attributed to land use differences and not vegetation or structure. The majority of pans were bare, with limited grass cover and surrounded by woody vegetation. Few pans were inundated with water at the time of the assessment. Examples of the pans identified within the proposed project area are indicated in Figure 9-5.

Grass species typical of damp areas were noted to occur within the pans. These include: *Bothriochloa insculpta, Brachiaria deflexa, Echinochloa colona, , Eragrostis trichophora* and *Eragrostis rotifer*. Other grass species include: *Aristida adscensionis*, *Cenchrus ciliaris*, *Schmidtia pappophoroides* and *Tragus berteronianus.*

Small trees surrounded the pans, including *Colophospermum mopane, Digitaria velutina, Terminalia prunioides, Ximenia americana Vachellia tortilis, Commiphora glandulosa* and a few individuals of *Boscia albitrunca, B. foetida, Combretum apiculatum,*and *Commiphora viminea* with small stands of *Dichrostachys cinerea.*

9.3.4.2.2 Drainage lines

An extensive network of drainage lines, covering approximately 296.21 ha, was observed within the proposed project area. These ranged from wide, deep, sandy ephemeral systems to small rocky features in isolated parts of the proposed project area. The addition of dams within drainage lines has resulted in the impoundment of water. The drainage lines had very similar species composition to the pans, with the addition of *Adansonia digitata.* Examples of the drainage lines are indicated in Figure 9-5 .

9.3.4.2.3 Artificial Impoundments

A number of artificial impoundments were noted within the Project area, amounting to a total area of 6.23 ha. Most of these were inundated with water, but not to a great extent. Utilisation by cattle was high, with cattle being present at almost all the dams.

Very low graminoid and herbaceous cover was noted around pans, with high levels of trampling as well as notable deterioration of water quality.

9.3.4.3 Ridge Bushveld

This vegetation type was encountered on the irregular hills and ridges in the southern portion of the project area. The vegetation structure is moderately open savannah with a poorly developed ground layer. The dominant tree species includes *Kirkia acuminata, Colophospermum mopane* and *Terminalia prunioides* and is prominent on the ridges along with *Adansonia digitata* and *Boscia albitrunca, which* were encountered on shallow calcareous gravel and calc-silicate soils. The shrub *Catophractes alexandri* was dominant, and was found on calcrete areas apart from the ridges.

The graminoid layer consists of *Trachypogon spicatus*, *Digitaria eriantha* subsp. *eriantha, Heteropogon contortus* and *Setaria sphacelata.*

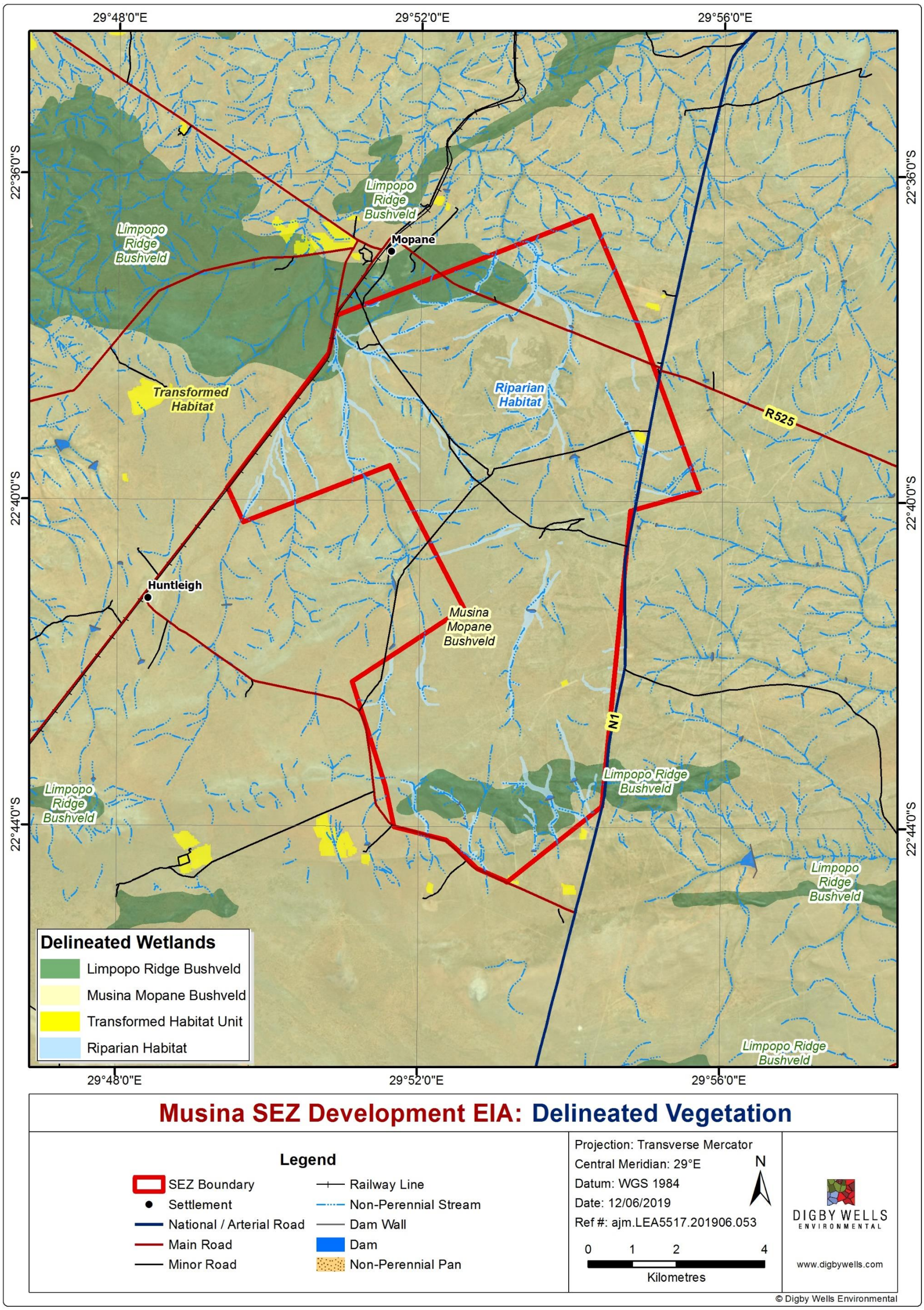

Figure 9-5: Delineated Vegetation Types

9.4 The Sensitivity of the Site and No- Go Areas

The ecological sensitivity of the habitat identified within the site was assessed in terms of the following:

- Presence or absence of Red Data Listed or protected plant and animal species;
- Presence or absence of exceptional species diversity;
- The extent of intact habitat in good ecological condition in the absence of disturbance; and
- Presence or absence of important ecosystems such as Important Bird Areas (IBA's), Protected Areas, areas demarcated for future protected area status (NPAES) and wetlands.

9.4.1 National List of Threatened Terrestrial Ecosystems for South Africa (2011)

The National List of Threatened Terrestrial Ecosystems for South Africa (NEM:BA: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011) was published in terms of NEM:BA. The list categorizes ecosystems into Critically Endangered, (CR) which have undergone severe degradation, Endangered (EN) which have undergone lesser degradation, Vulnerable (VU), which are at a high risk of undergoing degradation and protected which are of high conservation importance. According to Activity 12 of the third list of the 2017 NEMA listed activities, GN R324, authorisation is required for the clearance of 300 $m^{2,}$ or more of vegetation where 75 % or more of the vegetation cover constitutes indigenous vegetation within any listed critically endangered ecosystems.

According to the National List of Threatened Terrestrial Ecosystems, the proposed SEZ does not traverse any threatened ecosystems. Thus activity 12 of GNR 324 Listing Notice 3 will not be triggered and will not require authorisation. Activity 12 in Listing Notice 3 relates to the clearance of 300 m^2 of more of vegetation, which will trigger a basic assessment within any critically endangered or endangered ecosystem listed in terms of the Biodiversity Act.

9.4.2 National Biodiversity Assessment (2011)

South Africa's first National Spatial Biodiversity Assessment (NBA) of 2011 (Driver *et al*., 2011) is the most recent NBA to be published was commissioned by the Department of Environmental Affairs (DEA) and its national partners. Led by SANBI, the aim of the NBA was to assess the state of biodiversity state of the country's biodiversity based on best available science, with a view to understanding trends over time, and informing policy and decision-making across a range of sectors. This assessment followed the same process for biodiversity assessment as in 2005, except that it also included thematic sections on indigenous species, alien invasive species, and climate change. A synthesis report, a popular report and four technical reports each for the different environmental realms such as terrestrial, freshwater,

estuarine, and marine environments were published. With respect to each of these environmental realms, it identifies broad spatial priority areas for conservation action, makes recommendations concerning options for conservation action in each priority area, and provides a national context for conservation plans at the sub-national level. The NBA of 2011 serves as a primary informant of the National Biodiversity Strategy and Action Plan (NBSAP), the National Protected Areas Expansion Strategy (NPAES), and its provincial counterparts. A more recent NBA was recently undertaken in 2018 and will be published in 2019.

9.4.3 Limpopo Conservation Plan (2013)

The Limpopo Conservation Plan v2 (LCPv2) was developed with two primary products in mind, the map of Critical Biodiversity Areas and associated land use guidelines. Bioregional plans are one of a range of tools provided for in the (NEMBA) (No. 10 of 2004) that can be used to facilitate biodiversity conservation in priority areas outside the protected area network. The purpose of a bioregional plan is to inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity.

This is done by providing a map of biodiversity priority areas or CBAs together with accompanying land-use planning and decision-making guidelines. The conservation plan applies a target driven systematic spatial biodiversity planning methodology to develop this map and it is based on the best available biodiversity and context data, and an explicit set of biodiversity conservation targets. The resultant map represents the minimum area necessary to maintain biodiversity pattern and ecological processes in the landscape, i.e. ecologically functional landscapes.

The Limpopo Conservation Plan (v2) provides a spatial representation of land areas required to ensure the persistence and conservation of biodiversity and biodiversity targets within the Limpopo Province. These are represented as CBA and Ecological Support Areas (ESA).

There are four main categories that appear on the LCPv2 map hosted on the SANBI BGIS interactive map these include the following:

- Other Natural;
- Protected Areas;
- Ecological Support Areas (ESA 1 and 2);
- Critical Biodiversity Areas (CBA Areas 1 or 2).

The project area traverses large areas designated as Ecological Support Areas 1 (ESA1). Certain portions of the site including portion 0001 of Farm Joffre 584 MS, portion 00000 of Farm 585 Battle, portion 000000 of Farm 580 Lekkerlag and small sections of portion 00000 of Farm 611 Somme, will traverse an area designated as CBA2 as visually depicted in Figure 9-6. The infrastructure layout of the various stands and zones that are planned to be constructed indicate that certain infrastructure areas are located within the CBA2. These are displayed in Table 9-3.

Table 9-3: Infrastructure interaction with LCPv2 CBA areas

Zone (ha)	Stand (no.)	Other	Interaction
Environmental Conservation (1550)	Water Treatment Plant (21)	Roads	CBA2
	Reservoir (25)	Pipelines	CBA2
	Visitors Guest Lodge (26)	SEZ boundary Wall	CBA2
		Transformer Substation	CBA2
		18 Day Water Storage Dam	CBA2
Processing Zone (400)	Light Industrial Processing Zone (19)		CBA2

CBA2 are to be maintained in a natural state with limited or no biodiversity loss, recommendations from LCP2v2 are listed in Table 9-4 below.

Table 9-4: Summary of the Different Map layers for categories occurring within the UDM BSP

Map Category	Description	Sub-Category	Description	Land Management objectives
Protected Areas	Formal Protected Areas and Protected Areas pending declaration under NEM:PAA.	National Parks & Nature Reserves	Includes formally proclaimed National Parks, Nature Reserves, Special Nature Reserves, and Forest Nature Reserves.	Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near-natural state and manage for no further degradation Development subject to Protected Area objectives and zoning in a NEM: PAA compliant and management plan
		Protected Environments: Natural	Includes Protected Environments, declared in terms of Protected Areas Act (Act 57 of 2003, as amended).	
		Protected Environments: Modified	Heavily modified areas in formally proclaimed Protected Environments.	
Critical Biodiversity Areas (CBAs)	All areas required to meet biodiversity pattern and process targets; Critically Endangered ecosystems, critically linkages (corridor pinch-points) to maintain	**CBA 1: Irreplaceable**	Areas that are required to meet the biodiversity pattern and/or ecological process targets. No alternative sites are available to meet the process targets.	Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near-natural state, and manage for no further degradation.

Map Category	Description	Sub-Category	Description	Land Management objectives
	connectivity; CBAs are areas of high biodiversity value that must be maintained in a natural state.	**CBA 2: Best Design Selected Sites**	Areas that are selected to meet biodiversity pattern and/or ecological targets. Alternative sites may be available to meet the priority targets.	Maintain in a natural state with limited or no biodiversity loss. Maintain current agricultural activities. Ensure that land use is not intensified and that activities are managed to minimize the impact on threatened species.
Ecological Support Areas (ESAs)	Areas that are not essential for meeting targets but play important role in supporting the functioning of CBAs and that deliver services. Important ecological services	**ESA1: Ecological Support Areas (ESA)**	Natural, near natural and degraded areas supporting CBAs by maintaining ecological processes.	Maintain ecosystem functionality and connectivity, allowing for limited loss of biodiversity
		ESAs2: Ecological Support Areas: Species Specific	Areas with no natural habitat that is important for supporting ecological processes.	Avoid additional/ new impacts on ecological processes
Other Natural Areas (ONA) Areas that have not been identified as a priority in the current systematic biodiversity plant but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.				No management objectives, land management recommendations or Land-Use guidelines are prescribed. These areas are nevertheless subject to all applicable town and regional planning guidelines and policies

Map Category	Description	Sub-Category	Description	Land Management objectives
No natural habitat remaining: Areas with no significant direct biodiversity value. Not natural or degraded natural areas that are not required as ESA, including agricultural, urban, industry, and human infrastructure.				

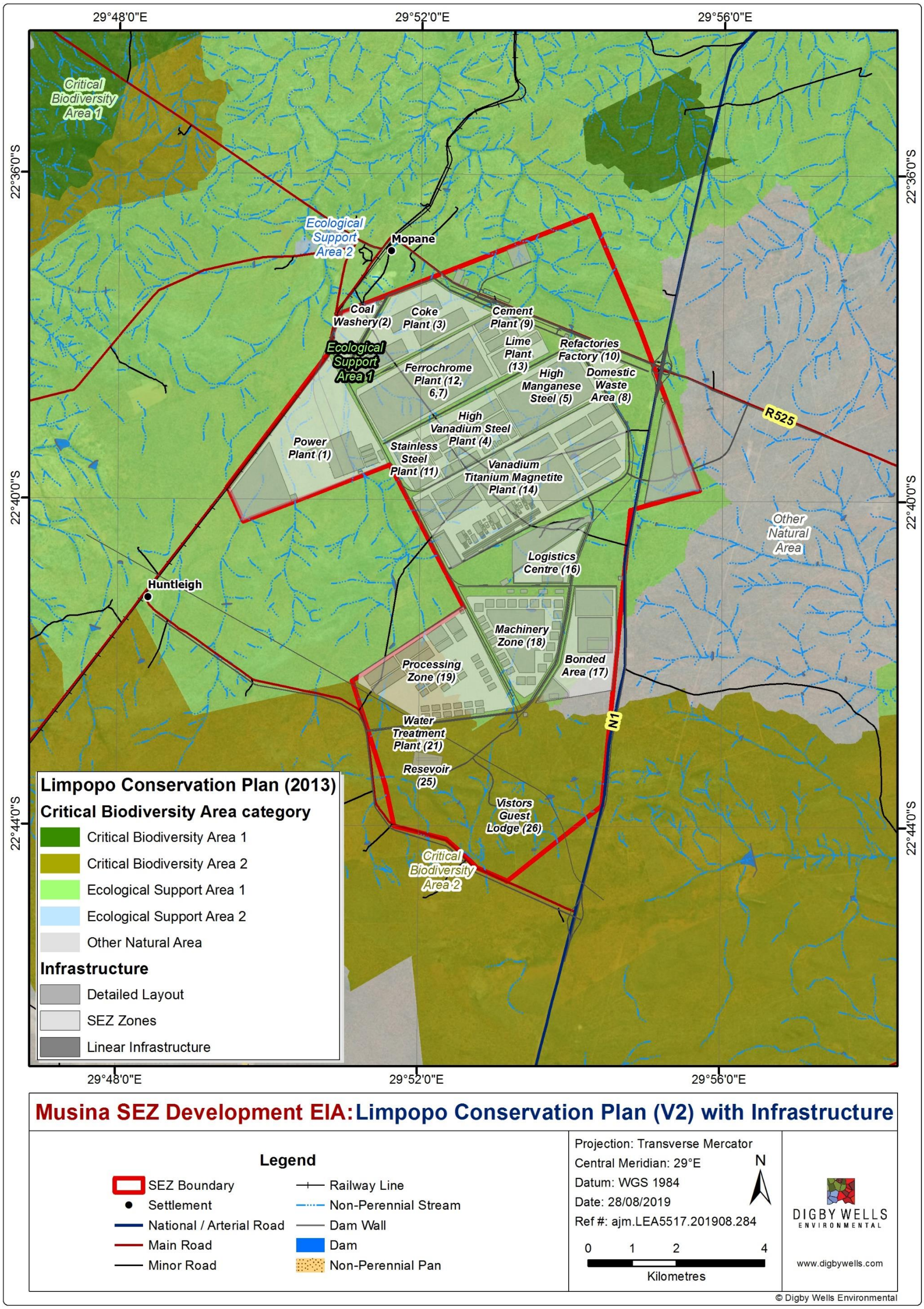

Figure 9-6: Limpopo Conservation Plan (LCPv2, 2013)

9.4.4 Protected Areas

South Africa is a “megadiverse” country and the third most biodiverse country after Brazil and Indonesia. Loss of this biodiversity may pose serious risks to the health and socio-economic aspects of life for future generations. The establishment and management of an extensive and representative system of protected areas is thus a critical strategy in the conservation of South Africa’s biodiversity and ecosystems. Developments within areas adjacent to or within protected areas could have far-ranging detrimental consequences as far as impacts on these areas are concerned. The proposed development areas do not traverse any either a formal or informal protected area.

Located approximately 2,5 km north of the project area is a formal land-based protected area (NBA 2011), the Baobab Private Nature Reserve, with the and Avarel Private Nature Reserve, directly adjacent to the project area. It is however anticipated that both these protected areas will not be affected by the proposed development.

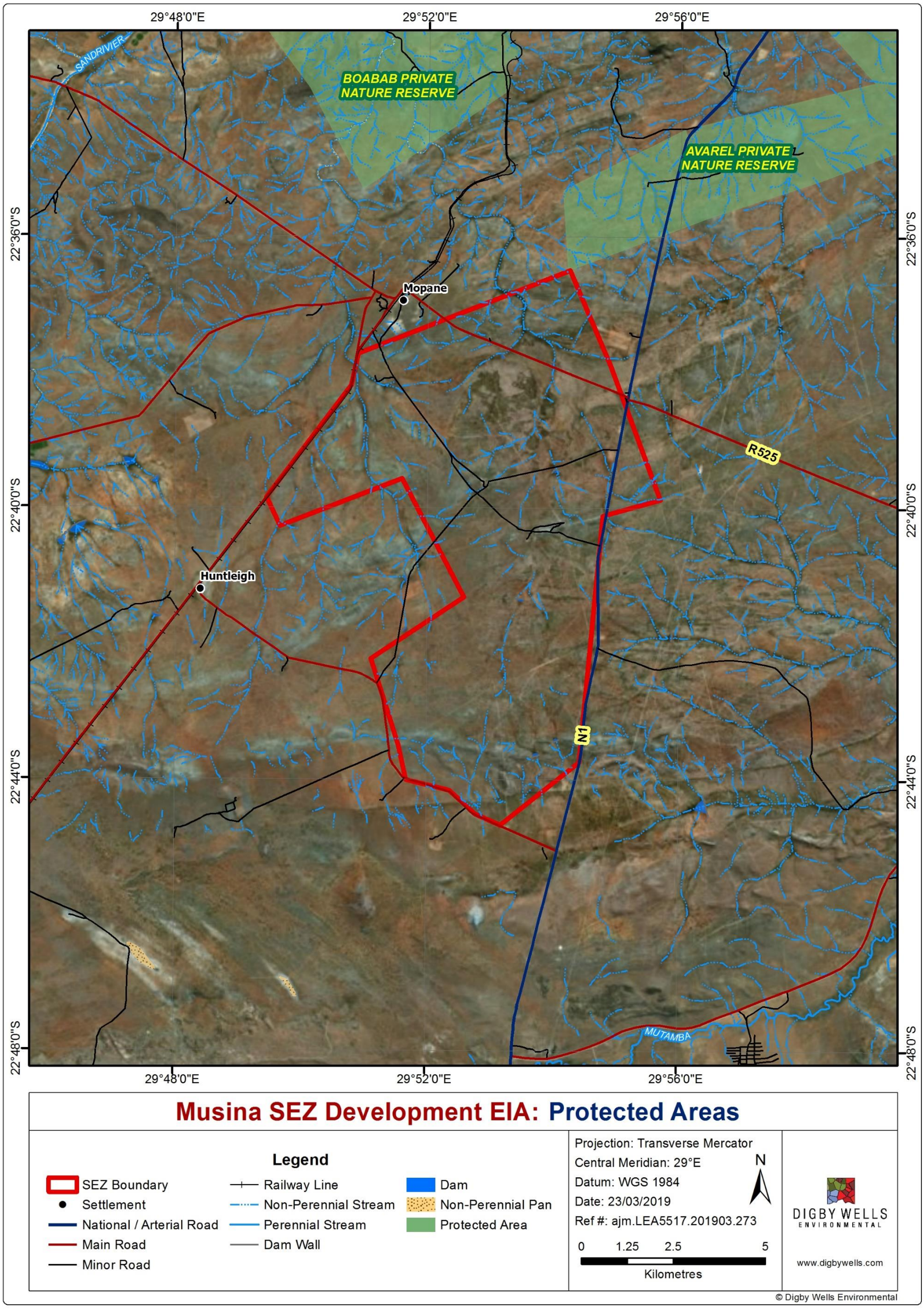

Figure 9-7: Protected Areas

9.4.5 Important Bird and Biodiversity Areas (IBAs) (2015)

The Important Bird Area programme identifies and works to conserve a network of sites that are critical for the long-term survival of bird species that are globally threatened, have restricted range, and are restricted to specific biomes/vegetation types or sites that have a significant population. The Project area does not traverse any IBA, however, on the southern side of the project area, approximately 9 km from the project area lies the Soutspansberg IBA. The impact of air pollution on birds could be severe, however this would need to further investigated. This IBA supports one colony of Cape Vultures (*Gyps coprotheres*). The forest vegetation in the valleys and basins support Crowned Eagle (*Stephanoaetus coronatus*), Forest Buzzard (*Buteo trizonatus*), Knysna Turaco (*Tauraco corythaix*), Chorister Robin-Chat (*Cossypha dichroa*), Narina Trogon (*Apaloderma narina*), Grey Cuckooshrike (*Coracina caesia*), Olive Bush-Shrike (*Chlorophoneus olivaceus*), Black-fronted Bush-Shrike (*C. nigrifrons*), Green Twinspot (*Mandingoa nitidula*), and Forest Canary (*Crithagra scotops*). The bushveld vegetation on the slopes supports Gorgeous Bush-Shrike (*Chlorophoneus viridis*), White-throated Robin-Chat (*Cossypha humeralis*), and Burntnecked Eremomela (*Eremomela usticollis*). The grassland vegetation is home to Gurney's Sugarbird (*Promerops gurneyi*). In the rivers that flow from the catchment area towards the Lowveld, there are small populations of African Finfoot (*Podica senegalensis*) and White-backed Night Heron (*Gorsachius leuconotus*).

9.4.6 Ecological Sensitivity

The objective of the ecological sensitivity analysis is to specify the location and extent of all sensitive landscapes/areas/species on site that must be protected from transforming land uses or degradation. The sensitivity map for the areas takes into account the sections discussed separately in Sections 9.4.1 to 9.4.5.

Sensitive Landscapes such as ridges and drainage lines are classified as highly sensitive due to their nature and the plant species that they represent. Furthermore, the habitat that these areas represent are regarded as sensitive because of the forage and shelter services they present to animals. For this reason, the transformation of these areas is not recommended, and they must actively be conserved. The abundance of listed and protected species is relatively high in all vegetation types present on site and it can be assumed that a large number of these species could be impacted by construction activities (please refer to Section 9.3.2.)

Medium high sensitivity was assigned to areas where the vegetation type itself was not characteristic of a sensitive landscape nor was it under pressure from development in general, but where protected trees were present (please refer to Section 9.3.2.).

A visual depiction of all sensitive areas to be protected from transforming land uses is presented in Figure 9-8 below.

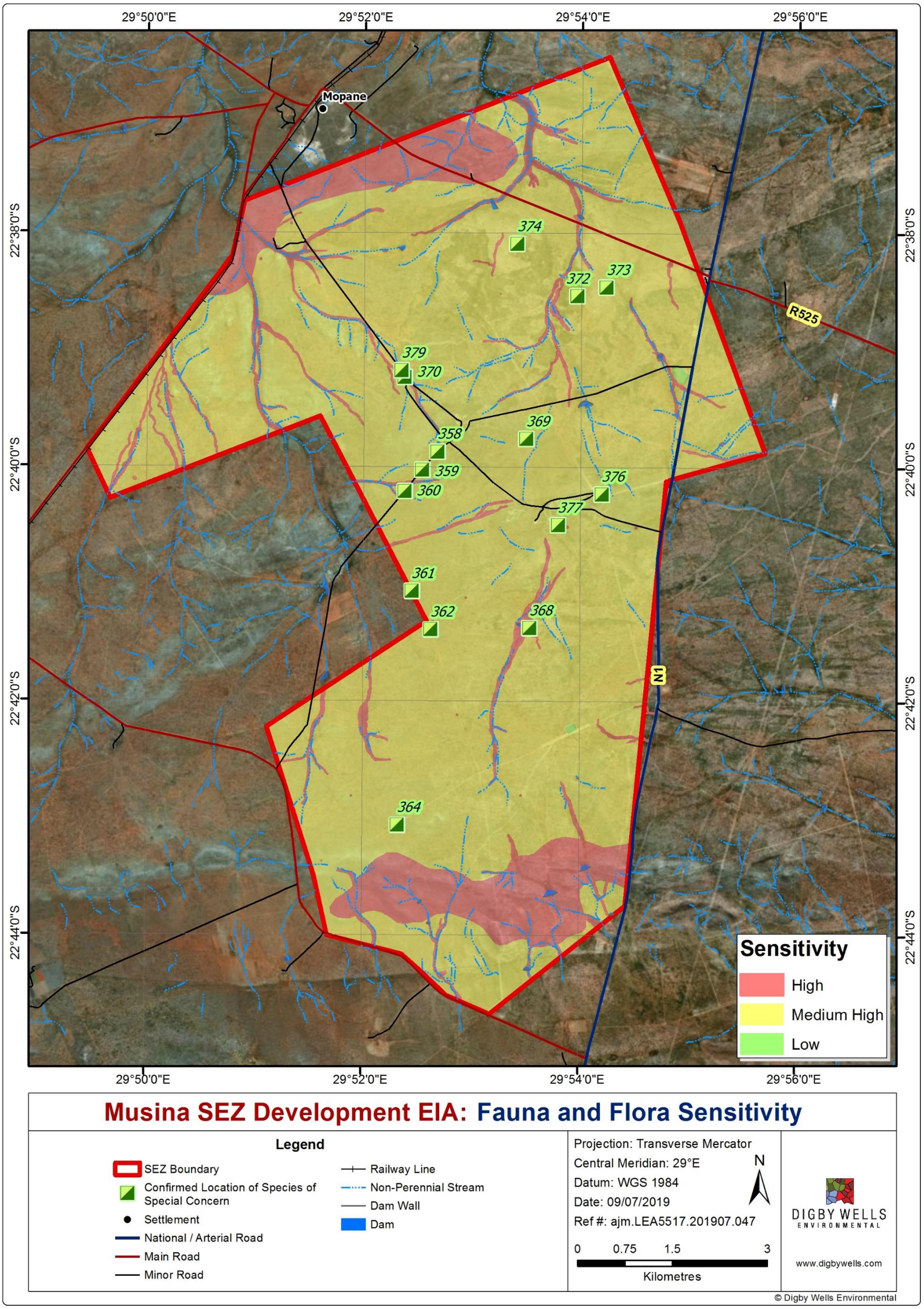

Figure 9-8: Ecological sensitivity map for the Musina/Makhado SEZ according to field surveys

9.4.7 Vhembe Biosphere Reserve

Biosphere reserves are areas of land or water that are protected by law in order to support the conservation of ecosystems, as well as the sustainability of mankind's impact on the environment.

Biosphere reserves are 'Science for Sustainability support sites' – special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity.

Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized.

There are 686 biosphere reserves in 122 countries, with ten in South Africa, including the Vhembe Biosphere Reserve (VBR, Figure 9-9).

The VBR covers five local municipal areas of the Limpopo Province. They are Blouberg, Musina, Makhado, Thulamela and Mutale. A portion of the Kruger National Park, north of the Shingwedzi River, is also included. "The eastern border is formed by the Mogalakwena River and the southern border extends roughly from just south of the Blouberg – Makgabeng and Soutpansberg Mountain Ranges, across the Luvuvhu River catchment, to the east. The northern and eastern boundaries are formed by the international boundaries with Botswana, Zimbabwe and Mozambique. The size of the VBR is approximately 30 701 km², it covers the entire area of the Vhembe District Municipality.

Conservation, Development and Logistics are the three key functions of the Biosphere:

1. Conservation – which aims to identify areas that are important to "contribute to the conservation of the hierarchy of bio-diversity, including landscapes, eco-systems, species and genes". The attached plan highlights such areas.
2. Development – the definition of development in the context of a Biosphere is to "foster economic development, which is socio-culturally and ecologically sustainable." All Biospheres therefore accept and encourage development within their areas. Historically environmentalists were prone to draw a "hard-line" boundary between areas of environmental sensitivity and areas of development. Biospheres are more flexible instruments that encourage a greater degree of flexibility. For example, c".
3. Research – aims to foster support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.

Biosphere reserves have three interrelated zones that aim to fulfil three complementary and mutually reinforcing functions:

- The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation;

- The buffer zone surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education; and
- The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable, the Musina Makhado SEZ is situated within the Transition Zone area of the VBR.

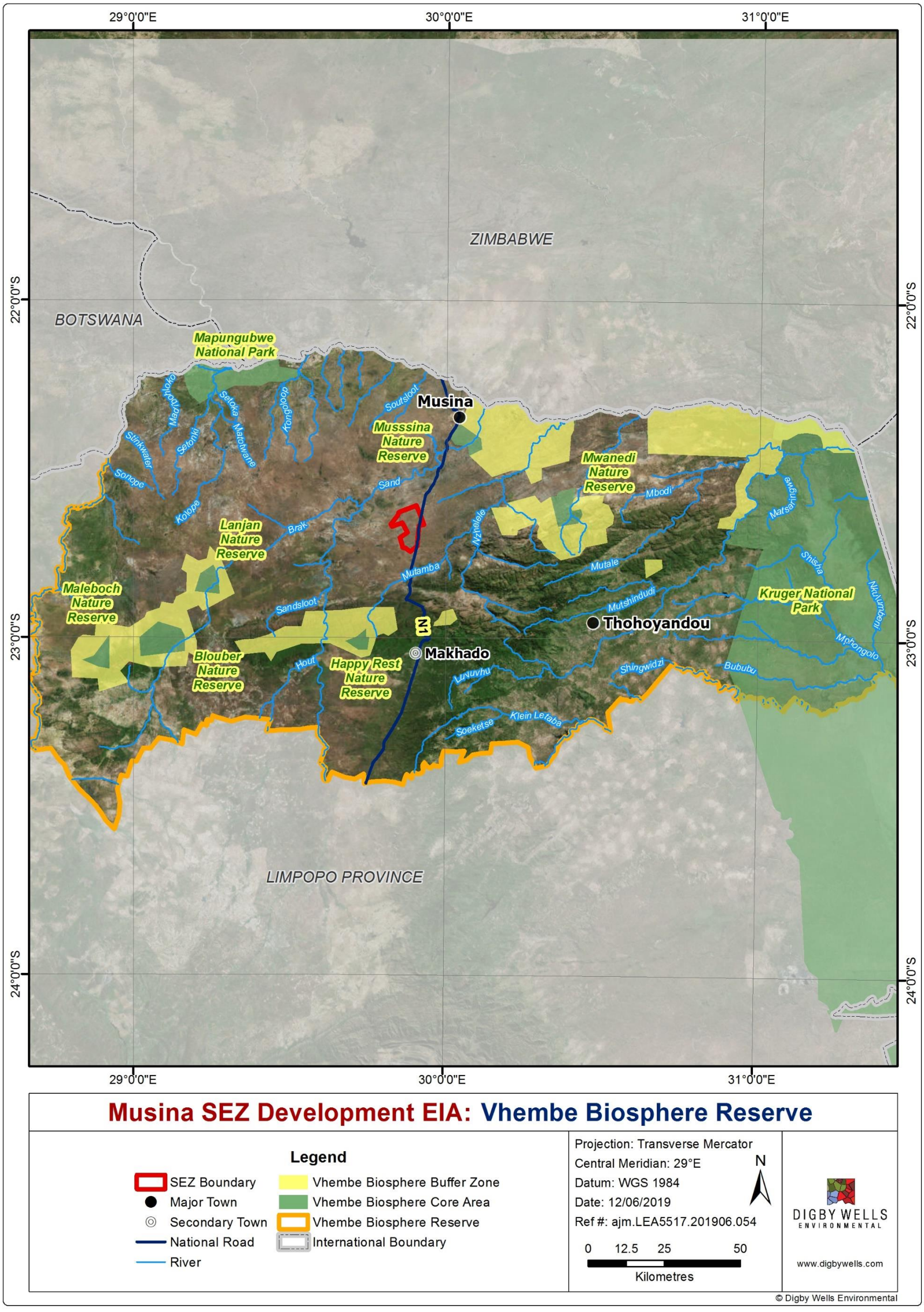

Figure 9-9: Vhembe Biosphere Reserve

9.5 Fauna

9.5.1 Mammals

A large portion of the Mopane bushveld in the Limpopo Province has been subdivided into game farms and many species are prevented from free movement due to game fencing. Medium sized mammals (baboons and bat eared foxes) can still move between habitats through holes under fences and by climbing fence poles, however, larger mammals are restricted by the fencing.

A total of 17 mammal species were identified during the infield assessment in February 2019. This includes three species listed according to the IUCN Red List of Threatened species, and one species with regional status (Table 9-5).

The Rough-haired Golden Mole (*Chrysospalax villosus*), Spotted Necked Otter (*Lutra maculicollis)* and African Marsh Rat (*Dasmys incomtus)* were not observed in the wetland and riverine areas.

Targeted surveys were completed for Juliana's golden mole (*Neamblysomus julianae*), with the purpose of identifying any individuals that could be present as well as their preferred habitat, however, no individuals were recorded.

The presence of bat roosting sites were investigated through a search for caves, crevices and miner adits, however, none were located.

Table 9-5: Mammals recorded during the infield assessment

Scientific Name	Common Name	Regional Status	TOPS (NEM: BA)	IUCN (Version 2018-2)
Aepyceros melampus	Impala	LC		LC
Canis mesomelas	Black Backed Jackal	LC		LC
Dendromus melanotis	Grey Climbing Mouse	LC		LC
Equus quagga burchelliii	Plains Zebra	LC		NT
Gerbilliscus leucogaster	Bushveld Gerbil	LC		LC
Giraffa camelopardalis	Giraffe	LC	Protected	VU
Lepus saxatilis	Scrub Hare	LC		LC
Micaelamys namaquensis subsp. Namaquensis	Namaqua Rock Mouse	LC		LC
Mungos mungo	Banded Mongoose	LC		LC
Panthera pardus	Leopard	VU	Protected	VU
Papio ursinus	Chacma Baboons	LC		LC
Paraxerus cepapi	Smith's Bush Squirrel	LC		LC
Phacochoerus africanus	Common Warthog	LC		LC
Raphicerus campestris	Steenbuck	LC		LC
Sylvicapra grimmia	Bush Duiker	LC		LC
Tragelaphus strepsiceros	The greater kudu	LC		LC
Xerus inauris	South African Ground Squirrel	LC		LC

The Mopane tree is the dominant species in the natural environment and offers various uses to mammals. During times of limited water and lack of grasses, many antelope species (such as the impala) will convert from grazing to browsing, and feed on the small branch tips and fresh leaves of the Mopane tree. The tree also offers nesting sites and safe haven for tree squirrels.

Figure 9-10: Small mammals recorded on site and surrounds (A: Grey Climbing Mouse (*Dendromus melanotis*), B: Namaqua Rock Mouse (*Micaelamys namaquensis subsp. namaquensis*), C: Scrub Hare (*Lepus saxatilis*), D: South African Ground Squirrel (*Xerus inauris*) and E: Bushveld Gerbil (*Gerbilliscus leucogaster*)

9.5.2 Bats

Bats are one of the most speciose group of mammals, second only to rodents. They belong to the order Chiroptera meaning hand-winged. Chiroptera play a major role in the control of insect pests, pollination, and seed dispersal. Bats tend to be sensitive to shifts in agriculture as natural areas generally house a greater abundance of insect prey than agricultural areas. Also, high-intensity agricultural activities use intensive pest management regimes which tend to cause a reduction in insect prey abundances (Meehan *et al*., 2011). For effective management and conservation of species in landscapes that are modified by human activities such as agriculture, it is of pivotal importance to maintain areas of natural vegetation to ensure the survival of sensitive species (Castro-Luna *et al*., 2007). A total of six bat species can be expected to be found in the project area. A list of these species is provided in Table 9-6 below.

Table 9-6 Bat species identified during the infield assessment

Species	Common Name	National Red List (2004)	TOPS (NEM: BA)	IUCN (Version 2018-2)	CITES
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	Not Evaluated	LC	Not Evaluated
Mops condylurus	Angola free-tailed bat	LC	Not Evaluated	LC	Not Evaluated
Tadarida aegyptiaca	Egyptian Free Tailed Bat	LC	Not Evaluated	LC	Not Evaluated
Chaerophon pumilus	Little Free Tailed Bat	LC	Not Evaluated	LC	Not Evaluated
Miniopterus schreibersii natalensis	Schreibers' long-fingered bat	Not Evaluated	Not Evaluated	LC	Not Evaluated
Myotis tricolor	Temminck's hairy bat	NT	Not Evaluated	LC	Not Evaluated

A relationship exists between the Baobab tree (present in the Mopane Bushveld) and the Wahlberg's Epauletted Fruit Bat (expected to be present in the Mopane Bushveld). The survival of the Baobab is dependent on the four species of Epauletted Fruit Bat that exist within the Mopane Bushveld (Jayway, Ezemvelo KZN Wildlife). The Mopane Bushveld offers many

different food sources for a variety of mammals and thus aids in seed dispersal when fruits are consumed.

9.5.3 Avifauna

Avifaunal species are considered good indicators of ecosystem health due to a number of factors including familiarity, mobility and their well-known life histories (Bock and Bock, 1987). Bird communities appear over a wide range of landscapes and can respond rapidly to changes in vegetation due to their high mobility. In addition to this, they display high species diversity, percentage endemism, can be easily sampled, and are taxonomically well-known thus allowing for relatively easy identification when one has adequate training (Armstrong and van Hensbergen, 1995).

Recently acquired data (according to South African Bird Atlas Project (SABAP2)) of the project area corresponding to 2229DB (Mopane) as well as old records from SABAP1 indicate that approximately 262 bird species are expected to occur in the study area. These are listed as Appendix B. This is also supported by the presence of suitable habitat in the study area as well as the proximity of the Soutspanesberg IBA. Of these 262 species, a total of 13 species are listed as Red Data species. These are listed in Table 9-7.

Table 9-7: Red Data avifauna species that could potentially occur on site based on historical records for the immediate region of the project area

Common Name	Scientific Name	Regional Conservation Status**	Global Conservation Status (IUCN)	Preferred Habitat
Tawny Eagle	*Aquila rapax*	EN	Not Listed	Lowveld and Kalahari Savannas, especially game farming areas and reserves.
Kori Bustard	*Ardeotis kori*	NT	NT	Arid open lowland savanna and karroid shrub.
Southern Ground Hornbill	*Bucorvus leadbeateri*	EN	VU	Open woodland and grassland habitat
Abdim's Stork	*Ciconia abdimii*	NT	Not Listed	Open stunted grassland, fallow land and agricultural fields
Black Stork	*Ciconia nigra*	VU	Not Listed	Breeds on steep cliffs within

Common Name	Scientific Name	Regional Conservation Status**	Global Conservation Status (IUCN)	Preferred Habitat
				Mountain ranges; forages on ephemeral wetlands.
Lanner Falcon	*Falco biarmicus*	VU	Not Listed	Varied, but prefers to breed in mountainous areas.
White-backed Vulture	*Gyps africanus*	CR	CR	Breed on tall, flat-topped trees. Mainly restricted to large rural or game farming areas.
Cape Vulture	*Gyps coprotheres*	EN	VU	Mainly confined to mountain ranges, especially near breeding site. Ventures far afield in search of food.
Marabou Stork	*Leptoptilos crumeniferus*	NT	Not Listed	Varied, from savanna to wetlands, pans and floodplains – dependent of game farming areas
Martial Eagle	*Polemaetus bellicosus*	EN	VU	Varied, from open karroid shrub to lowland savanna.
Secretarybird	*Sagittarius serpentarius*	VU	NT	Prefers open grassland or lightly wooded habitat.
Bateleur	*Terathopius ecaudatus*	EN	VU	Lowveld and Kalahari savanna; mainly on game farms and reserves
Lapped-faced Vulture	*Aegypius tracheliotos*	EN	VU	Lowveld and Kalahari savanna; mainly on game farms and reserves

A total of 26 avifauna species were identified during the infield assessment. A list of all species identified during the infield assessment is included in Table 9-8 below.

Table 9-8: Avifauna species identified during the infield assessment

Scientific Name	Common Name	IUCN 2019	TOPS (NEM: BA)
Elanus caeruleus	Black-shouldered Kite	LC	LC
Buphagus erythrorhynchus	Red-billed Oxpecker	LC	LC
Clamator jacobinus	Pied Cuckoo	LC	LC
Melierax metabates	Dark Chanting-Goshawk	LC	LC
Tockus rufirostris	Southern Red-Billed Hornbill	LC	LC
Tockus leucomelas	Southern Yellow-billed Hornbill	LC	LC
Coracias garrulus	European Roller	LC	LC
Spilopelia senegalensis	Laughing Dove	LC	LC
Oena capensis	Namaqua Dove	LC	LC
Halcyon chelicuti	Striped Kingfisher	LC	LC
Merops pusillus	Little Bee-eater	LC	LC
Upupa africana	African Hoopoo	LC	LC
Trachyphonus vaillantii	Crested Barbet	LC	LC
Dicrurus adsimilis	Fork Tailed Drongo	LC	LC
Merops nubicoides	Southern Carmine Bee-eater	LC	LC
Streptopelia semitorquata	Red-eyed Dove	LC	LC
Urocolius indicus	Red-faced Mousebird	LC	LC
Mirafra africana	Rufous-naped Lark	LC	LC
Mirafra sabota	Sabota Lark	LC	LC
Parus niger	Southern Black Tit	LC	LC
Ploceus velatus	Southern Masked-Weaver	LC	LC
Colius striatus	Speckled Mousebird	LC	LC
Pternistis swainsonii	Swainson's Spurfowl	LC	LC
Ploceus cucullatus	Village Weaver	LC	LC
Cinnyricinclus leucogaster	Violet-backed Starling	LC	LC

9.5.4 Herpetofauna

Herpetofauna is defined as reptiles and amphibians inhabiting a given area. Amphibians and reptiles are an important component of South Africa's biodiversity and are sensitive to severe habitat alteration and fragmentation. Herpetofauna have been considered important biological indicators due to their sensitive skins and use of both aquatic and terrestrial habitats which makes them vulnerable to environmental change.

Based on the results of the ADU database search, a total of 27 herpetofauna species are listed for the QDS 2229DB. This includes four frog species; one tortoise species, and 22 reptile species. Two of these species are listed as Red Data species.

During the infield assessment a total of 12 species of herpetofauna were identified, these are listed in Table 9-9 below. This low species diversity may be attributed the fact that herpetofauna are secretive and difficult to observe even during intensive field surveys conducted over several seasons. None of the species recorded were protected species.

Table 9-9: Herpetofauna identified during the infield assessment

Scientific Name	Common Name
Nucras tessellata	Striped Sandveld Lizard
Stigmochelys pardalis	Leopard Tortoise
Trachylepis margaritifer	Rainbow Skink
Trachylepis striata	Striped Skink
Chondrodactylus turneri	Turner's Gecko
Agama armata	Peter's Ground Agama
Bitis caudalis	Horned Adder
Platysaurus intermedius rhodesianus	Common Flat Lizard
Heliobolus lugbris	Bushveld Lizard
Nucras ornate	Ornate Sandveld Lizard
Bitis arientans	Puffadder
Dasypeltis scabra	Rhombic Egg-eater

9.5.5 Invertebrates

Invertebrates are the most diverse and abundant organisms on the planet and play an important role in maintaining the function of ecosystems in a number of ways. For instance, they form an integral part of food-webs, are important pollinators recycle organic matter and form the bulk of parasitic species which regulate plant and animal. Invertebrates may be better suited as bio-indicators than vertebrates as they can reflect trends in species diversity and community composition more accurately than vertebrates as they are more abundant and

diverse (Majer and Bisvac 1999; Kremen *et al*., 1993). In addition to this their small body dimensions when compared to vertebrates, makes them sensitive to local conditions, while their mobility enables them to move in response to changing conditions. A better understanding of the factors that influence invertebrate diversity within the local and landscape scale is important to ensure the conservation of biodiversity with the agricultural landscape. A list of all 19 invertebrate species recorded during the infield assessment is presented in Table 9-10 below. The Rear Horned Baboon Spider is commercially protected.

Table 9-10: Invertebrate species recorded during the infield assessment

Scientific Name	Common Name	Class	Threat Status
Junonia hierta	Yellow Pansy	Lepidoptera	*LC (SABCA 2013)*
Euchrysops subpallida	Ashen Smoky Blue	Lepidoptera	*LC (SABCA 2013)*
Anthene amarah	Black-striped Hairtail	Lepidoptera	*LC (SABCA 2013)*
Nephila senegalensis ssp. annulata	Banded-legged Golden Orb-web Spider	Arachnida	
Pseudothericles		Orthoptera	
Gymnopleurus humeralis	Small Green Dung Beetle	Coleoptera	
Belenois aurota	Pioneer White	Lepidoptera	*LC (SABCA 2013)*
Ceratogyrus darlingi	Rear Horned Baboon Spider	Arachnida	Commercially threatened (IUCN)
Junonia hierta spp. cebrene	Yellow Pansy	Lepidoptera	*LC (SABCA 2013)*
Harpactirella overdijki	Overdijk's Lesser Baboon Spider	Arachnida	
Brachionopus pretoriae		Arachnida	
Belenois gidica	African Veined White	Lepidoptera	*LC (SABCA 2013)*
Acraea natalica	Natal Acraea	Lepidoptera	*LC (SABCA 2013)*
Colotis agoye	Speckled Sulphur Tip	Lepidoptera	*LC (SABCA 2013)*
Ocyale guttata		Arachnida	*LC (SABCA 2013)*

Scientific Name	Common Name	Class	Threat Status
Mausoleopsis amabilis	White-spotted Fruit Chafer	Coleoptera	
Byblia ilithyia	Spotted Joker	Lepidoptera	*LC (SABCA 2013)*
	Fishing Spider	Arachnida	
	Armoured Ground Cricket		

Baboon spiders which were recorded on site, are classified as 'Commercially Threatened' in terms of the IUCN Red Data List on account of their popularity as pets. Horned Baboon Spiders are unique due to the distinctive horn projecting out of their carapace, making them sought-after specimens for collectors and the pet trade.

In 1987, three species of the baboon spider, including the Horned Baboon Spider were added to Schedule VII of the Transvaal Provincial Nature Conservation Ordinance as Protected Invertebrate Animals. Today this restriction is still in place in all South African provinces. Thus, without a permit, these animals may not be collected, transported or kept.

10 Ecological Impact Assessment

10.1 The Precautionary Principle

The precautionary principle, although confusing in its application, is an important part of ecological impact assessments, where scientific certainty is not possible (Cooney, 2004). Several organisations, including the IUCN and Fauna & Flora International (FFI) have partnered to assess the implications of its use, as well as for developing best practice. Best practice encourages integration of conservation, local and scientific knowledge. It is important that the principle is used with caution and not simply to aid conservationist goals, but to take into account all land use options. The principle grew from the tendency for favouring development and is designed to weigh unknown scientific information about potential impacts against that tendency to favour development. It is stated: “Where there is uncertainty concerning the impacts of an activity, rather than assuming human activities will proceed until and unless there is clear evidence that they are harmful, the precautionary principle supports action to anticipate and avert environmental harm in advance of, or without, a clear demonstration that such action is necessary. (Cooney, 2004.)” The Convention on Biological Diversity states: “where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat” (Cooney, 2004).

10.2 Mitigation Hierarchy

The mitigation hierarchy is international best practice for managing risks and impacts, and is listed by the IFC as the primary objective of in Performance Standard 1 as follows: “To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimise, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.”

The IFC further mentions the Mitigation Hierarchy in performance Standard 6, in the context of natural or critical habitat and states that “biodiversity offsets may only be considered after appropriate avoidance, minimisation and restoration measures have been applied” (IFC. 2012).

The Hierarchy follows a strict progression of best practice for dealing with impacts; these are explained in Table 10-1 below:

Table 10-1: The different levels of the Mitigation Hierarchy defined

Avoidance	If impacts on the natural environment can be avoided, this is the best possible way of reducing impacts. Avoidance can involve changes in the location of infrastructure, even though, in mining developments, the pit itself cannot be moved.
Minimisation	If impacts cannot be avoided, it is important that these are minimized. This is where mitigation measures usually described in an EIA fall. Minimization may include

	reducing the footprint of the development as far as possible, restricting access to loggers using drilling roads, or utilising already existing infrastructure.
Restore	If there are still residual impacts, restoration or rehabilitation may be employed to increase the biodiversity value of the site after development activities.
Offset	If residual impacts remain after all efforts to avoid, minimise and restore have been taken into consideration, offsets may be needed. These include the setting aside of areas within the mining lease area as corridors and conservation areas, as well as the setting aside of other areas for conservation. Offsets are difficult to determine and manage, and a separate study is often needed in order to identify the best options and those which compensate identical (or as close as possible) biodiversity to that which was impacted by the development.

10.3 Project Activities Assessed

The objective of this section is to rate the significance of the potential impacts pre-mitigation and post-mitigation. The impacts below are a result of both the environment in which the activity takes place, as well as the activity itself. This SEZ will compromise a connected pipeline of a minimum of eight catalytic projects (Figure 1-1).

It will be established across eight farms. The total farm sizes add up to approximately 8000 ha of which 6000 ha will be used for the SEZ. Project infrastructure that is expected to be constructed are listed in Table 1-1. The impact assessment is based on the sizes and location of various infrastructure placements located within each development zone, and it is assumed that open areas between infrastructure footprints will be left natural as far as is possible. Certain zones such as the ferrochrome plant for example is expected to transform the specific area in its entirety.

10.4 Construction Phase

10.4.1 Activity 1: Clearing and Site establishment, including infrastructure construction

The construction phase activities that will have an impact on the terrestrial ecology are summarised below. The loss of any vegetation or habitat type is reported as per the size of the planned construction areas in hectares, as per the table above.

Table 10-2: Construction phase Interactions with flora and fauna as well as impacts expected

Interaction	Impact
	Direct and permanent loss of approximately 4754 ha of natural habitat, containing SSC.

Interaction	Impact
Site clearing and establishment for infrastructure placement including the increased traffic to complete the activity	Loss of ecological services provided by areas of high sensitivity including the pans and woodland areas.
	Indirect impacts due to an industrial activity occurring within a largely natural landscape including increased road kills.

10.4.1.1 Impact Description

The major impacts associated with the proposed development from a fauna and flora perspective will largely occur during the site establishment and construction phase of the project. The major impacts at this stage of the proposed development will stem from site establishment as well as immediate vegetation clearing and earthworks that precede construction activities. This leads to natural vegetation transformation and complete destruction of vegetation communities, plant species habitats, and natural ecosystems within the project footprints. Results from the infield assessment indicate that significant portions of the Mopane Bushveld (4422.2 ha), and the three associated sub types as well as the Riparian Habitat (155 ha) and its associated sub types will be affected, these vegetation/habitat types coincide with the ESA1. Approximately 177.2 ha of delineated Ridge Bushveld will also be impacted. This vegetation/habitat type coincides with CBA 2.

From a conservation planning perspective, specifically the Limpopo Conservation Plan, two of the planned zones of construction are within LCPv2 CBA2 areas. The Processing zone consists of 400 ha of various industrial processing activities and it is expected that complete clearance of this area will take place. The Conservation Area zone to the extreme south of the project area will be approximately 1550 ha in size and is planned to have various stands within it such as a water treatment plant, reservoir and a visitors guest lodge. In addition, it can be expected that roads, pipelines and the perimeter wall will also be constructed here. Complete transformation of the natural ecosystem is not expected here as the infrastructure areas are relatively small and the area is aimed to be a conservation area. It is not known at this stage what is meant by conservation area or what aims and objectives will form part of this area.

The four protected tree species recorded during the field assessment are highly likely to be widespread and common throughout the project footprint. The strict management of these species must be according to the NFA and LEMA acts.

Clearance operations and site preparation also have the potential to result in the loss of top soil or to cause mechanical disturbance (compaction) to the soil. In addition, the presence of construction machinery and a fairly large construction work force may pose several risks to fauna and flora and cause permanent displacement of fauna, in particular SSC (Baboon Spider) that are present on site.

10.4.1.1.1 Management objectives

The objectives of management actions and mitigation measures are to avoid and reduce impacts to flora and fauna habitat on site and to mitigate any impacts that cannot be avoided. Management objectives will ensure that impacts from clearing and site establishment are limited and sensitive vegetation, plants and habitats are avoided during this process. To this end all clearing must be minimised and restricted to areas required for the construction activities of the project and disturbance to the undisturbed adjacent natural areas must be limited. Habitats, especially the delineated riparian areas and adjacent areas must be protected through the implementation of erosion and sediment control measures. All construction activity areas should be defined, and fences should be installed to demarcate areas that are out of bounds. Appropriate locating of lay down yard and infrastructure should be undertaken to limit damage to any vegetation. These should not be located within areas that will not be directly lost to construction and these should be cordoned off. All sensitive landscapes, vegetation types and locations of SSC must be avoided.

10.4.1.1.2 Management Actions and Targets

During the construction of the project related infrastructure, general mitigation and management actions provided in the following studies completed by Digby Wells as part of this project should be used to guide the effective management of the ecological resources affected by the proposed project:

- Aquatic Ecology Report;
- Rehabilitation Plan; and
- Surface Water Report.

The Ecological Management Plan detailed in Section 13 must be developed and used as a guide to inform management actions. However, specific important management actions are briefly discussed below:

A detailed sweep of the impacted areas or project area must be completed where:

- All protected trees are located and counted for the permitting process;
- All other floral SSC observed are located and documented;
- All nesting faunal species (including Baboon Spiders) are located, counted and documented;
- Ensure that the Present Ecological State is determined at the inception of the project and is calculated annually to determine if there is a decline or increase of species and appropriate management actions are determined and executed;
- Ensure the establishment of an integrated Alien Invasive Management plan; and
- Investigate the potential to establish or contribute to an ecological offset area, if the residual impact after mitigation is significant.

10.4.1.1.3 Impact rating

The rating of impacts related to natural vegetation transformation and disturbance of vegetation communities, plant species habitats, and natural ecosystems as well as the mtigation measures suggested to prevent, reduce, or remediate this impact are discussed in Table 10-3.

Table 10-3: Impact rating for natural vegetation transformation and disturbance of vegetation communities, plant species habitats, and natural ecosystems

Activity and Interaction: Clearing of vegetation and increased traffic during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 1 Description: **Direct and permanent loss of approximately 4755 ha of natural habitat. Including plant and animal SSC.** Topsoil stripping will eliminate fauna habitat and food resources that are required by animals. Roads and transport of material will negatively affect the natural occurring/protected species of the site. Increased human presence will affect natural cycles. Construction noise will disturb faunal natural environment and site clearing will disturb fauna and flora SSC.			
Prior to mitigation/ management			
Duration	Permanent (7)	The impact is irreversible even with management.	Major negative (-119)
Extent	Municipal (4)	Loss of habitat will occur locally but will impact mobile faunal species of a greater area	
Intensity	Irreplaceable loss (6)	Irreplaceable loss of sensitive biophysical resources	
Probability	Definite (7)	These impacts will occur if the project goes ahead.	
Nature	Negative (-1)		
Mitigation/ Management actions			
Limited mitigation measures exist for loss of habitat. However, the following are recommended as a minimum: ▪ Use previously disturbed areas where possible and where possible retain as much natural vegetation within the footprint of infrastructure. ▪ Complete a fauna and flora search and rescue program for all protected species to be recorded. ▪ No unpermitted disturbance of any kind to protected flora species should occur and fines should be instituted for such actions ▪ Fencing of construction camps. No equipment or personnel will be allowed outside of the fenced construction camps ▪ Plan to relocate Red Data or protected species prior to site clearing commencing.			

Activity and Interaction: Clearing of vegetation and increased traffic during construction			
Dimension	**Rating**	**Motivation**	**Significance**
▪ A 100 m buffer is recommended for the sensitive landscapes and habitats if possible. ▪ Ensure that the area is fenced off to limit the ingress of species into the construction areas. ▪ Ensure that environmental awareness training is held prior to and during construction operations. ▪ Strict speed regulation of motor vehicles must be done by means of signage. ▪ No poaching or lighting of fires or feeding of fauna. ▪ To further mitigate the permanent loss of natural habitat, ecological offsetting must be done.			
Post- mitigation			
Duration	Beyond project life (6)	The impact will remain for some time after the life of the project and is potentially irreversible even with management	Moderate negative (-98)
Extent	Municipal (4)	Loss of habitat will occur locally but will impact mobile faunal species of a greater area	
Intensity	Serious loss (4)	Irreplaceable loss of moderately sensitive biophysical resources	
Probability	Definite (7)	These impacts will occur if the project goes ahead.	
Nature	Negative (-1)		
Impact 2 Description: **Loss of ecological services provided by areas of high sensitivity including the wetlands, riparian habitat, pans and woodland areas.** Clearing of vegetation will directly remove some wetland and important riparian woodland habitat and their buffer areas. Construction and clearing of this vegetation will disturb these natural environments and compromise the ecological services they provide, which are of significance in the context of the area. These include water attenuation, flood protection, habitat creation, foodstuffs provisioning.			
Prior to mitigation/ management			
Duration	Permanent (7)	The impact will permanent and will remain after the life of the project and is potentially irreversible even with management	Moderate negative (-98)
Extent	Municipal (4)	Loss of ecological services will occur locally but will impact mobile faunal species of a greater area utilising these habitats.	

Activity and Interaction: Clearing of vegetation and increased traffic during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Serious damage to moderately sensitive environments (4)	Serious damage to sensitive biophysical resources limiting ecosystem function.	
Probability	Definite (7)	There are sound scientific reasons to expect that this impact will occur if the project goes ahead.	
Nature	Negative (-1)		
Mitigation/ Management actions			
Limited mitigation measures exist for loss of ecological services. However, the following are recommended: ▪ Use previously disturbed areas where possible, avoid sensitive landscapes/areas. ▪ Plan to relocate Red Data or protected species prior to site clearing commencing. ▪ A 100 m buffer is recommended for the pan and woodland habitats. Refer to the wetlands report for suggested buffer sizes. ▪ Ensure that the area is fenced off to limit the ingress of species into the construction areas. ▪ To further mitigate the permanent loss of natural habitat, ecological offsetting must be done.			
Post- mitigation			
Duration	Beyond project life (6)	Loss of ecological services will remain an impact beyond the project life.	Moderate negative (-91)
Extent	Municipal (4)	Loss of ecological services will occur locally but will impact mobile faunal species of a greater area utilising these habitats.	
Intensity	Moderate damage to sensitive environments (3)	With adequate mitigation, this can be moderate damage to sensitive biophysical resources limiting ecosystem function.	
Probability	Definite (7)	There are sound scientific reasons to expect that this impact will occur if the project goes ahead.	
Nature	Negative(-1)		

Activity and Interaction: Clearing of vegetation and increased traffic during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 3 Description: **Indirect impacts due to industrial construction activities occurring within a largely natural landscape.** Construction activities requiring the use of existing, upgraded and new roads will disturb the natural environment. Road deaths of naturally occurring Red Data and other faunal species will increase and. The fragmentation of natural habitats and the creation of edge effects will also occur due to this activity.			
Prior to mitigation/ management			
Duration	Medium term (3)	Construction activities will occur within 1-5 years.	Moderate negative (-77)
Extent	Municipal (4)	Indirect impacts (such as road kills) will occur locally but will impact mobile faunal species of the greater area.	
Intensity	Serious damage to or loss of sensitive environments (4)	Serious damage to or loss of sensitive biophysical resources such as SCC.	
Probability	Definite (7)	There are sound scientific reasons that the impact will definitely occur.>80% probability	
Nature	Negative (-1)		
Mitigation/ Management actions			
▪ Ensure that the width and length of roads are kept to a minimum. ▪ Use previously disturbed areas or existing roads where possible. ▪ Commit to relocate Red Data or protected species prior to construction commencing. ▪ Ensure that vehicle speeds are kept to a minimum. ▪ Ensure that noise levels are reduced. ▪ Limit construction to daylight only to reduce noise. ▪ Ensure that the project area is demarcated and no persons or vehicles permitted outside the demarcated area. ▪ Ensure that environmental awareness training is held prior and during construction operations are held.			
Post- mitigation			
Duration	Medium term (3)	Construction activities will occur within 1-5 years.	Minor Negative

Activity and Interaction: Clearing of vegetation and increased traffic during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Municipal (4)	Loss of ecological services will occur locally but will impact mobile faunal species of a greater area utilising these habitats.	-55
Intensity	Serious damage to or loss of sensitive environments (4)	Significant changes to structures / items of natural or social significance.	
Probability	Likely: The impact may occur. <65% probability (5)	The possibility of road deaths due to the mobility of the fauna is always a possibility	
Nature	Negative (-1)		

10.5 Operational Phase Impact

10.5.1 Activity 2: Operation of the various SEZ components

The operational phase activities that will have an impact on the terrestrial ecology are summarised below.

Table 10-4: Operational Phase Impacts

Interaction	Impact
Operation of the SEZ and associated local infrastructure including the, generation of heat, noise and dust, storage and reticulation of contaminated water, generation of domestic and hazardous waste and the ingress of humans into the area.	Indirect impacts due to an industrial activity occurring within a largely natural landscape including increased road kills.
Operation of smelters and coal fired power station resulting in air pollution and waste production.	The principal sources of pollution caused by coal fired power station and smelting are contaminant-laden air emissions and process wastes such as wastewater and slag, in the case of smelting.
Open areas occurring after construction.	Introduction of alien invasive plant species.

10.5.1.1.1 Management objectives

These objectives are to prevent/minimise the loss of or further damage to natural ecosystems and their buffer areas. This is important as the naturally occurring habitat and ecosystems play a major role in supporting a range of ecological processes and biodiversity in the region, particularly as the general area is a tourism area.

10.5.1.1.2 Management actions and targets

During the operational phase of the project related infrastructure, general mitigation and management actions provided in the following studies done by Digby Wells as part of this project should be used to guide the effective management of the ecological resources affected by the proposed project:

- Aquatic Ecology Report and
- Surface Water Report.

The Ecological Management Plan detailed in Section 14 must be used as a guide to inform management actions. Specific important management actions are briefly discussed below:

- Waste management must be completed in such a way that toxic substances are not emitted into the environment, including waste water, air pollution, and process waste products; and
- The management of AIP species must continue from construction phase within the framework of an integrated AIP management plan.

10.5.1.1.3 Impact Rating

Table 10-5: Potential Impacts of the Operational Phase on the Ecological Environment

Activity and Interaction: Operation of the SEZ and associated local infrastructure including generation of heat, noise and dust, storage of water, generation of domestic and hazardous waste and the ingress of humans into the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 1 Description: **Indirect impacts due to industrial activities occurring within a largely natural landscape.** Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.			
Prior to mitigation/ management			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Moderate negative (-91)
Extent	Municipal (4)	Impacts may occur locally but will impact mobile faunal species of a greater area	

Activity and Interaction: Operation of the SEZ and associated local infrastructure including generation of heat, noise and dust, storage of water, generation of domestic and hazardous waste and the ingress of humans into the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Serious damage to or loss of sensitive environments (4)	Serious damage to or loss of sensitive biophysical resources such as SCC.	
Probability	Definite (7)	There are sound scientific reasons that the impact will definitely occur.>80% probability	
Nature	Negative (-1)		
Mitigation/ Management actions			
▪ Ensure that a Biodiversity Action Plan addresses these impacts in full. ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented. ▪ Ensure continuous environmental awareness training takes place.			
Post- mitigation			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Minor negative (-72)
Extent	Local (3)	Sound mitigation and management measures may ensure the impacts occur locally	
Intensity	Moderate damage to or loss of sensitive environments (4)	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.	
Probability	Highly probable (6)	Sound mitigation and management measures may ensure the impacts are less likely to occur	
Nature	Negative (-1)		
Activity and Interaction: Air pollution and waste generation			
Dimension	**Rating**	**Motivation**	**Significance**

Activity and Interaction: Operation of the SEZ and associated local infrastructure including generation of heat, noise and dust, storage of water, generation of domestic and hazardous waste and the ingress of humans into the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 2 Description: One type of pollution attributed to air emissions is acid rain. The smelting of sulfide ores results in the emission of sulfur dioxide gas, which reacts chemically in the atmosphere to form a sulfuric acid mist. As this acid rain falls to the earth, it increases the acidity of soils, streams, and pans, harming the health of vegetation and fish and wildlife populations. When compared to pollution caused by air emissions, process waste and slag are of less concern. In modern smelters, much of the wastewater generated is returned to the process. If the economic value of the metal concentrate in slag is high enough, the slag may be returned to the process, thereby reducing the amount requiring permanent disposal.			
Prior to mitigation/ management			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Moderate negative (-91)
Extent	Municipal (4)	Impacts may occur locally but will impact mobile species of a greater area will be impacted by habitat loss	
Intensity	Serious damage to or loss of sensitive environments (4)	Serious damage to or loss of sensitive biophysical resources.	
Probability	Definite (7)	There are sound scientific reasons that the impact will definitely occur.>80% probability	
Nature	Negative (-1)		
Mitigation/ Management actions			
▪ Ensure the use of new technologies, such as electrostatic precipitators, adhere to national and international emissions standards. ▪ Ensure a waste management plan for water and production waste is in place			
Post- mitigation			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Minor negative (-72)

Activity and Interaction: Operation of the SEZ and associated local infrastructure including generation of heat, noise and dust, storage of water, generation of domestic and hazardous waste and the ingress of humans into the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Local (3)	Sound mitigation and management measures may ensure the impacts occur locally	
Intensity	Moderate damage to or loss of sensitive environments (4)	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.	
Probability	Highly probable (6)	Sound mitigation and management measures may ensure the impacts are less likely to occur	
Nature	Negative(-1)		
Activity and Interaction: Operation of transmission line			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 3 Description: **Proliferation of AIP species in areas disturbed by operation activities.**			
Prior to mitigation/ management			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Moderate negative (-91)
Extent	Municipal (4)	This impact if left unchecked could affect the municipal area	
Intensity	Irreplaceable loss (4)	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function	
Probability	Definite (7)	There are sound scientific reasons that the impact will definitely occur.>80% probability	
Nature	Negative (-1)		
Mitigation/ Management actions			

Activity and Interaction: Operation of the SEZ and associated local infrastructure including generation of heat, noise and dust, storage of water, generation of domestic and hazardous waste and the ingress of humans into the area.			
Dimension	**Rating**	**Motivation**	**Significance**
■ Ensure an integrated AIP management plan is in place and adhered to. ■ Specific control measures from an AIP Monitoring Plan must be incorporated into the working procedures. ■ Regular on-site monitoring for invase species must be carried out to allow early identification of invasive species before they bevome established and speread cleared areas. ■ Regular hygiene inspections of all equipment, vehicle and machinery should be carried to ensure no spread of alien invasive plants occurs.			
Post- mitigation			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Minor negative (-72)
Extent	Local (3)	Sound mitigation and management measures may ensure the impacts occur locally	
Intensity	Moderate damage to or loss of sensitive environments (4)	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.	
Probability	Highly probable (6)	Sound mitigation and management measures may ensure the impacts are less likely to occur	
Nature	Negative(-1)		

10.6 Decommissioning Phase

10.6.1 Impact Description

The demolition of the SEZ and associated infrastructure areas will have negative impacts similar to that of the construction activities due to the similarities of the actions. Affected areas will then need to be rehabilitated back to wilderness and/or game farming or according to the updated regional strategic goal for the area. The major impacts anticipated due to the proposed interaction are listed in Table 10-6 below.

Table 10-6: Interactions and Impacts of the Decommissioning Phase

Interaction	Impact
Decommissioning of the SEZ and associated infrastructure including the demolition and removal of infrastructure, removal of rubble, removal of roads and fences, rehabilitation of the all buildings, ingress of humans from the area.	Indirect impacts due to decommissioning activity occurring within a largely natural landscape.
Rehabilitation of impacted areas to wilderness	Improvements from rehabilitation will be recognisable over time as area is returned to wilderness – this will however not be natural bushveld.

10.6.1.1.1 Management Objectives

Management objectives are to inform the SEZ where there are ecological interactions with the proposed activities during the demolition of the infrastructure. These objectives are to prevent/minimise the loss of or further damage to natural ecosystems and their buffer areas. This is important as the naturally occurring habitat and ecosystems play a major role in supporting a range of ecological processes and biodiversity in the region; particularly as this currently is a tourism area.

10.6.1.1.2 Management Actions and Targets

During the demolition of the project related infrastructure, general mitigation and management actions provided in the following studies done by Digby Wells as part of this project should be used to guide the effective management of the ecological resources affected by the proposed project:

- Aquatic Ecology Report; and
- Surface Water Report.

The Ecological Management Plan detailed in Section 13 must be used as a guide to inform management actions. However, specific important management actions are briefly discussed below:

- Rehabilitate the area to wilderness in line with the local setting with expert knowledge.
- If an ecological offset area was established or contributed to, investigate the role this area can play in assisting rehabilitation.

10.6.1.1.3 Impact Ratings

Table 10-7: Potential impacts of the Decommissioning phase on the ecological environment

Activity and Interaction: Decommissioning of infrastructure including the demolition and removal of infrastructure, removal of rubble, removal of roads and fences, rehabilitation of the SEZ, ingress of humans from the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 1 Description: **Indirect impacts due to industrial activities occurring within a largely natural landscape.** Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.			
Prior to mitigation/ management			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Moderate negative (-91)
Extent	Municipal (4)	Impacts may occur locally but will impact mobile faunal species of a greater area	
Intensity	Serious damage to or loss of sensitive environments (4)	Serious damage to or loss of sensitive biophysical resources such as SCC.	
Probability	Definite (7)	There are sound scientific reasons that the impact will definitely occur.>80% probability	
Nature	Negative (-1)		
Mitigation/ Management actions			
▪ Ensure that a Biodiversity Action Plan addresses these impacts in full. ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented. ▪ Ensure continuous environmental awareness training takes place.			

Activity and Interaction: Decommissioning of infrastructure including the demolition and removal of infrastructure, removal of rubble, removal of roads and fences, rehabilitation of the SEZ, ingress of humans from the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Post- mitigation			
Duration	Project Life (5)	The impact will remain for the life of the project but is not reversible even with management	Minor negative (-72)
Extent	Local (3)	Sound mitigation and management measures may ensure the impacts occur locally	
Intensity	Moderate damage to or loss of sensitive environments (4)	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.	
Probability	Highly probable (6)	Sound mitigation and management measures may ensure the impacts are less likely to occur	
Nature	Negative (-1)		
Activity and Interaction: Rehabilitation of impacted areas to wilderness			
Dimension	**Rating**	**Motivation**	**Significance**
Impact 2 Description: **Improvements from rehabilitation will be recognisable over time as area is returned to wilderness – this will however not be natural bushveld.** These areas will have been transformed permanently from the natural state and this impact is captured in the construction phase. With well-planned and case specific rehabilitation actions the area will be improved from its new industrial status			
Prior to mitigation/ management			
Duration	Medium term (3)	The rehabilitation will be effective for 1 to 5 years before further degradation occurs	Negligible positive (36)
Extent	Local (3)	Local extending only as far as the development site area.	

Activity and Interaction: Decommissioning of infrastructure including the demolition and removal of infrastructure, removal of rubble, removal of roads and fences, rehabilitation of the SEZ, ingress of humans from the area.			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Average (3)	Ongoing positive benefits, not wide spread but felt by some elements of the baseline	
Probability	Probable (4)	Could occur < 50%	
Nature	Positive (-1)		
Mitigation/ Management actions			
▪ Ensure that the rehabilitation plan is updated during the project's term. ▪ Ensure that the environmental liability assessments are done annually and that the cost for rehabilitation is updated annually and the funds are available. ▪ Ensure that the correct specialists are involved well in advance to deal with all the aspects of decommissioning. ▪ Ensure that an ecologist is commissioned to guide the rehabilitation of the natural elements of the project site. ▪ Rehabilitate successfully to bushveld comprised of natural indigenous species with the carrying capacity of pre-disturbance standards.			
Post- mitigation			
Duration	Beyond project life (6)	Improvements and rehabilitation will be recognisable, ingress of fauna into the area overtime	Minor positive (65)
Extent	Local (3)	Will extend as far as the site	
Intensity	Average (4)	Average ongoing positive benefits felt by some elements of the baseline	
Probability	Likely (5)	Its most likely that this impact will occur	
Nature	Negative(-1)		

11 Cumulative Impacts

It is necessary to consider the impacts that the development will have from a broad area perspective, by considering land-use and transformation of natural habitat in areas surrounding the site. Cumulative impacts are assessed by considering past, present and anticipated changes to biodiversity. Albeit the Musina Mopane Bushveld and Limpopo Ridge Bushveld vegetation types are assigned a Least Concern status, large portions of this vegetation are under threat due to expanding mining operations, including the Mopane project, Chapudi project, Makhado project and Vele project. The level of protection that this vegetation type receives provincially is regarded as poor and it is regarded as endemic to the province (LEDET 2017). The cumulative loss of this vegetation type as well as the SSC found within it should be considered proactively. The continued loss of the vegetation type will only be exasperated by the various planned and existing developments, including the MUsina/Makhado SEZ. During this report the quantification of the regional cumulative impacts were not completed, it is however recommended that the developer of the SEZ work constructively with other developers in the area to plan an aggregated biodiversity offset. Such an offset if implemented correctly could mitigate the large scale vegetation and habitat loss that is envisaged regionally.

As indicated in the impact assessment sections approximately 177 ha of Limpopo Ridge Bushveld, 4422.2 ha of Musina Mopane Bushveld and 145 ha of Riparian vegetation will be permanently lost.

The Musina Makhado SEZ is situated within the Transition Zone area of the Vhembe Biosphere Reserve. The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable (Figure 11-1).

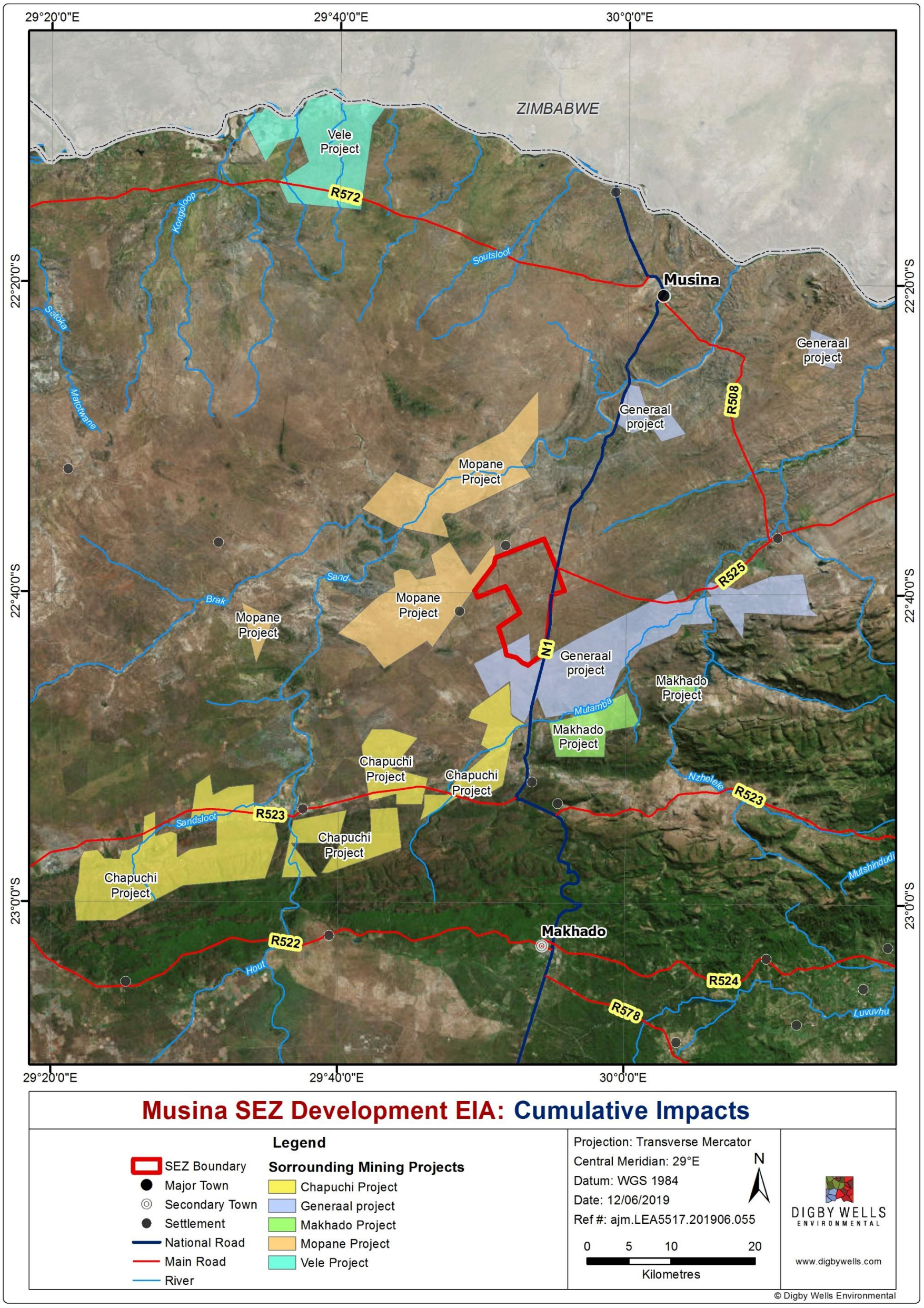

Figure 11-1: Cumulative Impact

12 Unplanned events and low risks

Low risks can be monitored to gauge if the baseline changes and mitigation is required. Unplanned events may happen on any project. Table 12-1 shows possible unplanned events and management/mitigation measures.

Table 12-1: Unplanned events, low risks and their management measures

Unplanned event	Potential impact	Mitigation/ Management/ Monitoring
Hydrocarbon spillage	Soil contamination	▪ Appropriate measures should be implemented to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person. This will include the use of spill kits. ▪ Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. ▪ Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use. ▪ Implement suitable erosion control measures.
Accidents and structural failure	Habitat degradation	▪ Equipment and infrastructure should be designed to withstand natural phenomena as best possible. ▪ Regular inspections and maintenance should be carried out in all sections until a closure certificate is obtained i.e. grass cutting, removal of debris, erosion repair ▪ Impacts from natural hazards, such as flooding, should not be exacerbated through improper management measures, or failure to plan;

13 Environmental Management Plan

The Environmental Management Plan (EMP) has been described according to the project activities to provide an understanding of what objectives and recommended management measures are required to minimise the environmental impacts arising from these activities.

13.1 Project Activities with Potentially Significant Impacts

Table 13-1: Potentially Significant Impacts of the SEZ

SEZ, Construction, Operation and Decommissioning/Rehabilitation	
Aspects	**Potential Significant impacts**
Removal of vegetation	Loss of habitat and biodiversity, especially Red Data species.
Excavation of soils	Loss of habitat and biodiversity, especially Red Data species.
Noise	Disturbance to the natural breeding cycles, loss of biodiversity especially amongst birds and mammals.
Influx of personnel	Loss of species due to poaching, presence of people will cause fauna to vacate the area causing a loss of biodiversity, habituation of wildlife, removal of wood, fires, poaching will cause the decrease of biodiversity.
Increased vehicle activity	Loss of individual species due to road deaths.
Exposure of contaminated water	Loss of individual species consuming contaminated water.
Dust	Dust generation will cause species to vacate the area resulting in a loss of biodiversity.
Generation of General and Hazardous Waste	Pollution of the environment may poison some species causing a loss in biodiversity.
Operation of the SEZ	Continuous noise and movement will ensure that species vacate the area permanently causing a loss of biodiversity
Decommissioning and Rehabilitation of the SEZ infrastructure and footprint	Fauna species may return to the area increasing biodiversity, revegetation of the exposed areas and SEZ will increase the flora biodiversity.

13.2 Summary of Mitigation and Management

Table 13-1 provides a description of the mitigation and management options for the environmental impacts anticipated during the construction, operational and decommissioning and closure phases. Table 13-2 to Table 13-4 provide a summary of the proposed project activities, environmental aspects and impacts on the receiving environment. Information on

the frequency of mitigation, relevant legal requirements, recommended management plans, timing of implementation, and roles / responsibilities of persons implementing the EMP.

Table 13-2: Impacts

Activities	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Vegetation clearing for access roads, and site establishment	Construction	4754 Ha	▪ Conduct a biodiversity walk through to locate protected species prior to commencement and relocate species where possible or required. ▪ Limit the vegetation disturbance to the designated areas only and the legal minimum requirement width for road and powerline servitudes is strictly adhered to. ▪ In the development areas, plan the location of infrastructure in such a manner as to leave as many natural vegetation areas or individual species as possible. ▪ Adhere to the guidelines and permit requirements for the removal of protected species. ▪ Developmental areas such as transmission lines and roads must be either be located on previously disturbed areas or existing development corridors.	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998) ▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	▪ Pre the commencement of construction activities
Topsoil removal and preparation of road bed and excavation infrastructure foundations	Construction	Unknown, but will be within the 6000 ha	▪ Ensure that dust control measures are implemented on the roads and, ▪ Ensure that the developmental footprint is not exceeded.	▪ Conservation of Agricultural Resources Act (CARA), 1993 (Act 43 of 1983 ▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)	▪ Pre and during construction
Increased vehicle activities	Construction, Operation and Decommissioning	Unknown, but will be within the 6000 ha	▪ Ensure that noise control measures are implemented by reducing speed, ensure that exhaust systems are functioning according to manufacturer's specifications. ▪ Ensure that heavy vehicle traffic is limited to daylight hours only. ▪ Ensure that speed limits are enforced		

Activities	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Increase of humans into the project site	Construction, Operation and Decommissioning	Unknown, but will be within the 6000 ha	▪ Limit the interaction of humans with the biophysical environment by ensuring that personnel remain within the demarcated areas. ▪ No fires allowed on site ▪ No poaching or harvesting flora ▪ No removal of trees for firewood. ▪ Ensure that food waste is stored in animal proof containers ▪ Ensure that there are waste disposal and littering prevention procedures in place ▪ No feeding of animals ▪ Ensure that environmental awareness training takes place at regular intervals ▪ Exclude fauna from the site where possible using passive means such as electrification of fences.	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998) ▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)	▪ Pre construction and during the lifetime of the project
Waste Management, Including collection and separation of general waste and the storage and handling of hazardous waste, especially building materials during the construction phase	Construction. Operation and Decommissioning	Unknown, but will be within the 6000 ha	▪ A waste management plan must be generated and implemented. ▪ The system must be monitored to ensure that the environment is not polluted and that fauna do not consume the waste. ▪ Ensure that there are spillage procedures in place so that any exposure to biophysical environment is limited. ▪ Ensure that the appropriate training is given to staff and management.	▪ National Environmental Waste Act, Act 59 of 2008	▪ Pre construction and during the life time of the project
Operation of the SEZ	Operational	Unknown, but will be within the 6000 ha	▪ At the design phase ensure that noise abatement measures are investigated and implemented to limit the noise generated by the SEZ which may have an effect on the fauna.	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)	▪ Pre and during the life time of the project
Decommissioning, removal of infrastructure and rehabilitation of the impacted areas.	Decommissioning and Rehabilitation	900 Ha	▪ Provision must be made for the re-establishment of the soil profile ▪ Planting species naturally occurring in the area will be provided for ▪ Should alien invasive plants be noticed on site that an Alien Invasive Management Plan be formulated and implemented	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998) ▪ Conservation of Agricultural Resources Act (CARA), 1993 (Act 43 of 1983	▪ Prior, during and post rehabilitation

Table 13-3: Objectives and Outcomes of the EMP

Activities	Potential impacts	Aspects affected	Phase	Mitigation	Standard to be achieved/objective
Vegetation clearing for access roads, extensive SEZ infrastructures,	▪ Loss of habitat, loss of Biodiversity, loss of Red Data Species	Fauna/ Flora	Construction	▪ Conduct a protected flora and fauna species survey prior to commencement and relocate species where possible or required ▪ Limit the vegetation disturbance to the designated areas only and the legal minimum requirement width for road and powerline servitudes is strictly adhered to ▪ In the development areas plan the location of infrastructure in such a manner as to leave as many natural vegetation areas or individual species as possible ▪ Adhere to the guidelines and permit requirements for the removal of protected species. ▪ Developmental areas such as transmission lines and roads must be either be located on previously disturbed areas or existing development corridors.	▪ Limit the loss of biodiversity. ▪ Increase the potential for a faster recovery to the areas pre construction state. ▪ Enhance the recovery of Red Data and naturally occurring species.
Topsoil removal and preparation of road bed and excavation infrastructure foundations	▪ Loss of soil properties	Flora & Fauna	Construction and Rehabilitation	▪ Ensure that dust control measures are implemented on the roads. ▪ Ensure that the developmental footprint is not exceeded.	▪ Ensure that the correct soils are used to rehabilitate the area which will aid the recovery of the vegetation.
Increased vehicle activities	▪ Destruction of flora ▪ Animal deaths ▪ Fauna will vacate the area ▪ Loss of biodiversity ▪ Loss of Red Data Species ▪ Excessive noise leading to fauna vacating the area ▪ Interruption of breeding and feeding cycles	Flora/Fauna	All Phases	▪ Ensure that noise control measures are implemented by reducing speed, ensure that exhaust systems are functioning according to manufacturer's specifications. ▪ Ensure that speed limits are enforced.	▪ Minimise the impact of vehicles on the biodiversity. ▪ Minimise death or destruction of fauna and flora.

Activities	Potential impacts	Aspects affected	Phase	Mitigation	Standard to be achieved/objective
Increase of human activity into the project site	▪ Disturbance of the natural cycles ▪ Loss of biodiversity ▪ Loss of species ▪ Pollution ▪ Habituation of species to humans	Fauna/Flora	All Phases	▪ Limit the interaction of humans with the biophysical environment by ensuring that personnel remain within the demarcated areas. ▪ No fires allowed on site. ▪ No poaching or harvesting flora. ▪ No removal of trees for firewood. ▪ Ensure that food waste is stored in animal proof containers ▪ Ensure that there are waste disposal and littering prevention procedures in place. ▪ No feeding of animals. ▪ Ensure that environmental awareness training takes place a regular intervals. ▪ Exclude fauna from the site where possible using passive means such as electrification of fences.	▪ Limit the influence that humans have on the environment in order to ensure that the biodiversity in the area is maintained ▪ Ensure that the natural cycles are maintained
Waste Management, Including collection and separation of general waste and the storage and handling of hazardous waste	▪ Soil pollution ▪ Water pollution ▪ Loss of species and biodiversity	Fauna/Flora	All Phases	▪ A waste management plan must be generated and implemented. ▪ The system must be monitored to ensure that the environment is not polluted and that fauna do not consume the waste. ▪ Ensure that there are spillage procedures in place so that any exposure to biophysical environment is limited. ▪ Ensure that the appropriate training is given to staff and management.	▪ Eliminate pollution from the environment. ▪ Ensure that there are no occurrences latent pollution which may arise post rehabilitation.
Erection of towers and stringing of power cables	▪ Inflight birds deaths ▪ Electrocution ▪ Loss of terrestrial species ▪ Loss of biodiversity ▪ Loss of Red Data Species	Fauna/Flora	Construction and operational	▪ Conduct an ecological audit in the tower foot print area for any Red Data Species. ▪ Ensure that there is a relocation plan in place. ▪ Place bird flight diverters on the earth wire of the powerline alternating with black and white at least 100m apart along the entire length of the power line. ▪ Insulate the phase conductor one meter on either side of the insulator for all three phase conductors.	▪ Minimise the occurrence of bird death and the loss of vulnerable species. ▪ Minimise or eliminate the loss of terrestrial species.
Maintenance of powerline servitudes	▪ Loss of species and biodiversity through incorrect maintenance practices		Operational	▪ Only approved access routes may be used for the maintenance of the servitude. ▪ Ensure that the Eskom standards for the maintenance of the servitude are adhered to. ▪ Ensure that should any aspect relating to the change of the biophysical environment along the servitude brought to the environmental managers.	▪ Eliminate the loss of species and biodiversity. ▪ Promote the recovery of the servitude when the transmission line is removed.

Activities	Potential impacts	Aspects affected	Phase	Mitigation	Standard to be achieved/objective
Operation of the SEZ	▪ Excessive continuous noise will disrupt feeding and breeding cycles ▪ Loss of biodiversity ▪ Loss of Red Data species	Fauna	Operational	▪ At the design phase ensure that noise abatement measures are investigated and implemented to limit the noise generated by the SEZ which may have an effect on the fauna.	▪ Ensure a quieter operation to ensure that species remain in the area which will improve the biodiversity levels.
Decommissioning, removal of infrastructure and rehabilitation of the impacted areas.	▪ Increase in biodiversity ▪ Reestablishment of the pre-construction ecological state ▪ Increase in Red Data Species ▪ Increase in ecosystem services	Fauna/Flora	Decommissioning and Rehabilitation	▪ Provision must be made for the re-establishment of the soil profile. ▪ The planting species that are naturally occurring in the area will be provided for. ▪ Should alien invasive plants be noticed on site that an Alien Invasive Management Plan be formulated and implemented.	▪ Restoration of the ecology to the pre development state.

Table 13-4: Mitigation

Activities	Potential impacts	Aspects affected	Mitigation Type	Time Period for implementation	Compliance with standards
Vegetation clearing for access roads, and extensive SEZ infrastructure	▪ Loss of habitat, loss of Biodiversity, loss of Red Data Species	Fauna/ Flora	▪ Conduct a protected flora and fauna species survey prior to commencement and relocate species where possible or required ▪ Limit the vegetation disturbance to the designated areas only and the legal minimum requirement width for road and powerline servitudes is strictly adhered to. ▪ In the development areas plan the location of infrastructure in such a manner as to leave as many natural vegetation areas or individual species as possible. ▪ Adhere to the guidelines and permit requirements for the removal of protected species. ▪ Developmental areas such as transmission lines, pipelines and roads must be either be located on previously disturbed areas or existing development corridors.	Daily	▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) ▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)
Topsoil removal and preparation of road bed and excavation infrastructure foundations	▪ Loss of soil properties	Flora & Fauna	▪ Ensure that dust control measures are implemented on the roads. ▪ Ensure that the developmental footprint is not exceeded.	Daily	▪ Conservation of Agricultural Resources Act (CARA), 1993 (Act 43 of 1983) ▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) ▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)
Increased vehicle activities	▪ Destruction of flora ▪ Animal deaths ▪ Fauna will vacate the area ▪ Loss of biodiversity ▪ Loss of Red Data Species ▪ Excessive noise leading to fauna vacating the area ▪ Interruption of breeding and feeding cycles	Flora/Fauna	▪ Ensure that noise control measures are implemented by reducing speed, ensure that exhaust systems are functioning according to manufacturer's specifications. ▪ Ensure that speed limits are enforced.	Daily	▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)

Activities	Potential impacts	Aspects affected	Mitigation Type	Time Period for implementation	Compliance with standards
Increase of humans into the project site	▪ Disturbance of the natural cycles ▪ Loss of biodiversity ▪ Loss of species ▪ Pollution ▪ Habituation of species to humans	Fauna/Flora	▪ Limit the interaction of humans with the biophysical environment by ensuring that personnel remain within the demarcated areas. ▪ No fires allowed on site ▪ No poaching or harvesting flora ▪ No removal of trees for firewood. ▪ Ensure that food waste is stored in animal proof containers ▪ Ensure that there are waste disposal and littering prevention procedures in place ▪ No feeding of animals ▪ Ensure that environmental awareness training takes place a regular intervals ▪ Exclude fauna from the site where possible using passive means such as electrification of fences.	Daily	▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) ▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998) ▪ National Environmental Waste Act, Act 59 of 2008
Waste Management, Including collection and separation of general waste and the storage and handling of hazardous waste, especially concrete	▪ Soil pollution ▪ Water pollution ▪ Loss of species and biodiversity	Fauna/Flora	▪ A waste management plan must be generated and implemented. ▪ The system must be monitored to ensure that the environment is not polluted and that fauna do not consume the waste. ▪ Ensure that there are spillage procedures in place so that any exposure to biophysical environment is limited. ▪ Ensure that the appropriate training is given to staff and management.	Daily	▪ National Environmental Waste Act, Act 59 of 2008
Operation of the SEZ components.	▪ Excessive continuous noise will disrupt feeding and breeding cycles ▪ Loss of biodiversity ▪ Loss of Red Data species	Fauna	▪ At the design phase ensure that noise abatement measures are investigated and implemented to limit the noise generated by the SEZ which may have an effect on the fauna.	During Project Life Time	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)
Decommissioning, removal of infrastructure and rehabilitation of the impacted areas.	▪ Increase in biodiversity ▪ Reestablishment of the pre-construction ecological state ▪ Increase in Red Data Species ▪ Increase in ecosystem services	Fauna/Flora	▪ During rehabilitation ensure that planting of species that are naturally occurring in the area is adhered to. ▪ Should alien invasive plants be noticed on site that an Alien Invasive Management Plan be formulated and implemented (Must form part of a BAP).	Daily	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998)

Table 13-5: Prescribed Environmental Management Standards, Practice, Guideline, Policy or Law

Specialist field	Applicable standard, practice, guideline, policy or law	
Ecological: Fauna, flora and riparian areas	**National:**	▪ National Environmental Management Act (NEMA),1998 (Act 107 of 1998) ▪ National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) ▪ National Environmental Waste Act, Act 59 of 2008 ▪ Conservation of Agricultural Resources Act (CARA), 1993 (Act 43 of 1983) ▪ National Water Act (NWA, Act 36 of 1998) ▪ Department of Water Affairs and Forestry (DWAF, 2005) "A practical field procedure for identification and delineation of wetlands and riparian areas" ▪ National Freshwater Ecosystems Priority Areas (NFEPA, Nel et al., 2011) ▪ SANBI, in collaboration with the DWS report on "Wetland offsets: a best-practice guideline for South Africa" (Macfarlane, et al., 2014)
	Provincial:	Limpopo Conservation Plan Version 2 (C-Plan 2) (Desmet *et al,* 2013).
	Municipal:	Waterberg District Municipality (WDM) Environmental Management Framework (EMF).

14 Conclusion and Recommendations

The Makhado/Musina SEZ offers an important if not high Biodiversity Value owing to the presence of intact savanna woodland habitat as well as Riparian and ephemeral pan habitat. Loss of these components will result in loss of biodiversity and biodiversity support, for the area. The opportunity exists however, for the proposed SEZ to contribute significantly to conservation of biodiversity within the Limpopo Bushveld region. Conservation of as much of the natural land in the area within the site as possible, and the creation of corridors linking other natural areas would aid in conservation of ecosystems, flora and fauna. Off set will aid in mitigating the negative impacts, and must be investigated.

The impacts as described, rated and mitigated in this document pose a risk to natural areas of High sensitivity. Protected tree species were recorded on site and mitigation measures as per legislation has been prescribed. Although this impact is potential of high significance, the mitigation measures, including the investigation specifically the off sets and permit application, could mitigate this. From a landscape perspective the highly sensitive landscapes include riparian, wetlands, pans and ridge bushveld, the impacts of this magnitude of development on these features will be significant, even after mitigation.

From a species perspective the protected tree species that were identified during this reporting is of primary concern at this stage as the abundance of these species are high, mitigation measures are prescribed within this document.

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Appendix A: Plant Species Recorded

Species Name	Common Name	Description
Gymnosporia buxifolia	Common Spikethorn	Tree
Gymnosporia senegalensis	Confetti Spikethorn	Shrub
Vachellia karroo	Sweet Thorn	Tree
Abutilon austro-africanum	-	Herb
Adonsonia digitata	Baobab	Tree
Anthephora pubescens	Wool Grass	Graminoid
Aptosimum lineare	Veld violet	Herb
Aristida congesta subsp. congesta	Tassel Three-awn	Graminoid
Aristida junciformis	Ngongoni	Graminoid
Asparagus laricinus	Wild asparagus	Shrub
Blepharis subvolubilis	-	Shrublet
Blepharis subvolubilis	-	Herb
Boscia albitrunca	Shepperd's Tree	Tree
Brachiara deflexa	False Panicum	Graminoid
Brachiara xantholeuca	-	Graminoid
Brachiaria brizantha	Common Signal Grass	Graminoid
Brachiaria spp.	-	Graminoid
Burkea africana	Wild seringa	Tree
Cephalaria humilis	Umpikayiboni	Herb
Chloris virgata	Feather Finger Grass	Graminoid
Cleome angustifolia	Spider Flower	Herb
Colophospermum mopane	Mopane	Tree
Combretum hereroense ssp. hereroense	Russet Bushwillow	Tree
Combretum imberbe	Leadwood	Tree
Commicarpus pentandrus	-	Herb
Commiphora viminea	Zebrabark	Tree
Corchorus asplenifolius	Igusha	Herb
Cynodon dactylon	Bermuda Grass	Graminoid
Dichrostachys cinerea	Sickle Bush	Shrub
Diospyros mespiliformis	Jackalberry	Tree
Dovyalis caffra	Kei-apple	Shrub
Elionurus muticus	Wire Grass	Graminoid
Enneapogon cenchroides	Nine-awned Grass	Graminoid
Eragrostis lehmanniana	Lehmann's Love Grass	Graminoid
Eragrostis trichophora	Hairy Love Grass	Graminoid
Eriosema salignum	Sand Pea	Herb
Eriosema sp	Sand Pea	Herb
Grewia flavescens	Sandpaper raisin	Shrub
Grewia monticola	Grey Raisin	Tree

Gymnosporia senegalensis	Confetti spikethorn	Shrub
Hermbstaedtia fleckii	Cat's tail	Herb
Hexalobus monopetalus	Shakamaplum	Shrub
Hibiscus lunarifolius	Rosemallow	Herb
Hyparrhenia filipendula	Fine Thatching Grass	Graminoid
Hyparrhenia tamba	Blue Thatching grass	Graminoid
Indigofera miniata	Scarlet Pea	Herb
Indigofera reducta	-	Herb
Indigofera sp	-	Herb
Ipomea crassipes	Leafy-flowered Ipomea	Creeper
Ipomoea bolusiana	-	Herb
Kirkia acuminata	White seringa	Tree
Lantana camara	Lantana	Alien herb
Ledebouria luteola	African hyacinth	Bulb
Melinis repens	Natal Red-Top	Graminoid
Nucras tessellata	Striped Sandveld Lizard	Herpetofauna
Opuntia ficus-indica	Sweet prickly pear	
Panicum maximum	White Buffalo Grass	Graminoid
Peliostomum leucorrhizum	-	Herb
Rhoicissus revoilii	Bushveld grape	Shrub
Sclerocarya birrea	Marula tree	Tree
Scolopia zeyheri	Thornpear	Tree
Searsia chirindensis	Red Currantrhus	Tree
Senegalia ataxacantha	Flamepord thorn	Tree
Senegalia caffra	Hook-Thorn	Tree
Senegalia erubescens	Blue Thorn	Tree
Senegalia senegal	Slender Three-hook Thorn	Tree
Sida cordifolia	Mallow	Shrub
Solanum incanum	Thorn-Apple	Alien
Sporobolus africanus	Rat's-Tail Dropseed	Graminoid
Stigmochelys pardalis	Leopard Tortoise	Herpetofauna
Tephrosia ssp.		Herb
Terminalia prunioides	Purple-pod Cluster-leaf	Tree
Tragus berteronianus	Carrot Seed Grass	Graminoid
Urochloa sp.		Graminoid
Vachellia xanthophloea	Fever Tree	Tree
Vepris reflexa	Bushveld white-ironwood	Tree
Ximenia caffra	Smooth Sourplum	Shrub

Appendix B: Avifauna Recorded

Scientific Name	Common Name
Elanus caeruleus	Black-shouldered Kite
Buphagus erythrorhynchus	Red-billed Oxpecker
Clamator jacobinus	Pied Cuckoo
Melierax metabates	Dark Chanting-Goshawk
Tockus rufirostris	Southern Red-Billed Hornbill
Tockus leucomelas	Southern Yellow-billed Hornbill
Coracias garrulus	European Roller
Spilopelia senegalensis	Laughing Dove
Oena capensis	Namaqua Dove
Halcyon chelicuti	Striped Kingfisher
Merops pusillus	Little Bee-eater
Upupa africana	African Hoopoo
Trachyphonus vaillantii	Crested Barbet
Dicrurus adsimilis	Fork Tailed Drongo
Merops nubicoides	Southern Carmine Bee-eater
Streptopelia semitorquata	Red-eyed Dove
Urocolius indicus	Red-faced Mousebird
Mirafra africana	Rufous-naped Lark
Mirafra sabota	Sabota Lark
Parus niger	Southern Black Tit
Ploceus velatus	Southern Masked-Weaver
Colius striatus	Speckled Mousebird
Pternistis swainsonii	Swainson's Spurfowl
Ploceus cucullatus	Village Weaver
Cinnyricinclus leucogaster	Violet-backed Starling