THE TERRESTRIAL ASSESSMENT FOR THE KAINGO LOW LEVEL BRIDGE

Vaalwater, Limpopo Province

November 2021

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a fauna and flora baseline assessment for the construction of a low level bridge at Kaingo reserve across the Mokolo River. The proposed low-level crossing will be situated across the Mokolo River, between the farms Mokolo River Private Nature Reserve 660 KQ and Laurel 159 KQ, in the Waterberg District of the Limpopo Province. The proposed site is approximately 48 km south of Lephalale (PG Consulting Engineers, 2021) .

The co-ordinates of the proposed low-level crossing are respectively as follows:

a) Start of left bank approach	24º 04’ 44.43’’S and 27º 46’ 25.52’’E
b) Start of bridge structure left side	24º 04’ 45.58’’S and 27º 46’ 25.65’’E
c) Start of right bank approach	24º 04’ 48.73’’S and 27º 46’ 28.98’’E
d) Start of bridge structure right side	24º 04’ 49.12’’S and 27º 46’ 29.40’’E
e) Centre of river	24º 04’ 46.65’’S and 27º 46’ 26.79’’E

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020): “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria). The National Web based Environmental Screening Tool has characterised the terrestrial sensitivity of the study area as “Very High”, while the animal sensitivity is rated as “High” and the plant sensitivity as “Low”.

The purpose of the specialist studies is to provide relevant input into the NEMA authorisation process. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the project.

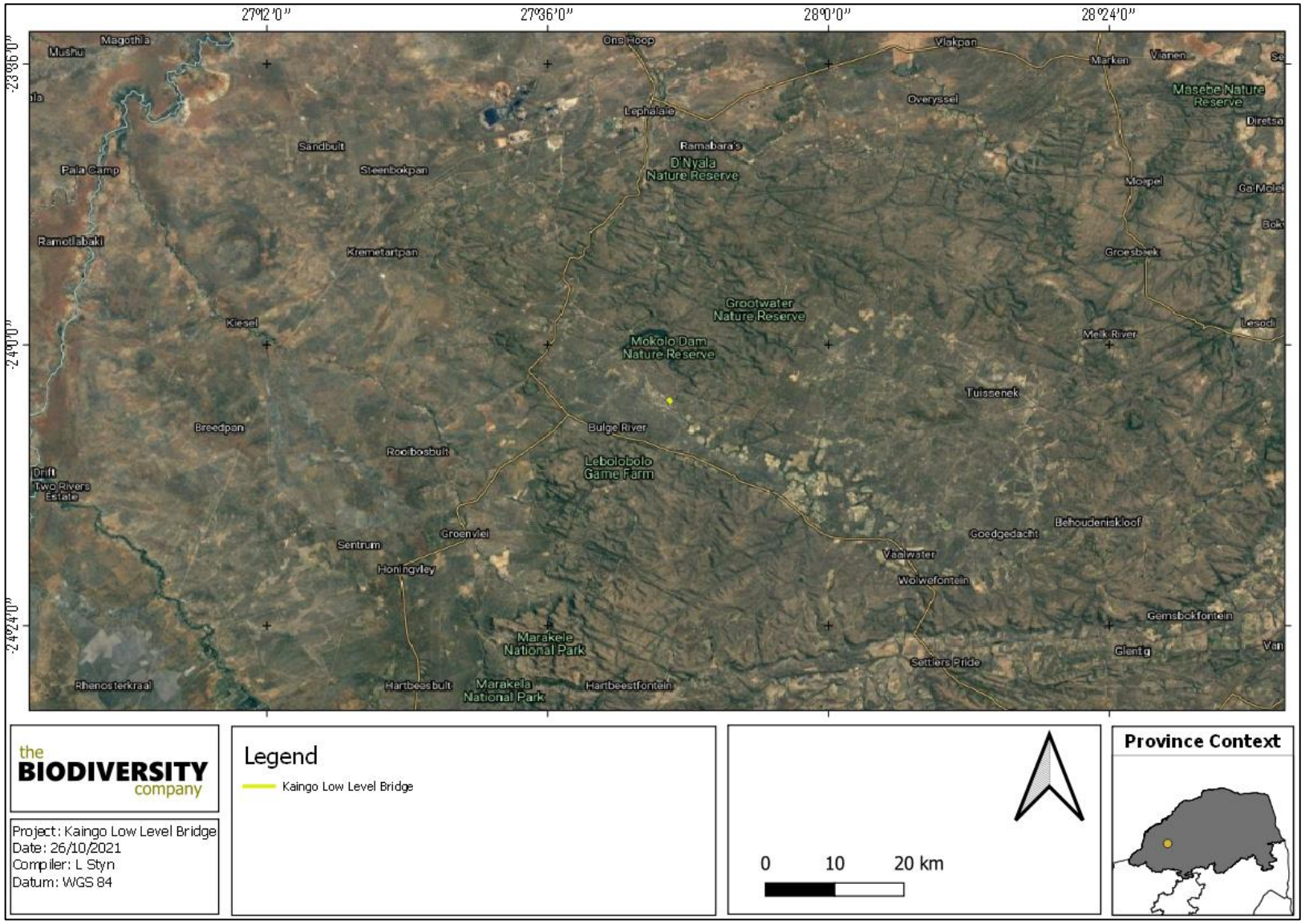

Figure 1-1 Location of the study area in relation to the nearby towns.

1.2 Specialist Details

Report Name	**THE TERRESTRIAL ASSESSMENT FOR THE KAINGO LOW LEVEL BRIDGE**
Reference	**Kaingo Bridge**
Submitted to	ecoleges Environmental Consultants
Report Writer	**Lindi Steyn** 
	Dr Lindi Steyn has completed her PhD in Biodiversity and Conservation from the University of Johannesburg. Lindi is a terrestrial ecologist with a special interest in ornithology. She has completed numerous studies ranging from basic Assessments to Environmental Impact Assessments following IFC standards.
Report Writer	**Michael Schrenk** 
	Michael completed his professional Civil and Environmental engineering degree at the University of the Witwatersrand in 2016. He has been working in the fields of project management, biodiversity and habitat assessment and ecological restoration for over 3 years.
Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

2 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the activity to the flora and fauna communities of the associated ecosystems within the study area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the study area;
- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the study area;
- Field survey to ascertain the species composition of the present flora and fauna community within the study area;
- Delineate and map the habitats and their respective sensitivities that occur within the study area;
- Identify the manner that the project impacts the flora and fauna community and evaluate the level of risk of these potential impacts; and

- The prescription of mitigation measures and recommendations for identified risks.

3 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 3-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 3-1 A list of key legislative requirements relevant to biodiversity and conservation in the Limpopo Province

Region	Legislation / Guideline
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Limpopo Conservation Plan (2018)
	Limpopo Environmental Management Act (2003)
	Waterberg District Bioregional Plan (LEDET, 2019)

4 Methods

4.1 Study area

The study area is situated 41 km north west of Vaalwater and 48 km south of Lephalale in the Limpopo Province (Figure 4-1). Presently, the study area is surrounded by some agricultural fields, some existing roads but largely by natural bushveld.

Figure 4-1 Map illustrating the location of the study area

4.2 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

4.2.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- *National Biodiversity Assessment 2018 (Skowno et al, 2019) (NBA)*- The purpose of the NBA is to assess the state of South Africa'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. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
    - *Ecosystem Threat Status* – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
    - *Ecosystem Protection Level* – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:
    - *South Africa Protected Areas Database (SAPAD) (DEA, 2020)* – The (SAPAD) Database contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
    - *National Protected Areas Expansion Strategy (NPAES) (SANBI, 2010)* – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Limpopo Conservation Plan

  The Limpopo Conservation Plan, was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas (CBA) and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories, based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- CBA1;
- CBA2;
- Ecological Support Area (ESA) 1);
- ESA2;
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2015) – IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.,* 2018) – A SAIIAE was established during the NBA of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types and pressures on these systems.

4.2.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) and SANBI (2019) was used to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the study area (Figure 4-2). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

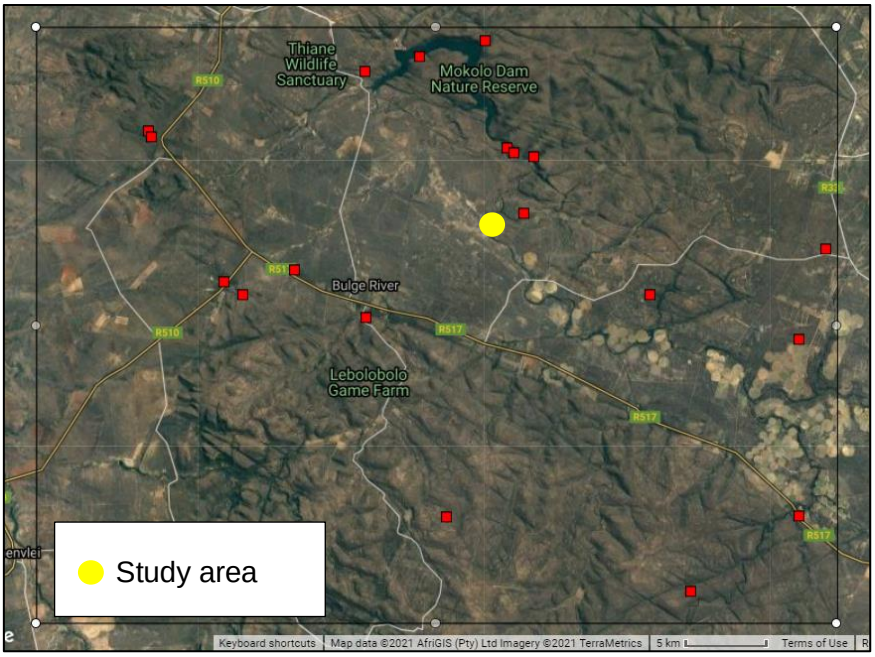

Figure 4-2 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Yellow dot indicates approximate location of the study area. The red squares are cluster markers of botanical records as per POSA data.***

4.2.3 Desktop Faunal Assessment

The faunal desktop assessment comprised of the following, compiling an expected:

- Amphibian list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2427 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2427 quarter degree square;
- Avifauna list, generated from the Southern African Bird Atlas Project 2 (2405_2745; 2405_2750; 2405_2740); and
- Mammal list from the IUCN spatial dataset (2017).

A single field survey was undertaken in November 2021, which is a wet season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types, within the limits of time and access.

4.2.4 Flora Survey

The fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the study area.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the study areas.

The timed random meander method is highly efficient for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g., livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the study area.

4.2.5 Fauna Survey

The faunal assessment within this report pertains to herpetofauna (amphibians and reptiles), avifauna and mammals. The faunal field survey comprised of the following techniques:

- *Visual and auditory searches* - This typically comprised of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.); and
- Utilization of local knowledge.

Relevant field guides and texts consulted for identification purposes included the following:

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);

- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Smithers' Mammals of Southern Africa (Apps, 2000);
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000);
- Sinclair and Ryan (2010), Birds of Africa. Secondary source for identification;
- Taylor *et al.* (2015), Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Used for conservation status, nomenclature and taxonomical ordering.

4.3 Terrestrial Site Ecological Importance

The different habitat types within the study area were delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 4-1 and Table 4-2, respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 4-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts, with no signs of major past disturbance.

High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts, with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		**Conservation Importance (CI)**				
		Very high	**High**	**Medium**	**Low**	**Very low**
Functional Integrity (FI)	**Very high**	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor, as summarised in Table 4-4.

Table 4-4 Summary of Resource Resilience (RR) criteria

Resilience	**Fulfilling Criteria**
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance (BI)				
		Very high	High	Medium	Low	Very low
Receptor Resilience (RR)	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the project is provided in Table 4-6.

Table 4-6 Guidelines for interpreting Site Ecological Importance in the context of the development activities

Site Ecological Importance	Interpretation in relation to development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The area was only surveyed during a single site visit and therefore, this assessment does not consider temporal trends;
- Only a single season survey will be conducted for the respective studies, this would constitute a wet season survey;
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 5 m;
- Fieldwork was conducted in the big five reserve without a guard present, for safety reasons the time spend on foot was limited, this very likely influenced the flora assessment.

5 Results & Discussion

5.1 Desktop Assessment

5.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the project to ecologically important landscape features are summarised in Table 5-1.

Table 5-1 Summary of relevance of the project to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Relevant – Overlaps with a Least Concerned ecosystem	5.1.1.1
Ecosystem Protection Level	Relevant – Overlaps with a Poorly Protected Ecosystem	5.1.1.2
Protected Areas	Relevant- The study area overlaps with the Waterberg Biosphere reserve and falls between the Kaingo Nature reserve and the Mokolo Nature Reserve	5.1.1.5
National Protected Areas Expansion Strategy	Relevant – The study area is found between a protected area and a NPAES area	5.1.1.4
Critical Biodiversity Area	Relevant – The study area overlaps with a CBA1 area.	5.1.1.3
Important Bird and Biodiversity Areas	Relevant – Located within the Waterberg IBA	5.1.1.6
South African Inventory of Inland Aquatic Ecosystems	Relevant - The study area overlap with an EN NBA River and an unclassified NBA wetland	5.1.1.7
National Freshwater Priority Area	Relevant – The study area overlaps with both an unclassified river and an unclassified wetland.	5.1.1.8
Strategic Water Source Areas	Relevant- The study area falls 23 km north of the Waterberg SWSA.	5.1.1.9

5.1.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. This provides a holistic view of the vegetation type, the threatened species associated with the ecosystem and the overall land use currently in the area. According to the spatial dataset the project overlaps with a LC ecosystem (Figure 5-1).

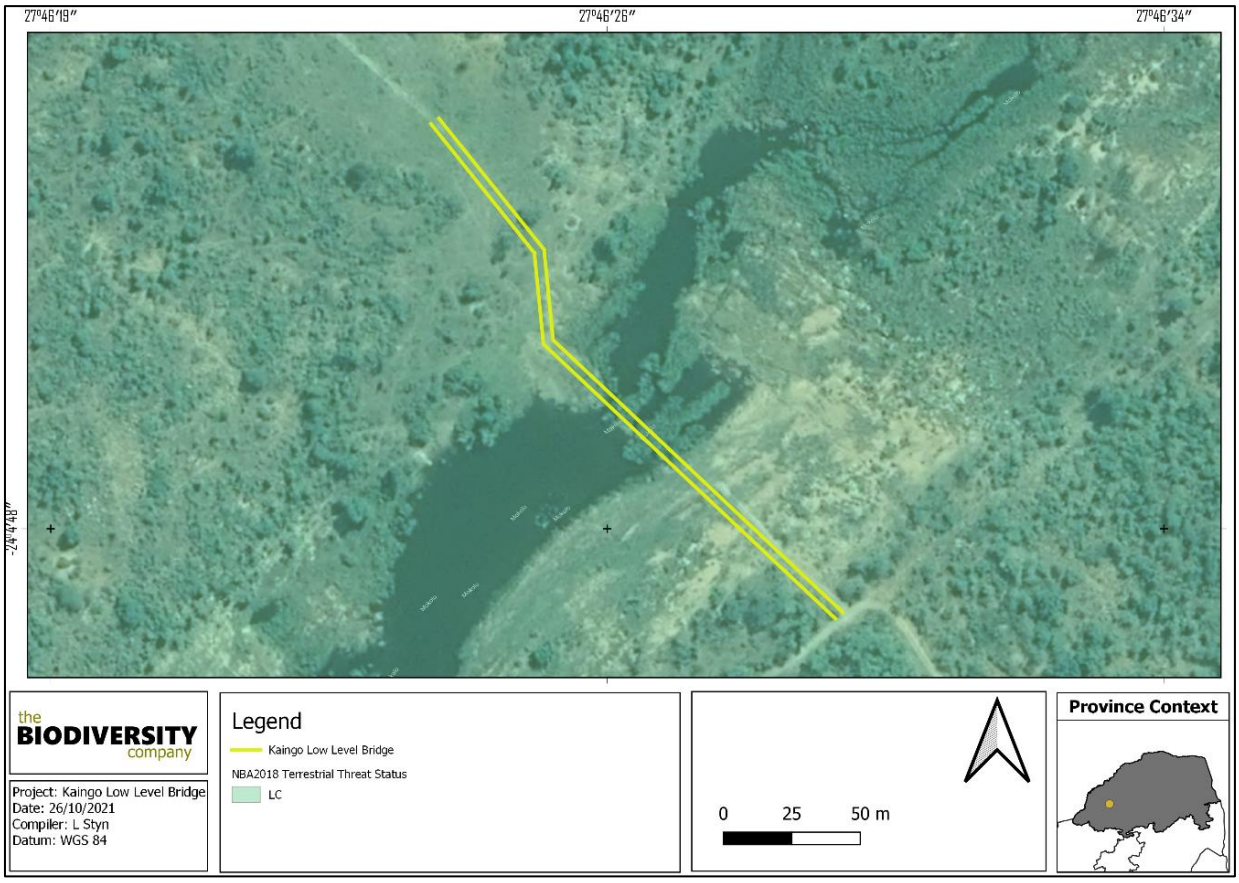

Figure 5-1 Map illustrating the ecosystem threat status associated with the study area.

5.1.1.2 Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The project overlaps with a PP ecosystem (Figure 5-2).

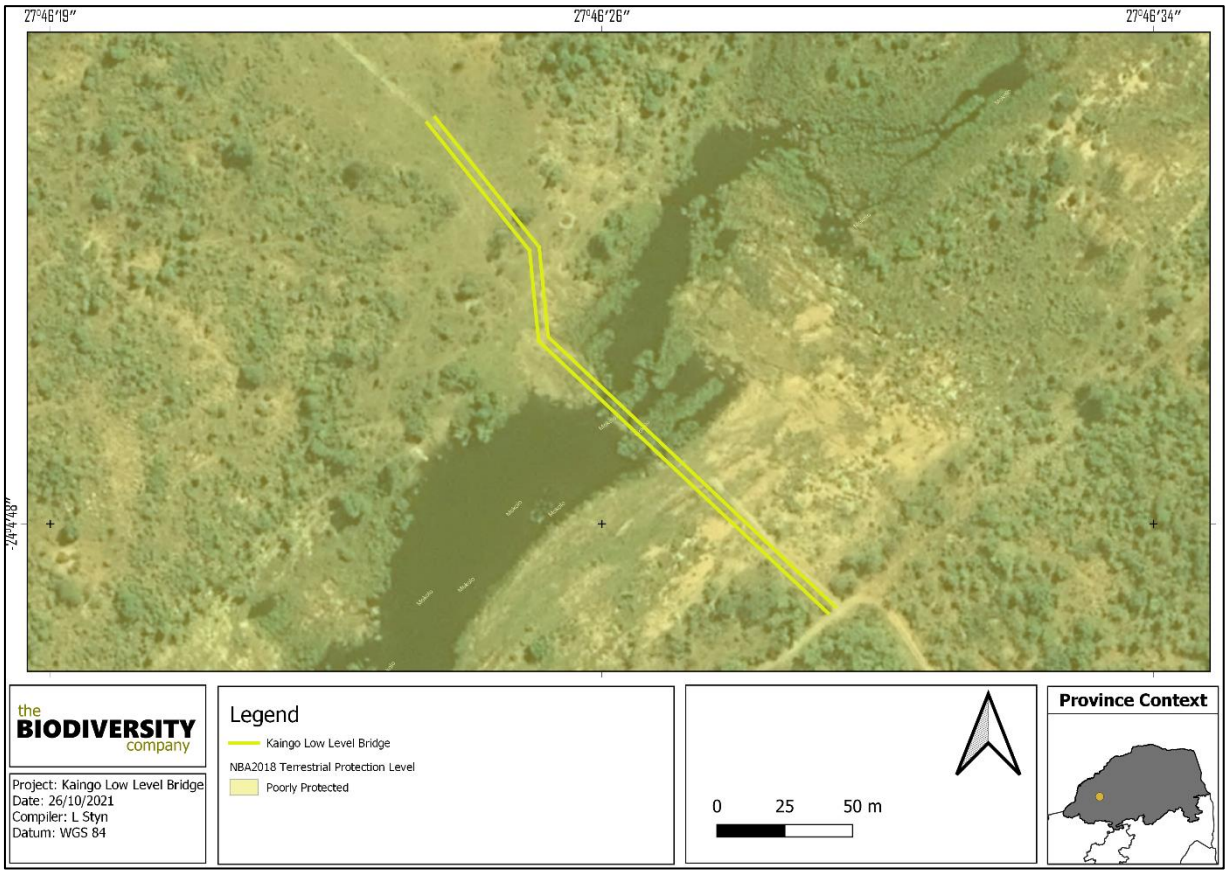

Figure 5-2 Map illustrating the ecosystem protection level associated with the study area

5.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

The Limpopo Conservation Plan, was completed in 2018 for the LEDET (Desmet *et al.,* 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- CBA1;
- CBA2;
- ESA1;
- ESA2;
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state, to ensure the continued existence and functioning of species and ecosystems and delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2018).

ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services (SANBI, 2017). ESAs may be terrestrial or aquatic.

ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Desmet *et al.,* 2018).

Areas with NNR are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Desmet *et al.,* 2018).

Figure 5-3 shows the study area superimposed on the Terrestrial CBA map. The study area overlaps with a CBA1 area.

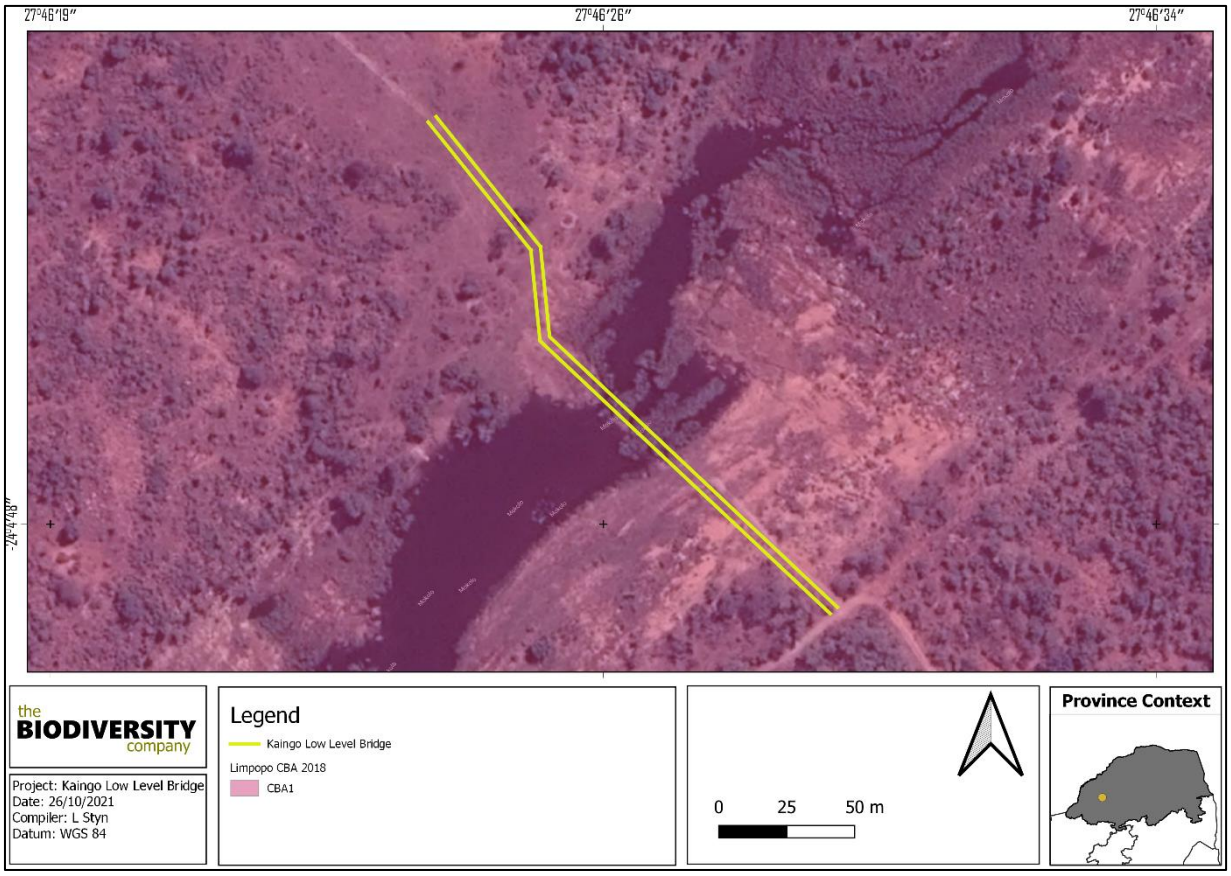

Figure 5-3 Map illustrating the locations of CBAs in the study area

5.1.1.4 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016).

The study area falls on the border of a NPAES and a protected area as can be seen in Figure 5-4.

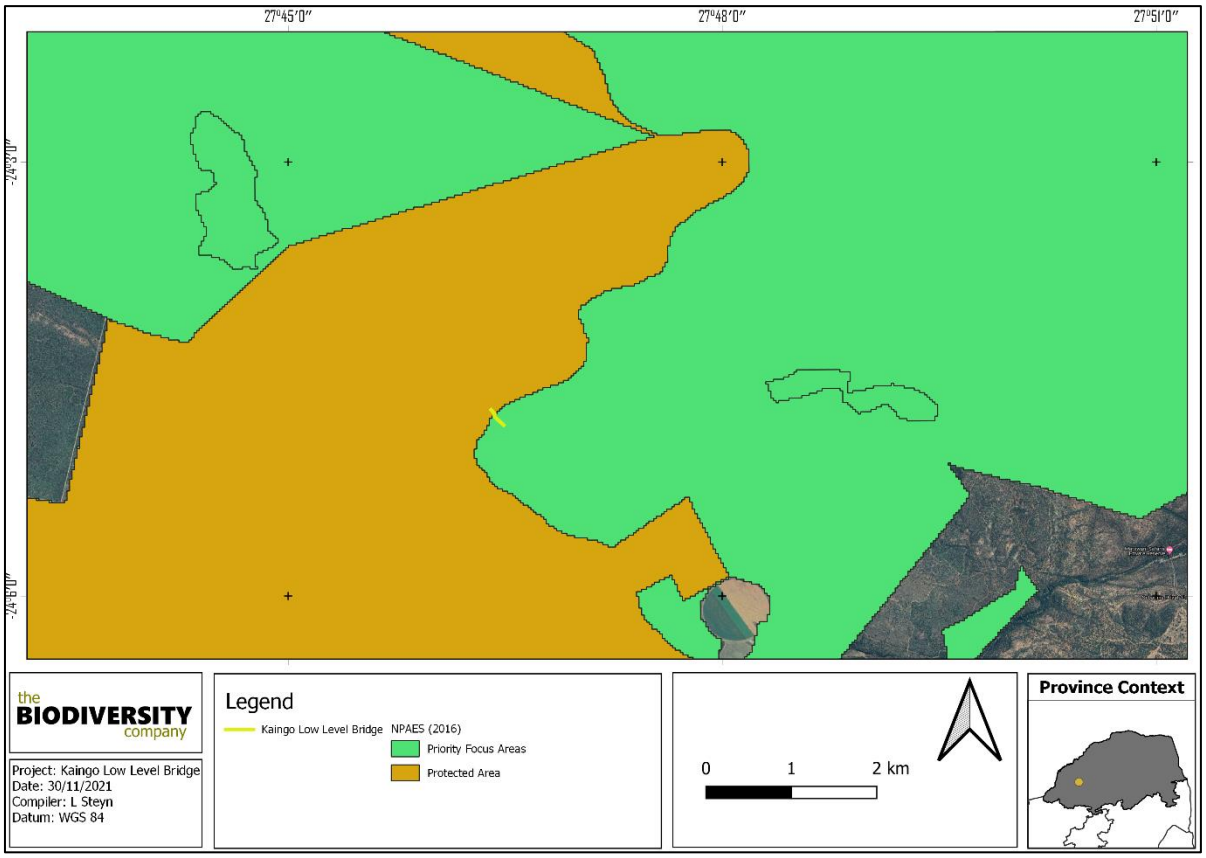

Figure 5-4 The study area in relation to the National Protected Area Expansion Strategy (2016)

5.1.1.5 Protected Area

The Department of Environmental Affairs maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas:

- Special nature reserves;
- National parks;
- Nature reserves;
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;
- Marine protected areas declared in terms of the Marine Living Resources Act;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

The types of conservation areas that are currently included in the database are the following:

- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Transfrontier conservation areas;
- Transfrontier parks;
- Military conservation areas and
- Conservancies.

The study area overlaps with the Waterberg Biosphere reserve and falls between the Kaingo Nature reserve and the Mokolo Nature Reserve (Figure 5-5).

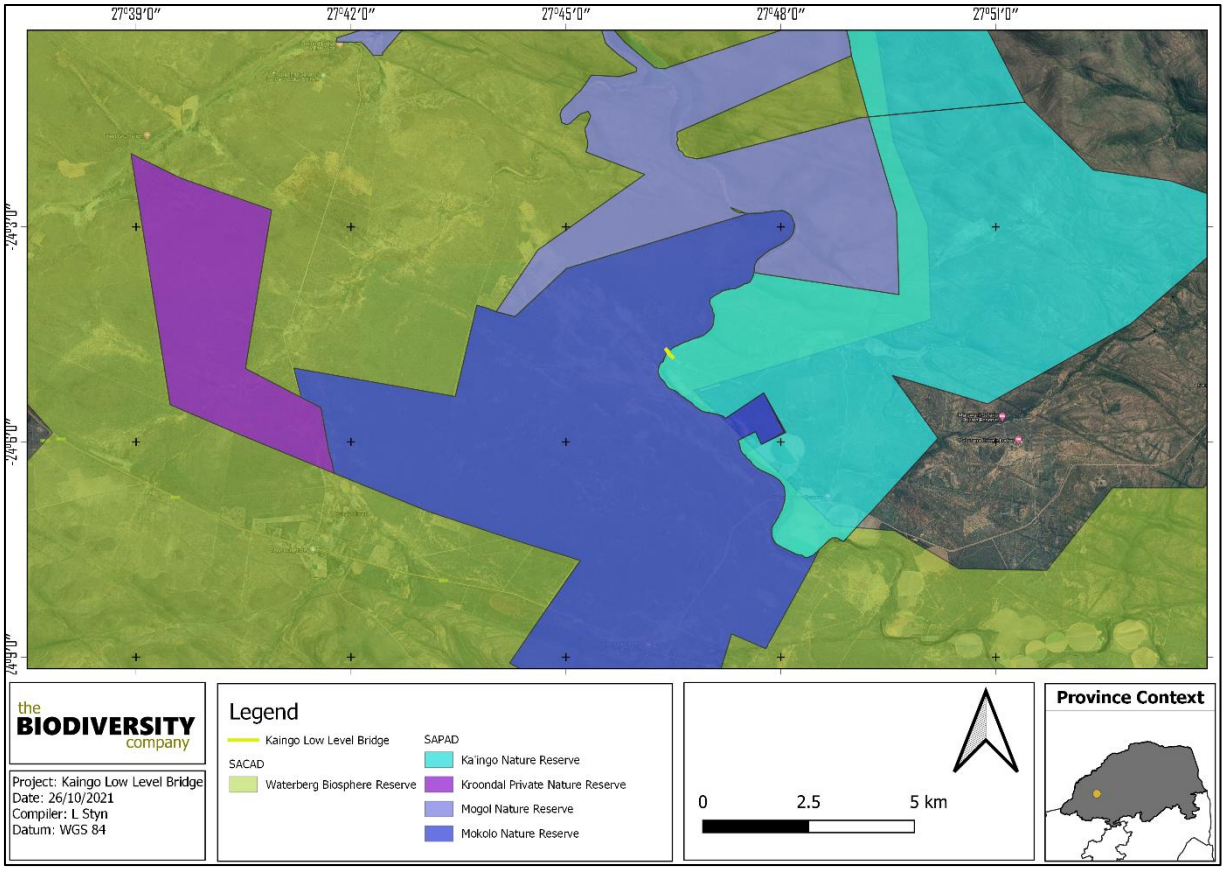

Figure 5-5 The study area in relation to the Protected Areas (SAPAD) and Conservation Areas (SACAD)

5.1.1.6 Important Bird & Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The Waterberg IBA consists of the whole Waterberg Plateau. The Kransberg is the western sector of the Waterberg range and falls within the Marakele National Park. The Kransberg holds a large colony of Cape vulture (*Gyps coprotheres*), approximately 800-850 pairs. The IBA also supports many other raptor species such as: Martial Eagle *Polemaetus bellicosus*, Verreauxs' Eagle *Aquila verreauxii*, Jackal Buzzard *Buteo rufofuscus* and African Harrier-Hawk *Polyboroides typus*. Breeding populations of Peregrine Falcon *Falco peregrinus*, Lanner Falcon *F. biarmicus*, Black Stork *Ciconia nigra* and Cape Eagle-Owl *Bubo capensis* occurs in this IBA.

Woodland bird species found in this IBA include Red-crested Korhaan *Lophotis ruficrista*, Monotonous Lark *Mirafra passerina*, Barred Wren-Warbler *Calamonastes fasciolatus*, Southern White-crowned Shrike *Eurocephalus anguitimens*, Scaly-feathered Finch *Sporopipes squamifrons*, Violet-eared Waxbill *Uraeginthus granatinus* and Black-faced Waxbill *Estrilda erythronotos*. Half-collared Kingfisher *Alcedo semitorquata* and Mountain Wagtail *Motacilla clara* occur along the mountain streams. Along some of the rivers White-backed Night Heron *Gorsachius leuconotus* and African Finfoot *Podica senegalensis* can be found. Buff-streaked Chat *Campicoloides bifasciata* and Cape Rock Thrush *Monticola rupestris*, which are endemic to South Africa, Lesotho and Swaziland, also occur in the IBA.

Biome-restricted species include Kurrichane Thrush *Turdus libonyanus*, White-bellied Sunbird *Cinnyris talatala*, Barred Wren-Warbler and Burchell's Starling *Lamprotornis australis*, which are common. White-throated Robin-Chat *Cossypha humeralis* is considered fairly common and Buff-streaked Chat, Kalahari Scrub Robin *Erythropygia paena* and Gurney's Sugarbird are regarded as uncommon (Birdlife South Africa, 2015A). Figure 5-6 shows the study area overlaps with the Waterberg IBA.

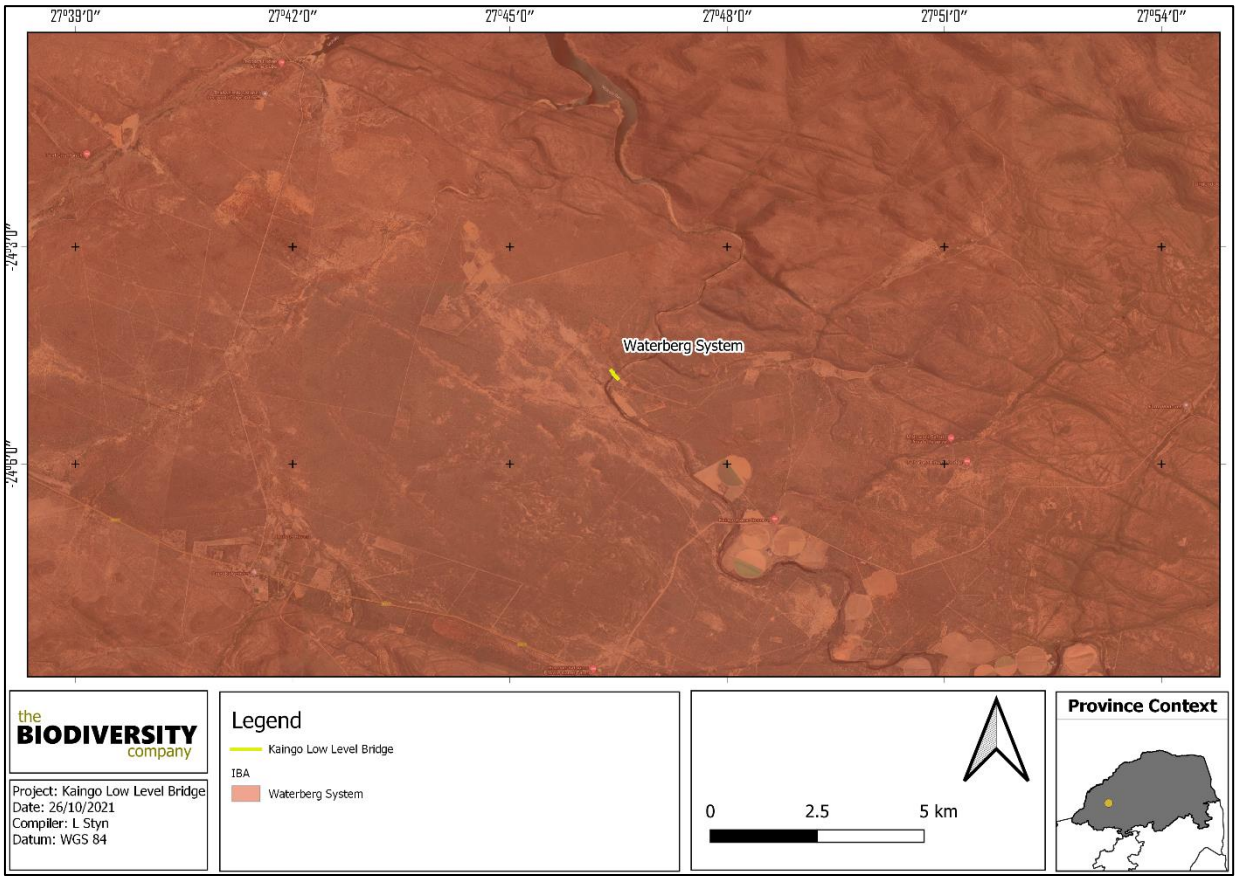

Figure 5-6 The study area in relation to the Waterberg IBA

5.1.1.7 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The study area overlaps with an EN NBA River and an unclassified NBA wetland (Figure 5-7).

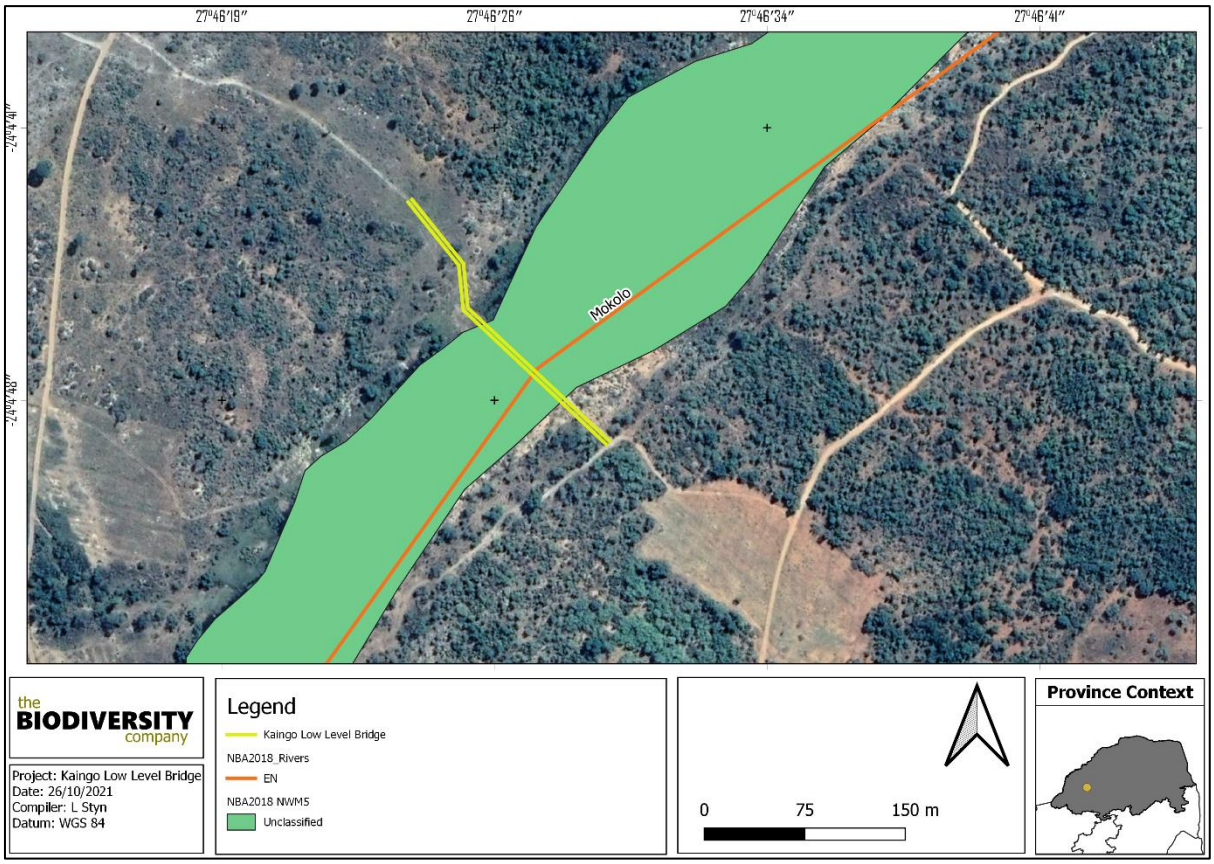

Figure 5-7 Map illustrating ecosystem threat status of river and wetland ecosystems in the study area

5.1.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

Figure 5-8 shows the location of the study area in relation to wetland and river FEPAs. The study area overlaps with both an unclassified river and an unclassified wetland.

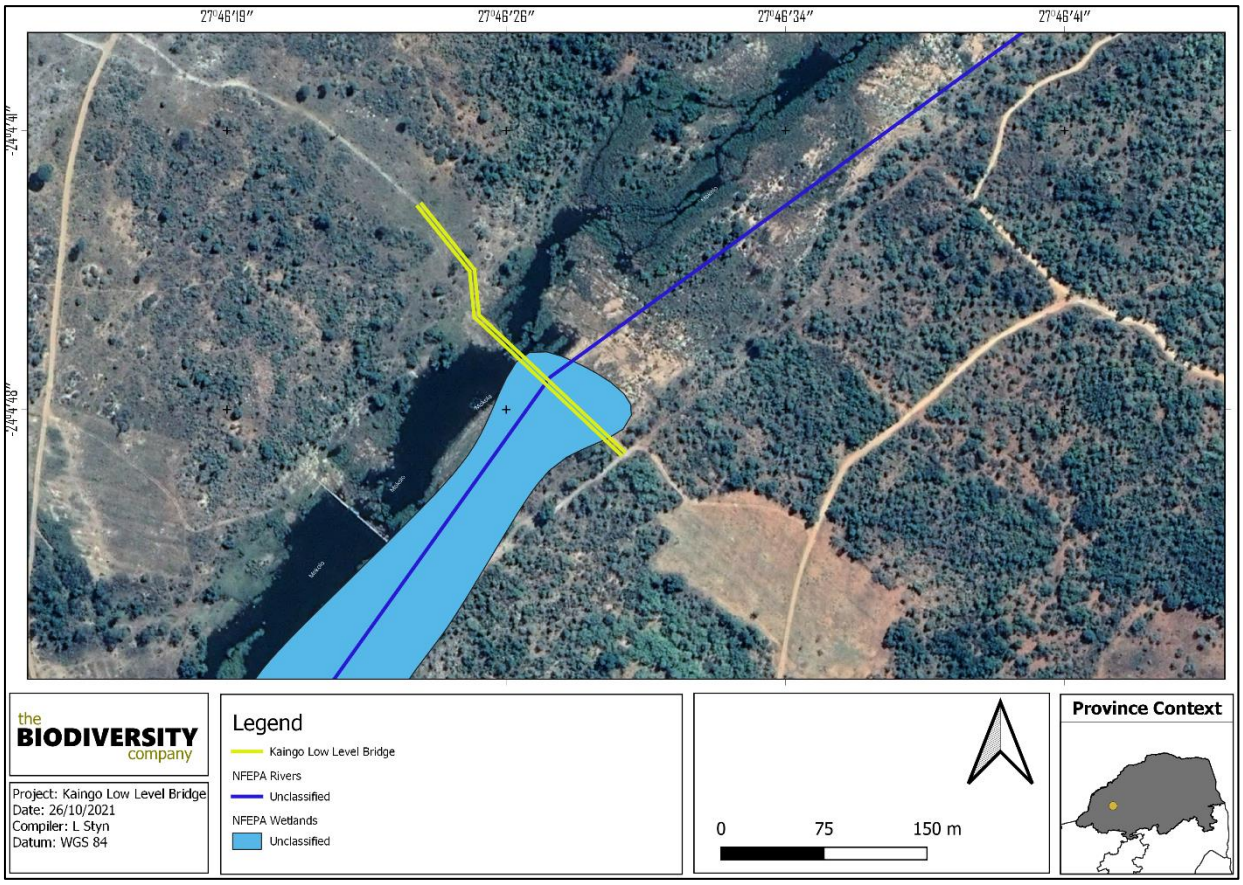

Figure 5-8 The study area in relation to the National Freshwater Ecosystem Priority Areas

5.1.1.9 Strategic Water Source Areas.

The Strategic Water Source Areas (SWSA) dataset outlines the surface water of south Africa as defined by the Water Research Commission (WRC) project (K5/2431) (WRC, 2017). Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. Figure 5-9 shows that the study area falls 23 km north of the Waterberg SWSA.

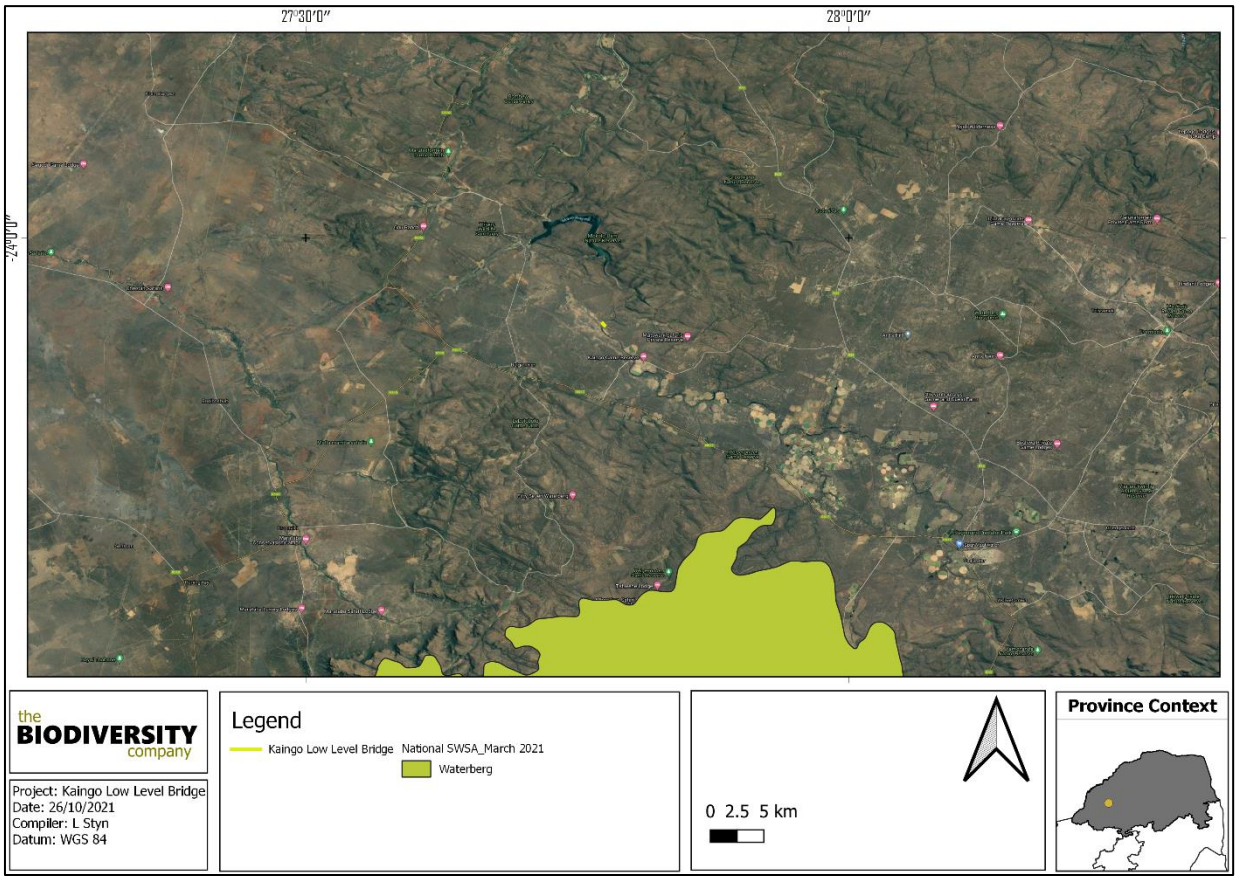

Figure 5-9 The Waterberg SWSA in relation to the study area

5.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

5.1.2.1 Vegetation Type

The study area is situated within the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Senegalia sp, Vachellia sp* and *Albizia sp*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the study area overlaps with one vegetation type: the Central Sandy Bushveld (Figure 5-10).

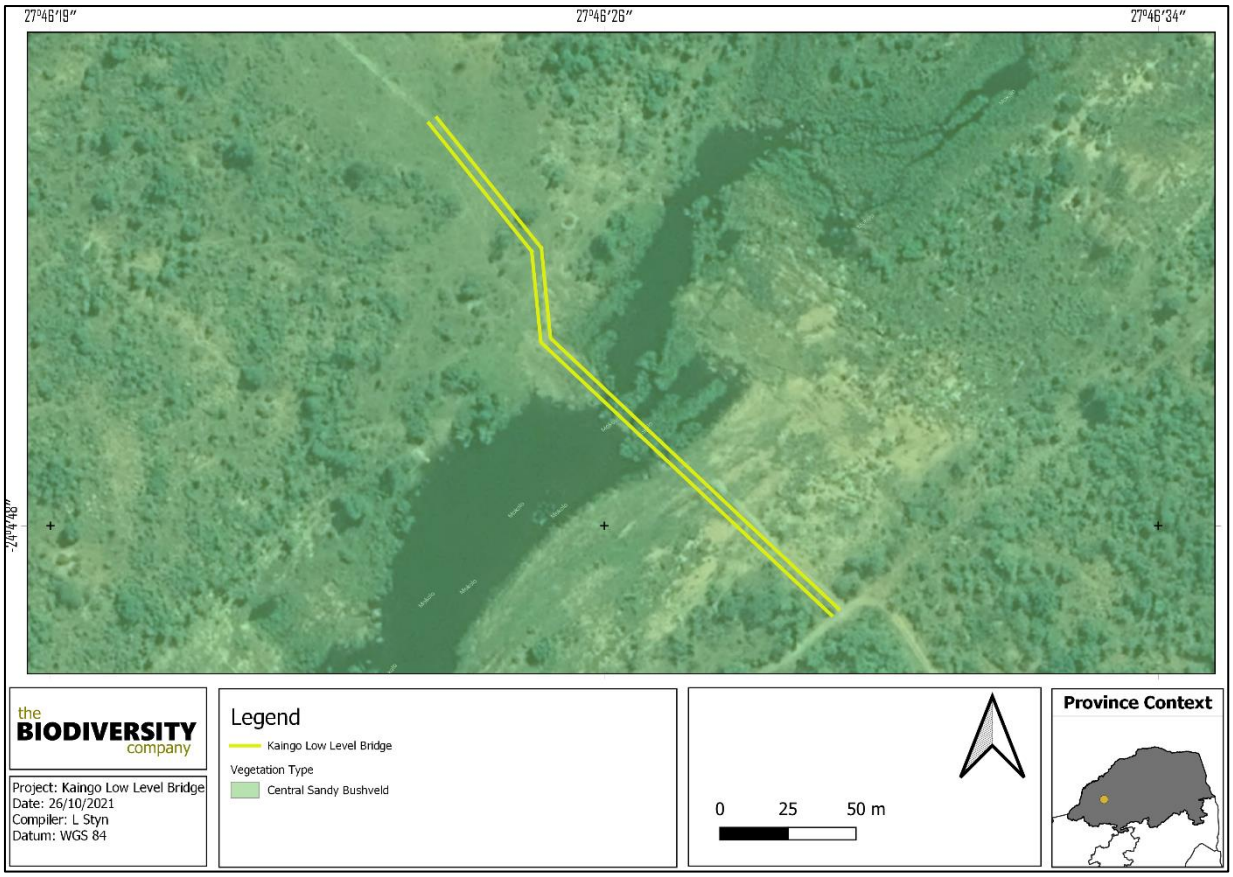

Figure 5-10 Map illustrating the vegetation type associated with the study area

5.1.2.1.1 Central Sandy Bushveld

Central Sandy Bushveld is undulating terrain at altitudes of 850-1450m. These areas are sometimes found between mountains, sandy plains and catenas that support tall, deciduous *Terminalia sericea* and *Burkea africana.*

Important Plant Taxa (d=dominant)

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Central Sandy Bushveld** vegetation type:

Tall Trees: *Senegalia burkei* (d), *Vachellia robusta*, *Sclerocarya birrea* subsp. *caffra*.

Small Trees: *Burkea africana* (d), *Combretum apiculatum* (d), *C. zeyheri* (d), *Terminalia sericea* (d), *Ochna pulchra*, *Peltophorum africanum*, *Rhus leptodictya*.

Tall Shrubs: *Combretum hereroense*, *Grewia bicolor*, *G. monticola*, *Strychnos pungens*.

Low Shrubs: *Agathisanthemum bojeri* (d), *Indigofera filipes* (d), *Felicia fascicularis*, *Gnidia sericocephala*.

Geoxylic Suffrutex: *Dichapetalum cymosum* (d).

Woody Climber: *Asparagus buchananii*.

Graminoids: *Brachiaria nigropedata* (d), *Eragrostis pallens* (d), *E. rigidior* (d), *Hyperthelia dissoluta* (d), *Panicum maximum* (d), *Perotis patens* (d), *Anthephora pubescens*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Brachiaria serrata*, *Elionurus muticus*, *Eragrostis nindensis*, *Loudetia simplex*, *Schmidtia pappophoroides*, *Themeda triandra*, *Trachypogon spicatus*.

Herbs: *Dicerocaryum senecioides* (d), *Barleria macrostegia*, *Blepharis integrifolia*, *Crabbea angustifolia*, *Evolvulus alsinoides*, *Geigeria burkei*, *Hermannia lancifolia*, *Indigofera daleoides*, *Justicia anagalloides*, *Kyphocarpa angustifolia*, *Lophiocarpus tenuissimus*, *Waltheria indica*, *Xerophyta humilis*.

Geophytic Herb: *Hypoxis hemerocallidea*.

Succulent Herb: *Aloe greatheadii* var. *davyana*.

Biogeographically Important Taxa (Central Bushveld endemics)

Graminoid: *Mosdenia leptostachys*.

Herb: *Oxygonum dregeanum* subsp. *canescens* var. *dissectum*.

Conservation Status of the Vegetation Type

The conservation status of this vegetation community was listed by Mucina and Rutherford (2006) as VU, while the Ecosystem is currently classed as LC according to the NBA Threat status (NBA, 2018). The national conservation target of 19% of which less than 3% is statutorily conserved across many nature reserves.

5.1.2.2 Expected Flora Species

The POSA database indicates that 209 species of indigenous plants are expected to occur within the study area. Appendix A provides the list of species and their respective conservation status and endemism. No IUCN species are expected, two national protected tree and seven provincially protected plants are expected (Table 5-2).

Table 5-2 Protected flora species that may occur within the study area

Family	Taxon	IUCN	Ecology	National Protected Tree, Forest Act 1998	Limpopo Management Act 2003, Schedule 12
Apocynaceae	*Ceropegia ampliata var. ampliata*	LC	Indigenous		X
Combretaceae	*Combretum imberbe*	LC	Indigenous	X	
Combretaceae	*Combretum petrophilum*	LC	Indigenous; Endemic		X
Sapindaceae	*Erythrophysa transvaalensis*	LC	Indigenous	X	X
Orchidaceae	*Eulophia angolensis*	LC	Indigenous		X
Malvaceae	*Grewia rogersii*	LC	Indigenous; Endemic		X
Apocynaceae	*Orbea carnosa subsp. keithii*	LC	Indigenous		X
Amaryllidaceae	*Scadoxus puniceus*	LC	Indigenous		X

5.1.3 Faunal Assessment

5.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 31 amphibian species are expected to occur within the area (Appendix B). None of the expected species are SCCs.

5.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 91 reptile species are expected to occur within the area (Appendix C). Three (3) are regarded as threatened (Table 5-3).

Table 5-3 Threatened reptile species that are expected to occur within the study area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Confirmed
Lygodactylus waterbergensis	Waterberg Dwarf Gecko	NT	NT	High
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	VU	High
Pseudocordylus transvaalensis	Northern Crag Lizard	NT	NT	High

Crocodylus niloticus (Nile Crocodile) is listed as VU on a regional basis. The Nile crocodile is quite widespread throughout sub-Saharan Africa, in different types of aquatic environments such as lakes, rivers, and marshlands. This species were recorded in the study area.

Lygodactylus waterbergensis (Waterberg Dwarf Gecko) is classified as NT both regionally and internationally. This species is endemic to Limpopo Province, where it is found in rocky areas of the grassland and savannas. The likelihood of occurrence is high as rocky habitat is present on the edge of the study area.

*Kinixys lobatsiana (*Lobatse Hinged Tortoise) is listed as VU on a global scale. This tortoise is a savanna species that inhabits rocky hillsides in habitats of mixed woodlands, tropical Bushveld and Thornveld where vegetation ranges from dense, short shrubland to open tree savanna. In South Africa it is protected by provincial nature conservation ordinances and biodiversity laws at a regional level, but the species is not protected at a national level by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004). The likelihood of occurrence of this species in the area is regarded as high as suitable habitat can be found on the edge of the study area.

Pseudocordylus transvaalensis (Northern Crag Lizard) is categorised as NT on both a regional and a global scale. This species is threatened by the pet trade and is listed on CITES. The likelihood of occurrence in the study area is high because of the rocky habitat present for this species.

5.1.3.3 Mammals

The IUCN Red List Spatial Data lists 98 mammal species that could be expected to occur within the area (Appendix D). This list includes large mammal species that are normally limited to protected areas as the footprint overlaps with protected areas. Nineteen (19) of these expected species are regarded as threatened (Table 5-4) (species with a high poaching concern were removed from the list below), five of these have a low likelihood of occurrence based on the lack of suitable habitat and food sources in the study area.

Table 5-4 Threatened mammal species that are expected to occur within the study area.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Acinonyx jubatus	Cheetah	VU	VU	Confirmed
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	South Africa Hedgehog	NT	NT	Moderate
Cloeotis percivali	Short-eared Trident Bat	EN	EN	Moderate
Crocidura mariquensis	Swamp Musk Shrew	NT	NT	High

Crocuta crocuta	Spotted Hyaena	NT	NT	Low
Damaliscus lunatus	Tsessebe	VU	VU	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hippotragus equinus	Roan Antelope	EN	EN	Low
Hippotragus niger	Sable Antelope	VU	VU	Confirmed
Leptailurus serval	Serval	NT	NT	High
Panthera pardus	Leopard	VU	VU	Confirmed
Parahyaena brunnea	Brown Hyaena	NT	NT	High
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	NT	Moderate
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Low

Acinonyx jubatus (Cheetah) is listed as VU both regionally and internationally. This cat species is found mainly in savannah and grassland habitats in Southern Africa. It is threatened by genetic distinction and hunting practices. The presence of a cheetah was confirmed by the farm manager.

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. The study area is over the Mokolo river, high number of crabs were also observed, thus the likelihood of occurrence is rated as high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is some suitable habitat in the study area and therefore the likelihood of occurrence is rated as moderate.

Cloeotis percivali (Short-eared Trident Bat) occurs in savanna areas where there is sufficient cover in the form of caves and mine tunnels for day roosting (IUCN, 2017). It feeds exclusively on moths, and appears to be very sensitive to disturbance. Suitable habitat can be found around the study area and therefore the likelihood of finding this species is rated as moderate.

Crocidura mariquensis (Swamp Musk Shrew) has very specific habitat requirements. It occurs in close proximity to open water with a distinct preference for marshy ponds, and riverine and semi-aquatic vegetation such as reed beds (IUCN, 2017). It is considered to be common in suitable habitats. The habitat is highly suitable therefore this species has a high likelihood of occurrence.

Crocuta crocuta (Spotted Hyaena) is classified as near-threatened on a national scale. This species mainly occur in protected areas but in Limpopo and the North-west Provinces they can still be found outside of protected areas. This species is predominantly found in savanna habitats, where they can occur in close association with humans. This species has not been observed in the area in the last 11 years according to the farm manager, however suitable habitat still exist.

Hippotragus niger (Sable) is listed as VU on a regional and international scale. This species is found in wooded savannah habitats, where they feed on both leaves and mid length grasses. The presence of this species were confirmed during the survey.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with

well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. The habitat is highly suitable for this species.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The presence of this species were confirmed by the farm manager.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the study area is moderate to good. The presence of moderate to large herbivores on the property increases the likelihood of occurrence of this species.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the study area and the likelihood of occurrence of this species is therefore considered to be high.

5.1.3.4 Avifauna

The SABAP2 dataset lists 257 avifauna species that could be expected to occur within the area (Appendix E). Six (6) of these expected species are regarded as threatened (Table 5 4).

Table 5-5 List of bird species of regional or global conservation importance that are expected to occur in the study area (SABAP2, 2021, ESKOM, 2015; IUCN, 2021)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Ciconia nigra	Stork, Black	VU	LC	High
Coracias garrulus	Roller, European	NT	LC	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	High
Podica senegalensis	Finfoot, African	VU	LC	High
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	High
Sagittarius serpentarius	Secretarybird	VU	VU	High

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would breed in the study area due to the lack of forested areas, however some suitable foraging habitat remains in the form of the open grasslands and riparian areas, and as such the likelihood of occurrence is rated as high.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a high chance of this species occurring in the study area as suitable habitat and food sources can be found.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are

suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to it's migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a high chance of this species occurring in the study area as suitable habitat is present.

Podica senegalensis (African Finfoot) occurs in forest and wooded savanna along permanent streams with thick growths of *Syzygium guineense*, along secluded reaches of thickly wooded rivers and on the edges of pools, lakes and dams with well-vegetated banks on the edges of dense papyrus beds far from the shore. It is rarely found away from shoreline vegetation and generally avoids stagnant or fast-flowing water (IUCN, 2017). There is a high chance of this species occurring in the study area as suitable habitat is present.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, which is resent in the study area, thus the likelihood of occurrence is high.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the nearby grasslands and riparian area in the study area.

5.2 Field Assessment

5.2.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the study area. A total of 62 tree, shrub, herbaceous and graminoid plant species were recorded in the study area during the field assessment (Table 5-6). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text. Plants listed as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text.

The list of plant species recorded to is by no means comprehensive, a survey conducted under guard may likely yield up to 40% additional flora species for the study area. However, floristic analysis conducted to date is however regarded as a sound representation of the local flora for the study area.

Table 5-6 Trees, shrub and herbaceous plant species recorded in the study area

Family	Scientific name	Threat status	SA Endemic	Alien Category
Anacardiaceae	*Searsia lancea*	LC	Not Endemic	
Anacardiaceae	*Searsia pyroides*	LC	Not Endemic	
Anacardiaceae	*Searsia mucronata*	LC	Not Endemic	
Apiaceae	*Centella asiatica*	LC	Not Endemic	
Apocynaceae	*Diplorhynchus condylocarpon*	LC	Not Endemic	
Asparagaceae	*Asparagus sp*			
Asteraceae	*Cyanthillium cinereum*			Naturalized exotic
Asteraceae	*Helichrysum kraussii*	LC	Not Endemic	
Boraginaceae	*Ehretia rigida*	LC	Not Endemic	
Brassicaceae	*Boscia albitrunca*	LC, Protected Tree	Not Endemic	
Cactaceae	*Opuntia ficus-indica*			NEMBA Category 1b.
Combretaceae	*Combretum apiculatum*	LC	Not Endemic	
Combretaceae	*Combretum erythrophyllum*	LC	Not Endemic	
Combretaceae	*Combretum zeyheri*	LC	Not Endemic	
Combretaceae	*Terminalia sericea*	LC	Not Endemic	
Commelinaceae	*Commelina africana*	LC	Not Endemic	
Convolvulaceae	*Persicaria lapathifolia*	LC	Not Endemic	
Cyperaceae	*Cyperus fastigiatus*	LC	Not Endemic	
Cyperaceae	*Kyllinga melanosperma*	LC	Not Endemic	
Ebenaceae	*Diospyros lycioides*	LC	Not Endemic	
Ebenaceae	*Euclea undulata*	LC	Not Endemic	
Fabaceae	*Burkea africana*	LC	Not Endemic	
Fabaceae	*Dichrostachys cinerea*	LC	Not Endemic	
Fabaceae	*Indigofera comosa*	LC	Not Endemic	

Fabaceae	*Peltophorum africanum*	LC	Not Endemic	
Fabaceae	*Pterocarpus rotundifolius*	LC	Not Endemic	
Fabaceae	*Schotia brachypetala*	LC	Not Endemic	
Fabaceae	*Senegalia burkei*	LC	Not Endemic	
Fabaceae	*Senegalia erubescens*	LC	Not Endemic	
Fabaceae	*Vachellia robusta*	LC	Not Endemic	
Fabaceae	*Vachellia karroo*	LC	Not Endemic	
Fabaceae	*Vachellia erioloba*	LC, Protected Tree	Not Endemic	
Haloragaceae	*Myriophyllum aquaticum*			Invasive Category 1b
Lamiaceae	*Vitex pooara*	LC	Endemic	
Lobeliaceae	*Lobelia erinus*	LC	Not Endemic	
Malvaceae	*Grewia bicolor*	LC	Not Endemic	
Malvaceae	*Grewia flava*	LC	Not Endemic	
Malvaceae	*Grewia flavescens*	LC	Not Endemic	
Malvaceae	*Sida Sp.*	LC	Not Endemic	
Nymphaeaceae	*Nymphaea nouchali*	LC	Not Endemic	
Nymphaeaceae	*Nymphaea sp*	LC	Not Endemic	
Ochnaceae	*Ochna pulchra*	LC	Not Endemic	
Onagraceae	*Ludwigia adscendens subsp. diffusa*	LC	Not Endemic	
Phyllanthaceae	*Flueggea virosa*	LC	Not Endemic	
Poaceae	*Aristida adscensionis*	LC	Not Endemic	
Poaceae	*Aristida congesta*	LC	Not Endemic	
Poaceae	*Cynodon dactylon*	LC	Not Endemic	
Poaceae	*Digitaria eriantha*	LC	Not Endemic	
Poaceae	*Elionurus muticus*	LC	Not Endemic	
Poaceae	*Eragrostis pallens*	LC	Not Endemic	

Poaceae	*Eragrostis rigidior*	LC	Not Endemic	
Poaceae	*Phragmites mauritianus*	LC	Not Endemic	
Poaceae	*Setaria incrassata*	LC	Not Endemic	
Poaceae	*Trachypogon spicatus*	LC	Not Endemic	
Rhamnaceae	*Ziziphus mucronata*	LC	Not Endemic	
Rubiaceae	*Gardenia volkensii*	LC	Not Endemic	
Sapotaceae	*Englerophytum magalismontanum*	LC	Not Endemic	
Velloziaceae	*Xerophyta retinervis*	LC	Not Endemic	
Verbenaceae	*Verbena bonariensis*			NEMBA Category 1b.

5.2.1.1 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- *Category 1a*: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- *Category 1b*: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- *Category 2*: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- *Category 3*: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the Alien and Invasive Species Regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the NEMBA;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEMBA.

Three (3) IAP species were recorded within the study area. These species are listed under the Alien and Invasive Species List 2021, Government Gazette No. 44182 as Category 1b. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

5.2.1.2 Floral Species of Conservation Concern

During the field assessment 2 species of protected trees were observed: *Boscia albitrunca* (Shepherd's Tree) and *Vachellia erioloba* (Camel Thorn). The protected trees observed are protected by the List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998) (NFA). In terms of the NFA, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected

tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence. One Shepherd's tree was observed, while a few Camel thorn trees occurred naturally spaced throughout the area (not to be confused with the *Vachellia robusta* found in between). The locations of the Shepherds tree and a Camel thorn (approximate location) are shown in Figure 5-11. An example of the trees observed can be seen in Figure 5-12.

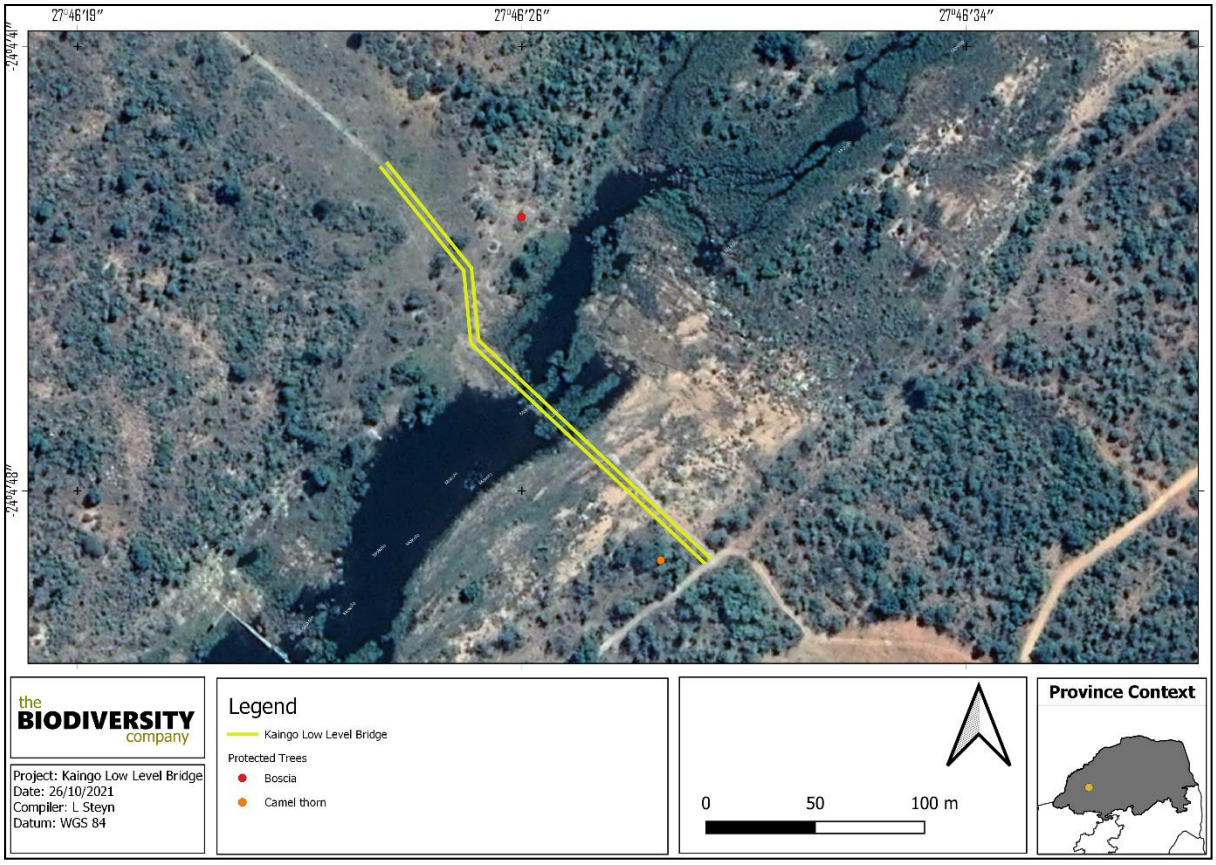

Figure 5-11 The location of the protected trees observed on site

Figure 5-12 Photograph illustrating the Camel Thorn (A) and the Shepherds Tree (B) observed in the study area

5.2.2 Faunal Assessment

Herpetofauna, mammal and avifauna observations and recordings are addressed in this section.

5.2.2.1 Amphibians and Reptiles

Nine reptile and no amphibian species were recorded in the study area during the survey. Surveys relied on opportunistic sightings as opposed to intensive and appropriate sampling methods. The only other method utilised 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, this method was also not intensively applied in the field. One of the herpetofauna species recorded are regarded as threatened.

The use of the rocky outcrop in the study area by some of these species on the fine-scale habitats is important to consider for mitigation actions when an area is cleared for placement of the infrastructure.

Table 5-7 Summary of herpetofauna species recorded within the study area.

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amphibians			
Amietia fuscigula	Common River Frog	LC	LC
Reptiles			
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC

Crocodylus niloticus	Nile Crocodile	VU	LC
Lygodactylus capensis	Cape dwarf gecko	LC	LC
Pedioplanis lineoocellata	Spotted Sand Lizard	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Trachylepis margaritifera	Rainbow Skink	LC	LC
Varanus niloticus	Water Monitor	LC	Unlisted

Figure 5-13 Some of the reptile species recorded in and around the study area: A) Tree Agama (Acanthocercus atricollis), B) Rainbow Skink (Trachylepis margaritifera), C) Spotted Sand Lizard (Pedioplanis lineoocellata) and D) Leopard Tortoise (Stigmochelys pardalis)

5.2.2.2 Mammals

Twelve (12) mammal species were observed that could naturally occur outside of protected areas, while an additional 12 species were found that are restricted to protected areas (Table 5-8). These observations were based on either direct observation or the presence of visual tracks and signs (Figure 5-14). Six of the species recorded are regarded as a SCC.

The use of the rocky outcrop in the study area by some of these species on the fine-scale habitats is important to consider for mitigation actions when an area is cleared for placement of the infrastructure.

Table 5-8 Summary of mammal species recorded within the study area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Canis mesomelas	Black-backed Jackal	LC	LC
Chlorocebus pygerythrus	Vervet Monkey	LC	LC

Galago senegalensis	Lesser bushbabies	Unlisted	LC
Hippopotamus amphibius	Hippopotamus	LC	VU
Lepus saxatilis	Scrub Hare	LC	LC
Micaelamys namaquensis	Namaqua Rock Mouse	LC	LC
Orycteropus afer	Aardvark	LC	LC
Papio ursinus	Chacma Baboon	LC	LC
Paraxerus cepapi	Tree Squirrel	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Protected Areas Species			
Aepyceros melampus	Impala	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Equus quagga	Plains Zebra	LC	NT
Hippotragus niger	Sable Antelope	VU	LC
Kobus ellipsiprymnus	Common Waterbuck	LC	LC
Loxodonta africana	African Elephant	LC	EN
Panthera leo	Lion	LC	VU
Syncerus caffer	African Buffalo	LC	LC
Tragelaphus angasii	Nyala	LC	LC
Tragelaphus oryx	Common eland	LC	LC
Tragelaphus scriptus	Cape Bushbuck	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC

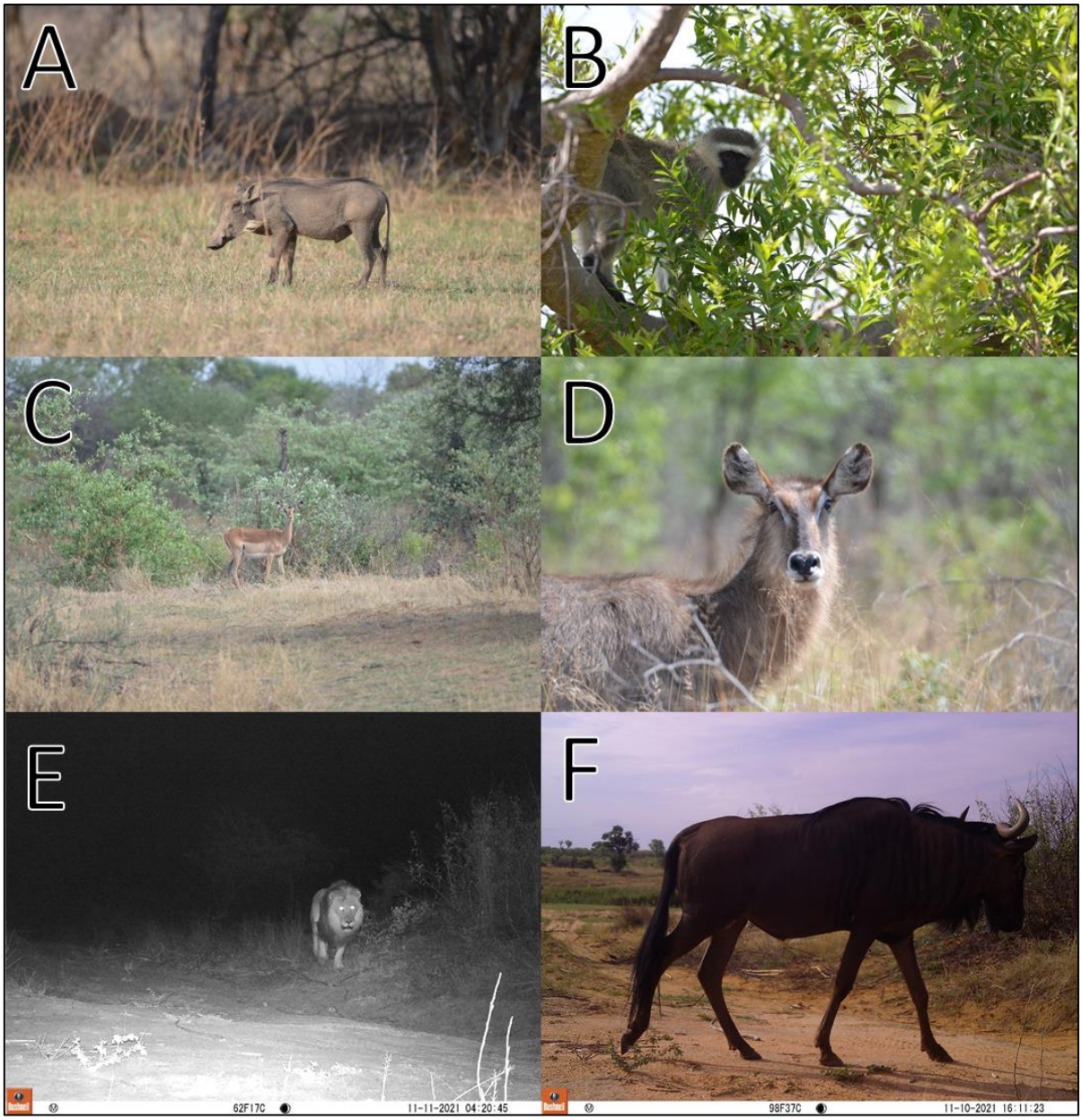

Figure 5-14 ***Some of the mammal species recorded in the study area, A) Common Warthog (Phacochoerus africanus), B) Vervet Monkey (Chlorocebus pygerythrus), C) Impala (Aepyceros melampus), D) Common Waterbuck (Kobus ellipsiprymnus), E) Lion (Panthera leo) and D) Common Wildebeest (Connochaetes taurinus)***

5.2.2.3 Avifauna

Sixty five (65) avifauna species were observed during the survey of the study area (Table 5-8) based on either direct observation or the presence of visual tracks and signs (Figure 5-15). None of the species recorded are regarded as a SCC.

Table 5-9 ***Summary of avifauna species recorded within the study area***

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted

Alopochen aegyptiaca	Goose, Egyptian	LC	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bubalornis niger	Buffalo-weaver, Red-billed	Unlisted	LC
Burhinus vermiculatus	Thick-knee, Water	Unlisted	LC
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted
Cecropis abyssinica	Swallow, Lesser Striped	Unlisted	LC
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Corvinella melanoleuca	Shrike, Magpie	Unlisted	LC
Corythornis cristatus	Kingfisher, Malachite	Unlisted	Unlisted
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon senegalensi	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Hirundo rustica	Swallow, Barn	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lophoceros nasutus	Hornbill, African Grey	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Melaniparus cinerascens	Tit, Ashy	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Microcarbo africanus	Cormorant, Reed	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Muscicapa caerulescens	Flycatcher, Ashy	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC

Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Saxicola torquatus	Stonechat, African	Unlisted	LC
Spilopelia senegalensis	Dove, Laughing	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Zapornia flavirostra	Crake, Black	Unlisted	LC
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted

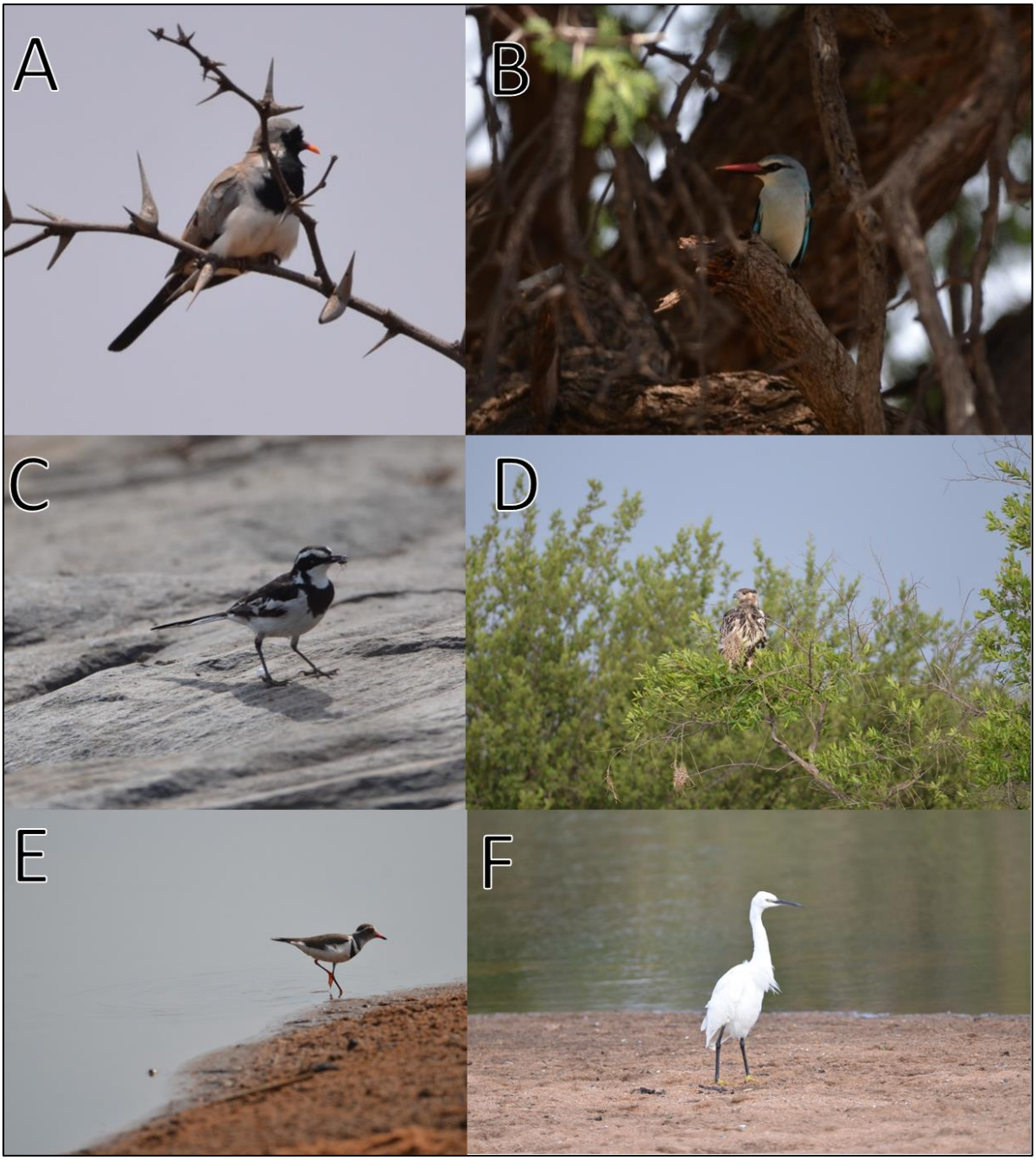

Figure 5-15 ***Photograph illustrating of the avifaunal species recorded in the study area. A) Namaqua Dove (Oena capensis), B) Woodlands Kingfisher (Halcyon senegalensis), C) African Pied Wagtail (Motacilla aguimp), D) Fish Eagle (Haliaeetus vocifer), E) Three-banded Plover (Charadrius tricollaris) and F) Little Egret (Egretta garzetta)***

6 Habitat Assessment and Site Ecological Importance

6.1 Habitat Assessment

The main habitat types identified across the study area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey; the delineated habitats can be seen in Figure 6-1. Emphasis was placed on limiting timed meander searches within the natural habitats and therefore habitats with a higher potential of hosting SCC.

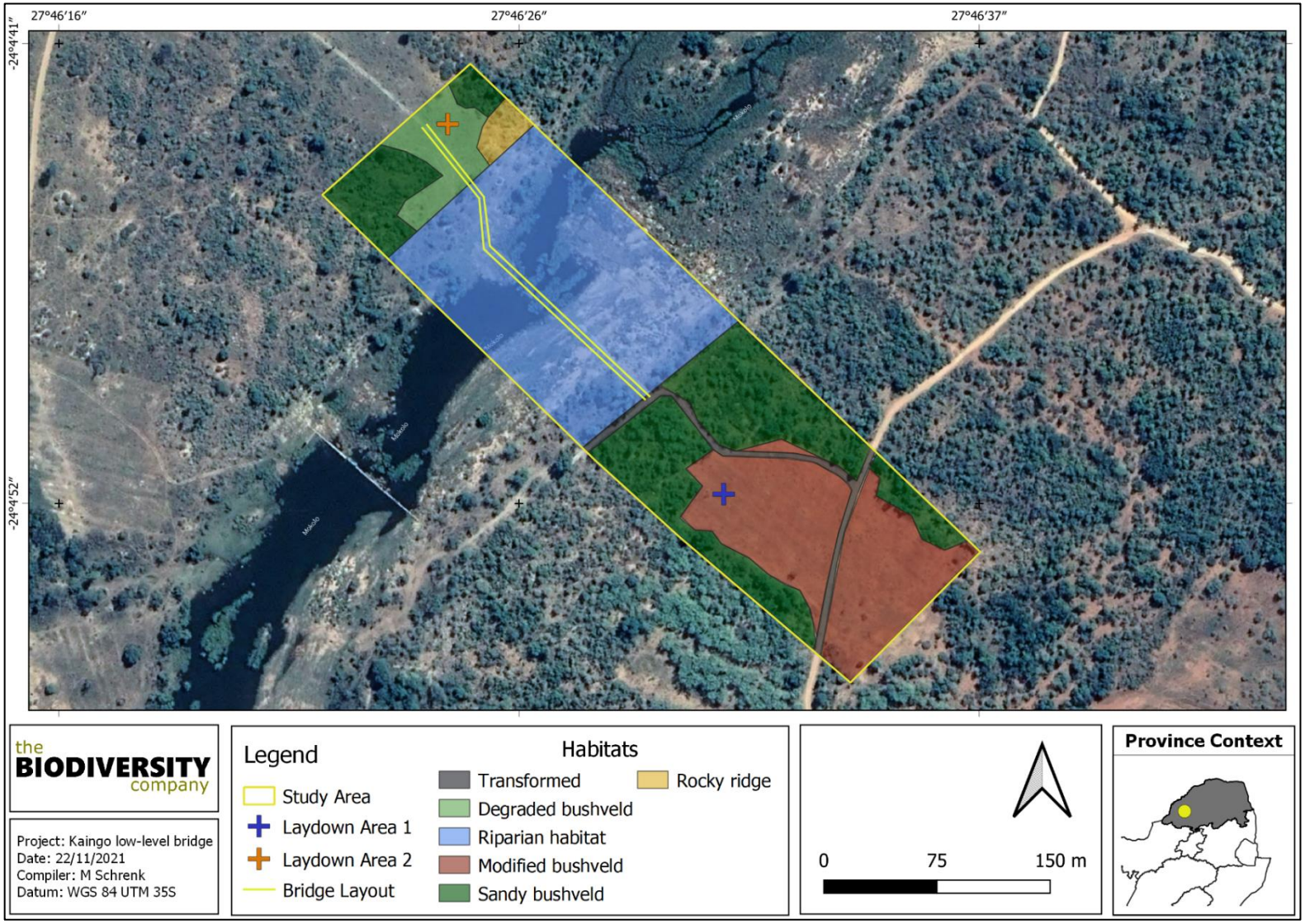

Figure 6-1 Habitats identified in the study area

Transformed

This delineated area contains a gravel road, it covers all sections of the study area that have been cleared of vegetation for the passage of vehicles. Figure 6-2 below presents an example of this transformed habitat.

Figure 6-2 A section of the gravel road that leads towards the proposed bridge crossing.

Degraded Bushveld

This habitat type is regarded as degraded or semi-natural bushveld, disturbed due to overgrazing and human infringement/clearing (current clearing by tractors and slashers). Historical satellite imagery reveals that this portion of the study area has been impacted by road ingress and vegetation clearing since at least 2012, it has however started to recover since 2018. The current ecological condition of this habitat with regards to the main driving forces is however intact, which is evident from the species diversity and number of plant species recorded. Figure 6-3 below shows an example of this habitat type.

Figure 6-3 Example of degraded bushveld habitat from the study area.

Riparian Habitat

A 200m riparian zone delineation has been made for the study area, guided by the 20-year floodline (as provided by Ecoleges) as well as the presence of hydrophilic vegetation. Riparian areas are regarded as niche zones that are important for specialised vegetation as well as sensitive fauna species (Figure 6-4). This specific area has been historically impacted upon by the presence of the weir immediately upstream (altering the hydrological state of this portion of the river), human and faunal traffic, as well as intense flooding. As such the area is dominated by exposed sandy soils (Figure 6-5) and holds limited plant species diversity, with the dominant species being the indigenous *Phragmites mauritianus* and *Eragrostis pallens.* Multiple sightings in addition to the spotting of tracks and signs confirms that this specific site is frequented by both herbivore and carnivore species traffic, and multiple avifaunal species such as *Ceryle rudis* and *Halcyon senegalensis* (kingfishers) as well as *Haliaeetus vocifer* (African Fish-eagle). The area also contains numerous rocky outcrops which are valuable microhabitats for many faunal species. It is thus important to take note of and implement the mitigation measures put forward in the management plan section of this report in order to manage the risks and impacts posed by the development on the riparian habitat and its dependants.

Figure 6-4 Portions of the riparian habitat remain untouched by severe human and faunal ingress. Dense stands of Phragmites mauritianus dominate these banks

Figure 6-5 Exposed sandy soils and rock outcrops are very common throughout the site specific riparian area

Modified Bushveld

This area has been significantly disturbed and modified from its historical state, it represents habitat that is more disturbed than the 'degraded bushveld' area, but not as disturbed as the 'transformed' area. Historical imagery shows that this site has been in this state for at least 15 years, but this is likely much longer as there are signs of prolonged alternative land use. This site is considered to have a low sensitivity due to the fact that there is very little healthy indigenous vegetation (Figure 6-6) and there are no signs of natural habitat recovery.

Figure 6-6 The modified bushveld habitat consists of sparce open plains which are not typical of the local central sandy bushveld vegetation type, of the savannah biome

Sandy Bushveld

The sandy bushveld habitat represents the most intact naturally occurring central sandy bushveld vegetation, characteristic of the region (Figure 6-7). This habitat occurs in a largely natural undisturbed state and contains low undulating terrain with deep sandy soils mixed with more shallow rocky soils and outcrops, typical of this bioregion. Vegetation recorded, and typical of this area, includes the tall deciduous *Terminalia sericea* and *Burkea Africana* as well as *Combretum* and *Vachellia* species. The nationally protected *Vachellia erioloba* was also observed within this delineated habitat. As this habitat type is still in an unmodified state it is important to limit any damage-inducing human activity as much as possible, construction and laydown processes should be confined to the 'degraded' and 'modified' bushveld areas.

Figure 6-7 An example of the denser and more natural sandy bushveld habitat occurring within the study area

Rocky Ridge

Although several large rocky ridges lie adjacent to the study area, only one occurs within the demarcated study site and outside of the riparian zone. This habitat is a particularly unique and sensitive feature within the landscape as it contains large rocks and boulders in addition to the naturally occurring sandy bushveld vegetation (Figure 6-8), which together provides specialised micro-habitat for a range of dependant flora and fauna species. Notable observations include the nationally protected tree *Boscia albitrunca* and a variety of *Grewia* species. Development and construction activities should avoid rocky ridges as much as possible due to their unique and sensitive natures. It is also useful to note that this area as well as the sandy bushveld habitat contains numerous decaying trees and overturned tree trunks which should be left in place during and post-construction as they are a valuable resource for the local fauna.

Figure 6-8 A figure illustrating the Rocky Ridge habitat occurring within the study area

6.2 Site Ecological Importance

The terrestrial biodiversity theme sensitivity as indicated in the screening report was derived to be Very High, due to the study area being within a CBA1 as well as multiple protected areas (Figure 6-9).

The completion of the terrestrial biodiversity assessment confirmed the high sensitivity of certain habitats that overlap with the study area and therefore the assessment findings corroborate the screening report. The high sensitivity habitats include the riparian, sandy bushveld, and rocky ridge habitats.

Figure 6-9 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool.

The location and extent of all habitats are illustrated in Figure 6-1 above. Based on the criteria provided in Section 4.3 of this report, all habitats within the assessment area of the project were allocated a sensitivity category (Table 6-1). The sensitivities of the habitat types delineated are illustrated in Figure 6-10 below.

Table 6-1 SEI Summary of habitat types delineated within the study area

Habitat (Area)	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Low	Low	Low	Medium	Low
Degraded Bushveld	High	Low	Medium	Medium	Medium
Riparian Habitat	Very High	High	Very High	Low	Very High
Modified Bushveld	Medium	Low	Low	Medium	Low
Sandy Bushveld	High	High	High	Medium	High
Rocky Ridge	High	Medium	Medium	Low	High

Table 6-2 Guidelines for interpreting Site Ecological Importance in the context of the development activities

Site Ecological Importance	Interpretation in relation to development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.

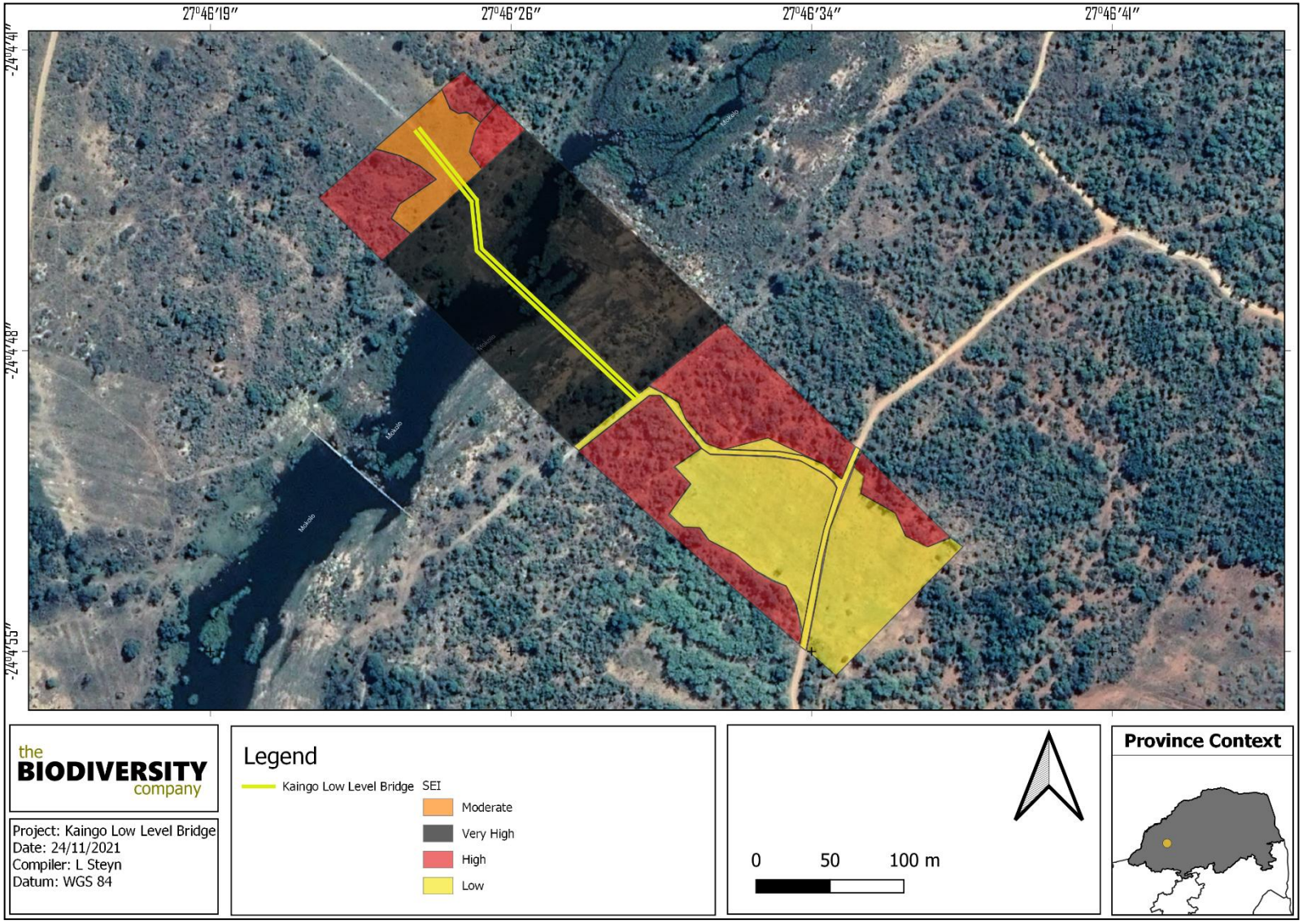

Figure 6-10 Sensitivity of the study area

7 Impact Risk Assessment

The section below and associated tables serve to indicate and summarise the significance of perceived impacts on the terrestrial ecology of the study area. Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the study area. The relevant impacts associated with the bridge development were then subjected to a prescribed impact assessment methodology as provided in Appendix G.

7.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the study area. These include:

- Historic (agriculture);
- Clearance of vegetation;
- Farm roads;
- Alien and/or Invasive Plants (AIP);
- Powerlines; and
- Fences and associated maintenance.

Figure 7-1 Some of the impacts observed in the study area; A) roads, B) Alien invasive species, C) Powerlines and fences, and D) Chopping of trees

7.2 Terrestrial Impact Assessment

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the study area. The relevant impacts associated with the development were then subjected to a prescribed impact assessment methodology and is available on request. Some of these impacts have been retrospectively assessed. No decommissioning phase was considered based on the nature of the development.

Anthropogenic activities drive habitat destruction causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

7.3 Alternatives considered

No alternatives were provided for the development.

7.4 Anticipated Impacts

The impacts anticipated for the activities are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity (Table 7-1).

Table 7-1 Anticipated impacts for the activities on terrestrial biodiversity

Main Impact	Project activities that can cause loss/impacts to habitat (especially with regard to the infrastructure areas):	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species.	Displacement/loss of flora & fauna (including possible SCC)
	Access roads and servitudes	Increased potential for soil erosion
	Soil dust precipitation	Habitat fragmentation
	Waste products	Increased potential for establishment of alien & invasive vegetation
	Random events such as fire (cooking fires or cigarettes)	Erosion
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
2. Spread and/or establishment of alien and/or invasive species	Vegetation removal	Habitat loss for native flora & fauna (including SCC)
	Vehicles potentially spreading seed	Spreading of potentially dangerous diseases due to invasive and pest species
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	Alteration of fauna assemblages due to habitat modification
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation	Loss of habitat
		Loss of ecosystem services
	Roadkill due to vehicle collision	Increase in rodent populations and associated disease risk
	Pollution of water resources due to dust effects, chemical spills, etc.	
	Intentional killing of fauna for food (hunting)	
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor	Reduced dispersal/migration of fauna
		Loss of ecosystem services
	Compacted roads	Reduced plant seed dispersal
	Removal of vegetation	
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills	Pollution in watercourses and the surrounding environment
	Erosion	Faunal mortality (direct and indirectly)
		Groundwater pollution
		Loss of ecosystem services
Main Impact	**Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.**	**Secondary impacts anticipated**
6. Disruption/alteration of ecological life cycles (breeding, migration,	Operation of machinery (Large earth moving machinery, vehicles)	Disruption/alteration of ecological life cycles due to noise
		Loss of ecosystem services

feeding) due to noise, dust and light pollution.	Project activities that can cause disruption/alteration of ecological life cycles due to dust	Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
	Vehicles	Loss of ecosystem services
Main Impact	**Project activities that can cause staff to interact directly with potentially dangerous fauna**	**Secondary impacts anticipated**
8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	All unregulated/supervised activities outdoors	Loss of SCCs

7.5 Identification of Potential Impacts

7.5.1 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Mitigations were provided in section 8 of this report. These sections must thus be read together. The decommissioning of the bridge was not considered as this is regarded as a long term permanent structure, the construction camps were however considered for decommissioning and rehabilitation.

7.5.1.1 Pre-Construction

The impact considered for the pre-construction phase is the disturbance associated with specialist studies. This was rated as having a low impact prior to mitigations and an absent impact post mitigations (Table 7-2). This can be mitigated successfully if the vehicle access around the site is restricted, and assessments mainly are conducted on foot.

7.5.1.2 Construction Phase

Table 7-3 summarises the significance of potential impacts associated with the project on fauna and flora before and after implementation of mitigation measures. The loss of habitat and the degradation of habitat were rated as ‘High’ prior to mitigations. Through the implementation of mitigations such as the restriction and demarcation of the project footprint this can be lowered to ‘Moderate-high’, it can however not be mitigated completely as habitat will still be lost. The pollution of the water source by hydrocarbons and building materials was rated as critical, should mitigations such as no mixing of cement in the riparian area be implemented this impact can be reduced to “Low”. Erosion and an associated habitats loss were rated as “High” pre-mitigations, should appropriate erosion control measures put in place and implemented long term this impact can be reduced to “Low”. As the protected trees will be avoided in the construction and not disturbed the impact on them were not considered.

The construction of the bridge will result in the disruption of the ecosystem corridor, this will particularly have an impact on the Crocodile and Hippopotamus found there. They will however adapt to the changes especially as it is a low level bridge. Terrestrial fauna will only temporarily be put off by the bridge and should adapt to the new structure. This impact was rated as “High” pre-mitigation and “Moderately high” post-mitigation.

7.5.1.3 Decomissioning and Rehabilitation

The decommissioning of the bridge was not considered as this is regarded as a long term permanent structure, the construction camps were however considered for decommissioning and rehabilitation. Table 7-4 shows the impacts pre- and post-mitigations for the decommissioning of the temporary contractors camp. The pollution of the habitat and water sources as well as the possible spread of alien invasive species were rated as ‘Moderately-high’ before mitigations and were rated as “Low” post mitigations.

Table 7-2 Assessment of significance of potential impacts on terrestrial biodiversity associated with the pre- construction phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
	2	3	3	3	3		2	2	2	2	2	
Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles	One month to one year: Short Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Low**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Absent**

Table 7-3 Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, fragmentation and degradation of habitats and ecosystems	5	3	4	4	5		5	2	4	4	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	Permanent	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Introduction of alien spp, especially plants	5	4	4	4	4		2	2	2	4	2	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Possible	**Low**
Displacement of faunal community (Including SCC) due to habitat loss, direct mortalities	5	4	4	5	4		5	2	3	4	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Highly likely	**High**	Permanent	Development specific/ within the site boundary / < 100 ha impacted / Linear	Significant / ecosystem structure and function	Ecology highly sensitive /important	Likely	**Moderate**

and disturbance (road collisions, noise, dust, vibration and possible poaching).		impacted / Linear features affected < 3000m						features affected < 100m	moderately altered			
Pollution of water source by hydrocarbon spills and pollution by building material in the stream	5	5	5	5	4		3	2	2	4	2	
	Permanent	Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology critically sensitive /important	Highly likely	**Critical**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Possible	**Low**
Destruction of nests and nesting material	5	4	3	3	4		3	2	2	4	2	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Possible	**Low**
Loss of habitat due to erosion and storm water	5	3	4	4	5		3	2	3	4	2	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Possible	**Low**

	5	3	4	4	5		5	3	3	4	3	
Loss of ecosystem Corridor	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderately High**

Table 7-4 Assessment of significance of potential impacts on terrestrial biodiversity associated with the rehabilitation phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Pollution of the habitat and nearby water source	3	4	4	4	4		2	2	2	4	1	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Highly unlikely	**Low**
Introduction of alien spp, especially plants	3	4	4	4	4		2	2	2	4	1	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Highly unlikely	**Low**

8 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that the can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines Table 8-1 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial study.

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the study area;
- As far as possible, reduce the negative fragmentation effects of the development and enable safe movement of faunal species;
- Prevent the direct and indirect loss and disturbance of faunal species and community (including occurring and potentially occurring species of conservation concern); and
- Follow the guidelines for interpreting SEI.

Table 8-1 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial study

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
All high sensitivity areas outside of the direct development area should be avoided and the work area must be demarcated to avoid these areas.	Construction Phase	Project manager & Farmer Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. All activities must be restricted too within the low/medium sensitivity areas. No further loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Existing access routes, especially roads must be made use of.	Construction Phase	Project manager & Farmer	Roads and paths used	Ongoing
All laydown etc. should be restricted to low/moderate sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the study area once the construction phase has been concluded. No permanent construction structures should be permitted. No storage of vehicles or equipment will be allowed in high sensitivity areas or undeveloped medium sensitivity areas	Construction Phase	Environmental Officer & Design Engineer	Development footprint	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Construction phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the study area.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing

It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the study area. No plant species whether indigenous or exotic should be brought into/taken from the study area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas, if not already in place for the reserve.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer	Protected Tree species	Ongoing
For the construction of the bridge: • No cement may be mixed on site and be spilled into the systems; • All rubble must be removed from site once construction has been completed; • The river bed and edge must be rehabilitated and revegetated with indigenous vegetation to prevent erosion.	Construction Phase	Environmental Officer & Contractor	Bridge construction	During Phase
Drilling can lead to: Ground vibrations, ground deformation (resulting in trees falling and habitat loss) and fly rock. • Watch For/Monitor Ground Heave, Block Movement.	Construction Phase	Environmental Officer & Contractor	Drilling	During Phase
Rocks not utilised in the construction may not be piled in sensitive areas and must be removed from site or be used as part of erosion control.	Construction	Environmental Officer & Contractor	Rock Piles	During Phase
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Decommissioning phase	Environmental Officer & Contractor	Woody material removed	During Phase
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
A qualified environmental control officer must be on site. A site walk through by a suitably qualified ecologist must take place prior to any construction activities. In situations where the protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species.	During phase
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments,	Construction Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing

• Signs must be put up to enforce this				
The duration of any further approved construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna. Construction must take place in the winter months to ensure nests and migratory species are not disturbed.	Construction	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed • Signs must be put up to enforce this;	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.	Construction Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight; • Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.	Construction Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation

Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. • No non environmentally friendly suppressants may be used as this could result in pollution of water sources	Life of operation	Contractor	Dustfall	Dust monitoring program.

Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the study area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days

Management outcome: Environmental awareness training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the study area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

employees must all undergo the induction and made aware of the areas to be avoided.				
Management outcome: Erosion				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Speed limits must be put in place to reduce erosion. • Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit; • Signs must be put up to enforce this.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
The engineer must include adequate stormwater management measures to ensure proper erosion control	Life of operation	Engineer	Management plan	Before construction phase: Ongoing

9 Conclusion and Impact Statement

The study area falls across the Mokolo River which is an Endangered river according to the 2018 National Biodiversity Assessment. The study area also overlap with a critical biodiversity area and is within the Waterberg bird and biodiversity area. It lies on the border between the Kaingo Nature Reserve and the Mokolo Nature Reserve. The fences were dropped between these two reserves and the purpose of the new bridge is for easier movement between the two areas. These are big 5 reserves with an established history of long term conservation.

Six habitats were identified in and around the project footprint, they are Transformed, Degraded Bushveld, Riparian vegetation, Modified Bushveld, Sandy Bushveld and Ricky Ridge. The high sensitivity habitats include the riparian, sandy bushveld, and rocky ridge habitats, while the degraded bushveld were given a moderate sensitivity and the modified bushveld and transformed habitat a low sensitivity. Two protected trees the Camel Thorn (*Vachellia erioloba*) and the Shepherds tress (*Boscia albitrunca*) were found just outside the direct footprint, it is imperative that these trees not be disturbed during the construction process. One reptile species of conservation concern (SCC) the Nile Crocodile (*Crocodylus niloticus*), and six mammal SCCs were observed. Of these mammal SCCs one, the Hippopotamus (*Hippopotamus amphibius*), can be found outside of protected areas. It is expected that the bridge development will have the greatest impact on the Hippopotamus and the Crocodile as this would be a direct alteration in their habitats and would result in the disruption of an ecological corridor. Other fauna species are likely to be displaced temporarily but will utilise the bridge at a later stage to cross the river.

Impact Statement

Taking into account that the development is for the facilitation of a larger protected area and the overall footprint of the development is small, the development may be favourably considered should all the mitigations strictly be adhered to. It is especially imperative that the construction take place in the winter months to ensure the water borne SCCs are not directly impacted and have temporarily moved out of the area to the upstream weir. Should this mitigation not be adhered to this would be regarded as a fatal flaw for the project.

10 References

ADU (Animal Demography Unit). (2017). Virtual Museum.

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J & de Villiers, M.S. (Eds). 2014. Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African Biodiversity Institute, Pretoria.

BGIS (Biodiversity GIS). (2017). http://bgis.sanbi.org/

BODATSA-POSA. (2021). Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/.

Boycott, R. and Bourquin, R. 2000. The Southern African Tortoise Book – A Guide to Southern African Tortoises, Terrapins and Turtles. Revised Edition. Hilton. 228 pages.

Branch, W.R. (1998). Field Guide to Snakes and Other Reptiles of Southern Africa. Struik, Cape Town.

Bird Atlas Project (SABAP2). (2012). http://vmus.adu.org.za/

Desmet, P. G., Holness, S., Skowno, A. & Egan, V.T. (2018). 2018 Limpopo Province Map of Critical Biodiversity Areas and Ecological Support Areas. http://bgis.sanbi.org/SpatialDataset/Detail/5707

Du Preez, L. & Carruthers, V. (2009) A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

Eskom. (2015). Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

EWT. (2016). Mammal Red List 2016. www.ewt.org.za

EWT (Endangered Wildlife Trust). (2017). Threatened Amphibian Programme. (2015). The Southern African Frog Atlas Project https://www.ewt.org.za/TAP/refrence.html (SAFAP, now FrogMAP). http://vmus.adu.org.za

Fish, L., Mashau, A.C., Moeaha, M.J. & Nembudani, M.T. (2015). Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions. SANBI, Pretoria.

IUCN. (2021). The IUCN Red List of Threatened Species. www.iucnredlist.org

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

MammalMap. (2017). http://mammalmap.adu.org.za/

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Monadjem, A., Taylor, P.J., Coterrill, F.D.P. & Schoeman, C. (2010). Bats of southern and central Africa: a biogeographic and taxonomic synthesis. Wits University Press, Johannesburg.

Mucina, L. & Rutherford, M.C. (Eds.). 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria, South African.

Mucina, L., Rutherford, M.C. & Powrie, L.W. (Eds.). 2007. Vegetation map of South Africa, Lesotho and Swaziland. 1:1 000 000 scale sheet maps. 2nd ed. South African National Biodiversity Institute, Pretoria.

NBA (2018). National Biodiversity Assessment spatial data. http://bgis.sanbi.org/

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

National Protected Areas Expansion Strategy for South Africa (NPAES) (2016). Department of Environmental Affairs, Pretoria, South Africa.

Raimonde, D. (2009). Red list of South African Plants. SANBI, Pretoria.

SADAP (South Africa Protected Areas Database) and SACAD (South Africa Conservation Areas Database) (2021). http://egis.environment.gov.za

SANBI. 2013. Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers. Compiled by Cadman, M., de Villiers, C., Lechmere-Oertel, R. and D. McCulloch. South African National Biodiversity Institute, Pretoria. 139 pages.

SANBI-BGIS. 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning.

SANBI. (2017). South African National Biodiversity Institute – Red List of South African Plants. http://redlist.sanbi.org/

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

Van Deventer, H., Smith-Adao, L., Collins, N.B., Grenfell, M., Grundling, A., Grundling, P-L., Impson, D., Job, N., Lötter, M., Ollis, D., Petersen, C., Scherman, P., Sieben, E., Snaddon, K., Tererai, F. and Van der Colff D. 2019. *South African National Biodiversity Assessment 2018: Technical Report.* Volume 2b: Inland Aquatic (Freshwater) Realm. CSIR report number CSIR/NRE/ECOS/IR/2019/0004/A. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6230.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K. 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa.

11 Appendix Items

11.1 Appendix A – Flora species expected to occur in the study area.

Family	Taxon	Author	IUCN	Ecology
Malvaceae	*Abutilon angulatum var. angulatum*	(Guill. & Perr.) Mast.	NE	Indigenous
Fabaceae	*Acacia sp.*			
Lamiaceae	*Aeollanthus parvifolius*	Benth.	LC	Indigenous
Turneraceae	*Afroqueta capensis*	(Harv.) Thulin & Razafim.	LC	Indigenous
Fabaceae	*Albizia brevifolia*	Schinz	LC	Indigenous
Cyperaceae	*Alinula paradoxa*	(Cherm.) Goetgh. & Vorster	LC	Indigenous
Fabaceae	*Alistilus bechuanicus*	N.E.Br.	LC	Indigenous
Poaceae	*Andropogon chinensis*	(Nees) Merr.	LC	Indigenous
Commelinaceae	*Aneilema hockii*	De Wild.	LC	Indigenous
Archidiaceae	*Archidium acanthophyllum*	Snider		Indigenous
Archidiaceae	*Archidium ohioense*	Schimp. ex Mull.Hal.		Indigenous
Archidiaceae	*Archidium sp.*			
Poaceae	*Aristida adscensionis*	L.	LC	Indigenous
Poaceae	*Aristida rhiniochloa*	Hochst.	LC	Indigenous
Poaceae	*Aristida spectabilis*	Hack.	LC	Indigenous
Asparagaceae	*Asparagus aggregatus*	(Oberm.) Fellingham & N.L.Mey.	LC	Indigenous; Endemic
Pottiaceae	*Barbula eubryum*	Mull.Hal.		Indigenous
Acanthaceae	*Barleria galpinii*	C.B.Clarke	LC	Indigenous
Acanthaceae	*Barleria heterotricha subsp. heterotricha*	Lindau		Indigenous
Fabaceae	*Bauhinia petersiana subsp. macrantha*	Bolle	LC	Indigenous
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Acanthaceae	*Blepharis breyeri*	Oberm.	LC	Indigenous; Endemic
Poaceae	*Bothriochloa radicans*	(Lehm.) A.Camus	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	(Vahl) R.W.Haines	LC	Indigenous
Cyperaceae	*Bulbostylis pusilla*	(Hochst. ex A.Rich.) C.B.Clarke	LC	Indigenous
Leucobryaceae	*Campylopus introflexus*	(Hedw.) Brid.		Indigenous
Leucobryaceae	*Campylopus pyriformis*	(F.W.Schultz) Brid.		Indigenous
Poaceae	*Cenchrus ciliaris*	L.	LC	Indigenous
Pedaliaceae	*Ceratotheca triloba*	(Bernh.) Hook.f.	LC	Indigenous
Apocynaceae	*Ceropegia ampliata var. ampliata*	E.Mey.	LC	Indigenous
Fabaceae	*Chamaecrista absus*	(L.) H.S.Irwin & Barneby	LC	Indigenous
Pteridaceae	*Cheilanthes hirta var. hirta*	Sw.	LC	Indigenous

Pteridaceae	*Cheilanthes viridis var. glauca*	(Forssk.) Sw.	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. viridis*	(Forssk.) Sw.	LC	Indigenous
Gentianaceae	*Chironia palustris subsp. transvaalensis*	Burch.	LC	Indigenous
Agavaceae	*Chlorophytum galpinii var. galpinii*	(Baker) Kativu	LC	Indigenous
Acanthaceae	*Chorisochora transvaalensis*	(A.Meeuse) Vollesen	LC	Indigenous
Vitaceae	*Cissus cactiformis*	Gilg	LC	Indigenous
Cleomaceae	*Cleome macrophylla*	(Klotzsch) Briq.	LC	Indigenous
Combretaceae	*Combretum apiculatum subsp. apiculatum*	Sond.	LC	Indigenous
Combretaceae	*Combretum imberbe*	Wawra	LC	Indigenous
Combretaceae	*Combretum kraussii*	Hochst.	LC	Indigenous
Combretaceae	*Combretum petrophilum*	Retief	LC	Indigenous; Endemic
Combretaceae	*Combretum zeyheri*	Sond.	LC	Indigenous
Commelinacea e	*Commelina africana var. lancispatha*	L.	LC	Indigenous
Commelinacea e	*Commelina eckloniana*	Kunth	LC	Indigenous
Burseraceae	*Commiphora africana var. africana*	(A.Rich.) Engl.	LC	Indigenous
Burseraceae	*Commiphora angolensis*	Engl.	LC	Indigenous
Burseraceae	*Commiphora pyracanthoides*	Engl.	LC	Indigenous
Burseraceae	*Commiphora schimperi*	(O.Berg) Engl.	LC	Indigenous
Burseraceae	*Commiphora sp.*			
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Rubiaceae	*Cordylostigma virgatum*	(Willd.) Groeninckx & Dessein		Indigenous
Fabaceae	*Crotalaria burkeana*	Benth.	LC	Indigenous
Fabaceae	*Crotalaria virgultalis*	Burch. ex DC.	LC	Indigenous
Euphorbiaceae	*Croton gratissimus var. subgratissimus*	Burch.	LC	Indigenous
Cyperaceae	*Cyperus albostriatus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus capensis*	(Steud.) Endl.	LC	Indigenous; Endemic
Cyperaceae	*Cyperus denudatus*	L.f.	LC	Indigenous
Cyperaceae	*Cyperus rupestris var. rupestris*	Kunth	LC	Indigenous
Cyperaceae	*Cyperus sphaerospermus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus tenax*	Boeckeler	LC	Indigenous
Cyperaceae	*Cyperus tenuispica*	Steud.	LC	Indigenous
Vitaceae	*Cyphostemma puberulum*	(C.A.Sm.) Wild & R.B.Drumm.	LC	Indigenous
Hyacinthaceae	*Dipcadi glaucum*	(Burch. ex Ker Gawl.) Baker	LC	Indigenous
Apocynaceae	*Diplorhynchus condylocarpon*	(Mull.Arg.) Pichon	LC	Indigenous
Hyacinthaceae	*Drimia altissima*	(L.f.) Ker Gawl.	LC	Indigenous
Boraginaceae	*Ehretia rigida subsp. nervifolia*	(Thunb.) Druce	LC	Indigenous
Cyperaceae	*Eleocharis acutangula*	(Roxb.) Schult.	LC	Indigenous

Rubiaceae	*Empogona lanceolata*	(Sond.) Tosh & Robbr.		Indigenous
Poaceae	*Eragrostis biflora*	Hack. ex Schinz	LC	Indigenous
Poaceae	*Eragrostis pallens*	Hack.	LC	Indigenous
Eriocaulaceae	*Eriocaulon abyssinicum*	Hochst.	LC	Indigenous
Fabaceae	*Eriosema pauciflorum var. pauciflorum*	Klotzsch	LC	Indigenous
Asteraceae	*Erlangea misera*	(Oliv. & Hiern) S.Moore	LC	Indigenous
Sapindaceae	*Erythrophysa transvaalensis*	I.Verd.	LC	Indigenous
Ebenaceae	*Euclea undulata*	Thunb.	LC	Indigenous
Orchidaceae	*Eulophia angolensis*	(Rchb.f.) Summerh.	LC	Indigenous
Euphorbiaceae	*Euphorbia limpopoana*	L.C.Leach ex S.Carter	LC	Indigenous
Exormothecaceae	*Exormotheca pustulosa*	Mitt.		Indigenous
Zygophyllaceae	*Fagonia sp.*			
Cyperaceae	*Fimbristylis dichotoma subsp. dichotoma*	(L.) Vahl	LC	Indigenous
Cyperaceae	*Fuirena leptostachya forma nudiflora*	Oliv.	NE	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Rubiaceae	*Gardenia volkensii subsp. spatulifolia*	K.Schum.	LC	Indigenous
Iridaceae	*Gladiolus elliotii*	Baker	LC	Indigenous
Iridaceae	*Gladiolus rehmannii*	Baker	LC	Indigenous
Malvaceae	*Grewia avellana*	Hiern	LC	Indigenous
Malvaceae	*Grewia flavescens*	Juss.	LC	Indigenous
Malvaceae	*Grewia olukondae*	Schinz	LC	Indigenous
Malvaceae	*Grewia retinervis*	Burret	LC	Indigenous
Malvaceae	*Grewia rogersii*	Burtt Davy & Greenway	LC	Indigenous; Endemic
Celastraceae	*Gymnosporia tenuispina*	(Sond.) Szyszyl.	LC	Indigenous
Pedaliaceae	*Harpagophytum zeyheri subsp. zeyheri*	Decne.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum kraussii*	Sch.Bip.	LC	Indigenous
Asteraceae	*Helichrysum setosum*	Harv.	LC	Indigenous
Malvaceae	*Hermannia grisea*	Schinz	LC	Indigenous; Endemic
Malvaceae	*Hermannia stellulata*	(Harv.) K.Schum.	LC	Indigenous
Apiaceae	*Heteromorpha arborescens*	(Spreng.) Cham. & Schltdl.		Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	*Hibiscus engleri*	K.Schum.	LC	Indigenous
Malvaceae	*Hibiscus meyeri subsp. transvaalensis*	Harv.	LC	Indigenous; Endemic
Malvaceae	*Hibiscus platycalyx*	Mast.	LC	Indigenous
Malvaceae	*Hibiscus schinzii*	Gurke	LC	Indigenous
Malvaceae	*Hibiscus waterbergensis*	Exell	LC	Indigenous; Endemic

Fabaceae	*Indigofera adenoides*	Baker f.	LC	Indigenous
Fabaceae	*Indigofera melanadenia*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera oxalidea*	Welw. ex Baker	LC	Indigenous
Fabaceae	*Indigofera vicioides subsp. vicioides*	Jaub. & Spach	LC	Indigenous
Convolvulaceae	*Ipomoea albivenia*	(Lindl.) Sweet	LC	Indigenous
Convolvulaceae	*Ipomoea coptica*	(L.) Roth ex Roem. & Schult.	LC	Indigenous
Convolvulaceae	*Ipomoea gracilisepala*	Rendle	LC	Indigenous
Convolvulaceae	*Ipomoea robertsiana*	Rendle	LC	Indigenous; Endemic
Convolvulaceae	*Ipomoea transvaalensis*	A.Meeuse	LC	Indigenous
Cyperaceae	*Isolepis costata*	Hochst. ex A.Rich.	LC	Indigenous
Juncaceae	*Juncus dregeanus subsp. dregeanus*	Kunth	LC	Indigenous
Acanthaceae	*Justicia minima*	A.Meeuse	LC	Indigenous; Endemic
Acanthaceae	*Justicia odora*	(Forssk.) Lam.	LC	Indigenous
Rubiaceae	*Kohautia cynanchica*	DC.	LC	Indigenous
Cyperaceae	*Kyllinga melanosperma*	Nees	LC	Indigenous
Hyacinthaceae	*Ledebouria burkei subsp. burkei*	(Baker) J.C.Manning & Goldblatt	LC	Indigenous
Hyacinthaceae	*Ledebouria revoluta*	(L.f.) Jessop	LC	Indigenous
Poaceae	*Leptochloa eleusine*	(Nees) Cope & N.Snow	LC	Indigenous
Linderniaceae	*Lindernia parviflora*	(Roxb.) Haines	LC	Indigenous
Cyperaceae	*Lipocarpha chinensis*	(Osbeck) J.Kern	LC	Indigenous
Cyperaceae	*Lipocarpha rehmannii*	(Ridl.) Goetgh.	LC	Indigenous
Verbenaceae	*Lippia javanica*	(Burm.f.) Spreng.	LC	Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Malvaceae	*Melhania acuminata var. acuminata*	Mast.	LC	Indigenous
Malvaceae	*Melhania transvaalensis*	Szyszyl.	LC	Indigenous; Endemic
Fabaceae	*Mundulea sericea subsp. sericea*	(Willd.) A.Chev.	LC	Indigenous
Lythraceae	*Nesaea cordata*	Hiern	LC	Indigenous
Nymphaeaceae	*Nymphaea nouchali var. caerulea*	Burm.f.	LC	Indigenous
Lamiaceae	*Ocimum angustifolium*	Benth.	LC	Indigenous
Rubiaceae	*Oldenlandia corymbosa var. caespitosa*	L.	LC	Indigenous
Rubiaceae	*Oldenlandia lancifolia var. scabridula*	(Schumach.) DC.	LC	Indigenous
Apocynaceae	*Orbea carnosa subsp. keithii*	(Stent) Bruyns	LC	Indigenous
Osmundaceae	*Osmunda regalis*	L.	LC	Indigenous
Oxalidaceae	*Oxalis depressa*	Eckl. & Zeyh.	LC	Indigenous
Sapindaceae	*Pappea capensis*	Eckl. & Zeyh.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A.Dyer	LC	Indigenous

Malvaceae	*Pavonia clathrata*	Mast.	LC	Indigenous
Fabaceae	*Pearsonia uniflora*	(Kensit) Polhill	LC	Indigenous
Asteraceae	*Pegolettia tenuifolia*	Bolus	LC	Indigenous; Endemic
Fabaceae	*Peltophorum africanum*	Sond.	LC	Indigenous
Phyllanthaceae	*Phyllanthus incurvus*	Thunb.	LC	Indigenous
Phyllanthaceae	*Phyllanthus pentandrus*	Schumach. & Thonn.	LC	Indigenous
Lamiaceae	*Plectranthus hadiensis var. tomentosus*	(Forssk.) Schweinf. ex Spreng.	LC	Indigenous
Asteraceae	*Polydora angustifolia*	(Steetz) H.Rob.	LC	Indigenous
Polygalaceae	*Polygala producta*	N.E.Br.	LC	Indigenous
Polygalaceae	*Polygala sphenoptera var. sphenoptera*	Fresen.	LC	Indigenous
Rubiaceae	*Psydrax livida*	(Hiern) Bridson	LC	Indigenous
Amaranthaceae	*Pupalia lappacea var. lappacea*	(L.) A.Juss.	LC	Indigenous
Cyperaceae	*Pycreus flavescens*	(L.) P.Beauv. ex Rchb.	LC	Indigenous
Cyperaceae	*Pycreus macranthus*	(Boeckeler) C.B.Clarke	LC	Indigenous
Cyperaceae	*Pycreus nitidus*	(Lam.) J.Raynal	LC	Indigenous
Cyperaceae	*Pycreus pelophilus*	(Ridl.) C.B.Clarke	LC	Indigenous
Cyperaceae	*Pycreus pumilus*	(L.) Nees	LC	Indigenous
Fabaceae	*Rhynchosia totta var. rigidula*	(Thunb.) DC.		Indigenous
Ricciaceae	*Riccia atropurpurea*	Sim		Indigenous
Ricciaceae	*Riccia congoana*	Steph.		Indigenous
Ricciaceae	*Riccia okahandjana*	S.W.Arnell		Indigenous
Bryaceae	*Rosulabryum capillare*	(Hedw.) J.R.Spence		Indigenous
Amaryllidaceae	*Scadoxus puniceus*	(L.) Friis & Nordal	LC	Indigenous
Hyacinthaceae	*Schizocarphus nervosus*	(Burch.) Van der Merwe	LC	Indigenous
Fabaceae	*Schotia brachypetala*	Sond.	LC	Indigenous
Acanthaceae	*Sclerochiton ilicifolius*	A.Meeuse	LC	Indigenous; Endemic
Anacardiaceae	*Searsia rigida var. dentata*	(Mill.) F.A.Barkley	LC	Indigenous; Endemic
Polygalaceae	*Securidaca longepedunculata var. longepedunculata*	Fresen.	LC	Indigenous
Selaginellaceae	*Selaginella dregei*	(C.Presl) Hieron.	LC	Indigenous
Asteraceae	*Senecio inaequidens*	DC.	LC	Indigenous
Fabaceae	*Senegalia burkei*	(Benth.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Senegalia caffra*	(Thunb.) P.J.H.Hurter & Mabb.	LC	Indigenous
Fabaceae	*Senegalia erubescens*	(Welw. ex Oliv.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Sesbania bispinosa var. bispinosa*	(Jacq.) W.Wight	NE	Not indigenous; Naturalised
Malvaceae	*Sida cordifolia subsp. cordifolia*	L.	LC	Indigenous
Malvaceae	*Sida dregei*	Burtt Davy	LC	Indigenous

Solanaceae	*Solanum catombelense*	Peyr.	LC	Indigenous
Solanaceae	*Solanum tomentosum*	L.		Indigenous
Rubiaceae	*Spermacoce senensis*	(Klotzsch) Hiern	LC	Indigenous
Malpighiaceae	*Sphedamnocarpus pruriens subsp. galphimiifolius*	(A.Juss.) Szyszyl.	LC	Indigenous
Lamiaceae	*Stachys natalensis var. natalensis*	Hochst.	LC	Indigenous
Orobanchaceae	*Striga gesnerioides*	(Willd.) Vatke	LC	Indigenous
Loganiaceae	*Strychnos cocculoides*	Baker	LC	Indigenous
Loganiaceae	*Strychnos madagascariensis*	Poir.	LC	Indigenous
Fabaceae	*Stylosanthes fruticosa*	(Retz.) Alston	LC	Indigenous
Lamiaceae	*Syncolostemon canescens*	(Gurke) D.F.Otieno	LC	Indigenous
Myrtaceae	*Syzygium guineense subsp. guineense*	(Willd.) DC.	LC	Indigenous
Loranthaceae	*Tapinanthus quequensis*	(Weim.) Polhill & Wiens	LC	Indigenous
Loranthaceae	*Tapinanthus sp.*			
Fabaceae	*Tephrosia purpurea subsp. leptostachya*	(L.) Pers.	NE	Indigenous
Combretaceae	*Terminalia sericea*	Burch. ex DC.	LC	Indigenous
Acanthaceae	*Thunbergia neglecta*	Sond.	LC	Indigenous
Zygophyllaceae	*Tribulus zeyheri subsp. zeyheri*	Sond.	LC	Indigenous
Poaceae	*Triraphis schinzii*	Hack.	LC	Indigenous
Malvaceae	*Triumfetta angolensis*	Sprague & Hutch.	LC	Indigenous
Malvaceae	*Triumfetta annua forma annua*	L.	NE	Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	(L.f.) Thunb.	NE	Indigenous
Rubiaceae	*Vangueria sp.*			
Rubiaceae	*Vangueria triflora*	(Robyns) Lantz	LC	Indigenous; Endemic
Fabaceae	*Xanthocercis zambesiaca*	(Baker) Dumaz-le-Grand	LC	Indigenous
Xyridaceae	*Xyris capensis*	Thunb.	LC	Indigenous
Xyridaceae	*Xyris congensis*	Buttner	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous
Fabaceae	*Zornia glochidiata*	Rchb. ex DC.	LC	Indigenous

11.2 Appendix B – Amphibian species expected to occur in the study area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Breviceps mossambicus	Mozambique Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC	LC
Hemisus marmoratus	Mottled Shovel-nosed Frog	LC	LC
Hildebrandtia ornata	Southern Ornate Frog	LC	LC
Hyperolius marmoratus	Painted Reed Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Poyntonophrynus fenoulheti	Northern Pygmy Toad	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Ptychadena mossambica	Mozambique Ridged Frog	LC	LC
Ptychadena porosissima	Striped Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	LC	LC
Pyxicephalus edulis	African Bullfrog	LC	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys pusilla	Flatbacked Toad	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Strongylopus grayii	Clicking Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna krugerensis	Knocking Sand Frog	LC	LC
Tomopterna marmorata	Marbled sand frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC

11.3 Appendix C – Reptile species expected to occur in the study area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Acontias occidentalis	Savanna Legless Skink	LC	Unlisted
Acontias percivali	Percival's legless lizard	Unlisted	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Amblyodipsas polylepis	Purple Gloss Snake	Unlisted	Unlisted
Amblyodipsas ventrimaculata	Kalahari purple-glossed snake	Unlisted	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Aspidelaps scutatus scutatus	Common Shield Snake	LC	Unlisted
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus defilippii	Snouted Night Adder	LC	Unlisted
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chondrodactylus turneri	Turner's Gecko	LC	Unlisted
Cordylus jonesii	Jones' Girdled Lizard	LC	Unlisted
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dendroaspis polylepis	Black Mamba	LC	LC
Dispholidus typus	Boomslang	LC	Unlisted
Elapsoidea boulengeri	Boulenger's Garter Snake	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Gonionotophis capensis	Common File Snake	LC	LC
Gracililima nyassae	Black File Snake	LC	LC
Heliobolus lugubris	Bushveld Lizard	LC	Unlisted
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Hemirhagerrhis nototaenia	Eastern Bark Snake	LC	Unlisted
Homopholis wahlbergii	Wahlberg's Velvet Gecko	LC	LC
Ichnotropis capensis	Ornate Rough-scaled Lizard	LC	Unlisted
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	VU
Kinixys spekii	Speke's Hinged-Back Tortoise	LC	Unlisted

Leptotyphlops distanti	Distant's Tread Snake	LC	LC
Leptotyphlops incognitus	Incognito Thread Snake	LC	Unlisted
Leptotyphlops scutifrons	Peters' Thread Snake	LC	Unlisted
Limaformosa capensis	Common File Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lycophidion variegatum	Variegated Wolf Snake	LC	Unlisted
Lygodactylus capensis	Cape dwarf gecko	LC	LC
Lygodactylus waterbergensis	Waterberg Dwarf Gecko	NT	NT
Matobosaurus validus	Common Giant Plated Lizard	LC	Unlisted
Meroles squamulosus	Common Rough-scaled Lizard	LC	Unlisted
Mochlus sundevallii	Sundevall's Writhing Skink	LC	LC
Monopeltis capensis	Cape Worm Lizard	LC	LC
Monopeltis infuscata	Dusky Worm Lizard	LC	Unlisted
Naja annulifera	Snouted Cobra	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Nucras intertexta	Spotted Sandveld Lizard	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pedioplanis lineoocellata pulchella	Common sand lizard	LC	LC
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Pelusios sinuatus	Serrated Hinged Terrapin	LC	Unlisted
Philothamnus hoplogaster	South Eastern Green Snake	LC	Unlisted
Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Platysaurus guttatus	Dwarf Flat Lizard	LC	LC
Platysaurus minor	Waterberg Flat Lizard	LC	LC
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna bivittata	Two-Striped Shovel-Snout	LC	Unlisted
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis angolensis	Dwarf Sand Snake	LC	Unlisted
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis jallae	Jalla's Sand Snake	LC	Unlisted
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC

Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus transvaalensis	Northern Crag Lizard	NT	NT
Python natalensis	Southern African Python	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Scelotes limpopoensis limpopoensis	Limpopo Dwarf Burrowing Skink	LC	Unlisted
Smaug breyeri	Waterberg Dragon Lizard	LC	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Thelotornis capensis	Southern Twig Snake	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis damarana	Damara skink	Unlisted	LC
Trachylepis margaritifera	Rainbow Skink	LC	LC
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis striata	Striped Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted
Xenocalamus bicolor australis	Waterberg Quill-snouted Snake	LC	Unlisted
Xenocalamus bicolor bicolor	Bicoloured Quill-snouted Snake	LC	Unlisted
Zygaspis quadrifrons	Kalahari Dwarf Worm Lizard	LC	Unlisted

11.4 Appendix D – Mammal species expected to occur within the study area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acinonyx jubatus	Cheetah	VU	VU
Acomys spinosissimus	Spiny Mouse	LC	LC
Aepyceros melampus	Impala	LC	LC
Aethomys chrysophilus	Red Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	NT
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT

Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Civettictis civetta	African Civet	LC	LC
Cloeotis percivali	Short-eared Trident Bat	EN	EN
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC
Crocidura hirta	Lesser Red Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	NT
Crocuta crocuta	Spotted Hyaena	NT	NT
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus lunatus	Tsessebe	VU	VU
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Diceros bicornis	Black Rhinoceros	EN	EN
Eidolon helvum	African Straw-colored Fruit Bat	LC	LC
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	LC
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Galago moholi	Southern Lesser Galago	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Giraffa camelopardalis	Giraffe	LC	LC
Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Graphiurus platyops	Rock Dormouse	LC	LC
Helogale parvula	Dwarf Mongoose	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hipposideros caffer	Sundevall's Leaf-nosed Bat	LC	LC
Hippotragus equinus	Roan Antelope	EN	EN
Hippotragus niger	Sable Antelope	VU	VU
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Kobus ellipsiprymnus	Common Waterbuck	LC	LC
Lemniscomys rosalia	Single-striped Mouse	LC	LC

Leptailurus serval	Serval	NT	NT
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus indutus	Desert Pygmy Mouse	LC	LC
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Oreotragus oreotragus	Klipspringer	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otolemur crassicaudatus	Thick-tailed Bushbaby	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Paraxerus cepapi	Tree Squirrel	LC	LC
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	NT
Potamochoerus larvatus	Bushpig	LC	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Raphicerus sharpei	Sharpe's Grysbok	LC	LC
Redunca arundinum	Southern Reedbuck	LC	LC
Redunca fulvorufula	Mountain Reedbuck	EN	EN
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC

Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Steatomys pratensis	Fat Mouse	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thallomys paedulcus	Tree Rat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Tragelaphus scriptus	Cape Bushbuck	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC
Vulpes chama	Cape Fox	LC	LC

11.5 Appendix E – Avifauna species expected to occur within the study area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Accipiter badius	Shikra	Unlisted	LC
Accipiter minullus	Sparrowhawk, Little	Unlisted	LC
Accipiter tachiro	Goshawk, African	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Alopochen aegyptiaca	Goose, Egyptian	LC	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anaplectes rubriceps	Weaver, Red-headed	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anthoscopus caroli	Penduline-tit, Grey	Unlisted	LC
Anthus caffer	Pipit, Bushveld	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC

Apus caffer	Swift, White-rumped	Unlisted	LC
Aquila spilogaster	Hawk-eagle, African	Unlisted	LC
Ardea alba	Egret, Great	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea intermedia	Egret, Yellow-billed (Intermediate)	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Batis molitor	Batis, Chinspot	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubalornis niger	Buffalo-weaver, Red-billed	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Buphagus erythrorynchus	Oxpecker, Red-billed	Unlisted	Unlisted
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Burhinus vermiculatus	Thick-knee, Water	Unlisted	LC
Buteo buteo	Buzzard, Common (Steppe)	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Butorides striata	Heron, Green-backed	Unlisted	LC
Calamonastes fasciolatus	Wren-warbler, Barred	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Camaroptera brevicaudata	Camaroptera, Grey-backed	Unlisted	Unlisted
Campephaga flava	Cuckoo-shrike, Black	Unlisted	LC
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC
Caprimulgus rufigena	Nightjar, Rufous-cheeked	Unlisted	LC
Caprimulgus tristigma	Nightjar, Freckled	Unlisted	LC
Ceblepyris caesius	Cuckoo-shrike, Grey	Unlisted	LC
Cecropis abyssinica	Swallow, Lesser Striped	Unlisted	LC
Cecropis cucullata	Swallow, Greater Striped	Unlisted	LC
Cecropis semirufa	Swallow, Red-breasted	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC
Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC

Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chlorocichla flaviventris	Greenbul, Yellow-bellied	Unlisted	LC
Chlorophoneus sulfureopectus	Bush-Shrike, Orange-breasted	Unlisted	LC
Chloropicus namaquus	Woodpecker, Bearded	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Ciconia nigra	Stork, Black	VU	LC
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Clamator jacobinus	Cuckoo, Jacobin	Unlisted	LC
Clamator levaillantii	Cuckoo, Levaillant's	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Coracias garrulus	Roller, European	NT	LC
Coracias naevius	Roller, Purple	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corythornis cristatus	Kingfisher, Malachite	Unlisted	Unlisted
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Cossypha humeralis	Robin-chat, White-throated	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crinifer concolor	Go-away-bird, Grey	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra mozambica	Canary, Yellow-fronted	Unlisted	LC
Cuculus clamosus	Cuckoo, Black	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Curruca subcoerulea	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Cursorius temminckii	Courser, Temminck's	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC

Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Eremomela usticollis	Eremomela, Burnt-necked	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eurocephalus anguitimens	Shrike, Southern White-crowned	Unlisted	LC
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco subbuteo	Hobby, Eurasian	Unlisted	LC
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Glaucidium perlatum	Owlet, Pearl-spotted	Unlisted	LC
Granatina granatina	Waxbill, Violet-eared	Unlisted	LC
Gymnoris superciliaris	Petronia, Yellow-throated	Unlisted	LC
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon chelicuti	Kingfisher, Striped	Unlisted	LC
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Hieraaetus wahlbergi	Eagle, Wahlberg's	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo dimidiata	Swallow, Pearl-breasted	Unlisted	LC
Hirundo rustica	Swallow, Barn	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC

Ispidina picta	Pygmy-Kingfisher, African	Unlisted	LC
Kaupifalco monogrammicus	Buzzard, Lizard	Unlisted	LC
Lagonosticta rhodopareia	Firefinch, Jameson's	Unlisted	LC
Lagonosticta rubricata	Firefinch, African	Unlisted	LC
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis australis	Starling, Burchell's	Unlisted	LC
Lamprotornis chalybaeus	Starling, Greater Blue-eared	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Lophoceros nasutus	Hornbill, African Grey	Unlisted	LC
Lophotis ruficrista	Korhaan, Red-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC
Megaceryle maxima	Kingfisher, Giant	Unlisted	Unlisted
Melaenornis mariquensis	Flycatcher, Marico	Unlisted	LC
Melaenornis pallidus	Flycatcher, Pale	Unlisted	LC
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC
Melaenornis silens	Flycatcher, Fiscal	Unlisted	LC
Melaniparus niger	Tit, Southern Black	Unlisted	Unlisted
Melierax canorus	Goshawk, Southern Pale Chanting	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Merops hirundineus	Bee-eater, Swallow-tailed	Unlisted	LC
Merops nubicoides	Bee-eater, Southern Carmine	Unlisted	LC
Merops persicus	Bee-eater, Blue-cheeked	Unlisted	LC
Merops pusillus	Bee-eater, Little	Unlisted	LC
Microcarbo africanus	Cormorant, Reed	Unlisted	LC
Micronisus gabar	Goshawk, Gabar	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Muscicapa caerulescens	Flycatcher, Ashy	Unlisted	LC

Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Myioparus plumbeus	Tit-flycatcher, Grey	Unlisted	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Nilaus afer	Brubru	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe familiaris	Chat, Familiar	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer motitensis	Sparrow, Great	Unlisted	LC
Peliperdix coqui	Francolin, Coqui	Unlisted	LC
Pernis apivorus	Honey-buzzard, European	Unlisted	LC
Phalacrocorax lucidus	Cormorant, White-breasted	Unlisted	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phyllastrephus terrestris	Brownbul, Terrestrial	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus intermedius	Masked-weaver, Lesser	Unlisted	LC
Ploceus ocularis	Weaver, Spectacled	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Pluvialis squatarola	Plover, Grey	Unlisted	LC
Podica senegalensis	Finfoot, African	VU	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC
Pternistis natalensis	Spurfowl, Natal	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pterocles bicinctus	Sandgrouse, Double-banded	Unlisted	LC

Ptyonoprogne fuligula	Martin, Rock	LC	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Sagittarius serpentarius	Secretarybird	VU	VU
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Spermestes cucullata	Mannikin, Bronze	Unlisted	LC
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Spilopelia senegalensis	Dove, Laughing	Unlisted	LC
Sporopipes squamifrons	Finch, Scaly-feathered	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC
Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Tockus rufirostris	Hornbill, Southern Red-billed	Unlisted	Unlisted
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Treron calvus	Green-pigeon, African	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Turdoides bicolor	Babbler, Southern Pied	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turdus libonyana	Thrush, Kurrichane	Unlisted	Unlisted
Turdus litsitsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Turnix sylvaticus	Buttonquail, Kurrichane	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC

Tyto alba	Owl, Barn	Unlisted	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Urolestes melanoleucus	Shrike, Magpie	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua chalybeata	Indigobird, Village	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC
Vidua purpurascens	Indigobird, Purple	Unlisted	LC
Vidua regia	Whydah, Shaft-tailed	Unlisted	LC
Zapornia flavirostra	Crake, Black	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

11.6 Appendix F - Specialist Declarations

I Lindi Steyn, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Lindi Steyn

Terrestrial Ecologist

The Biodiversity Company

November 2021

I Michael Schrenk, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Michael Sherenk

Terrestrial Ecologist

The Biodiversity Company

November 2021

11.7 Appendix G – Impact Matrix

Environmental Risk Ratings

The significance of the identified impacts will be determined using an accepted methodology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998. As with all impact methodologies, the impact is defined in a semi-quantitative way and will be assessed according to methodology prescribed in the following section.

Scale utilised for the evaluation of the Environmental Risk Ratings:

Likelihood Descriptors

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

Consequence Descriptors

Severity of impact	Rating
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**Rating**
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	5
Duration of impact	**Rating**

One day to one month: Temporary	1
One month to one year: Short Term	2
One year to five years: Medium Term	3
Life of operation or less than 20 years: Long Term	4
Permanent	5