Terrestrial biodiversity assessment for the development of a 2000 MW gas to power plant within Richards Bay IDZ phase 1F, KwaZulu-Natal

Scoping phase

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CONDITIONS OF THIS REPORT

Even though every care is taken to ensure the accuracy of this report, terrestrial biodiversity assessment studies are limited in scope, time and budget. Discussions are made on reasonable and informed assumptions built on *bona fide* scientific principles, resources, experience and deductive reasoning. In reality the most accurate and factual environmental findings based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and animal migrations.

Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage. The specialist is thus not responsible for conclusions made and mitigation measures proposed based on good faith using all available scientific and empirical information.

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EXECUTIVE SUMMARY

Rautenbach Biodiversity Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment (scoping phase) for the development of a 2000 MW combined cycle gas to power plant in Richards Bay, Kwa-Zulu Natal province.

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3) is proposing to develop a 2000MW combined cycle gas to power plant located on various erven within the Richards Bay IDZ Phase 1F, Richards Bay, KwaZulu Natal. The proposed development will be 11,2 ha in extent.

The following general conclusions were drawn upon completion of the terrestrial biodiversity scoping assessment:

From a conservation planning perspective, terrestrial biodiversity sensitivities relating to the project site are the siting of the proposed development in a:

- 'Critically Endangered' ecosystem (Kwambonambi Hygrophilous grassland).
- 'Endangered' vegetation type (Maputaland Wooded Grassland).
- 'Vulnerable' wetland habitat (Subtropical Freshwater Wetlands).
- The Maputaland-Pondoland biodiversity hotspot.
- NPAES focus area.
- National and provincial CBA areas.

However, local (uMhlathuze municipality) land use planning demarcated the project site for the development of noxious industry, with only small areas set aside for conservation within Phase 1F. These areas do not intersect with the project site.

From a fauna and flora perspective, the sensitivities relating to the project site included the potential occurrence of:

- 13 Flora species of conservation significance.
- 12 Fauna species of conservation significance.

A preliminary site inspection was conducted on 16 July 2020 with the aim of identifying any discrepancies with the current land use and the environmental *status quo* versus the environmental sensitivities identified on the national web based environmental screening tool, and the provincial, district and municipal scale conservation planning tools.

The project site was found to be located within degraded coastal grasslands and hygrophilous sedge wetlands, with visible surface water present on the southern portion. Most of the site was recently mowed, thus the site had a homogenous appearance. Unvegetated areas, particularly along the northeastern and southeastern boundaries were noted. Numerous vehicle tracks crossed the entire site. Surprisingly, few invasive plant species were noted although species such as *Psidium guajava* and *Cuscuta campestris* were observed, albeit at low densities.

These initial observations indicated that the terrestrial biodiversity on the project site is not representative of the environmental sensitivities identified during the desktop assessment. Nevertheless, several SCC fauna and flora species may potentially be present, albeit probability of occurrence was regarded as Low for most of the species. Since the precautionary approach is to assume that the species listed is present, the ecological importance of the site was regarded as of Medium sensitivity.

More detailed fauna and flora assessments will be required to confirm the presence or absence of these species and to gain a better understanding of the potential impacts the proposed development may have on the biodiversity of the project site and surrounding habitats.

Flora and vegetation studies should be conducted during the summer season (beginning of November to end of April for KwaZulu-Natal). The detection probability of many of the SCC flora species listed in this report is greatly reduced by the mowing of the site. Further environmental disturbance should therefore not be allowed until the relevant authorities have granted environmental authorization for the proposed development.

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ACRONYMS AND ABBREVIATIONS

ADU	Animal Demography Unit (Cape Town)
BGIS	Biodiversity Geographic Information System
BRAHMS	Botanical Research and Herbarium Management Software
CBA	Critical Biodiversity Areas
CITES	Convention on International Trade in Endangered Species of Fauna and Flora
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KZN Wildlife
ESA	Ecological Support Areas
GIS	Geographic Information System
ha	Hectares
IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature
LUDS	Land Use Decision Support
masl	Meters above sea level
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management Biodiversity Act

NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
NR	Nature Reserve
PNR	Private Nature Reserve
QDGS	Quarter degree grid square
RAMSAR	Ramsar Convention on Wetlands of International Importance
RLE	Red List Ecosystems
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African Biodiversity Institute
SANLC	South Africa National Land Cover
SARCA	South African Reptile Conservation Assessment
SCC	Species of conservation concern
TOPS	Threatened or Protected Species
WWF	World Wildlife Fund

GLOSSARY OF TERMS

fauna	Mammals; reptiles; frogs; birds (this report)
herpetofauna	Reptiles and frogs (this report)
pentad	Five minutes of latitude by five minutes of longitude – i.e., squares with sides of roughly 9 km, one ninth the size of quarter degree grid cells.
poikilothermic	Vertebrates having a body temperature that varies with the temperature of the surroundings.

1. INTRODUCTION

1.1 Project details and background

Rautenbach Biodiversity Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment (scoping phase) for the development of a 2000 MW combined cycle gas to power plant in Richards Bay, Kwa-Zulu Natal province.

Phakwe Richards Bay Gas Power 3 (Pty) Ltd (PRBGP3) is proposing the development of a 2000MW combined cycle gas to power plant located on various erven within the Richards Bay IDZ phase 1F, Richards Bay, KwaZulu Natal.

The power plant will operate at mid-merit to baseload duty and will include the following main infrastructure:

- A number of gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- A number of Heat Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- A number of steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality)).
- Water retention pond.
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines.
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, wastewater.
- Fire water (FW) storage and FW system.
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal).
  - Warehousing and buildings.
  - Workshop building.
  - Fire water pump building.
  - Administration and Control building.

- Ablution facilities.
- Storage facilities.
- Guard House.
- Fencing.
- Maintenance and cleaning area.
- Operational and maintenance control centre.

» Electrical facilities including:
- Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
- Generators and auxiliaries.
- Eskom 275 or 400kV GIS interface Substation, underground 275 or 400kV power cabling connecting Power Plant GIS substation and Eskom GIS Interface substation and an overhead 275kV or 400kV power line connecting the Eskom interface substation to the selected Eskom grid connection point (all subject to a separate environmental authorisation application):

» Service infrastructure including:
- Stormwater channels.
- Water pipelines.
- Temporary work areas during the construction phase (laydown areas).

A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the RB Harbour. A separate EIA process will be undertaken for the dedicated fuel-supply pipeline.

1.2 Location

The proposed development will be located within Phase 1F of the Richards Bay Industrial Development Zone (RIDZ), approximately 5 km northeast of Richards Bay and 1 km north of the suburb of Alton, on the following properties:

ERF NAME	SURVEYOR GENERAL ERF NO.	SURVEYOR GENERAL PORTION NO.	SG 21-DIGIT ID	RBIDZ PLOT ALLOCATION
Unnamed	16674	0	N0GV04210001667400000	Erf 16674
Unnamed	9042	0	N0GV04210000904200000	Service infrastructure (water servitude)
Unnamed	8822	0	N0GV04210000882200000	Erf 16819
Unnamed	8821	0	N0GV04210000882100000	Erf 16820
Unnamed	8820	0	N0GV04210000882000000	Erf 17442

The project site (GPS coordinates taken from the centre of the site: Lat: -28.74309; Long: 32.02950) is situated in the City of uMhlathuze local municipality which falls within jurisdiction of the King Cetshwayo District Municipality, in KwaZulu-Natal province. The combined size of the project site is ~ 11,2 ha in extent. This area is located within the 2832 CA Quarter Degree Grid Square (QDGS).

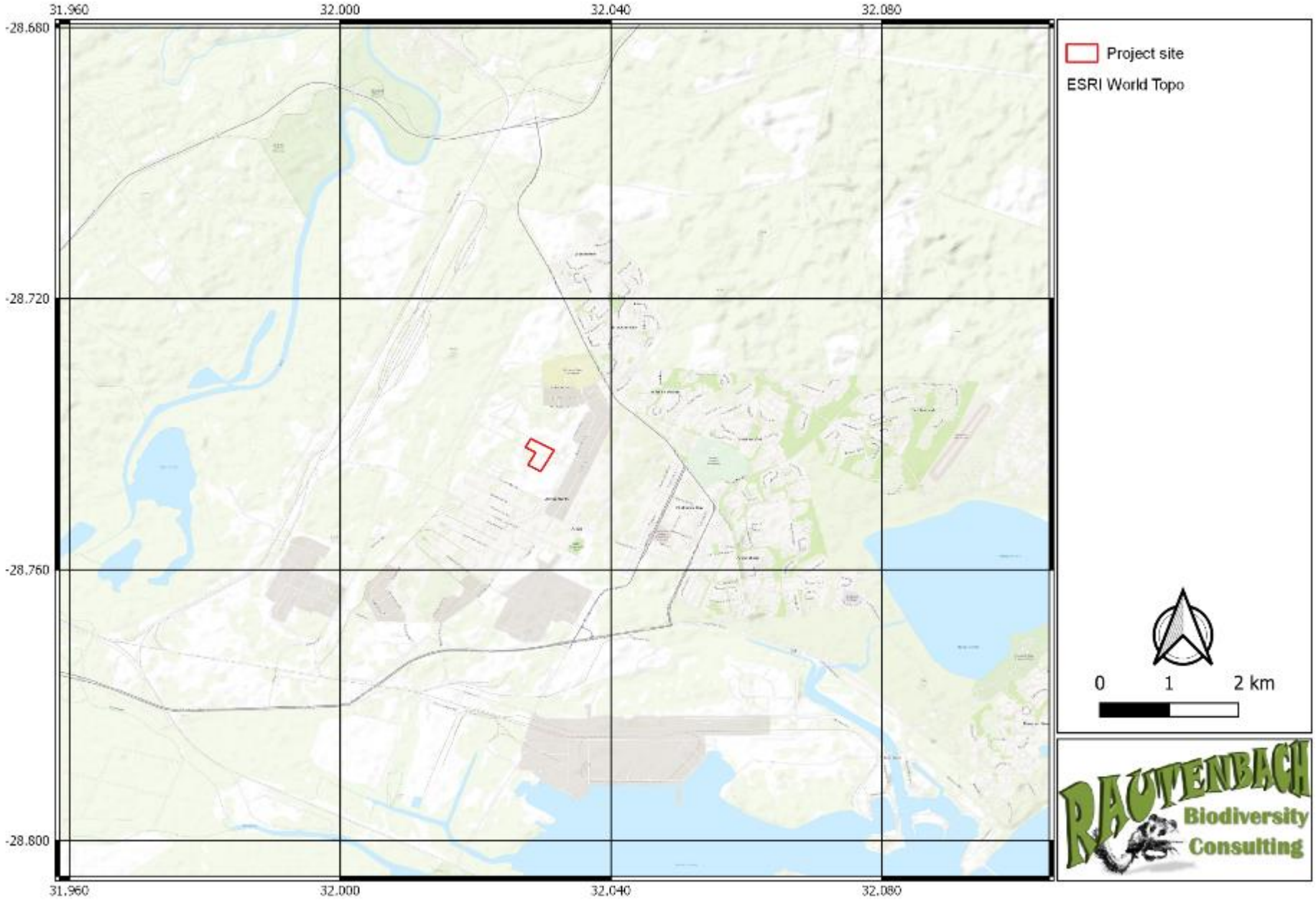


FIGURE 1: Locality of the project site in Richards Bay.

1.3 Scope and objectives

Scope

The purpose of the scoping report was to determine the main issues and potential impacts the proposed development may have on terrestrial biodiversity, flora, and fauna, using existing information.

Objectives

- To assess the significance of the fauna and flora habitat components and the current general conservation status of the project site qualitatively and quantitatively.
- To identify and comment on ecological sensitive areas and ecological service(s).
- Comments on connectivity with natural vegetation and habitats along a 500-meter zone on adjacent terrain.
- To provide a list of fauna and flora species that occur or might occur, and to identify species of conservation concern.
- To determine the nature and extent of potential impacts during the construction and operation phases.
- The identification of no-go areas, where applicable.
- To summarize the potential impacts that will be considered further in the EIA Phase through specialist assessments and provide details of the methodology that should be adopted in assessing these impacts.
- To identify any environmental fatal flaws or red flag issues.
- The identification of any gaps in knowledge that must be addressed during the EIA Phase.

2. APPROACH AND METHODOLOGY

2.1 Desktop review

The purpose of the desktop review was to gather contextual information of the site to be surveyed by using existing spatial information, results from past surveys, literature, and database searches. This information was used to provide background information and assisted in the identification of sensitive terrestrial ecosystems, priority listed flora, vegetation and fauna occurring, or potentially occurring on the project site.

2.1.1 Legislative framework

It is widely recognised that it is of the utmost importance to conserve natural resources to maintain ecological processes and life support systems for plants, animals, and humans. To ensure that sustainable development takes place, it is therefore important that the environment is considered before relevant authorities approve any development.

In South Africa, there are dedicated legal, policy and planning tools for biodiversity management and conservation, linked to broader environmental management on international, national, and provincial levels that secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development. Table 1 lists key environmental legislation relevant to biodiversity conservation and management in KwaZulu-Natal that were taken into consideration during the assessment.

TABLE 1: Key legislation relevant to biodiversity and conservation management in KwaZulu-Natal.

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 2006)
	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)
	National Environmental Management Act: Procedures for the assessment and minimum criteria for reporting of identified environmental themes when applying for environmental authorisation (G. 43310; GoN 320).
	Mountain Catchment Areas Act (Act No. 63 of 1970)
	National Forest Act (Act No. 84 of 1998)
	National Water Act (Act No. 36 of 1998)
	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
	National Environmental Management Biodiversity Act (No. 10 of 2004) Alien and Invasive Species Regulations, 2014
	Alien and Invasive Species Regulations (Act No 10. of 2004) Alien and Invasive Species Lists, 2016
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
PROVINCIAL	KwaZulu-Natal Nature Conservation Management Act (Act 29 of 1997)
	KwaZulu-Natal Nature Conservation Management Amendment Act (Act 5 of 1999)
	Natal Nature Conservation Ordinance 15 of 1974

2.1.2 Guidelines

In addition to the legal requirements (Table 1), the following national and regional guidelines, draft notices and bills were taken into consideration:

- South African National Biodiversity Assessment 2018: Technical Report. Volume 2b (van Deventer *et al*., 2019).
- National Biodiversity Assessment 2018: Technical Report. Volume 1: Terrestrial Realm (Skowno *et al*., 2019).
- Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes Version 3.3 (EKZNW 2016).
- Ezemvelo KZN Wildlife: Guideline: Biodiversity Impact Assessment in KwaZulu Natal (Version 2, February 2013).
- KwaZulu-Natal Systematic Conservation Plan (EKZNW 2012).
- UThungulu (now King Cetshwayo) District Municipality: Biodiversity Sector Plan, V2 (EKZNW 2014).
- KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 (KZNEBPA 2014)
- uMhlatuze Municipality Spatial Development Framework (May 2017).
- uMhlatuze Municipality Spatial Development Framework Second Review (May 2019).

2.1.3 Environmental sensitivities of the project site

A comprehensive desktop study was carried out to document all known and predicted ecological information for the project site. The conservation importance of the site was assessed on National (NBA 2018), Provincial (EKZNW 2012), district (EKZNW 2014), and municipal scales. The spatial data sources included is listed below:

NATIONAL GIS DATA LAYERS	
National Biodiversity Assessment 2018 (Volume 2b) Inland Aquatic (Freshwater) realm (www.sanbi.org):	• 2018 Artificial Wetlands [Vector] 2018, downloaded on 18 November 2019. • 2018 National Wetland Map 5 Confidence Map (Shapefile) [Vector] 2018, downloaded on 18 November 2019. • 2018 National Wetland Map 5 Ecosystem threat status and protection level [Vector] 2018, downloaded on 18 November 2019. • 2018 River ecosystem threat status and protection level (Shapefile) [Vector] 2018, downloaded on 18 November 2019.
National Biodiversity Assessment 2018 (Terrestrial) (www.sanbi.org):	• 2018 Terrestrial ecosystem threat status and protection level - remaining extent [Vector] 2018, downloaded on 18 November 2019. • 2018 Terrestrial ecosystem threat status and protection level layer [Vector] 2018, downloaded on 18 November 2019. • National vegetation map (VEGMAP2018_AEA_V22_7_16082019_Final)
Department of Environmental Affairs (http://egis.environment.gov.za)	• South Africa Protected Areas Database (SAPAD_OR_2019_Q3) • South Africa Conservation Areas Database (SACAD_OR_2019_Q3)
DEA screening tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44)	• National CBAs • Aquatic CBAs • Indigenous forest patches • NPAES focus areas • Threatened ecosystems • Animal species theme • Plant species theme
Birdlife South Africa (http://www.birdlife.org.za/conservation/important-bird-areas/documents-and-downloads).	• Important Bird Areas 2015
PROVINCIAL/MUNICIPAL GIS DATA LAYERS	
2012 KwaZulu-Natal Systematic Conservation Plan (www.sanbi.org):	• KZN Landscape Ecological Corridors 2010 – Ezemvelo KZN Wildlife (2010) Version 3.1. Unpublished GIS Coverage [kzncor05v3_1_10_wll.zip]. • KwaZulu-Natal Freshwater Systematic Conservation Plan (KZNSCP); Best Selected Surface (Marxan). Unpublished GIS Coverage [Freshwater_cons_plan_2007]. • KZNSCP: Terrestrial Systematic Conservation Plan – EKZNW (2010) Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip].
2014 UThungulu District Municipality: Biodiversity Sector Plan, V2.0 (www.sanbi.org):	• Ezemvelo KZN Wildlife. KZN Biodiversity Sector Plans Local Corridors 2014 [Vector] 2014. • KZN CBA Irreplaceable version 26012016 (2016). GIS Coverage [KZN_CBA_Irreplaceable_wll_26012016]. • KZN CBA Optimal version 03032016 (2016). GIS Coverage [KZN_CBA_Optimal_wll_03032016.zip]. • KZN ESA version 01022016 (2016). GIS Coverage [KZN_ESA_wll_01022016.zip]. • KZN ESA Species Specific version 01022016 (2016). GIS Coverage [KZN_ESA_Species_wll_01022016_01022016.zip]. • Ezemvelo Managed Protected Area Boundary – Areas recently acquired but not currently proclaimed (2016). Unpublished GIS Coverage [ekznw_pabnd_owned_not_yet_proclaimed_ 2016_wll.zip]. • DAFF Managed Forest Wilderness Area Boundary – DEA Protected Area Database Extract (2016). Published GIS Coverage [DAFF_forest_wilderness_area_wll_2016.zip]. • Ezemvelo KZN Wildlife. KZN Landscape Corridors 2016 [Vector] 2016. • Ezemvelo KZN Wildlife (2016). KZN Private Nature Reserves (2016). Unpublished GIS Coverage [KZN_Private_NR_wll_2016.zip]. • Ezemvelo KZN Wildlife Proclaimed Protected Area boundary (2015). Unpublished GIS Coverage [ekznw_pabnd_2015_wdd.zip]. • Ezemvelo KZN Wildlife (2016) KZN Proclaimed Stewardship Sites (January 2016). Unpublished GIS Coverage [stewardship_wll_jan2016_draft.zip]. • KZN Vegetation Types Provincial Conservation Status [kznveg05v2_0_11_public_oct2011_constats_wll.zip].
uMhlathuze Municipality	• http://gis.umhlathuze.gov.za/

2.1.4 Flora and vegetation

Flora and vegetation distribution data for the QDGS 2832 CA were obtained from the following sources:

The Vegetation of South Africa, Lesotho, and Swaziland	Mucina & Rutherford, 2006 vegetation descriptions; Mucina & Rutherford, 2018 vegetation delineation)
Spatial terrestrial biodiversity priority areas of South Africa	(priority_areas_shp) – ArcView shapefile
National Red List of Threatened Plants of South Africa	(Driver *et al*., 2009)
Botanical database of Southern Africa	South African National Biodiversity Institute. 2016. Botanical Database of Southern Africa (BODATSA) [dataset]. doi: to be assigned.
The Global Biodiversity Information Facility (GBIF)	https://www.gbif.org/species/3577253
iNaturalist (KwaZulu-Natal checklist for plants)	https://www.inaturalist.org/
iSPOT nature	https://www.ispotnature.org/communities/southern-africa/observations
EKZNW 2014	2014 UThungulu District Municipality: Biodiversity Sector Plan, V2.0 (www.sanbi.org)

2.1.5 Fauna

Fauna distribution data were obtained from various publications and field guides to ascertain which species was historically recorded from the QDGS 2832 CA.

Fauna

- **Mammals**

As many mammals are either secretive, nocturnal, hibernators and/or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species. This can be done with a high level of confidence, irrespective of season.

Since all mega-mammals and many of the large and medium sized ungulates and carnivores (i.e., elephants, rhino, buffalo, lions, sable antelope, roan antelope) have long since been extirpated by hunting, poaching, and anthropogenic disturbance, they can only be found in protected areas and was therefore not included in this assessment. In addition, all feral mammal species present/potentially present (e.g., house mice, house rats, dogs, and cats) were omitted from the assessment since these cannot be considered when estimating the conservation value of an area.

- **Herpetofauna (reptiles and frogs)**

As most reptiles and amphibians are secretive, poikilothermic, and/or nocturnal or seasonal; distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of species.

- **Avifauna**

Due to the inherent mobility of birds, it is important to consider avifauna not only on the project site, but also the avifauna beyond the site. The broader areas included bird distribution data from the following pentads: 2840_3155, 2840_3200, 2845_3155 and 2845_3200.

Literature sources and databases reviewed for all fauna taxa is listed in Table 2.

TABLE 2: Literature sources and databases reviewed for fauna distributions.

MAMMALS	HERPETOFAUNA	AVIFAUNA
The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005)	A *Guide to the Reptiles of Southern Africa* (Alexander & Marais, 2007)	Important Bird and Biodiversity Areas of South Africa (Marnewick *et al*., 2015)
Bats of Southern and Central Africa (Monadjem *et al*., 2010)	*A Complete guide to the Snakes of Southern Africa* (Marais, 2004)	*The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho, and Swaziland* (Taylor *et al*., 2015)
A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013)	*Atlas and Red List of Reptiles of South Africa, Lesotho, and Swaziland* (Bates *et al*., 2014)	Roberts VII Multimedia Birds of Southern Africa
The 2016 Red List of Mammals of South Africa, Lesotho, and Swaziland (www.ewt.org.za)	*A Complete Guide to the Frogs of Southern Africa* (du Preez & Carruthers, 2009)	*Newman's Birds of Southern Africa* (Newman, 2010)
ADU's MammalMap (mammalmap.adu.org.za)	*Atlas and Red Data Book of the Frogs of South Africa, Lesotho, and Swaziland* (Mintner *et al.*, 2004)	*Roberts Birds of Southern Africa* (Hockey *et al.,* 2005)
iNaturalist (https://www.inaturalist.org)	FrogMAP (frogmap.adu.org.za)	iNaturalist (https://www.inaturalist.org)
	ReptileMAP (sarca.adu.org.za)	First and Second Southern African Bird Atlas Projects (http://sabap2.adu.org.za).
	iNaturalist (https://www.inaturalist.org)	

2.1.6 Review of past surveys and reports

The following research/reports relevant to the area under investigation was reviewed:

- Vegetation type conservation targets, status, and level of protection in KwaZulu-Natal in 2016 (Jewittt, 2018).
- Development of the Richards Bay combined cycle power plant (CCPP) and associated infrastructure on a site near Richards Bay, KwaZulu-Natal province (DEA reference number: 14/12/16/3/3/2/1123). Savannah Environmental Pty (Ltd).
- Vegetation and wetland status quo assessment for the proposed Nyanza Light Metals (Pty) Ltd. TiO_2 pilot plant within the RBIDZ Phase 1F, Richards Bay, KwaZulu-Natal. (DEDTEA Ref no: DC28/0011/2019 & KZN/EIA/0001161/2019). October 2019. Compiled by Exigent.
- Draft Scoping Report for the Richards Bay Industrial Development Zone – Phase 1F – Installation of Bulk Infrastructure Services, Richards Bay, KwaZulu-Natal (DEA Ref.no. 14/12/16/3/3/2/665). September 2014. Prepared by Nemai Consulting.

2.1.7 Assessment methodology for species of conservation concern

The presence of species of conservation concern (SCC) is a measure of habitat quality and an indicator when setting conservation priorities. The following categories were used to categorise SCC:

Threatened species

South Africa uses the internationally endorsed IUCN Red List categories and criteria to measure a species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. Any species classified in the IUCN categories as 'Critically Endangered', 'Endangered' or 'Vulnerable' is a threatened species. Threatened species are species that are facing a high risk of extinction.

Species classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically/Extremely Rare, Rare, Declining and Data Deficient – Insufficient Information (DDD) have a high

conservation importance in terms of preserving South Africa's high biodiversity. A summary of National Red List categories is provided below:

National Red List category definitions (available from speciesstatus.sanbi.org)
Categories marked with **N** are non-IUCN, National Red List categories for species not in danger of extinction but considered to be of national conservation concern. The IUCN equivalent of these categories is of 'Least Concern' (**LC**).

EX - Extinct	When there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual**.**
EW - Extinct in the wild	When it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
RE - Regionally extinct	When it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
CR PE - Critically endangered, possibly extinct	A special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
CR - Critically endangered	When the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
EN - Endangered	When the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
VU - Vulnerable	When the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
NT - Near threatened	When available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
[N]**Critically rare** (plants) – Extremely rare (butterflies)	When a species it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
[N]**Rare**	When a species it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows: • Restricted range: Extent of Occurrence (EOO) <500 km^2, OR • Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR • Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR • Small global population: Less than 10 000 mature individuals.
LC - Least concern	When a species it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as of Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
DDD - Data deficient (insufficient information)	When there is inadequate information to assess its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
DDT - Data deficient (taxonomically problematic)	When taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
NE - Not evaluated	When a species has not been evaluated against the criteria. Certain species do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. In certain cases, species have not been assessed nationally as taxon specialists prefer to use only the Global Red List status.

National protected species (TOPS species lists)
The National Environmental: Biodiversity Act (NEMBA), 2004 (Threatened and Protected Species Regulations of 2015) lists various species that are threatened or otherwise in need of protection.

It is important to note that although the category names on the NEMBA list are similar to those on the IUCN Red List, and NEMBA category definitions are broadly similar to those of the IUCN categories, they are not equivalent since different classification systems were used. Therefore, a species' category in NEMBA may differ from its Red List category.

NEMBA (TOPS) categories:

CR - Critically Endangered	Indigenous species facing an extremely high risk of extinction in the wild in the immediate future**.** Restricted activities include the hunting, or killing by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, or kill except for conservation, enforcement or scientific purposes unless in possession of a permit.
EN - Endangered	Indigenous species facing a high risk of extinction in the wild in the near future, although they are not a 'Critically Endangered' species. Restricted activities include the hunting, or killing by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, or kill except for conservation, enforcement or scientific purposes unless in possession of a permit.
VU - Vulnerable	Indigenous species facing a high risk of extinction in the wild in the medium-term future, although they are not a 'Critically Endangered' species or an 'Endangered' species. Restricted activities include the hunting, or killing by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, or kill except for conservation, enforcement or scientific purposes unless in possession of a permit.
PROT - Protected	Indigenous species of high conservation value or national importance that require national protection. Restricted activities include the hunting, or killing by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, or kill except for conservation, enforcement or scientific purposes unless in possession of a permit.

Protected tree species under the National Forest Act (Act no 84 of 1998)

The list of protected tree species under the National Forest Act (No. 155 of March 2021) was consulted. None of the trees listed may be cut, disturbed, damaged, or destroyed and no person may 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.

Provincial protected species

The KZN Conservation Ordinance (15 of 1974) and the KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill (2014) were used to evaluate the conservation status of fauna species on provincial scale:

- **KZN Conservation Ordinance 15 of 1974**

Restrictions and requirements with regards to several activities relating to the species listed in the shedules listed below is outlined in Sections 34 – 58 of the Ordinance.

  - Schedule 2 – Protected game
  - Schedule 3 – Specially protected game
  - Schedule 7 – Protected amphibians, invertebrates, and reptiles
  - Schedule 9 – Specially protected birds
  - Schedule 12 – Specially protected indigenous plants

- **KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill (2014)**
  - Schedule 3 – Protected animal species. Restricted activities include the following: Destroy, degrade or alter habitat in a way that causes or is likely to cause significant decline in the number of individuals of the species there; possess, breed, sell, make available for sale or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, release, display, export, import or keep in captivity.
  - Schedule 4 – Restricted use protected animal species. Restricted activities include the following: Hunt, possess, breed, sell, make available for sale or otherwise trade in, buy, receive, give, donate or accept as

a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, release into the environment, display, export, import or keep in captivity.

- Schedule 5 – Restricted use animal species. Restricted activities include the following: Hunt, release into the environment, keep in captivity, sell, make available for sale, or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, display, export, import.
- Schedule 7 – KwaZulu-Natal threatened plant species. Restricted activities involving wild or wild sourced specimens: Harvest, gather, collect, transport, convey, import, or export, have in possession or exercise physical control over or wilfully damage or destroy. Grow, breed or in any other way propagate or cause to multiply for commercial purposes, sell, trade in or buy Restricted activities requiring a permit involving artificially propagated specimens: Have in possession or exercise physical control over, transport, convey, import or export from the Province. Sell or trade-in, grow, breed or in any other way propagate, for commercial purposes.
- Schedule 8 – KwaZulu-Natal protected plant species. Restricted Activities requiring a permit involving wild or wild sourced plant specimens: harvest, gather, collect, transport, convey or export, sell, trade in.

Endemic/near-endemic species

Endemic and near-endemic species generally have restricted distributions and are often highly adapted to their home range; consequently, threats to endemics carry a higher risk of extinction than for broadly distributed species.

Although many of these species have wide distributional ranges within the region and have a conservation status of 'Least Concern', with some ranking among our most widespread and abundant (i.e., Cape white-eye), all endemic/near-endemic species require some vigilance to ensure that population numbers stay stable.

Sensitive species

Species were also evaluated in terms of CITES agreements. CITES is an international agreement between governments that aims to ensure that the international trade in specimens of wild fauna and flora does not threaten their survival. Appendices I, II and III of the Convention are lists of species afforded different levels of protection from over-exploitation and is summarized below:

CITES categories:

Appendix I	Species threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial (see Article III of the Convention), for instance for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate). Article VII of the Convention provides for several exemptions to this general prohibition.
Appendix II	Species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e., species whose specimens in trade look like those of species listed for conservation reasons (see Article II, paragraph 2 of the Convention). International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild (See Article IV of the Convention).
Appendix III	Species included at the request of a party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation (see Article II, paragraph 3, of the Convention). International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates (See Article V of the Convention).

2.2 Preliminary site inspection

A preliminary site inspection was conducted on 16 July 2020 with the aim of identifying any discrepancies with the current land use and the environmental *status quo* versus the environmental sensitivities identified on the national

web based environmental screening tool, and the provincial, district and municipal scale conservation planning tools.

2.3 Likely occurrence of SCC fauna and flora species

This section involved collating current vegetation and habitat characteristics and literature relevant to SCC fauna and flora habitat preferences and distributions to draw up lists of fauna and flora species likely to be present. Parameters used to assess likelihood of occurrence were evaluated according to the following:

PARAMETER	DESCRIPTION
Habitat requirements	Most Red Listed/TOPS listed species have specific habitat requirements; the presence of these habitats on the *project area of influence* was evaluated.
Habitat status	The ecological condition of available habitat on the *project area of influence*.
Habitat linkage	The connectivity of the *project area of influence* to surrounding habitats and the adequacy of these linkages.
Geographic distribution of species	i.e., Municipal, provincial, national.

The estimated likelihood of occurrence was then presented in the following categories:

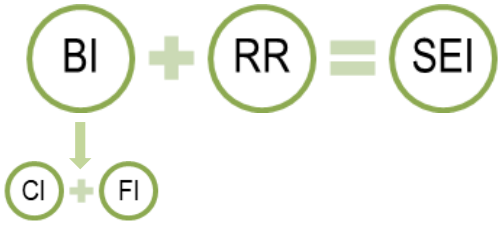
CATEGORY	DESCRIPTION
High (71–100%)	Applicable to Red Listed/TOPS listed species with a distributional range overlying the *project area of influence* as well as the presence of prime habitat. A further consideration included in this category was for a species to be common, abundant, and widespread.
Medium (41-70%)	A species with its distributional range peripherally overlying the *project area of influence* or required habitat on the *project area of influence* being sub-optimal; the size of the area as it relates to its likelihood to sustain a viable breeding population, as well as its geographical location. These species normally do not occur at high population numbers but cannot be deemed as rare.
Low (0–40%)	Applicable to species with its distributional range peripheral to the *project area of influence*, and habitat that was sub-optimal. These species are generally deemed to be rare.

2.4 Verification of project site ecological importance

The evaluation of the terrestrial biodiversity, fauna, flora and vegetation importance of the site was evaluated according to the procedures for the assessment and reporting of impacts on terrestrial biodiversity, terrestrial fauna species and flora, for activities requiring environmental authorisation as published under the National Environmental Management Act, 1998 (Act No. 107 of 1998): *Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for environmental authorisation [G 42946 – GN 9]* and SANBI's Draft *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa.* The methodology is outlined below:

The ecological importance of an area (i.e., site ecological importance (SEI) is considered to be a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC species, vegetation/fauna communities present) and its

resilience to impacts (Receptor Resilience). BI in turn is a function of the Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:



CI refers to the importance of an area for supporting biodiversity features of conservation concern present, while the FI refers to the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts. The criteria for determining CI and FI is provided in Tables 3 and 4, respectively.

TABLE 3: Conservation importance (CI) criteria.

CONSERVATION IMPORTANCE	CRITERIA
Very High	**Fauna and flora** • Critical habitat for range restricted species of conservation concern that have a global range of less than 10 km^2. • Species of conservation concern listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. **Sensitive terrestrial biodiversity features** • Any area of natural habitat[1] of a CR ecosystem type or large area (> 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type.
High	**Fauna and flora** • Confirmed habitat for species of conservation concern. • Species of conservation concern listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria. **Sensitive terrestrial biodiversity features** • 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.
Medium	**Fauna and flora** • Suspected habitat for species of conservation concern based either on there being records for this species collected in the past prior to 2002 or being a natural area included in a habitat suitability model. • Species of conservation concern listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria. **Sensitive terrestrial biodiversity features** • Any area of natural habitat of threatened ecosystem type with status of VU. • > 50 % of receptor contains natural habitat with potential to support SCC.
Low	• No confirmed or highly likely populations of Species of Conservation Concern. No confirmed or highly likely populations of range-restricted species.

[1] Excluding areas of transformed habitat within a defined ecosystem even if these are partially restored, e.g. Highveld grasslands that have been converted to maize fields and then abandoned so that some form of functional grassland is restored; this is not natural habitat as it does not and will not in the future have species composition representative of the original natural habitat.

	• < 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: Function integrity (FI) criteria.

FUNCTIONAL INTEGRITY	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 (e.g. ploughing).
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 (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) 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 (e.g., established population of alien and invasive flora) 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 transformed 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

The Biodiversity Importance (BI) where then derived from the following matrix:

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 Receptor Resilience were evaluated according to the following criteria:

TABLE 5: Receptor resilience (RR) criteria.

RESILIENCE	CRITERIA
Very High	Species that have an exceedingly high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.

High	Species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Species that are unlikely to return to a site once the disturbance or impact has been removed.

Following the evaluation of the BI and the RR, the final SEI were then derived from the following matrix:

Site Ecological Importance (**SEI**)		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

The SEI were subsequently interpreted according to the criteria provided in Table 6:

TABLE 6: SEI interpretation criteria

SITE ECOLOGICAL IMPORTANCE	INTERPRETATION
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. Minimization 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	Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.

SEI for terrestrial biodiversity features, flora and fauna were combined and the maximum SEI per receptor was selected. The final combined SEI were mapped to indicate ecological sensitive areas.

2.5 Preliminary identification of potential environmental impacts

The purpose of the Scoping Report was to determine the main issues and potential impacts that the proposed project may have on the receiving environment and will include the following:

- The identification of sensitive environments and receptors that may be impacted on by the proposed development.
- A description of the impacts (direct and indirect) that are most likely to occur.

- A determination of the nature and extent (wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development, regional, or national) during the construction and operational phases.
- The identification of 'No-Go' areas where applicable.
- A summary of the potential impacts that must be considered further in the EIA phase through specialist assessments and details of the methodology to be used in assessing these impacts (Plan of Study for EIA).

3. LIMITATIONS AND ASSUMPTIONS

The following limitations applied to the studies undertaken for this report:

- This report deals exclusively with the defined area and the potential impacts associated with the land use change on the terrestrial biodiversity, vegetation, flora, and fauna.
- Due to the dynamic nature of ecosystems, there is the likelihood that some aspects (of which some may be important) may have been overlooked. Terrestrial ecological assessments usually extend over several seasons or years to obtain long-term and significant ecological data that considers the impacts of unusual/abnormal conditions prevailing on an area. Due to time and budget constraints such long-term studies are unrealistic for this project and conclusions are therefore drawn from data collected over a much shorter time period.
- The assessment of potential impacts was informed by site-specific environmental conditions at the time of the site visit and ecological concerns based on the investigator's working knowledge and experience with similar projects.
- This assessment excluded any assessment of invertebrates.
- This assessment excluded any assessments of wetlands or aquatic ecosystems.
- Information used to inform the assessment was limited to data and GIS coverage's available for the province at the time of the assessment.
- Information available from databases accessed (i.e KZN environmental data in specific) are outdated and may not be reflective of current environmental conditions.

4. RESULTS

4.1 Protected areas and other conservation areas

Protected areas and other conservation areas included national parks, nature reserves (i.e., provincial, and private game reserves, stewardship sites), mountain catchment areas; world heritage sites; protected environments; forest nature reserves; forest wilderness areas; biosphere reserves, transfrontier parks and conservation areas, conservancies; IBA areas; NPAES focus areas and RAMSAR sites.

These areas are amongst the best areas for the conservation of wildlife and habitats, and are important core areas, steppingstones, and corridors for wildlife in fragmented landscapes but are increasingly compromised by human encroachment.

Protected/conservation areas associated with the project site included the following:

- NPAES focus areas – The entire site falls within a NPAES focus area; an area important for land-based protected areas expansion (Figure 2; DEA screening tool).

No other protected/conservation areas are associated with the project site.

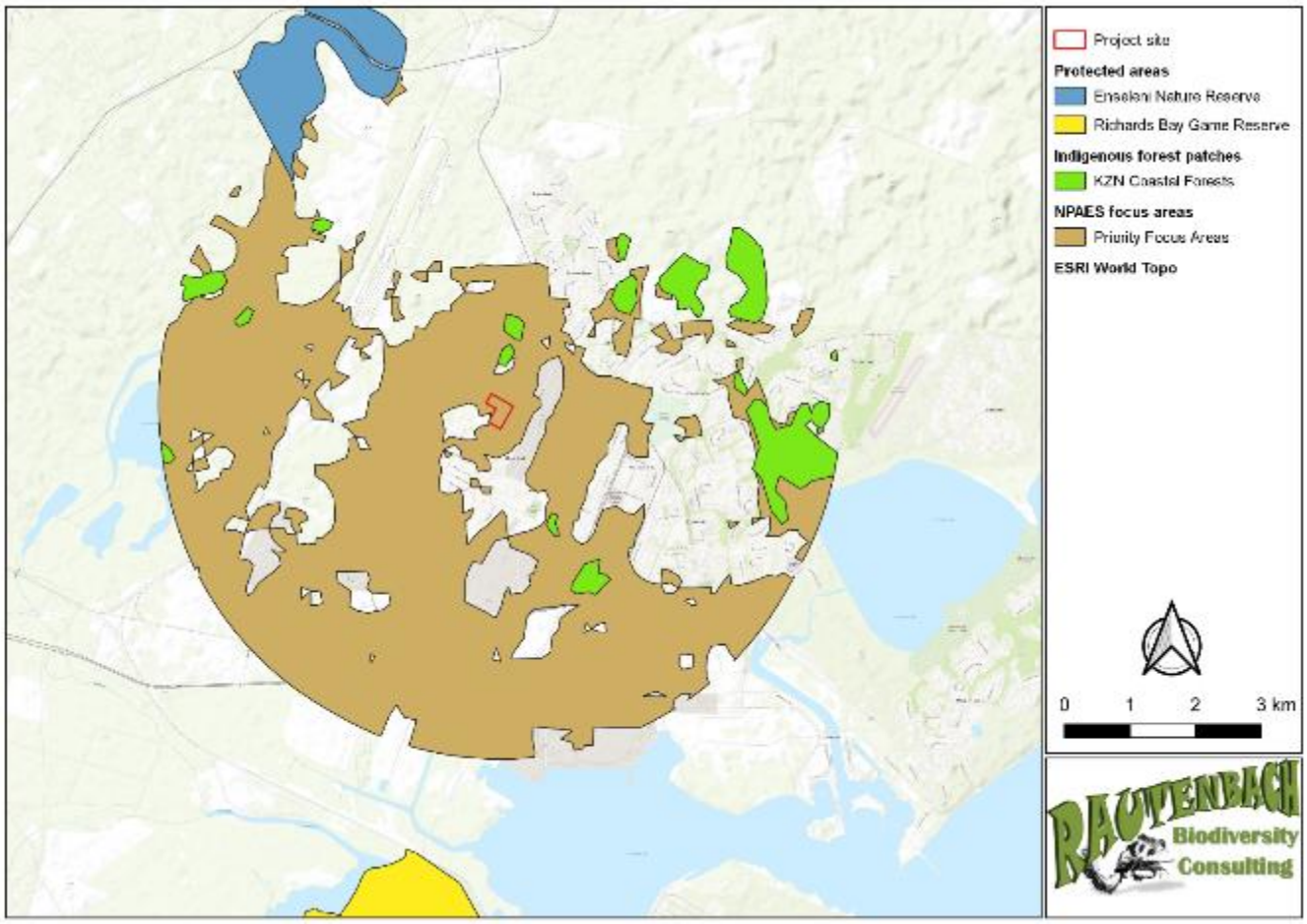


FIGURE 2: Protected and other conservation areas in relation to the project site.

4.2 National threatened terrestrial ecosystems

The first list of national threatened terrestrial ecosystems in South Africa was gazetted in December 2011 (NEMBA: National List of ecosystems that are threatened and in need of protection, G34809, GoN 1002), with the aim of reducing the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition.

Ecosystem delineation was based on the 435 national vegetation types published in 2006 (Mucina & Rutherford, 2006 vegetation delineation); National Forest Types (DWAF), priority areas identified in provincial Systematic Biodiversity Plans, and high irreplaceability forest patches or clusters systematically identified by DWAF.

Since 2006, various refinements and changes were made to the national vegetation map and included numerous boundary changes in KwaZulu-Natal, Northern Cape, Western Cape, and Mpumalanga, refinements to forest type boundaries in KwaZulu-Natal, Limpopo, Mpumalanga, and the Eastern Cape amongst others (Mucina & Rutherford, 2018 vegetation delineation). The NBA 2018 terrestrial ecosystem assessment focused purely on the 2018 vegetation delineations (i.e., 458 vegetation types delineated) and did not consider special habitats identified from various provincial fine scale planning projects as was done during the NBA 2011 assessment.

For the NBA 2018, ecosystem threat status was indicated by following the new 2017 IUCN RLE methodology, a framework for assessing the risks to ecosystems and identifying where ecosystems are threatened (Skowno *et al*., 2019). The IUCN RLE threat categories are presented in Figure 3.

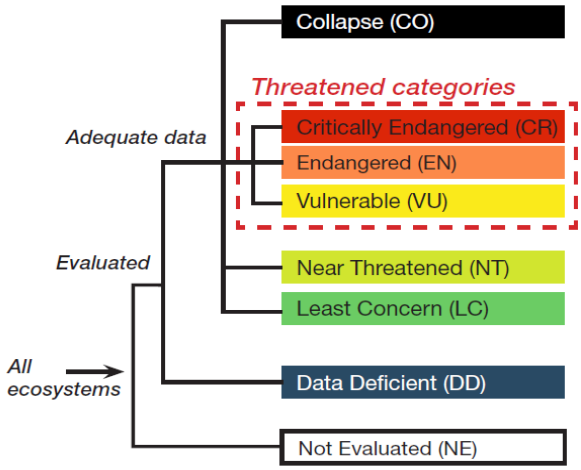


FIGURE 3: IUCN RLE threat categories.

The project site falls entirely with the 'Critically Endangered' Kwambonambi Hygrophilous Grassland terrestrial ecosystem (Figure 4; DEA screening tool).

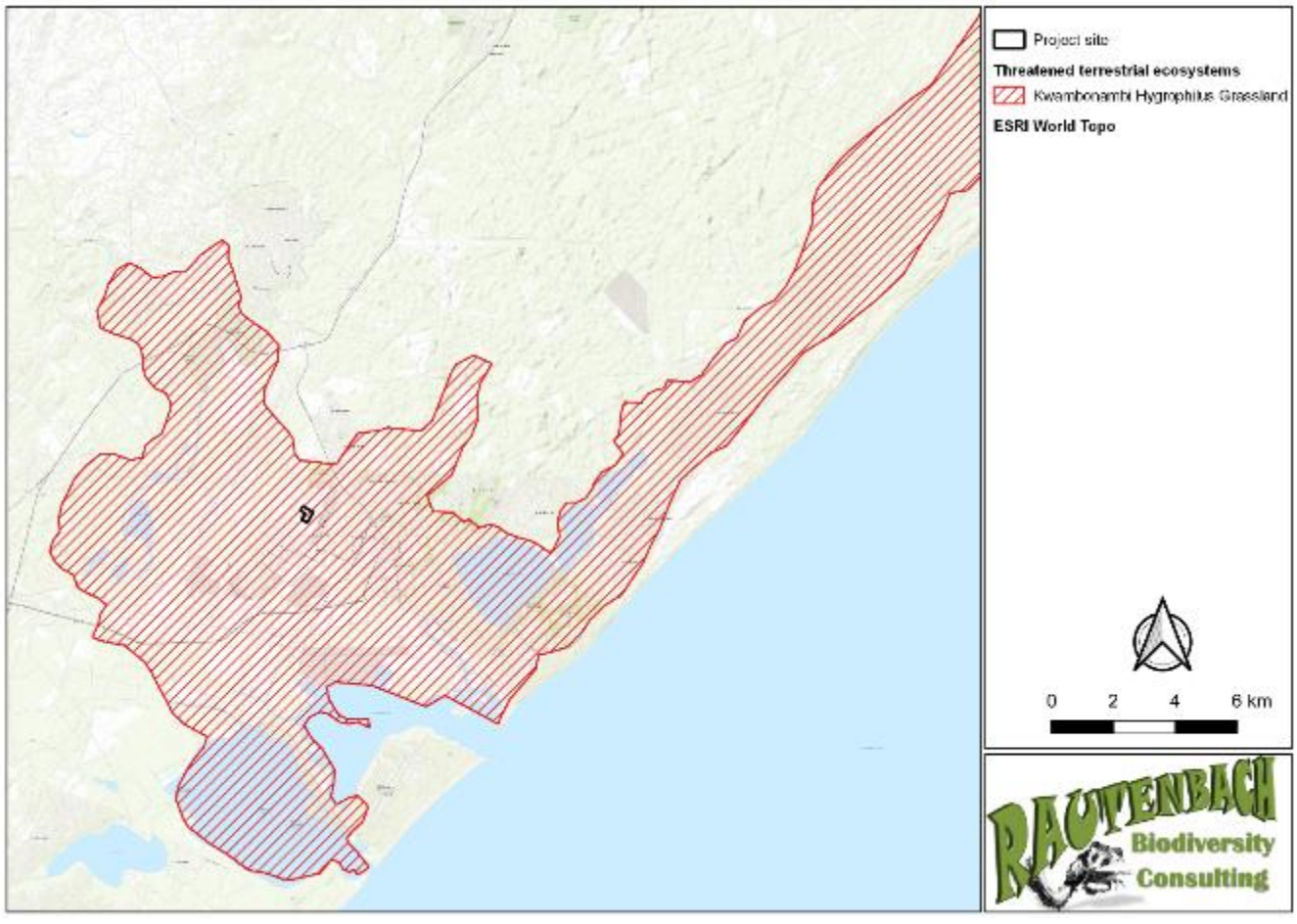


FIGURE 4: The extent of the Kwambonambi Hygrophilous Grassland ecosystem in relation to the project site.

4.3 Regional and provincial vegetation classification

The project site falls within the 'Endangered' Maputaland Wooded Grassland (SANBI Veg code CB 2) vegetation type of the Indian Ocean Coastal Belt biome (Figure 5; SANBI 2006 – 2018 vegetation delineation). Historical distribution, vegetation and landscape features, geology, important taxa, and conservation status of these vegetation types are summarised in Appendix 1.

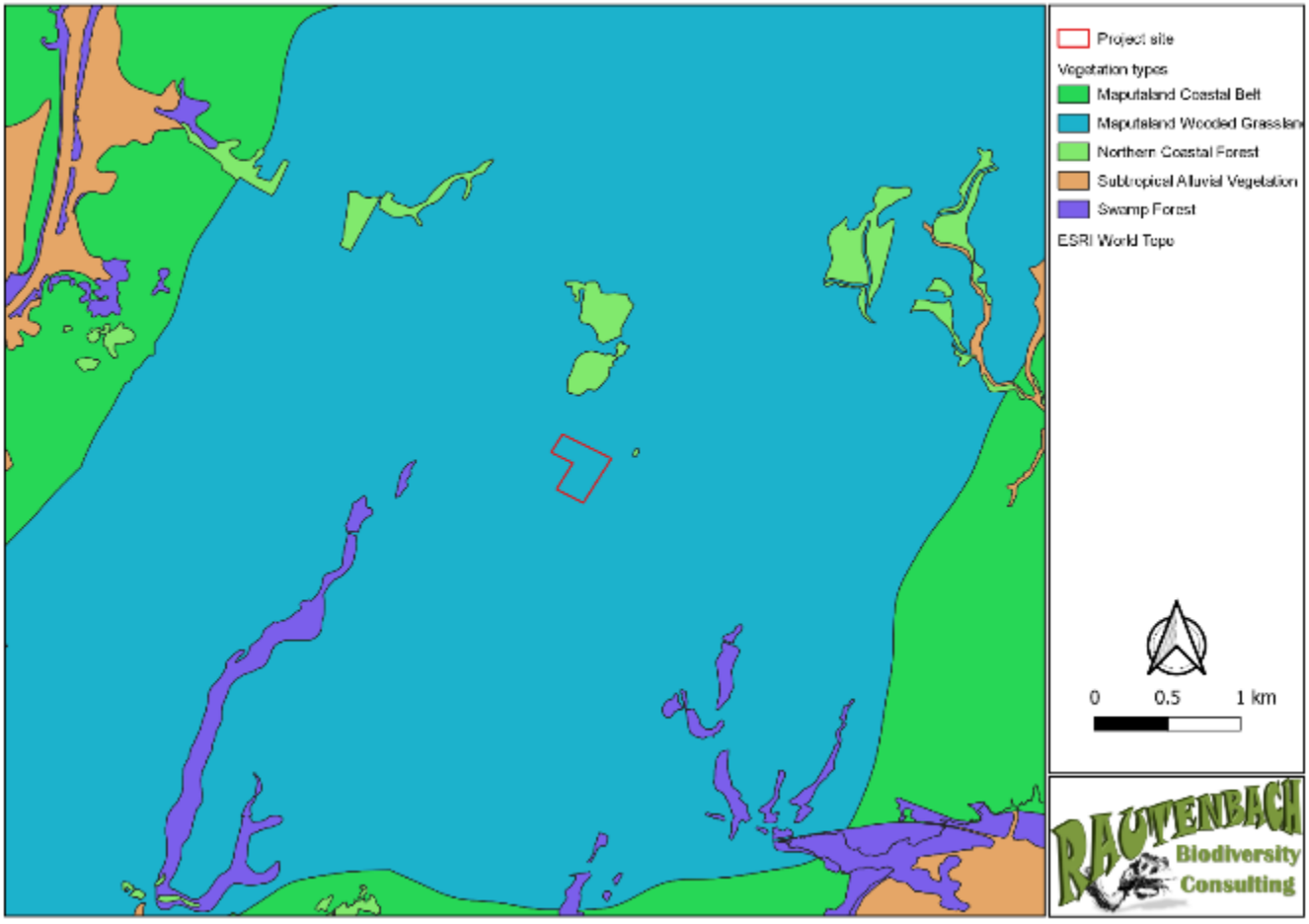


FIGURE 5: Regional vegetation classification on the project site.

Provincial vegetation delineation demarcated two vegetation types intersecting with the project site, *viz.* the "Endangered" Maputaland Wooded Grassland, and "Vulnerable" Subtropical freshwater wetlands (Figure 6; Jewitt *et al*., 2011). Historical distribution, vegetation and landscape features, geology, important taxa, and conservation status of these vegetation types are summarised in Appendix 1.

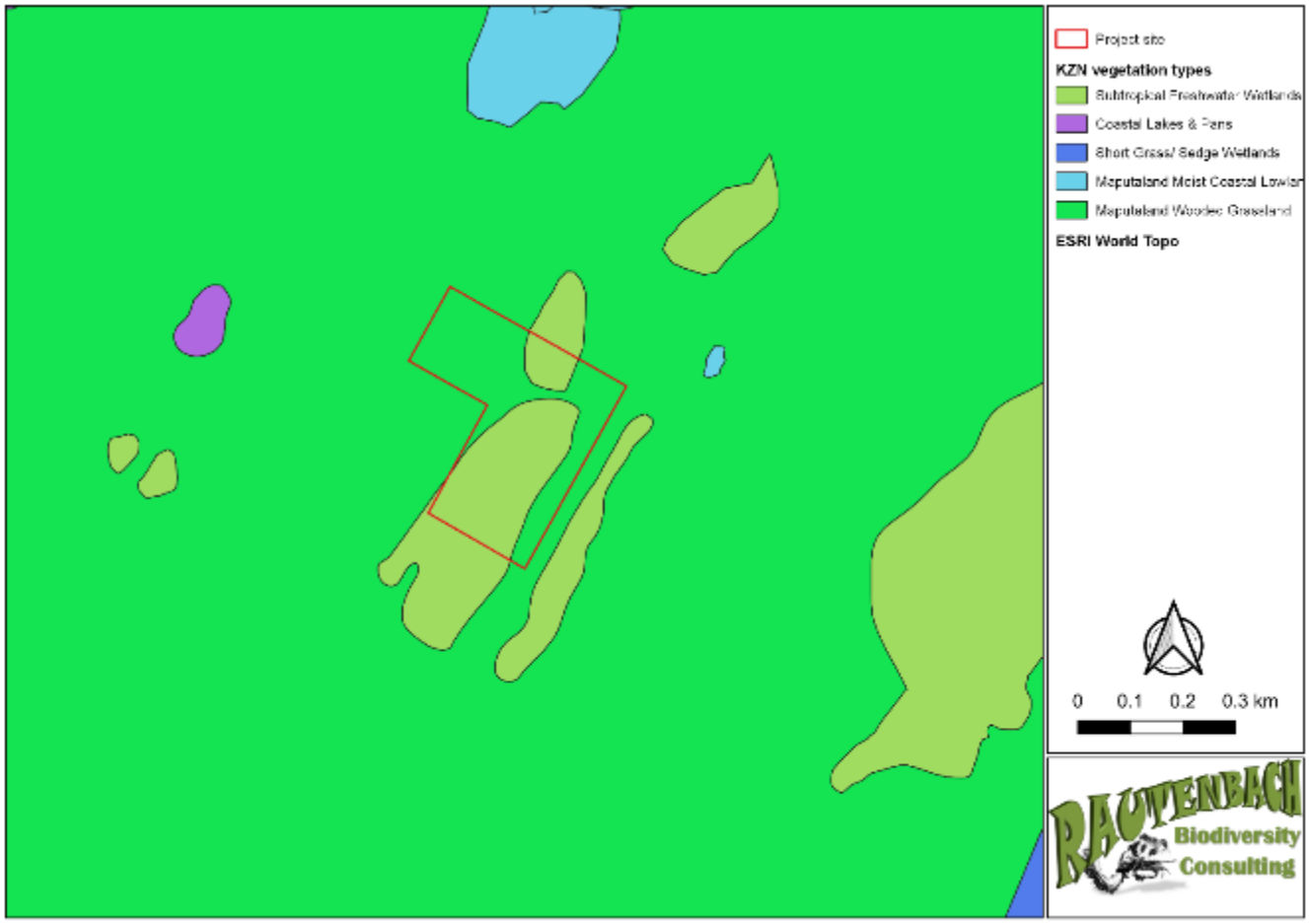


FIGURE 6: Provincial vegetation classification.

The project site falls entirely within the Maputaland-Pondoland Biodiversity hotspot area which is recognized as the second richest floristic region in Africa (Figure 7).

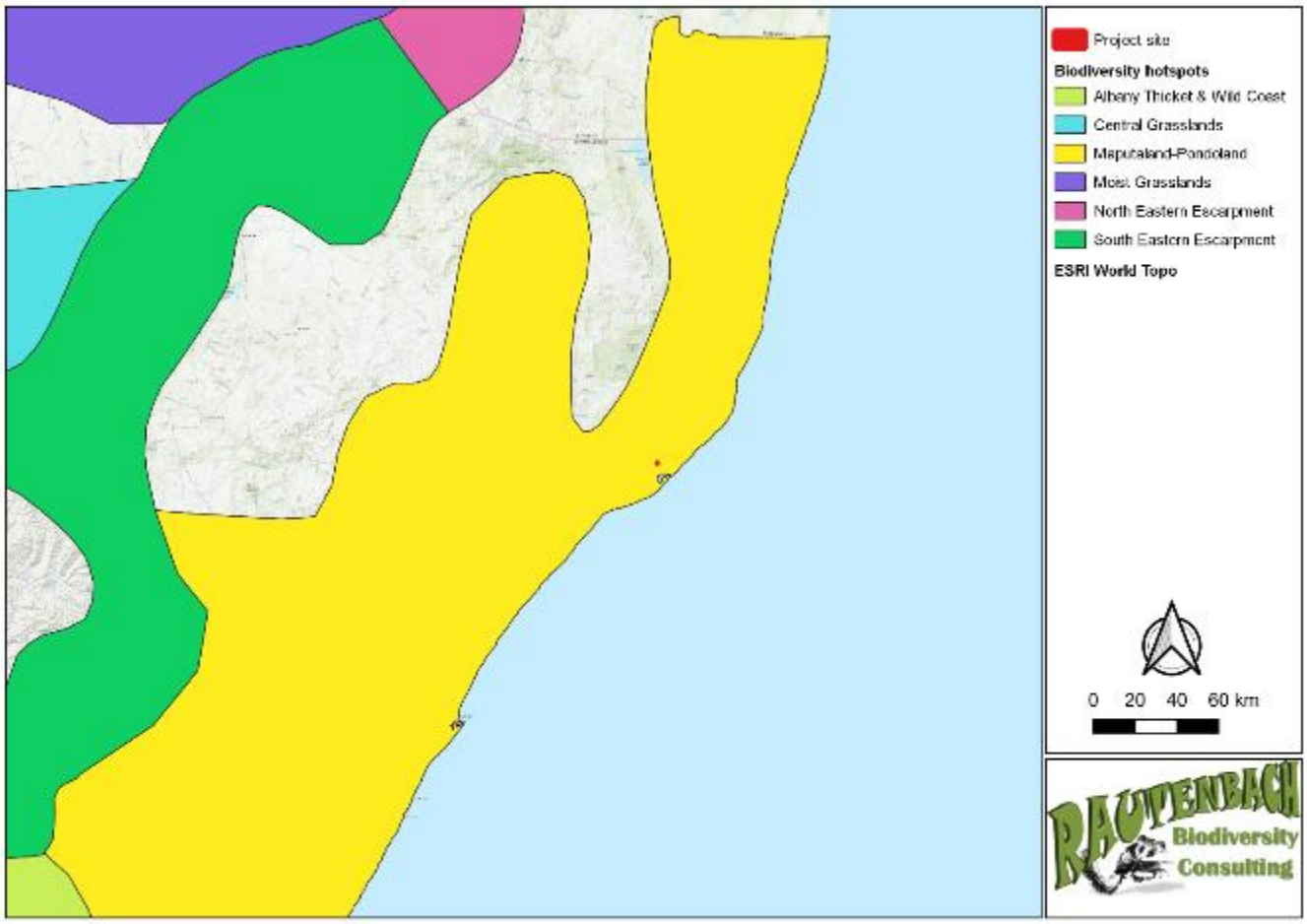


FIGURE 7: The extent of the Maputaland-Pondoland biodiversity hotspot in relation to the project site.

4.4 Terrestrial CBA and ESA areas

National (Skowno *et al*., 2018) and provincial scale data layers (KZN CBA Irreplaceable version 26012016) identified CBA areas intersecting with the project site (Figure 8). Important biodiversity features contained within the CBA areas include the presence of NPAES focus areas and the Critically Endangered Kwambonambi Hygrophilous Grassland ecosystem. No national or provincial ESA designated areas intersect with the project site.

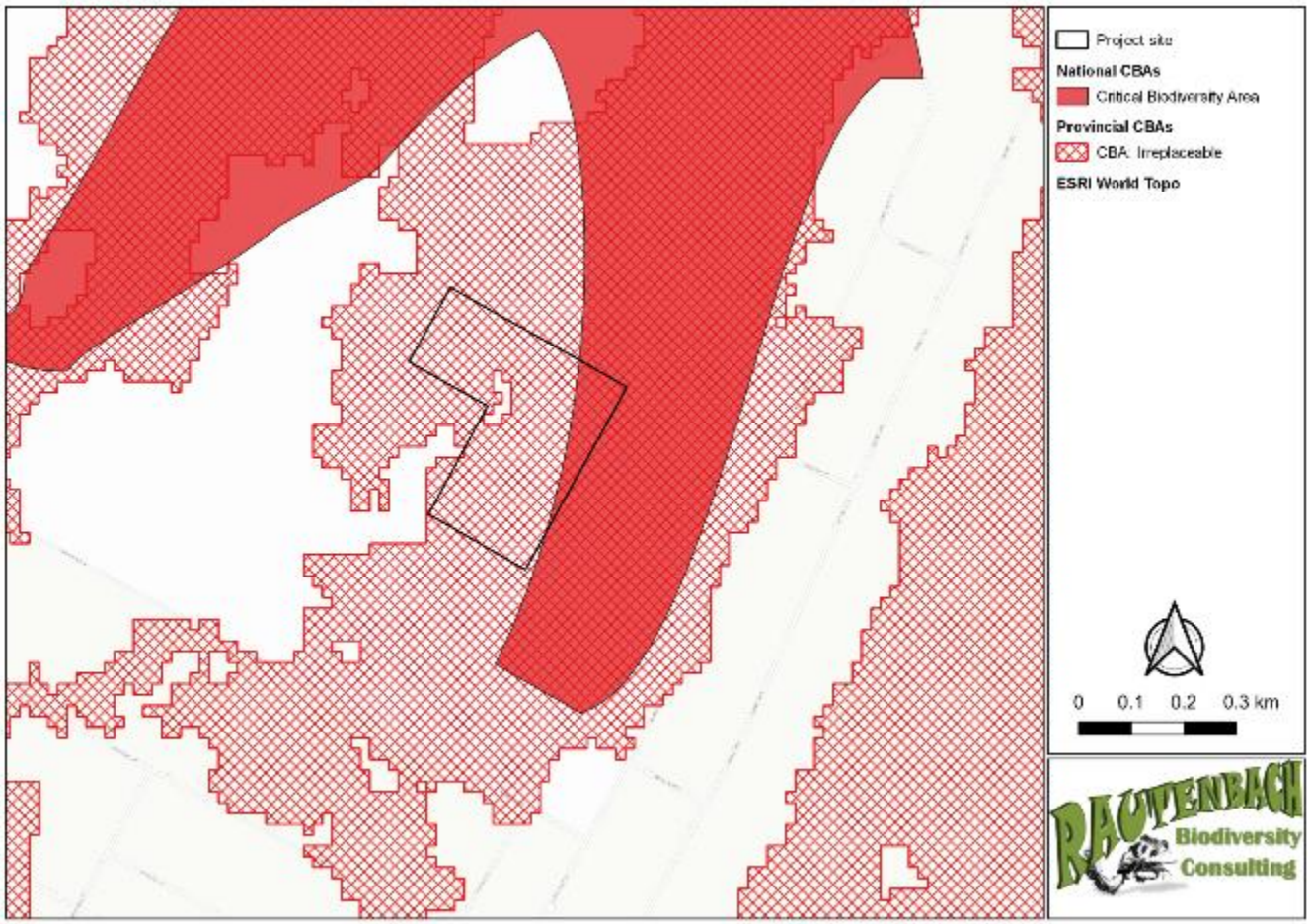


FIGURE 8: The extent of national and provincial CBA areas on the project site.

4.5 Landscape and local connectivity

Maintaining connectivity between natural areas is considered crucial for the long-term persistence of both ecosystems and species. Natural ecological corridors/linkages are vital for allowing species to migrate naturally and to accommodate shifts in species ranges in response to climate change.

The EKZNW 2015 identified a series of altitudinal and biogeographic corridors which created a linked landscape for the conservation of species in a fragmented environment and which facilitate evolutionary, ecological and climate change processes. The project site does not intersect with any landscape or locally recognized important ecological corridors.

The project site is bordered by industrial and residential developments and natural grassland (Figure 9; SA Land cover 2018). Areas directly adjacent to the project site categorized as natural grassland are degraded (personal observation). The project site is thus not connected to untransformed habitats, but migrations may still be possible across some of the surrounding transformed/degraded habitats, specifically the more mobile species such as birds.

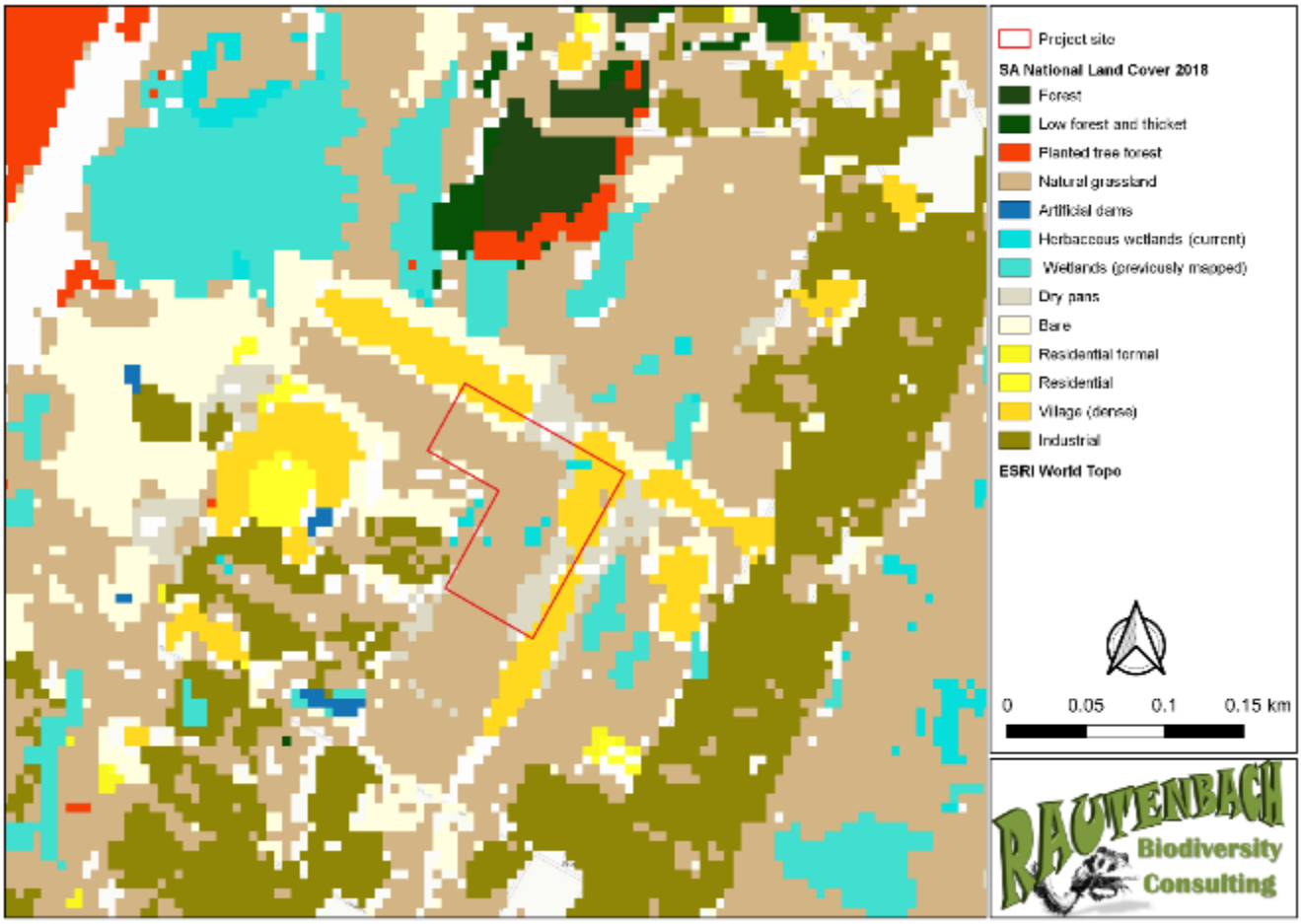


FIGURE 9: Land cover on the project site and surrounding areas.

4.6 Inland aquatic ecosystems

The NBA 2018 (inland aquatic realm) datasets indicated the presence of four wetlands on and close to the project site (Figure 10; van Deventer *et al*., 2018). A summary of the attrubutes associated with these wetlands was extracted from the NBA 2018 wetlands data layers and presented below:

WETLAND UNIT ID	9065[2]	9067[3]	9063	9071
SUBTYPE (CS_L1)	Inland, Natural	Inland, Natural	Inland, Natural	Inland, Natural
BIOREGION (CS_L2)	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt
DOMINANT LANDFORM (CS_L3)	Plain	Plain	Plain	Plain
HYDROGEOMORPHIC CLASSIFICATION (CS_L4A)	Depression	Depression	Depression	Depression
HECTARE	8,2	1,8	2,9	2,3
EXISTING IMPACTS	Roads	-	Roads	-
ECOLOGICAL CONDITION	** D/E/F	* A/B	**D/E/F	*A/B
ECOSYSTEM THREAT STATUS	VU	VU	VU	VU
ECOSYSTEM PROTECTION LEVEL	Well protected	Well protected	Well protected	Well protected

*** =** Natural/Near natural

[2] Total size of wetland unit = 8,24 ha. Size of wetland unit on project site = 4,62 ha.
[3] Total size of wetland unit = 1,85 ha. Size of wetland unit on project site = 0,76 ha.

**** =** Heavily to critically modified

The DEA screening tool identified the project site as falling within a strategic water source area (SWA) of Very High sensitivity.

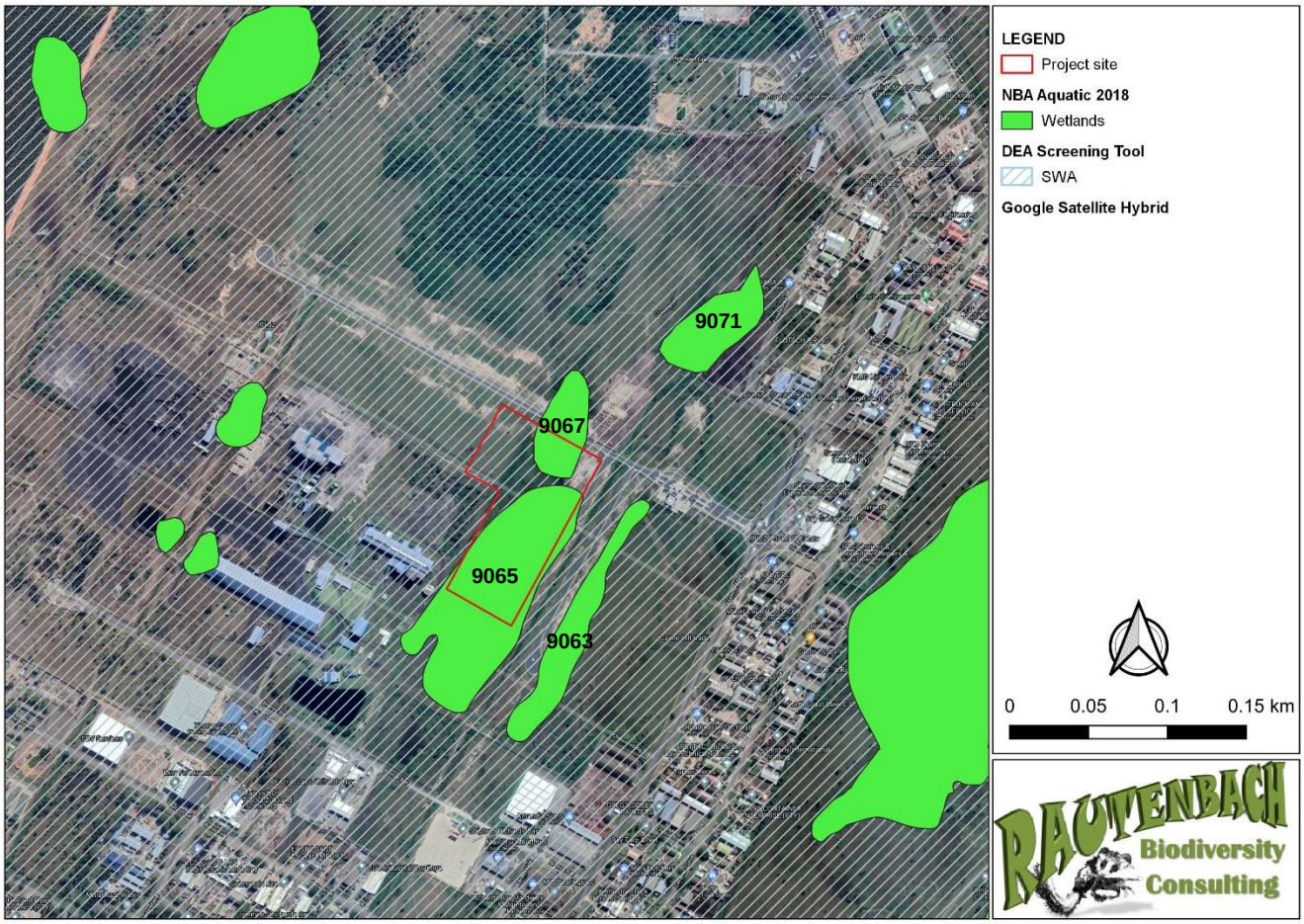


FIGURE 10: Wetlands and strategic water source areas on the project site.

4.7 City of uMhlathuze land use zoning

Information retrieved from the City of uMhlathuze land use zoning data layers (http://gis.umhlathuze.gov.za/), indicated that the project site is zoned for noxious industry development (Figure 11) and falls within Phase 1F of the IDZ.

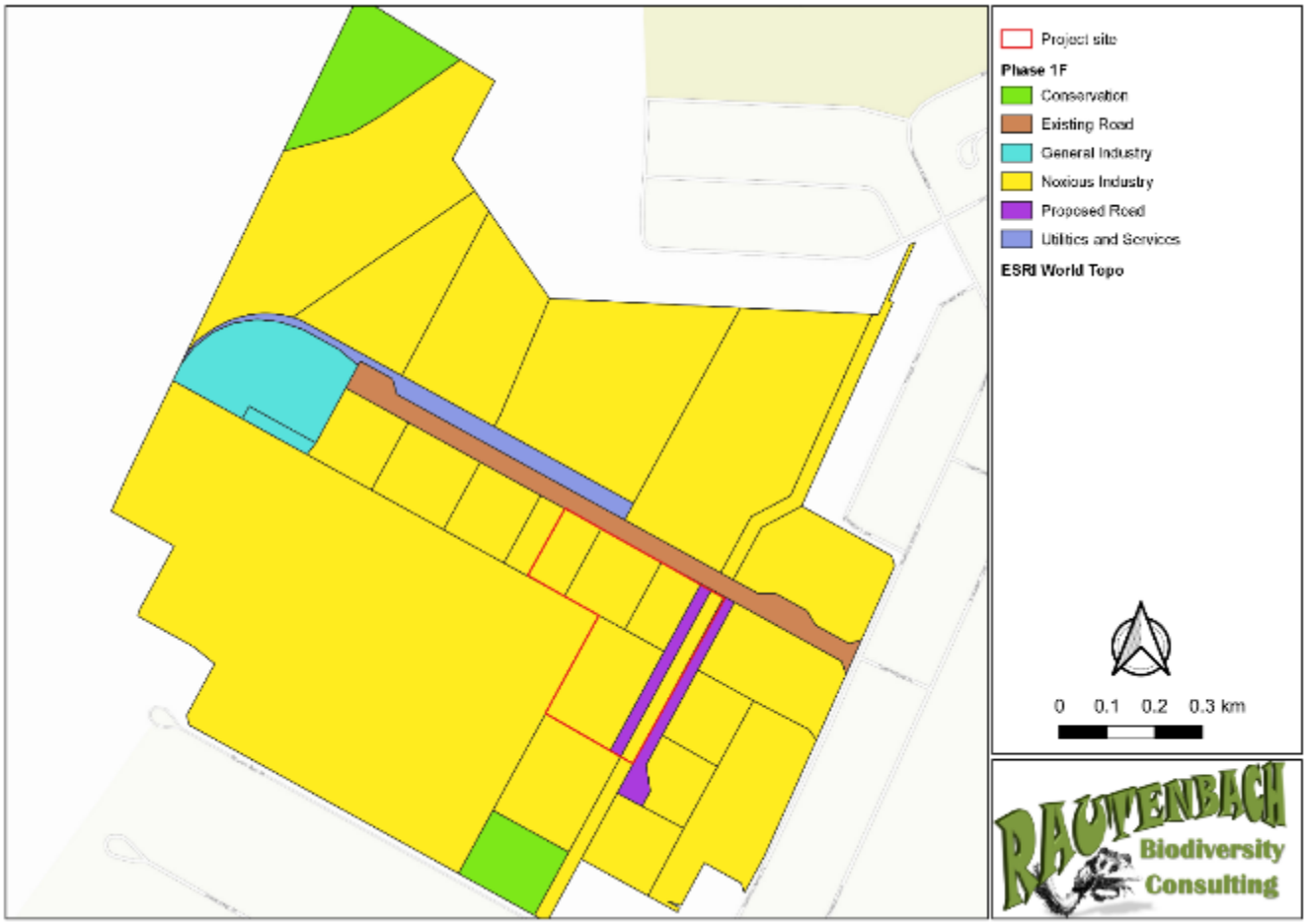


FIGURE 10: Land use zoning on Phase 1F.

4.8 Preliminary site inspection

The project site was found to be located within degraded coastal grasslands and hygrophilous sedge wetlands, with visible surface water present on the southern portion. Most of the site was recently mowed, thus the site had a homogenous appearance.

Unvegetated areas, particularly along the northeastern and southeastern boundaries were noted, and numerous vehicle tracks crossed the entire site. Surprisingly, few invasive plant species were present although species such as *Psidium guajava* and *Cuscuta campestris* were observed, albeit at low densities. Photographic records documenting current site conditions was taken from 10 vantage points (Figure 12) and is presented in Figures 13 & 14.

FIGURE 11: Google Earth view of the project site.

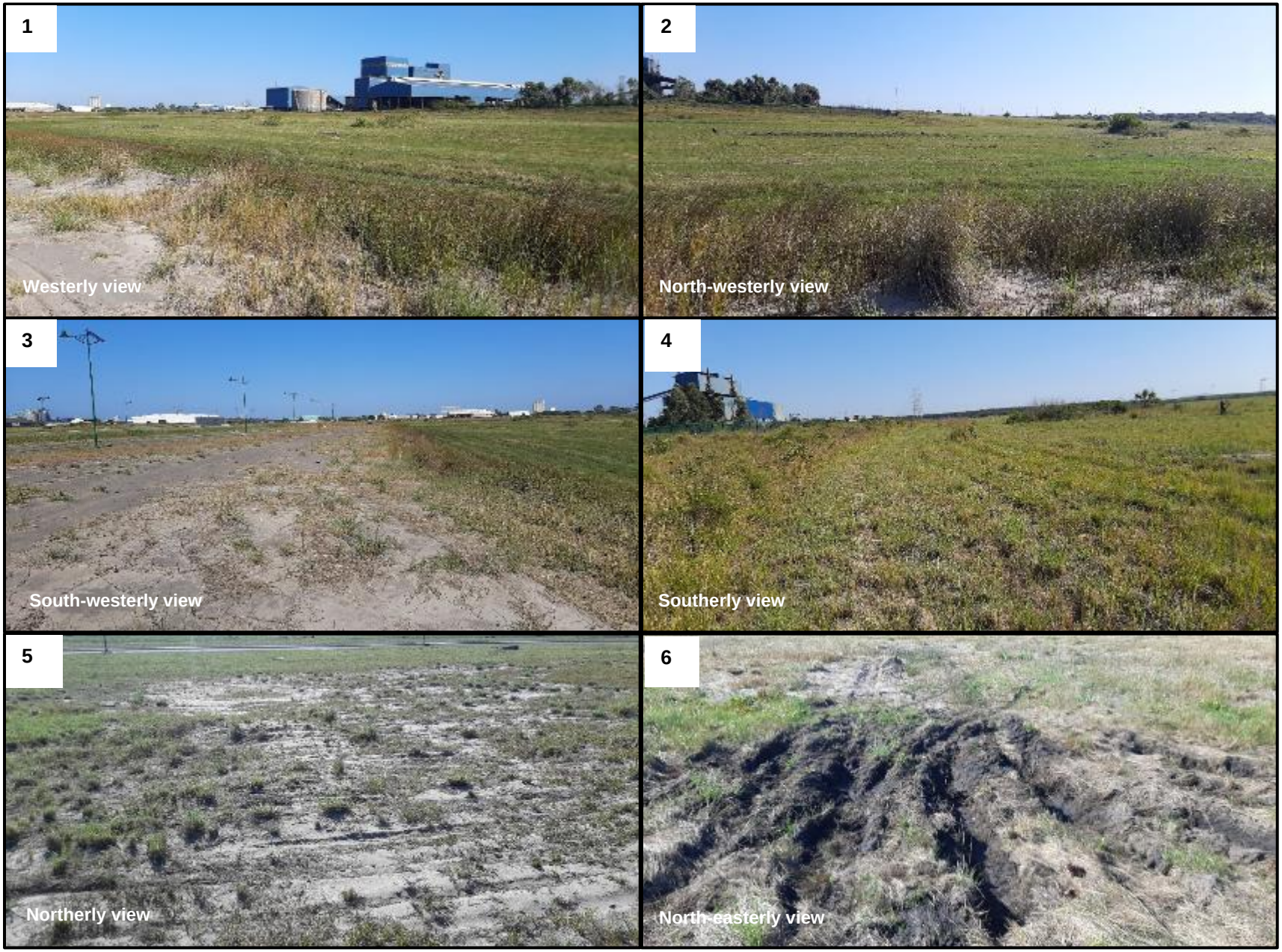


FIGURE 12: Photographic records of the project site (vantage points 1-6).

FIGURE 13: Photographic records of the project site (vantage points 7-10).

4.9 Likely occurrence of SCC fauna and flora species

Database searches identified 94 Red Listed fauna and flora species known/expected to be present in KwaZulu-Natal (Tables 7 & 8, Appendices 2 & 3). Of these, **25** species may potentially be present on the project site (Figure 15, Tables 7 & 8). Due to the degraded nature of the project site, most of these species have a Low probability of occurrence.

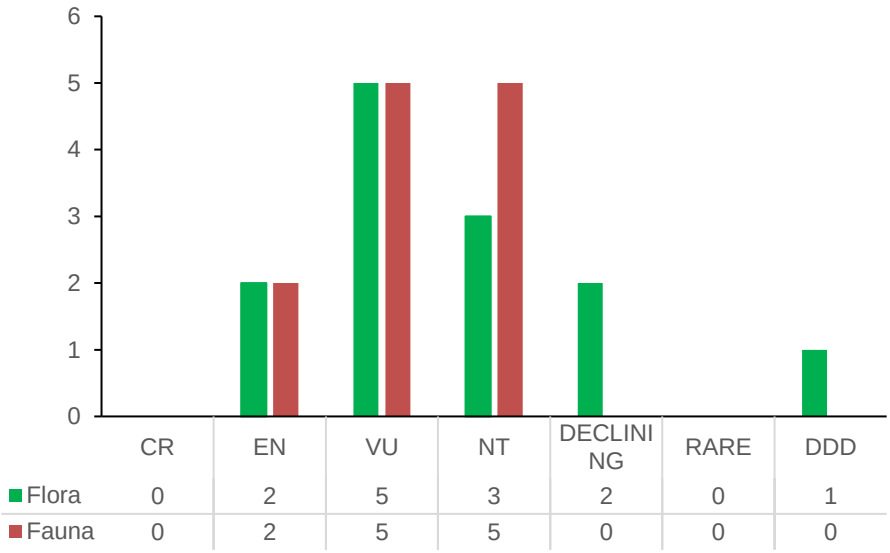


FIGURE 14: Number of Red Listed fauna and flora species potentially present on the project site.

TABLE 7: List of Red Listed flora species potentially present on the project site.

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
APOCYNACEAE	*Raphionacme lucens*	NT	-	Sched 8	-	Succulent/geophyte/herb	Coastal grasslands. Mtunzini to Maputo.	Jul-Jan	Low	Known only from fewer than 5 locations. Project site falls within its known distributional range. Low probability owing to transformed nature of the Mpautaland Wooded Grassland vegetation on the project site.
	Sisyranthus franksiae	DDD	-	Sched 8	Endemic	Herb	Unknown, possibly wetlands, marshes or swamps.	Insuffucient information	Medium	Previously collected from the Alton north area. Wetlands present on the project site.
	Pachycarpus concolor subsp. *arenicola*	VU				Succulent/herb	Grassy vegetation on stabilized dunes within 20 km of the coast. KwaZulu-Natal Coastal Belt Grassland, Maputaland Wooded Grassland, Maputaland Coastal Belt.	No information	Low	Known to occur in the Maputaland Wooded grassland vegetation type. Low probability on account of the degraded nature of the project site.
ARACEAE	*Wolffiella denticulata*	VU			SA endemic	Pleustophyte/hydrophyte/herb	Floating in coastal freshwater marshes, lakes or slow-moving streams. Swamp forest. Northern KwaZulu-Natal between Mtunzini and Kosi Bay and in Mozambique.	-	Low	Low on account of the degraded nature of the wetlands.
ASPHODELACEAE	** *Aloe cooperi*	DECLINING	-	Sched 8		Succulent/herb	Grows in grasslands in dry, rocky areas or wet, marshy habitats in	Sep-Mar	Medium	Widespread in KZN. Owing to the recent mowing of the project site, it could have

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
							altitude from sea level to 1 800 m.			been overlooked. Wetland habitat present on the site.
	Kniphofia littoralis	NT	-	Sched 8	Endemic	Herb	Coastal grassland. Moist depressions, not usually in permanently waterlogged soils, 5-200m	Apr-Sept	Low	Known to be present in the Richards'Bay area. May be present in Maputaland Wooded Grassland vegetation on the project site.
ASTERACEAE	*Nidorella tongensis*	EN	-	-	Endemic	Succulent/ herb	Damp places among dunes overlooking the sea. Northern Coastal Forest, Maputaland Coastal Belt, Subtropical Dune Thicket, Subtropical Seashore Vegetation, Muzi Palm Veld and Wooded Grassland, KwaZulu-Natal Coastal Belt Grassland, Maputaland Wooded Grassland.	Insufficient information	Low	Known to be present in the Richards Bay area. May be present in the Maputaland Wooded Grassland vegetation on the project site.
CYPERACEAE	*Cyperus sensilis*	NT	-	Sched 8	SA endemic	Helioph yte/cyp eroid	Coastal grasslands and dunes, associated with seasonal pans, forms a conspicuous zone around the water edge, 5-50 m. Indian Ocean Coastal Belt	Insufficient information	Low	Wetland habitat present on the project site.
FABACEAE	*Aspalathus gerrardii*	VU	-	Sched 7	SA endemic	Shrub	Coastal grasslands, forest margins, often in damp or marshy sites, on sandstones and Msikaba Formation Sandstone in the south, 0-500 m. Pondoland-Ugu Sandstone Coastal	Throughout year	Low	Known to be present in the Richards Bay area. Wetlands on project site.

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
							Sourveld, KwaZulu-Natal Coastal Belt Grassland, Maputaland Coastal Belt			
HYPOXIDACEAE	*Hypoxis hemerocallidea*	LC (DECREASING)		Sched 8	-	Geophyte	It occurs in a wide range of habitats, including sandy hills on the margins of dune forests, open, rocky grassland, dry, stony, grassy slopes, mountain slopes and plateaus. It appears to be drought and fire tolerant. Albany Thicket, Grassland, Indian Ocean Coastal Belt, Savanna biomes.	Aug-Apr	Medium	A common and widespread species in KZN.
IRIDACEAE	*Freesia laxa* subsp. *azurea*	VU	-	Sched 12/Sched 7	-	Geophyte	Grassy dunes or light shade along margins of coastal forests. Northern Coastal Forest, Maputaland Coastal Belt, Maputaland Wooded Grassland, Swamp Forest. Maputaland north of Richard's Bay and extending to central Mozambique.	Late winter to early spring	Low	Known from Richards Bay area. May be present on Maputaland Wooded Grassland vegetation on the project site.
POLYGONACEAE	*Oxygonum dregeanum* subsp. *streyi*	EN				Herb	Coastal grasslands and palm veld, sandy soils. Muzi Palm Veld and Wooded Grassland, Maputaland Pallid Sandy Bushveld, Zululand Lowveld, Tembe Sandy Bushveld, Pondoland-Ugu Sandstone Coastal Sourveld, KwaZulu-Natal Coastal Belt Grassland,	September	Low	This taxon is a long-lived grassland forb, that regenerates after grassland fires from persistent underground rootstocks. Potential habitat within the Maputaland Wooded Grassland vegetation

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
							Maputaland Wooded Grassland, Maputaland Coastal Belt. Historical records indicate that it formerly occurred all along the KwaZulu-Natal coast, but it now persists predominantly in a network of protected areas on the Maputaland coastal plain, with a few isolated occurrences on the KwaZulu-Natal South Coast.			type on the project site.
SANTALACEAE	*Thesium polygaloides*	VU	-	Sched 7	Endemic	Parasite/herb	Swamps on coastal flats. KwaZulu-Natal Coastal Belt Grassland, Maputaland Wooded Grassland, Maputaland Coastal Belt.	Insufficient information	Low	Potentially present in the Maputaland Wooded Grassland vegetation type and wetlands on the project site.

**** CITES Appendix II**

TABLE 7: List of Red Listed fauna species potentially present on the project site.

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**	**SA RED LISTING**	**NEMBA 2015**	**PROVINCIAL**	**CITES**	**SA ENDEMISM**	**HABITAT**	**PROBABILITY OF OCCURRENCE**	**MOTIVATION**
MAMMALS										
MURIDAE	*Dasymys incomtus*	African Marsh Rat	NT	-	Sched 3	-	No	Wide variety of habitats, including forest and savannah, swampland, and grasslands, but they rely on intact wetlands in these areas.	Very low	Wetland habitat present on the project site. Within distributional range.
SORICIDAE	*Crocidura maquassiensis*	Maquassie Musk Shrew	VU	-	Sched 3	-	No	It may tolerate a wide range of habitats, including urban and rural landscapes. Restricted to wetlands and waterlogged areas.	Low	Within distributional range. Wetland habitat present on the project site.
	Crocidura mariquensis	Swamp Musk Shrew	NT	-	-	-	No	Occuring only close to open water with intact riverine and semi-aquatic vegetation such as reedbeds, wetlands and the thick grass along riverbanks.	Low	Within distributional range. Wetland habitat present on the project site.
VESPERTILIONIDAE	*Scotoecus albofuscus*	Thomas' House Bat	NT	-	Sched 3	-	End of range	Appears to be associated with low-lying, humid savannahs of the coastal plains of Mozambique and northern KwaZulu-Natal, especially where large rivers or wetlands occur.	Very low	No roosting habitat present. May occasionally forage over wetlands on the project site.
REPTILES										
PELOMEDUSIDAE	*Pelusios rhodesianus*	Variable hinged terrapin	VU	-	Sched 3	-	No	Temporary pans and semi-permanent, well-vegetated water bodies in sandy coastal regions.	Very low	Known to occur within the QDGS 2832CA. Wetland habitat present on the project site.
FROGS										
HEMISOTIDAE	*Hemisus guttatus*	Spotted Shovel-nosed Frog	VU	-	Sched 3	-	Endemic	Along the coast, inhabits Coastal Bushveld/ Grassland, while in the interior it occurs in	Low	Known to be present within the 2832CA QDGS. Wetland

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
								Northeastern Mountain Grassland and Natal Central Bushveld. It breeds on the edges of pans or swampy areas, and along rivers, especially where the gradient is slight and alluvial deposits are present.		habitat present on project site.
HYPEROLIIDAE	*Afrixalus spinifrons*	Natal Leaf-folding Frog	VU	-	Sched 3	-	No	Wide variety of habitats in coastal bushveld grassland and moist upland grassland.	Low	Known to be present within the 2832CA QDGS. Wetland habitat present on project site.
	Hyperolius pickersgilli	Pickersgill's reed frog	EN	-	Sched 3	-	No	Coastal Bushveld-Grassland, where it breeds in marshy areas containing dense stands of Saw Grass *Cyperus immensus*. The water at breeding sites is stagnant and rarely exceeds 50 cm in depth.	Low	Known to be present in the Richards Bay area. Wetland habitat on project site.
BIRDS										
ACCIPITRIDAE	*Circus ranivorus*	Marsh-harrier, African	EN	-	Sched 3	II	No	Inland and coastal wetlands and adjacent moist grassland.	Low	May use the site occasionally for foraging.
CORACIIDAE	*Coracias garrulus*	Roller, European	NT	-	-	-	No	Open woodlands, perching on open dead branches, on telephone poles and power lines.	High	Frequently recorded in the Richards Bay area.
MOTACILLIDAE	*Anthus brachyurus*	Pipit Short-tailed	VU	-	Sched 3	-	No	Preferred habitat during the breeding season is short sparse grassland, while in the winter months are also recorded on short seasonally flooded grassland. Native resident in the Richards Bay area.	Medium	Known to occur in the Richards Bay area (2016 latest record).

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
ROSTRATULIDAE	*Rostratula benghalensis*	Painted-snipe Greater	NT	-	Sched 3			It occurs at scattered wetland localities across much of the north-eastern half of the country, as well as sparsely in coastal areas in Eastern Cape, mainly in summer. A small, isolated and apparently contracting population persists in Western Cape.	Low	Known to occur in the area (2019 records). Wetland habtat present on the project site.

The DEA screening tool identified the project site as falling in an area classified as of Medium sensitivity for plant species, and of High sensitivity for animal species. Sensitivity features associated with the plant and animal species identified is presented in Table 9.

TABLE 8: Sensitive fauna and flora features associated with the project site.

SENSITIVITY	FEATURE
FLORA	
Medium	*Freesia laxa* subsp. *azurea*
Medium	Sensitive species 275
Medium	*Oxygonum dregeanum* subsp. *streyi*
Medium	*Pachycarpus concolor* subsp. *arenicola*
Medium	Sensitive species 471
Medium	*Nidorella tongensis*
Medium	*Senecio ngoyanus*
Medium	*Aspalathus gerrardii*
Medium	*Wolffiella denticulata*
Medium	*Thesium polygaloides*
FAUNA	
High	*Zoothera guttata* (Bird)
Medium	*Philantomba monticola* (mammal)
Medium	*Dendroaspis angusticeps* (reptile)
Medium	*Ourebia ourebi ourebi* (mammal)
Medium	*Pelusios rhodesianus* (reptile)
Medium	*Hyperolius pickersgilli* (frog)
Medium	Medium Sensitive species 17

Except for *S. ngoyanus* (flora), *Z. guttata*, *P. monticola*, *D. anguticeps*, *O. ourebia ourebi* (fauna), data and probability of occurrence of the species listed in Table 9 is already presented in Tables 7 & 8 and will therefore not be discussed further.

S. ngoyanus, although formerly widespread, now only occurs around St Lucia and Ngoye Forest and therefore unlikely to be present on the project site (Appendix 2). The fauna species listed above are unlikely to be present since the site does not offer suitable habitat (Table 9; Appendix 3).

4.10 Habitat sensitivity analysis

To evaluate the SEI (Site Ecological Importance) of the project site, results from the desktop assessment and the preliminary site inspection were combined and the maximum SEI per receptor (i.e., vegetation community, habitat, species) were selected.

During the preliminary site inspection, the area was found to be degraded, with existing negative environmental impacts present. The terrestrial biodiversity is therefore not representative of the environmental sensitivities identified during the desktop assessment (e.g., CR ecosystems, EN & VU vegetation types, CBA areas, NPAES focus areas, wetlands). Nevertheless, several SCC fauna and flora species may potentially be present, albeit probability of occurrence is regarded as Low for most of the species. The precautionary approach is to assume that the species listed is present and more detailed studies will be required to confirm the presence or absence of these species, and to gain a better understanding of the environmental impacts the proposed development may have on the species.

The overall SEI for the project site was regarded as of Medium sensitivity. A summary of the SEI evaluation is provided in Table 10 and results mapped in Figure 16.

TABLE 9: Evaluation of the Site Ecological Importance of vegetation communities and habitats on the project site.

VEGETATION COMMUNITY/HABITAT	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SITE ECOLOGICAL IMPORTANCE
Subtropical freshwater wetlands (~ 5,37 ha)	**Medium** • Potential occurrence of EN, VU and NT fauna species (*Crocidura mariquensis, C. maquassiensis, Dasymys incomtus, Pelusios rhodesianus, Hemisus guttatus, Circus ranivorus, Rostratula benghalensis*). Low probability of occurrence for all fauna species. • Potential occurrence of VU flora species (*Wofffiella denticulata, Thesium polygaloides*). Medium – Low probability of occurrence for flora species. • Presence of globally significant species not expected. • Located entirely within a CR ecosystem but habitat already disturbed and transformed. • Located entirely within a NPAES focus area important for terrestrial biodiversity. • Located within wetland habitat listed as VU, but habitat already disturbed and transformed. • Small area (0,038 % of total extent of Subtropical freshwater depression wetlands (total extent = 14 039,32 ha). • Located within the Maputaland-Pondoland biodiversity hotspot. • The extension of wetland unit 9065 into a CBA area of national conservation importance (0,098 ha).	**Low** • Small area (5,37) ha with limited habitat connectivity but migrations may still be possible across some of the surrounding transformed/degraded habitats. • Low rehabilitation potential. Wetlands difficult and costly to restore. • Current negative ecological impacts related to the mowing of the area, vehicle tracks bisecting the wetland habitats (i.e., vegetation disturbance, soil compaction, habitat fragmentation).	**Very low** • Wetland habitat will be unable or very slow to recover from existing impacts and it is unlikely to have a species composition representative of the original natural habitat in future.	**Medium** BI = Low RR = Medium
Maputaland Wooded Grassland (~ 5,83 ha)	**Medium** • Potential occurrence of VU and NT fauna species (*Coracias garrulus, Anthus brachyurus*). High to medium probability of occurrence. • Potential occurrence of EN, VU, NT flora species and species listed Decreasing (*Raphionacme lucens, Pachycarpus concolor* subsp*. arenicola, Kniphofia littoralis,*	**Low** • Small area (5,83) ha with limited habitat connectivity but migrations may still be possible across some of the surrounding transformed/ degraded habitats. • Current negative ecological impacts related to the mowing of the area, vehicle tracks bisecting the grassland habitats (i.e., vegetation	**Low** • Low rehabilitation potential and unlikely to have a species composition representative of the original natural habitat in future.	**Medium** BI = Low RR = Low

VEGETATION COMMUNITY/HABITAT	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SITE ECOLOGICAL IMPORTANCE
	Nidorella tongensis, Freesia laxa subsp*. azurea, Oxygonum dregeanum* subsp. streyi, *Thesium polygaloides and Hypoxis hemerocallidea*). Medium to low probability of occurrence. • Located entirely within a CR ecosystem (Kwambonambi Hygrophilous Grassland). • Located entirely within a NPAES focus area important for terrestrial biodiversity. • Localiton of the project site in a vegetation type listed as EN. • Small area relative to the total extent (112210.42 ha) of this vegetation type (0,005%). • Located entirely within the Maputaland-Pondoland biodiversity hotspot. • Located entirely within a provincial CBA irreplaceable area.	disturbance, soil compaction, habitat fragmentation) and vegetation clearance		

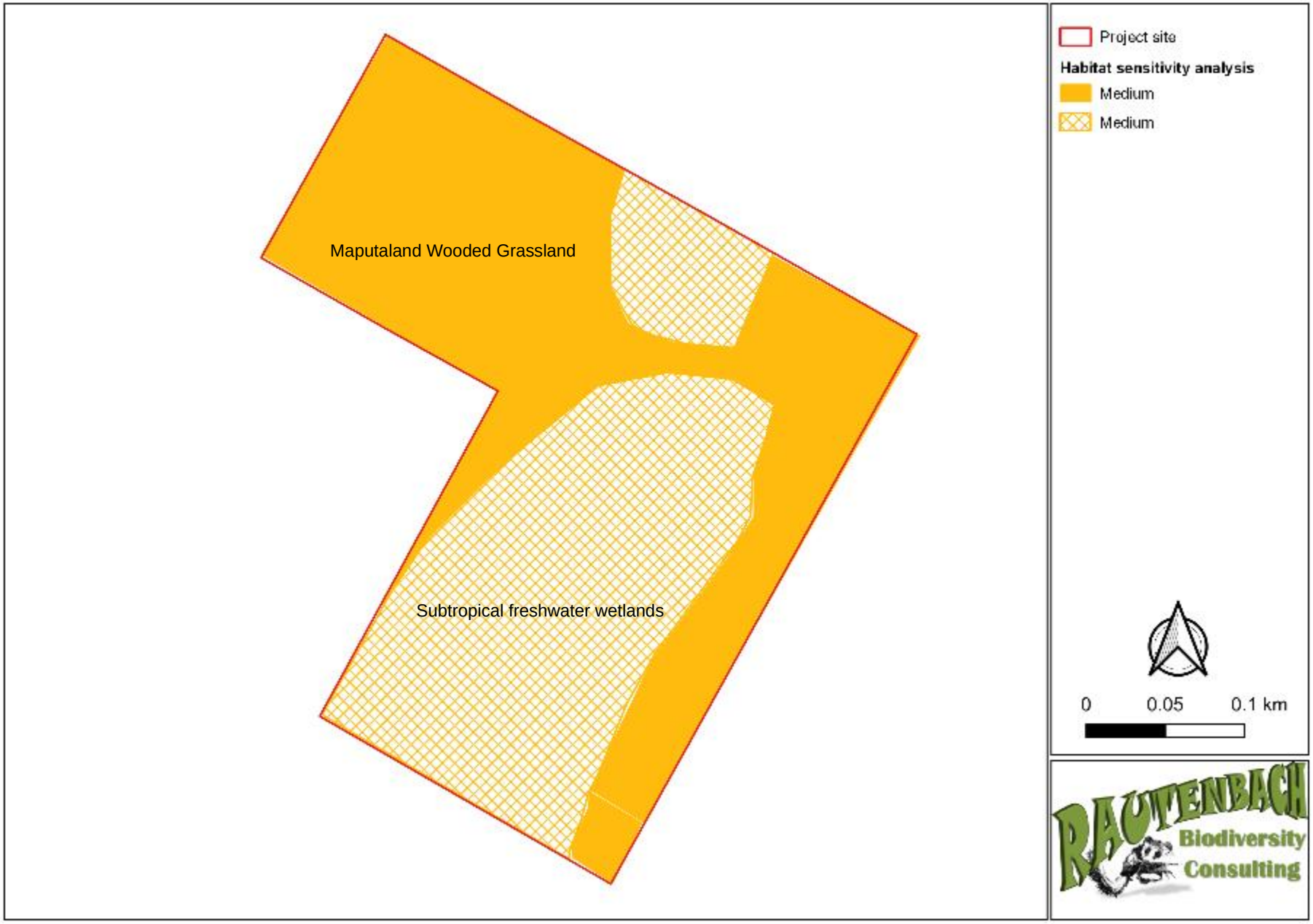


FIGURE 15: Habitat sensitivity analysis of the project site.

4.11 Potential ecological impacts on terrestrial biodiversity

Potential impacts that the proposed development may have on the receiving environment during the construction and operational phases that should be investigated further during the EIA phase is presented in Table 11.

TABLE 10: Identification and summary of potential impact assessment that should be investigated further.

IMPACT DESCRIPTION	DESKTOP SENSITIVITY OF THE SITE	ISSUE	NATURE OF THE IMPACT	EXTENT OF THE IMPACT	NO-GO AREAS
CONSTRUCTION PHASE					
Loss of sensitive terrestrial biodiversity features (NPAES focus areas, the Critically Endangered Kwambonambi Hygrophilous Grassland ecosystem, the Endangered Maputaland Wooded Grassland vegetation type, the Vulnerable Subtropical Freshwater wetlands, National and provincial CBA areas).	Medium	Disturbance and loss of natural indigenous vegetation. The vegetation of the project site was found to be transformed and not representative of the environmental sensitivities identified during the desktop assessment. The impact is expected to be low on account of the degraded nature of the site. The SEI of the site was however regarded as Medium owing to the potential occurrence of SCC fauna and flora although most of the species have Low probabilities of occurrence. The precautionary approach is to assume that the species listed is present and more detailed studies will be required to confirm the presence or absence of these species, and to gain a better understanding of the environmental impacts the proposed development may have on the species.	**Direct impacts** • Habitat fragmentation • Loss of biodiversity • Environmental degradation • Loss of habitat for SCC fauna & flora. **Indirect impacts** • Negative changes to the conservation status of identified biodiversity features. • Negative changes to the conservation status of identified biodiversity features. • Alterations to population dynamics and biotic interactions of species present in the area.	National	None identified on the project site.at this stage but will have to be investigated during the EIA phase when more detailed studies will be conducted. The remaining extent of wetland units 9065 and 9067 outside the boundaries of the project site, and wetland units 9063 and 9071 (Figure 10) should be regarded as no-go areas.
Potential loss of SCC flora species and habitat.	Medium	Disturbance and loss of natural indigenous vegetation during vegetation clearance. The SEI of the site was regarded as Medium owing to the potential occurrence of SCC flora although the majority of the species have Low probabilities of occurrence. The precautionary approach is to assume that the species listed is present and more detailed studies will be required to confirm the presence or absence of these species, and to gain a better understanding of the environmental impacts the proposed	**Direct impacts** associated with the removal of vegetation during the construction phase include: • The complete destruction of SCC flora species. • Fragmentation of populations on the affected areas. • Loss of genetic variation within a community. • Illegal collection of sensitive flora. **Indirect impacts** • Negative change of a species' conservation status on national/regional scale.	National	No specific no-go areas have been identified at this stage. This will be further investigated during the EIA phase when more detailed flora studies will be conducted to confirm the

IMPACT DESCRIPTION	DESKTOP SENSITIVITY OF THE SITE	ISSUE	NATURE OF THE IMPACT	EXTENT OF THE IMPACT	NO-GO AREAS
		development may have on these species.			presence or absence of Red Listed flora species potentially present.
Potential loss of SCC fauna species and fauna habitat.	Medium	The SEI of the site was regarded as Medium owing to the potential occurrence of SCC fauna although the majority of the species have Low probabilities of occurrence. The precautionary approach is to assume that the species listed is present and more detailed studies will be required to confirm the presence or absence of these species, and to gain a better understanding of the environmental impacts the proposed development may have on the species. The complete removal of vegetation during construction activities to accommodate infrastructure will result in a general loss of habitat of fauna species and cause a general reduction in fauna diversity.	**Direct impacts** • Loss/displacement of SCC fauna species. • Inadvertent killing of slow-moving species during earthworks. • Illegal collection/poaching of fauna species. • Loss of genetic variation. • Isolation of local fauna populations. • Loss of fauna diversity. • Habitat fragmentation. **Indirect impacts** • Alterations to population dynamics and biotic interactions. • Negative change of a species' conservation status on national/regional scale.	National	No specific no-go areas have been identified at this stage. This will be further investigated during the EIA phase when more detailed fauna studies will be conducted to confirm the presence or absence of Red Listed fauna species.
Soil and water contamination of wetlands (fauna, flora, Wetland habitat)	Medium	Untreated wastewater and other effluents from the construction activities may contaminate wetland habitats on the project site and adjacent properties. Hazardous materials and non-hazardous waste if disposed of into the surroundings may contaminate the soil and water resources of the proposed sites.	**Direct impacts** • Loss of fauna & flora habitat. • Habitat degradation. • Loss of biodiversity. **Indirect impacts** • Changes in trophic interactions of species.	Local	None identified at this stage and will be investigated during the EIA phase.
Colinization by IAPs and weeds	Medium	The colonization of areas by weeds and IAPs (Invasive Alien Plants) poses a risk to indigenous plant species and would be facilitated by disturbance of natural vegetation and surface soil layers during construction. IAPs and indigenous weeds can out-compete and replace indigenous flora, which will in	**Direct impacts** • Decrease in species richness and diversity. • Changes to the physical and structural complexity of the environment. **Indirect impacts** • Habitat loss/alteration	Local	None identified at this stage and will be investigated during the EIA phase.

IMPACT DESCRIPTION	DESKTOP SENSITIVITY OF THE SITE	ISSUE	NATURE OF THE IMPACT	EXTENT OF THE IMPACT	NO-GO AREAS
		turn impact on natural biodiversity. Clearing and disturbance is also likely to result in an increase in edge habitat immediately adjacent to disturbed areas. Edge habitat is characterized by a predominance of generalist and alien species that are usually highly competitive species which can invade areas of established vegetation.	• Change in ecosystem processes (e.g., changes in soil nutrient dynamics.		
OPERATIONAL PHASE					
Impacts on fauna species caused by permanent alterations in nighttime conditions.	Medium	Alteration of the natural variation in diurnal and nocturnal light intensities and spectral properties have the potential to disrupt the physiology, behaviour, and ecology of herpetofauna (Perry *et al*., 2008) and mammal species such as bats (Stone *et al*., 2009; Gaston *et al*., 2012).	**Direct impacts** • Loss of fauna and flora diversity. **Indirect impacts** • Changes in trophic interactions of species.	Local	None identified at this stage and will be investigated during the EIA phase.
Spread of IAPs and weeds to adjacent habitats	Medium	This impact is generally initiated during the construction phase, when large areas of vegetation are cleared to accommodate infrastructure. This creates ideal opportunities and optimal conditions for weeds and alien & invasive plant species to invade disturbed areas. IAPs and indigenous weeds can out-compete and replace indigenous flora, which will in turn impact on natural biodiversity. Clearance and disturbance can also result in an increase in 'edge habitat' immediately adjacent to disturbed areas. These areas are particularly prone to alien & invasive species invasions and can invade areas of established vegetation. The spread of IAPs and weeds to adjacent sensitive areas can be exacerbated if not effectively managed and may even introduce new alien species to sensitive areas because of disturbance.	**Direct impacts** • Decrease in species richness and diversity. • Changes to the physical and structural complexity of the environment. **Indirect impacts** • Habitat loss/alteration • Change in ecosystem processes (e.g., changes in soil nutrient dynamics.	Local	None identified at this stage and will be investigated during the EIA phase.
GAPS IN KNOWLEDGE AND RECOMMENDATIONS FOR FURTHER STUDIES					

IMPACT DESCRIPTION	DESKTOP SENSITIVITY OF THE SITE	ISSUE	NATURE OF THE IMPACT	EXTENT OF THE IMPACT	NO-GO AREAS
• The presence of SCC fauna and flora species should be confirmed with more detailed specialist assessments. • Flora and vegetation studies should be conducted during the summer season (beginning of November – end of April. • The mowing of the vegetation on the site significantly decreases the detection probability of several SCC flora species potentially present. **Further environmental disturbance should not be allowed until the relevant authorities have granted environmental authorization for the proposed development.** • A detailed wetland assessment will be required by a suitably qualified specialist to assess the condition of the wetland habitats on the project site. • Although the project site falls within several areas considered to be of terrestrial biodiversity importance, due to the degraded nature of the site, the terrestrial biodiversity is not representative of the environmental sensitivities identified during the desktop assessment. However, several SCC fauna and flora species may potentially be present. The identification of no-go areas will therefore be dependent on the results of more detailed fauna, flora and wetland assessments. Consequently, the identification of no-go areas can only be conducted following the completion of the recommended studies.					

4. CONCLUSIONS AND RECOMMENDATIONS

The project site falls entirely within a NPAES focus area, the 'Critically Endangered' Kwambonambi Hygrophilous Grassland ecosystem, the 'Endangered' Maputaland Wooded Grassland vegetation type, and intersects with 'Vulnerable' Subtropical Freshwater wetlands and National and Provincial CBA areas. These findings are therefore in contradiction with local (uMhlathuze municipality) conservation planning objectives which zoned the project site for the development of noxious industries, with only a small area on Phase 1F (Figure 11) set aside for conservation.

During the preliminary site inspection, it was determined that the site is already degraded and therefore not representative of the environmental sensitivities identified during the desktop assessment, and unlikely to support high levels of biodiversity.

Nevertheless, several SCC fauna and flora species may potentially be present, albeit probability of occurrence is regarded as Low for most of the species. The precautionary approach is to assume that the species listed is present and more detailed studies will be required to confirm the presence or absence of these species, and to gain a better understanding of the environmental impacts the proposed development may have on SCC fauna and flora.

It is therefore recommended that the presence of SCC fauna and flora should be confirmed with more detailed assessments during the EIA phase.

Flora and vegetation studies should be conducted during the summer season (beginning of November to end of April for KwaZulu-Natal) and should include the following:

- The location and extent of all plant communities on the project site should be documented and mapped according to the guidelines and requirements provided in the Sensitivity Mapping Rules for Biodiversity Assessments (EKZNW Guidelines for Biodiversity Impact Assessments, 2013); the Protocols for the Specialist assessment and minimum report content requirements for environmental impacts on biodiversity [G 43310 – GB320], and the Species Environmental Assessment Guidelines (Version 1.0) (SANBI 2020).
- A list of plant species should be provided, indicating the number of forbs/herbs, grasses, shrubs, tree species and a description of the vegetation structure for each plant community identified. Medicinal and exotic/invasive species should be indicated.
- All Red and Orange listed plant species, as well as plant populations should be mapped out with a GPS (WGS84 datum; geographic coordinate system).
- Protective buffer zone widths, consistent with the Red List Plant Species Guidelines should be designated as sensitive on a sensitivity map.

Fauna studies should include the following:

- To assess the significance of the fauna habitat components of the site qualitatively and quantitatively.
- To provide a detailed list of all fauna species confirmed to be present on site and all adjacent properties within a 500 m radius.
- To provide GPS locations (WGS 84 datum; geographic coordinate system) of all Red listed, provincially protected and endemic fauna species confirmed to be present on site, as well as the location and extent of all habitats for Red Listed species on site and on adjacent properties within a 500 m radius a sensitivity map (Guidelines for Biodiversity Impact Assessments in KZN, 2013; Protocols for the Specialist assessment and minimum report content requirements for environmental impacts on biodiversity [G 43310 – GB320], and the Species Environmental Assessment Guidelines (Version 1.0) (SANBI 2020).
- To determine the size and location of buffer zones for all Red Data fauna species. Buffer zone sizes should be motivated in terms of the latest research.
- To provide detailed site-specific mitigation measures where appropriate.

For the avifauna field survey, an ecosystem/regional approach should be adopted and should include the following:

- To determine wether the proposed development site falls within the known or expected distributional range of any of the Red List Bird Species.
- To determine if suitable habitat occurs on the proposed development site or neighbouring properties for Red Listed Bird Species whose distributional ranges overlap with the proposed development site.
- All flight paths, breeding sites and related buffer and specific threat areas (e.g., collisions, electrocutions etc.) should be indicated on sensitivity map according to the Sensitivity Mapping Rules for Biodiversity Assessments (Guidelines for Biodiversity Impact Assessments in KZN, 2013; Protocols for the Specialist assessment and minimum report content requirements for environmental impacts on biodiversity [G 43310 – GB320], and the Species Environmental Assessment Guidelines (Version 1.0) (SANBI 2020).

It is also recommended that a detailed wetland assessment should also be conducted by a suitably qualified specialist to assess the condition of the wetland habitats on the project site.

The detection probability of many of the SCC flora species listed in Table 7 is reduced by the mowing of the site. **Further environmental disturbance should not be allowed until the relevant authorities have granted environmental authorization for the proposed development.**

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APPENDIX 1: Regional and provincial vegetation type summaries.

MAPUTALAND WOODED GRASSLAND (Mucina & Rutherford, 2006 vegetation description	
Historical distribution	KwaZulu-Natal Province and southern Mozam¬bique: In South Africa from the Mozambique border near KwaNgwanase southwards to Sileza, Sibaya, Mseleni, Mbaz¬wana, Sodwana Bay, Ozabeni, eastern and western shores of Lake St Lucia, KwaMbonambi and as far south as near Richards Bay. Altitude varies from about 20–120 m.
Vegetation & landscape features	Generally flat landscape of the Maputaland coastal plain supporting coastal sandy grasslands rich in geoxylic suffrutices, dwarf shrubs, small trees and very rich herbaceous flora. Excluded from this unit are the many interdune depression wetlands and hygrophilous grasslands neighbouring the wooded grasslands.
Geology & soils	Quaternary redistributed sand supporting yellowish redistributed sands of the Berea Formation (Maputaland Group). These are dystric regosols building dune crests, slopes and relatively high-lying level plains. Water table found at depth 1.6–2.0 m below surface (and slightly deeper) in average rainfall years.
Important taxa	
Geoxylic suffrutices (# suffrutex form)	*Parinari curatellifolia*, *Salacia kraussii*, *Ancylobotrys petersiana*, *Diospyros galpinii*, *Eugenia capensis*#, *Syzygium cordatum*#.
Graminoids	*Diheteropogon amplectens*, *Themeda triandra* (d), *Aristida stipitata* subsp. *graciliflora*, *Bewsia biflora*, *Cyperus obtusiflorus*, *C. tenax*, *Digitaria natalensis*, *Eustachya paspaloides*, *Setaria sphacelata*, *Sporobolus fimbriatus*, *S. subulatus*, *Urelytrum agropyroides*.
Herbs	*Chamaecrista plumosa*
Geophytic herbs	*Cyrtanthus galpinii*
Low shrubs	*Helichrysum kraussii* (d), *Agathisanthemum bojeri*, *Crotalaria monteiroi* var. *monteiroi*.
Small trees and tall shrubs	*Acridocarpus natalitius* var. *linearifolius*, *Dichrostachys cinerea* subsp. *nyassana*, *Diospyros lycioides* subsp. *sericea*, *Hyphaene coriacea*, *Terminalia sericea*.
Biogeographically important taxa Taxa ([C]Coastal belt element, [M]Maputaland endemic, [S]Southern distribution limit)	
Geoxylic suffrutices	*Eugenia albanensis*[C], *Gymnosporia markwardii*[M]
Graminoids	*Abildgaardia hygrophila*[C], *Cyperus natalensis*[C]
Herbs	*Helichrysopsis septentrionale*[M]; *Oxygonum robustum*[M], *Tricliceras mossambicense*[M]
Tall shrubs	*Grewia microthyrsa*[S]
Woody climbers	*Albertisia delagoensis*[S], *Cissampelos hirta*[S]
Endemic taxa (# Suffrutex form)	
Geoxylic suffrutices	*Ochna* sp. nov., *Syzygium cordatum*#
Succulent herb	*Aloe* sp. nov. (*Strey 5100 PRE*)
Geophytic herb	*Brachystelma vahrmeijeri*
Conservation status (SANBI 2006 – 2018; Jewitt, 2018)	**ENDANGERED**
Conservation target (SANBI 2006 – 2018; Jewitt, 2018)	25%
Level of protection (SANBI 2006 – 2018; Jewittt, 2018)	Moderately protected (MP)
SUBTROPICAL FRESHWATER WETLANDS (Mucina & Rutherford, 2006 vegetation description)	
Historical distribution	KwaZulu-Natal, Mpumalanga, Gauteng, North-West, Limpopo and Eastern Cape Provinces as well as in Swaziland: Wetlands embedded within the Albany Thicket Biome, the Coastal Belt from Transkei as far as Maputaland as well as those of Lowveld and the Central Bushveld regions. Altitude ranging from 0–1 400 m.
Vegetation and landscape features	Flat topography supporting low beds dominated by reeds, sedges and rushes, waterlogged meadows dominated by grasses. Found typically along edges of often seasonal pools in aeolian depressions as well as fringing alluvial backwater pans or artificial dams.

Geology, soil and hydrology	Waterlogged, clayey soils of Champagne and Arcadia forms, containing certain levels of decaying organic matter, especially in very productive reed beds. These wetlands are underlain mostly by Cenozoic alluvium, less so by Karoo Supergroup volcanic rocks and sediments, as well as by the Cretaceous (and younger coastal) sediments of the Zululand and Maputaland Groups. Waterlogged habitats with water regularly forming columns of variable depth. The highest water levels are found in summer, during periods of maximum seasonal rainfall.
Important taxa	
Marshes	
Small trees	*Hyphaene coriacea* (d), *Phoenix reclinata* (d)
Graminoids	*Chloris virgata* (d), *Cynodon dactylon* (d), *Cyperus articulatus* (d), *Dactyloctenium aegyptium* (d), *Diplachne fusca* (d), *Echinochloa pyramidalis* (d), *Fimbristylis obtusifolia* (d), *Hemarthria altissima* (d), *Imperata cylindrica* (d), *Ischaemum arcuatum* (d), *Leersia hexandra* (d), *Pycreus mundii* (d), *Sporobolus nitens* (d), *S. smutsii* (d), *Urochloa stolonifera* (d), *Bolboschoenus glaucus, Courtoisia cyperoides*, *Cyperus alopecuroides*, *C. pectinatus*, *Digitaria natalensis*, *Echinochloa stagnina*, *Eragrostis chapelieri, E. lappula, Eriochloa meyeriana*, *Fimbristylis bisumbellata*, *Fuirena ecklonii*, *Oxycaryum cubense*, *Paspalidium obtusifolium*, *Paspalum commersonii*, *Pycreus pelophilus*, *P. polystachyos*, *Scleria poiformis*, *Sporobolus consimilis*.
Herbs	*Pentodon pentandrus* (d), *Persicaria senegalensis* (d), *Burmannia madagascariensis, Centella coriacea*, *Commelina diffusa, Convolvulus mauritanicus*, *Desmodium dregeanum*, *Eclipta prostrata, Epaltes gariepina*, *Eriocaulon abyssinicum*, *Ethulia conyzoides*, *Glinus lotoides*, *Hydrocotyle ranunculoides, Ludwigia adscendens* subsp. *diffusa*, *L. leptocarpa*, *L. octovalvis*, *L. palustris*, *Neptunia oleracea*, *Persicaria attenuata* subsp. *africana, P. hystricula*, *Rorippa madagascariensis*, *Sium repandum*, *Vahlia capensis*.
Geophytic herbs	*Eulophia angolensis*, *Zeuxine africana*
Succulent herbs	*Salicornia pachystachya*.
Semiparasitic herb	*Buchnera longespicata*
Aquatic herbs	*Bergia salaria*, *Lagarosiphon crispus*.
Lakes and ponds	
Graminoids	*Eleocharis dulcis* (forming rafts)
Aquatic herbs	*Azolla pinnata* var. *africana* (d), *Ceratophyllum demersum* (d), *Lemna minor* (d), *Nymphaea nouchali* var. *caerulea* (d), *Pistia stratiotes* (d), *Wolffia arrhiza* (d), *Aponogeton desertorum, A. natalensis, A. rehmannii, Ceratophyllum muricatum*, *Marsilea macrocarpa*, *Najas marina* subsp. *delilei*, *N. pectinata*, *Nymphoides indica* subsp. *occidentalis*, *N. rautanenii*, *Ottelia exserta*, *Potamogeton crispus*, *P. pectinatus*, *P. schweinfurthii*, *Spirodela polyrhiza*, *S. punctata, Trapa natans* var. *bispinosa*.
Carnivorous herbs	*Utricularia gibba* subsp. *exoleta*, *U. inflexa*, *U. subulata*
Geophytic herbs	*Crinum paludosum*
Reed & sedge beds	
Megagraminoids	*Cladium mariscus* subsp. *jamaicense* (d), *Cyperus papyrus* (d), *Phragmites australis* (d), *P. mauritianus* (d), *Schoenoplectus corymbosus* (d), *S. scirpoideus* (d), *Typha capensis* (d). Graminoids: *Cyperus fastigiatus* (d), *C. difformis*, *C. digitatus, C. latifolius*, *C. sexangularis*, *Fuirena ciliaris*.
Biogeographically important taxa (all southernmost distribution limit)	
Streambanks	
Herbs	*Floscopa glomerata, Ipomoea aquatica*
Geophytic herbs	*Bolbitis heudelotii*.
Lakes and ponds	
Aquatic herbs	*Brasenia schreberi*, *Ceratopteris cornuta, Wolffia globosa, Wolffiella welwitschii.*
Herbs	*Hygrophila schulli, Limnophyton obtusifolius, Marsilea apposita, M. coromandelina, M. minuta*, *M. villifolia*
Reed and sedge beds	
Graminoids	*Cyperus dives, C. procerus, C. prolifer.*
Endemic taxa	

Marshes	
Graminoids	*Cyperus sensilis* (embedded within Indian Ocean Coastal Belt of KwaZulu-Natal).
Lakes and ponds	
Geophytic herbs	*Crinum campanulatum* (Albany region).
Aquatic herbs	*Isoetes wormaldii* (Albany region), *Wolffiella denticulata* (Maputaland).
Conservation status (Jewittt, 2018)	**VULNERABLE**
Conservation target (Jewitt, 2018)	24%
Level of protection (SANBI 2006 – 2018; Jewitt, 2018)	Moderately protected (MP)

APPENDIX 2: Red Listed flora species known/expected to be present in KwaZulu-Natal.

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	**SCIENTIFIC NAME**	**SA RED LIST STATUS**	**NEMBA (2015)**	**PROVINCIAL**	**SA ENDEMISM**	**GROWTH FORM**	**PREFERRED HABITAT**	**FLOWERING TIME**	**PROBABILITY OF OCCURRENCE**	**MOTIVATION**
APOCYNACEAE	*Asclepias gordon-grayae*	EN	-	Sched 7	Endemic	Herb	Tall, unburnt coastal grassland, in black peat soils in marshy areas, 10-100 m.	Sep - Apr	Unlikely	No habitat/grassland species. No confirmed records of occurrence within 5 km of the project site.
	Brachystelma petraeum	VU	-	Sched 12	Endemic	Succulent/geophyte	Moist grassland, in humus pockets in crevices of large, flat rock surfaces and flat, damp basal gravel. Midlands Mistbelt Grassland, Mooi River Highland Grassland, Drakensberg Foothill Moist Grassland.	Spring	Unlikely	No habitat.
ASPHODELACEAE	** *Aloe saundersiae*	EN	-	Sched 7	Endemic	Succulent/herb	It occurs in crevices and small pockets on cool, semi-shaded rocky slopes in mistbelt and moist grassland. KwaZulu-Natal Sandstone Sourveld, Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland	Feb-Mar	Unlikely	No habitat
	** *Aloe umfolozienesis*	LC	-		Kzn endemic	Succulent/herb	It occurs in river valleys with savanna and wooded grassland. Maputaland Coastal Belt, KwaZulu-Natal Coastal Belt Grassland, Tembe Sandy Bushveld, Western Maputaland Clay Bushveld, Zululand Coastal Thornveld, Eastern Valley Bushveld, Southern Lebombo Bushveld, Northern Zululand Sourveld, Zululand Lowveld	Jul-Aug	Unlikely	Not observed during site verification visit. Unlikely to have been missed owing to its

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
										conspicuous nature.
	Kniphofia leucocephala	CR	-	Sched 7	Endemic	Herb	Known only from vleis or wetlands in low-lying coastal grassland in the Richards Bay area of KwaZulu-Natal	Feb-Mar	Unlikely	Known from only one location close to Lake Mzingazi
ASTERACEAE	*Gerbera aurantiaca*	EN		Sched 12	SA endemic	Herb	Mistbelt grassland, well-drained doleritic areas. Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland, Dry Coast Hinterland Grassland, Northern Zululand Mistbelt Grassland, KaNgwane Montane Grassland, Paulpietersburg Moist Grassland, Wakkerstroom Montane Grassland	Aug-Oct	Unlikely	Preferred habitat absent.
	Senecio ngoyanus	VU		Sched 7		Herb	Formerly widespread along the coast of KwaZulu-Natal from Stanger northwards, now only occurring around St. Lucia and Ngoye Forest. It also occurs in southern Mozambique.	Unknown	Unlikely	Outside of currant distributional range. No habitat.
	Cineraria atriplicifolia	VU	-	Sched 7	Endemic	Herb	Grassland, open dry thornveld, or sometimes at the edges of thicket or forest or below steep cliffs in river valleys, 30-800 m.	Mar-Jul	Unlikely	Outside of currant distributional range. No habitat.
BEGONIACEAE	*Begonia dregei*	EN	EN	Sched 7	Endemic	Succulent/herb	Rocky cliffs, steep earth banks and among rocks in forest below 600 m. Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest	Dec-Aug	Unlikely	No habitat

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
CELASTRACEAE	*Elaeodendron croceum*	DECLINING	-	Sched 8	-	Tree	Margins of coastal and montane forests.	Oct-May	Unlikely	No habitat
CURTISIACEAE	*Curtisia dentata*	NT		Sched 8	-	Shrub/tree	Evergreen forest from coast to 1800 m.	Oct-Mar	Unlikely	No habitat
EUPHORBIACEAE	*Acalypha entumenica*	EN		Sched 7	SA endemic	Herb	Mistbelt and Ngongoni Grassland on dolerite, 850-1 600 m. Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland.	Unknown	Unlikely	No habitat.
FABACEAE	*** *Philenoptera sutherlandii*	LC		Sched 8	SA endemic	Tree	Scarp forest	Nov-Mar	Unlikely	No habitat
GESNERIACEAE	*Streptocarpus wendlandii*	RARE		Sched 8	Rare/KZN endemic	Epiphyte/herb	A range-restricted species (EOO <50 km²), but not threatened. Scarp forest 300-500 m, grows on steep earth banks but is occasionally epiphytic.	Dec-Mar	Unlikely	No habitat
HYACINTHACEAE	*Merwilla plumbea*	NT	PROT	Sched 8	-	Geophyte	Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m. Grassland biome.	Sept-Dec	Unlikely	No habitat
IRIDACEAE	*Dierama argyreum*	LC		Sched 12	Kzn endemic	Geophyte/herb	In grassland, 200 – 1900 m.	Sept-Feb	Unlikely.	No confirmed records for the Richards Bay area.
LAURACEAE	*Cryptocarya myrtifolia*	VU	VU	Sched 7	SA endemic	Tree	Evergreen, mistbelt and scarp forests, on steep slopes and valley bottoms, close to waterfalls and streams. Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest	Oct-Feb	Unlikely	No habitat

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	SA ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME	PROBABILITY OF OCCURRENCE	MOTIVATION
	Cryptocarya wyliei	NT		Sched 8	SA endemic	Shrub/tree	Scarp forest. Occurs on forest margins, in fringes of riverine forest, thicket and coastal bush.	Dec-Jan	Unlikely	No habitat
	**** Ocotea bullata*	EN		Sched 7	SA endemic	Tree	High, cool, evergreen Afromontane forests. Northern Coastal Forest, Southern Coastal Forest, Scarp Forest, Northern Mistbelt Forest, Southern Mistbelt Forest, Northern Afrotemperate Forest, Southern Afrotemperate Forest.	Nov-May	Unlikely	No habitat
OLINIACEAE	*Olinia radiata*	LC		Sched 8	Kzn endemic	Tree	It occurs in mistbelt and afromontane forest. Northern Coastal Forest, Scarp Forest, Northern Mistbelt Forest, Southern Mistbelt Forest.	Sept-Feb	Unlikely	No habitat
ORCHIDACEAE	*** Disa zuluensis*	EN		Sched 12/Sched 7	SA endemic	Geophyte/herb	Swampy areas, vleis in grassland, 1500-2000 m. Income Sandy Grassland, KwaZulu-Natal Highland Thornveld, Steenkampsberg Montane Grassland, Wolkberg Dolomite Grassland, Sekhukhune Montane Grassland	Dec-Jan	Unlikely	No habitat
	Mystacidium aliceae	VU		Sched 12/Sched 7	SA endemic		Occurs in thick scrub in hilly regions as a low-level epiphyte in shady conditions. Northern Coastal Forest, Southern Coastal Forest, Scarp Forest	Spring/summer	Unlikely	No habitat
	*** Schizochilus gerrardii*	EN		Sched 12/Sched 7	SA endemic	Geophyte/herb	Mistbelt grassland, around margins of rock outcrops in shallow soil, frequently in slight seepages, 1200 m. Northern Zululand Mistbelt Grassland	Dec-Jan	Unlikely	No habitat
	******** *Bonatea lamprophylla*	VU	VU	Sched 12/Sched 7	-	Geophyte/herb	Deeply shaded areas in coastal dune forest.	Sept-Oct	Unlikely	No habitat
	*** Disperis johnstonii*	NT	-	Sched 12/Sched 8	-	Geophyte/herb	*Brachystegia* woodland, forest patches, usually in shelter of rocks, 1050-1350 m.	Mar-Jun	Unlikely	No habitat

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY				
FAMILY	**SCIENTIFIC NAME**	**SA RED LIST STATUS**	**NEMBA (2015)**	**PROVINCIAL**	**SA ENDEMISM**	**GROWTH FORM**	**PREFERRED HABITAT**	**FLOWERING TIME**	**PROBABILITY OF OCCURRENCE**	**MOTIVATION**
PASSIFLORACEAE	*Adenia gummifera* var. *gummifera*	DECLINING	-	Sched 12/Sched 8	-	Succulent/climber	Forested ravines, forest patches and forest margins, forest scrub, miombo woodland, savanna, dune forest, on stony slopes, termitaria and littoral bush, 0-1 800 m.	Oct-Apr	Unlikely	No habitat
RESTIONACEAE	*Restio zuluensis*	VU	-	Sched 7	-	Restioid/dwarf shrub	Grows on the margins of wetlands in short coastal grassland. Northern KwaZulu-Natal (from Kwambonambi) and southern Mozambique.	Insufficient information	Unlikely	Not known from the Richards Bay area
ZAMIACEAE	*Stangeria eriopus*	VU	VU	Sched 12/Sched 7		Geophyte/herb	Scarp and coastal forest, Ngongoni and coastal grassland. KwaZulu-Natal Coastal Belt Grassland, Pondoland-Ugu Sandstone Coastal Sourveld, Scarp Forest, Moist Coast Hinterland Grassland, Transkei Coastal Belt, KwaZulu-Natal Coastal Belt Thornveld, Northern Coastal Forest, Northern Zululand Sourveld, KwaZulu-Natal Sandstone Sourveld, Eastern Valley Bushveld, Bhisho Thornveld, Southern Lebombo Bushveld, Maputaland Coastal Belt, Lebombo Summit Sourveld, KwaZulu-Natal Hinterland Thornveld, Dry Coast Hinterland Grassland		Unlikely	No collection records for Richards Bay.
	* *Encephalartos natalensis*	NT	PROT	Sched 7	KZN endemic	Shrub/tree	Cliffs and either hot, dry slopes or cool, south-facing, often forested slopes. Forest, Grassland, Indian Ocean Coastal Belt, Savanna		Unlikely	No habitat
	* *Encephalartos ngoyanus*	VU	VU	Sched 7		Geophyte/dwarf shrub/shrub	Open grassland and forest margins, often among boulders. Southern Lebombo Bushveld, Scarp Forest, KwaZulu-Natal Coastal Belt Grassland		Unlikely	No habitat.

*** CITES Appendix I**

**** CITES Appendix II**

***** SA Forest Act**

APPENDIX 3: Red Listed fauna species known/expected to be present in KwaZulu-Natal.

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**	**SA RED LISTING**	**NEMBA 2015**	**PROVINCIAL**	**CITES**	**SA ENDEMISM**	**HABITAT**	**PROBABILITY OF OCCURRENCE**	**MOTIVATION**
MAMMALS										
BOVIDAE	*Cephalophus natalensis*	Natal Red Duiker	NT	-	Sched 2/Sched 4	-	No	Indigenous forests, dense thickets, including coastal, riverine, swamp and montane slope forests and forest clumps, as well as wooded ravines.	None	No habitat
	Philantomba monticola	Blue duiker	VU	VU	Sched 2/Sched 4	II	No	Forested and wooded habitats, including primary and secondary forests, gallery forests, dry forest patches, coastal scrub farmland and regenerating forest.	None	No habitat
	Ourebia Ourebi	Oribi	EN	-	Sched 2/Sched 4	-	Near	Savannah woodlands, floodplains, and other open grasslands, from around sea level to about 2,200 masl. (Mpumalanga Province).	None	No habitat
FELIDAE	*Leptailurus serval*	Serval	NT	PROT	Sched 4	II	No	In and around marshland, well-watered savannah, and long-grass environments, and are particularly associated with reed-beds and other riparian vegetation types.	None	No habitat
HIPPOSIDERIDAE	*Cloeotis percivali*	Short-eared Trident Bat	EN	-	Sched 3	-	No	Savannah and woodland areas with sufficient cover in the form of caves and mine tunnels for day roosting.	None	No habitat
MINIOPTERIDAE	*Miniopterus inflatus*	Greater long-fingered bat	NT	-	Sched 3	-	No	Associated with moist savannah habitats, depending on the availability of roosting sites (primarily caves).	None	No habitat and suitable roosting sites on project site or immediate vicinity.
MURIDAE	*Otomys auratus*	Vlei Rat (Grassland type)	NT	-	-	-	No	Mesic grasslands and wetlands within alpine, montane and sub-montane regions in dense vegetation in close proximity to water.	Unlikely	No habitat

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
	Otomys laminatus	Laminate Vlei Rat	NT	-	-	-	Endemic	Mesic sub-montane grasslands along the Drakensberg foothills and has also been recorded from coastal forests as well as Restio-dominated coastal and mountain fynbos.	Unlikely	No habitat
MUSTELIDAE	*Aonyx capensis*	Cape Clawless Otter	NT	-	Sched 3	II	No	Predominantly aquatic and seldom found far from permanent water. Fresh water is an essential habitat requirement.	Unlikely	No habitat
	Hydrictis maculicollis	Spotted-necked Otter	VU	-	Sched 3	II	No	Freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes.	Unlikely	No habitat
	Poecilogale albinucha	African Striped Weasel	NT	-	Sched 3	-	No	Savannah and grassland habitats, although it probably has a wide habitat tolerance and has been recorded from lowland rainforest, semi-desert grassland, fynbos with dense grass and pine.	Unlikely	No evidence of a dense rodent population (preferred prey species) on the project site.
NYCTERIDAE	*Nycteris woodi*	Wood's Slit-faced Bat	NT	-	-	-	End of range	Semi-arid and moist woodland savannahs (including miombo and mopane woodlands) where suitable day-roosts such as hollow trees, caves, rock fissures, maine adits and buildings are available.	Unlikely	No habitat/roosting sites
RHINOLOPHIDAE	*Rhinolophus blasii*	Peak-saddle Horseshoe Bat	NT	-	Sched 3	-	End of range	Savannah woodlands and are dependent on the availability of daylight roosting sites such as caves, mine adits or boulder piles.	Unlikely	No habitat/roosting sites
SORICIDAE	*Myosorex sclateri*	Sclater's Forest Shrew	VU	-	Sched 3	-	Endemic	Near water in subtropical swamps and coastal forests. Present in grassland, wetland and reedbed habitats.	Unlikely	No habitat

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
VESPERTILIONIDAE	*Kerivoula argentata*	Damara Woolly Bat	NT	-	Sched 3	-	End of range	Evergreen forests, riverine forests and both mesic and dry woodland savannahs (including bushveld and miombo), mostly occurring in riverine associations such as riparian corridors.	Unlikely	No habitat
	Laephotis wintoni	De Winton's Long-eared Bat	VU	-	-	-	End of range	Appears to prefer highland, mountainous grassland regions and has also been recorded from mountainous areas within mosaics of evergreen bushland, secondary wooded grasslands and farmlands, and forests.	Unlikely	No habitat
REPTILES										
CORDYLIDAE	*Chamaesaura macrolepis*	Large-scaled grass lizard	NT	-	-	-	Near endemic to KZN	Occurs in the Savanna, Indian Ocean Coastal Belt and Grassland biomes in grassland, especially rocky, grassy hillsides.	Unlikely	No records from the Richards Bay area.
CROCODYLIDAE	*Crocodylus niloticus*	Nile crocodile	VU	VU	Sched 7/Sched 3	II	No	Rivers	Unlikely	No habitat
ELAPIDAE	*Dendroaspis anguticeps*	Green mamba	VU	VU	Sched 3	-	No	In South Africa it is restricted to small patches of low altitude forests along the KwaZulu-Natal coastline, extending as far south as the extreme northeastern parts of the Eastern Cape.	Unlikely	No habitat
BIRDS										
ACCIPITRIDAE	*Aquila rapax*	Eagle, Tawny	EN	EN	Sched 3	II	No	Favours open savanna woodland. Able to colonize treeless areas where pylons can support nest structures.	Unlikely	Mostly confined to protected areas.
	Buteo rufofuscus	Buzzard, Jackal	LC	-	Sched 3	II	Near endemic	Hilly and mountainous regions from sea level to 3000 m.	Unlikely	No habitat
	Circaetus fasciolatus	Snake-eagle,	CR	-	Sched 3	II	No	Lowland evergreen forest, sand forest and plantation margins; in	Unlikely	No habitat

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
		Southern Banded						SE Zimbabwe in mixed miombo woodland and evergreen forest.		
	Polemaetus bellicosus	Eagle, Martial	EN	EN	Sched 3	II	No	Mostly open savanna and woodland on plains, also semi-arid shrublands; rare in mountainous areas.	Unlikely	Last recorded in the area in 2008.
	Stephanoaetus coronatus	Eagle, African Crowned	VU	-	Sched 3	II	No	Favours tall closed canopy forest, also found in riparian forest, dense woodland, and forested gorges in grassland. Inhabits gum and pine plantations.	Unlikely	No habitat
ALCEDINIDAE	*Halcyon senegaloides*	Kingfisher, Mangrove	EN	-	Sched 3	-	No	Occupies two different habitats. The non-br season (Mar-Sept) is spent in mangroves. During Oct-Mar, the KwaZulu-Natal population migrates to the Transkei estuarine forests, and the Mozambique birds move to adjacent lowland forest to breed	Unlikely	No habitat
ANATIDAE	*Nettapus auritus*	Pygmy-Goose, African	VU	-	Sched 3	-	No	Prefers permanent waters with waterlilies.	Unlikely	No habitat
CAPRIMULGIDAE	*Caprimulgus natalensis*	Nightjar Swamp	VU		Sched 3			Grassland adjoining swamps, lagoons and rivers, along KZN coast to Eastern Cape.	Unlikely	No known distribution records for the project site.
CICONIIDAE	*Ephippiorhynchus senegalensis*	Stork, Saddle-billed	EN	-	Sched 3	-	No	Along large river systems, lake margins and wetlands.	Unlikely	No habitat
	Mycteria ibis	Stork, Yellow-billed	EN	-	Sched 9/Sched 3	-	No	Shoreline of most inland freshwater bodies, also occasionally in estuaries	Unlikely	No habitat
FALCONIDAE	*Falco biarmicus*	Falcon, Lanner	VU	-	Sched 3	II	No	Favours open grassland or woodland near cliff or electricity pylon br sites.	Unlikely	Last recorded from the area in 2011

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
HELIORNITHIDAE	*Podica senegalensis*	Finfoot, African	VU	-	Sched 3		No	Favours slow flowing streams with overhanging branches.	Unlikely	No habitat
JACANIDAE	*Microparra capensis*	Jacana, Lesser	VU	-	Sched 3	-	No	Permanent and seasonal shallow freshwaters with floating vegetation, especially water lilies.	Unlikely	No habitat
LARIDAE	*Sterna caspia*	Tern, Caspian	VU	-	Sched 3	-	No	Predominantly a marine or estuarine species; also occurs inland.	Unlikely	No distribution records for the project site.
OTIDIDAE	*Neotis denhami*	Bustard Denham's	VU	VU	Sched 9/Sched 3	II	No	It inhabits grasslands, grassy Acacia-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, also grass-covered ironstone pans and burnt savanna woodland in Sierra Leone and high rainfall sour grassveld, planted pastures and cereal croplands in fynbos in South Africa	Unlikely	No habitat
PELECANIDAE	*Pelecanus onocrotalus*	Pelican, Great White	VU	-	Sched 3	-	No	Shallow lakes, estuaries, large pans and dams. Food Mainly fish, also shrimps, and occasionally scavenges offal.	Unlikely	No habitat
	Pelecanus rufescens	Pelican, Pink-backed	VU	-	Sched 9/Sched 3	-	No	Wetlands and estuaries.	Unlikely	No habitat
PHALACROCORACIDAE	*Phalacrocorax capensis*	Cormorant, Cape	EN	-	-	-	No	Inshore marine habitats, also estuaries and lagoons.	Unlikely	No habitat
PHOENICOPTERIDAE	*Phoenicopterus minor*	Flamingo, Lesser	NT	-	Sched 9/Sched 3	II	No	Primarily eutrophic shallow wetlands, especially saltpans.	Unlikely	No habitat
	Phoenicopterus ruber	Flamingo, Greater	NT	-	Sched 9/Sched 3	II	No	Favours saline or brackish shallow water bodies such as saltpans, large dams and coastal mudflats.	Unlikely	No habitat
SCOLOPACIDAE	*Calidris canutus*	Knot Red	LC (NT)	-	-		No	Confined to the coastline, sheltered lagoons, estuaries and occasionally open coast. Breeds	Unlikely	Confined to coastline

TAXONOMIC INFORMATION			CONSERVATION STATUS							
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LISTING	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT	PROBABILITY OF OCCURRENCE	MOTIVATION
								in high Arctic tundra, circumpolar, mostly north of 70ºN.		
	Calidris ferruginea	Sandpiper Curlew	LC (NT)	-	-		No	Common non-breeding Palaearctic migrant. Occurs in coastal lagoons, estuaries, sheltered coastlines and inland wetlands with muddy fringes.	Unlikely	No habitat
	Limosa lapponica	Godwit Bar-tailed	LC (NT)	-	-		No	Uncommon to locally common non-breeding Palaearctic migrant. Occurs at coastal estuaries and lagoons, inland records are usually passage birds.	Unlikely	No habitat
	Numenius arquata	Curlew, Eurasian	NT	-	-	-	No	Primarily sandy coastal wetlands but with more frequent inland records than Whimbrel.	Unlikely	No habitat or recent sitings.
SULIDAE	*Morus capensis*	Gannet, Cape	VU	VU	-	-	No	Mainly coastal (to continental shelf).	Unlikely	No habitat
TURDIDAE	*Zoothera guttata*	Ground-thrush, Spotted	EN	-	Sched 3	-	No	Coastal and coastal-scarp forests.	Unlikely	No habitat

APPENDIX 4: Declaration of independence

I, Anita Rautenbach (ID: 7103180154085) declare that I:

- Am committed to biodiversity conservation, but concomitantly recognise the need for economic development.
- Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them.
- Am subcontracted as a specialist consultant by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment for the development of a 1060 MW simple cycle gas to power plant in Richards Bay, KwaZulu Natal province.
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed.
- Have not and will not engage in conflicting interests in the undertaking of the activity.
- Undertake to disclose to the client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority.
- The intellectual property in this report will only be transferred to the client (the party/company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognize that written consent of the client will be required for me to release any part of this report to third parties.
- In addition, remuneration for services provided by us is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

A. Rautenbach (Pr. Sci. Nat)

APPENDIX 5: Details of specialist consultant

ANITA RAUTENBACH (Pr.Sci.Nat)

Gender	Female
Date of Birth	18 March 1971
Languages	Afrikaans and English
Driver's license	Code 08
Mobile number	(+27) 83 305 1516
Email	rabiodiversity@gmail.com & akkedis1@gmail.com
Physical/Postal address	13 Killarney Valley road, Cato Ridge, 0132

BACKGROUND

Anita graduated with a Master's degree in Biological Science from the School of Life Sciences, University of KwaZulu-Natal Durban. Her Master's dissertation investigated patterns and processes of rodent and shrew assemblages in the Savanna Biome of KwaZulu-Natal. Her main interest involves fauna taxonomy, distribution patterns and ecology. She has been involved in various research projects and ecological assessments in southern Africa. Anita has approximately 12 years of in the environmental field and is currently registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).

ACADEMIC QUALIFICATIONS

University of KwaZulu Natal – MSc. Biological Science, Durban
University of KwaZulu Natal - Bachelor of Science Honours (Biological Science)
University of South Africa – Bachelor of Science (Zoology & Geography)

SKILLS

- Fauna, flora and vegetation assessments
- Threatened species assessments
- Small mammal assessments, trapping and identification
- Desk-based assessments
- Training – small mammal trapping, handling of live specimens, processing and identification
- Sample design set-up
- Data collection and analyses
- Radiotracking
- GIS Mapping.

PROJECT EXPERIENCE (Selected projects)
2019

- Retrospective ecological assessment for the unauthorized construction of an irrigation dam on farm Neederland 202 HT
  Ecological assessment – Mpumalanga
  Richards Bay Combined Cycle (CCPP) Power Plant and associated infrastructure near Richards Bay, KwaZulu-Natal Province
- Ecological Assessment - EIA Report
- Retrospective assessment for the unauthorized enlargement of an irrigation dam on the Farm Witklip 4/207 HT
  Ecological assessment –Mpumalanga
- Wilmar Processing (Pty) Ltd Vegetable Oil Pipeline, Richards Bay Port, KwaZulu-Natal
  Terrestrial Ecological Assessment
- Proposed housing development on Erf 2082, Shelley Beach
  Terrestrial ecological assessment – KwaZulu-Natal

- Specialist input to the wetland offset plan for the proposed Richcards Bay Combined Cycle Gas Turbine Power Plant
  Threatened species assessment – KwaZulu-Natal
- Proposed development of a business park on Erf 947, Port Edward
  Botanical assessment – KwaZulu-Natal
- Proposed mining development on the farm 'The Corner RE/11328, Umzumbe
  Botanical assessment – KwaZulu-Natal
- Proposed housing development, Kwamathukuza, Newcastle
  Ecological opinion – KwaZulu-Natal

2018

- Proposed development of an opencast pit and underground decline shaft, ZAC Colliery
  Ecological assessment – KwaZulu-Natal
- Proposed development of a hospital, Newcastle
  Vegetation and flora assessment, KwaZulu-Natal
- Proposed closed-cycle gas plant development
  Ecological assessment – KwaZulu-Natal
- Proposed development of a new abattoir, Inkosi Langibalele municipality
  Biodiversity assessment – KwaZulu-Natal
- Retrospective assessment for the unauthorized construction of a dam on Portion 5 of the Farm Tweefontein 3344
  Biodiversity assessment – Newcastle

2017

- Proposed Craigside Housing Development
  Ecological assessment – KwaZulu-Natal
- Proposed Development of a 3000MW Closed Cycle Gas Turbine (CCGT) Plant in Richards Bay, KwaZulu-Natal (Ref nr: SE1655)
  Ecological Assessment - Screening Report
  The Proposed Development of a 3000MW Closed Cycle Gas Turbine (CCGT) Plant in Richards Bay, KwaZulu-Natal (Ref nr: SE1655)
  Ecological Assessment - Scoping Report
- Proposed development of a housing Estate, Coral Lagoon (Pty) Ltd
  Threatened species assessment – Black headed dwarf chameleon - KwaZulu-Natal
- Proposed open-cast mining development – Mdzonyane
  Ecological assessment – Limpopo Province
- Proposed Umzimkhulu Housing development
  Ecological assessment – KwaZulu-Natal
- Proposed development of the Pavua Dam Hydropower facility
  Terrestrial fauna assessment – Mozambique
- Proposed development of the Maphumulo Integrated Energy Centre (IEC), Glendale
  Vegetation assessment – KwaZulu-Natal
- Proposed development of Portion 1 of Erf 286, Forest Hills
  Botanical assessment – KwaZulu-Natal
- Proposed development of macadamia orchards on the Farm Witkloof 456 HU
  Ecological opinion – KwaZulu-Natal
- Proposed housing development – Amaoti
  Ecological assessment – KwaZulu-Natal
- Proposed Thukela-Goedertrou pipeline development
  Ecological assessment – KwaZulu-Natal

- Retrospective assessment on Farm Stefco 4/428 for the unauthorized construction of a dam
  Biodiversity Assessment – KwaZulu-Natal

2016

- Proposed development of the Shixini 3 Macadamia Orchard
  Ecological Assessment – Eastern Cape
- Proposed construction of Ilanga Secondary School, Nkomazi Municipality
  Ecological assessment - Mpumalanga
- Illovo Sugar Cane Estate, love Sugar Ltd.
  Biodiversity assessment – KwaZulu-Natal
- Buffelsdraai Landfill site, University of KwaZulu-Natal
  Small mammal assessment – KwaZulu-Natal
- Proposed development of the Mkhuhlu Quarry
  Ecological survey - Mpumalanga
- Proposed bridge construction – Standerton
  Development of construction work method statements for in-stream works across water courses – Mpumalanga Province
- Proposed upgrade of road infrastructure
  Avian assessment - Ladysmith
- Proposed housing Development – Kingsburg housing Development
  Ecological assessment – KwaZulu-Natal
- Proposed Ingogo Dams Development
  Ecological assessment – KwaZulu-Natal

2015 - 2007

- University of KwaZulu-Natal
  Small mammal assessment – KwaZulu-Natal
- Proposed development of a township on the Farm Impala, Nkomazi Municipality
  Ecological assessment – Mpumalanga Province
- Proposed development of Mapulaneng hospital, Bushbuckridge Municipality
  Ecological assessment – Mpumalanga Province
- Proposed development of an Eco-housing Estate
  Ecological assessment – Mpumalanga Province
- Proposed construction of a bridge, Umjindi Municipality
  Ecological assessment – Mpumalanga Province
- Proposed construction of the Frank Maghinyane School, Bushbuckridge Municipality
  Ecological assessment – Mpumalanga Province
- Upgrade of Queen Nandi, Kwamashu and Inanda Interchanges, SANRAL
  Fauna assessment – KwaZulu-Natal
- Proposed development of a new dig-out Port in Durban, Transnet Capital Projects
  Mammal assessment – KwaZulu-Natal
- Proposed development of a new mine, Base Titatium
  Mammal assessment – Kenya
- Bioblitz, Operation Wallacea
  Small mammal assessment, Mkhuze Game Reserve – KwaZulu-Natal
- University of KwaZulu-Natal
  Small mammal assessment – KwaZulu-Natal
- University of Swaziland - Swaziland
  Radio tracking of Wahlberg's epauletted fruit bat - Swaziland
- Durban Natural Science Museum
  Bat assessment Paradise Valley – KwaZulu-Natal
- Durban Natural Science Museum

Small mammal assessment – Madagascar
- &Beyond
  Small mammal assessments - Phinda Private Game Reserve – KwaZulu-Natal
- Phelindaba – Gauteng
  Rodent assessment - Gauteng
- Durban Natural Science Museum
  Small mammal assessment - Albert Falls Dam – KwaZulu-Natal
- Durban Natural Science Museum
  Small mammal assessments – Ecorat - Swaziland

EMPLOYMENT HISTORY

Rautenbach Biodiversity Consulting – Durban *(Independent Specialist Consultant)*
March 2015 – present (full-time)

- Environmental impact assessments
- Threatened species assessments
- Biodiversity assessments

Rautenbach Biodiversity Consulting – Durban *(Independent Specialist Consultant)*
2012 March – March 2015 (part-time)

- Environmental impact assessments
- Threatened species assessments
- Biodiversity assessments

GVK Siya Zama Building and Renovations – Durban *(Regional Safety Manager)*
March 2013 – March 2015

- Development of HSE Plans
- Hazard identification and risk assessments
- Data analyses
- Report writing
- Training
- Quarterly safety meetings
- Monthly OHSAS 18001 and ISO 14001 compliance audits

GVK Siya Zama Building and Renovations - Durban *(Roaming Safety Officer)*
March 2012 – February 2013

- Ensure on-site subcontractor compliance
- Conduct risk assessments
- Monthly safety meetings
- Induction training
- Incident investigation and report writing
- Training

Durban Natural Science Museum (Mammal technician)
April 2007 – August 2011

- Acceptance, accessioning, care and loan of mammal specimens
- Preparation of specimens for addition to museum collections
- Data entry
- Biological sampling

- Co-ordination, organizing and conducting field surveys
- Assistance with research
- Mammal identification
- Training

PROFESSIONAL AFFILIATIONS

South African Council for Natural Scientific Professions (400725/15)

PUBLICATIONS

- Solano, E., Taylor, P, J., Rautenbach, A., Ropiquet, A., Castiglia, R. 2014. Cryptic speciation and chromosomal repatterning in the African climbing mice Dendromus (Rodentia, Nesomyidae). PloS One (DOI:10.1371/journal.phone.0088799).
- Rautenbach, A., Dickerson, T., Schoeman, M.C. 2013. Diversity of rodents and shrew assemblages in different vegetation types of the savannah biome in South Africa: no support for nested subset or competition hypotheses. African Journal of Ecology 5(1) pp. 30-40.
- Taylor, P.J., Rautenbach, A., Schoeman, M.C., Combrink, X. 2007. A winter survey of the smaller mammals of the uMkhuze section of the iSimangaliso Wetland Park, KwaZulu-Natal Province, South Africa. (https://www.researchgate.net/228787004).

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