ARID CACTUS

CONSULTING

Ecological Assessment for the proposed Prospecting Right Application on several farms in the Sihlengeni area in The Zululand District Mucipality, KwaZulu-Natal

SIHLENGENI, ZULULAND DISTRICT

CLIENT: NIARA MINERALS (PTY) LTD

DATE: JULY 2025

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Prepared For:	**Niara Minerals (Pty) Ltd**
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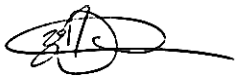
Declaration

I, Ndumiso Dlamini, as duly authorised representative of Arid Cactus Consulting, hereby confirm my independence and declare that I:

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

Signature of the specialist:	
Designation:	Ecologist (Pr. Sci. Nat.)
Qualifications:	BSc Life and Environmental Sciences (UJ) BSc Hons Botany (UJ) M. Sustainable Urban Planning (UJ) - Current
Date:	17 July 2025

1 Introduction

Arid Cactus Consulting (Arid Cactus or ACC) was appointed to undertake an Ecological assessment for a proposed Prospecting Right Appication on several farms within the Zululand District Municipality area within the within the KwaZulu-Natal Province.

This report presents the results of an ecological assessment completed for the proposed project. This report should be interpreted after taking into consideration the findings and recommendations provided by the specialist herein. Further, this report should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.1 Aim and Objectives

As part of this assessment, the following objectives were established:

- The identification of habitat areas through a desktop assessment;
- The identification of habitat, vegetation and fauna with the project area;
- Conduct an impact assessment for the proposed development;
- The prescription of mitigation measures and recommendations for identified impacts / risks.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Explanation of certain documents or organisations is provided where these have a high degree of relevance to the project and/or are referred to in this assessment.

2.1 International Legislation and Policy

- Convention on Biological Diversity (Rio de Janeiro, 1992);
- The Ramsar Convention (on wetlands of international importance);
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival; and
- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable

2.2 National Legislation

- Constitution of the Republic of South Africa (Act 108 of 1996). The Bill of Rights, in the Constitution of South Africa states that everyone has a right to a nonthreatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development;
- The National Environmental Management Act (NEMA) No. 107 of 1198): Ecological Assessment Regulations, 2014. Specifically, the requirements of the specialist report as per the requirements of Appendix 6;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations;
- National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003);
- National Water Act, 1998 (Act 36 of 1998);
- Environmental Conservation Act, 1989 (ECA), (Act no. 73 of 1989);
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Heritage Resources Act, 1999 (Act 25 of 1999);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).

2.3 National Policy and Guidelines

- South Africa's National Biodiversity Strategy and Action Plan (NBSAP);
- National Spatial Ecological Assessment (NSBA); and
- National Freshwater Ecosystem Priority Areas (NFEPA's).

2.4 Provincial and Municipal Level

In addition to national legislation, South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

- The KwaZulu-Natal Biodiversity Conservation Plan Critical Bioidiversity Areas (2016)

3 Description of the Project Area

The project area is located on several farms namely Misty Valley 831 HT, Toovernaarsrust 518 HT, Vergenoeg 570HT, Isihlengeni 689 HT, Weltevrede 540 HT and Demoina 830 HT, approximately 45km east of Vryheid and 30lm west of Nongoma in the Abaqulusi Local Municipality with the KwaZulu-Natal Province as presented in Figure 3-1. The project area comprises of forestry plantations open grassland, residential stands and gravel road networks. The summary of the property details of the project area presented in Table 3-1.

Table 3-1: Summary of Project Property Details

Province	KwaZulu-Natal
District Municipality	Zululand District Municipality
Local Municipality	Abaqulusi Local Municipality
Nearest Town	Nongoma
Catchment Zone	W31B, W31C, W22E, W22A, W22C
Water Management Area	Pongola to Mtamvuna (Previously Usutu to Mhlathuze)
Property Name(s)	Misty Valley 831 HT, Toovernaarsrust 518 HT, Vergenoeg 570HT, Isihlengeni 689 HT, Weltevrede 540 HT and Demoina 830 HT

The proposed project is located within the W31B, W31C, W22E, W22A, and W22C quaternary catchments, which fall under the Pongola to Mtamvuna Water Management Area (WMA 4) as defined by the Department of Water and Sanitation (DWS, 2016). This WMA was formerly part of the Usutu to Mhlathuze WMA, but administrative realignments by the DWS led to its incorporation into the larger Pongola to Mtamvuna system. The project area lies predominantly in northern KwaZulu-Natal, with some parts extending into Mpumalanga Province, and shares international borders with both Eswatini and Mozambique. The region is hydrologically significant, with two major transboundary rivers—the Usutu River, originating in South Africa and flowing through Eswatini into Mozambique, and the Pongola River, portions of which flow through Eswatini—converging to form the Maputo River in Mozambique (DWS, 2016; ORASECOM, 2022).

Climatically, the area ranges from sub-humid to humid, with mean annual precipitation between 600 mm and 1,500 mm, influenced by elevation and proximity to the coast (SAWS, 2023). The catchment is part of a broader hydrological network that supports strategic inter-basin transfers, such as from the Upper Usutu system to the Vaal and Olifants WMAs, and from the Thukela WMA to the Mhlathuze sub-catchment, underlining its national water security role (DWS, 2016; Stats SA, 2022).

Land use in the local area is characterised by a mixture of commercial forestry plantations, subsistence and irrigated agriculture, low-density rural settlements, mining operations, and an expanding network of gravel roads (DEA, 2019). The surrounding grasslands are mainly used for livestock grazing and seasonal crop cultivation, while economic activity in the wider region includes heavy industry centred in Richards Bay and Empangeni, ecotourism, and timber production (KZN COGTA, 2023).

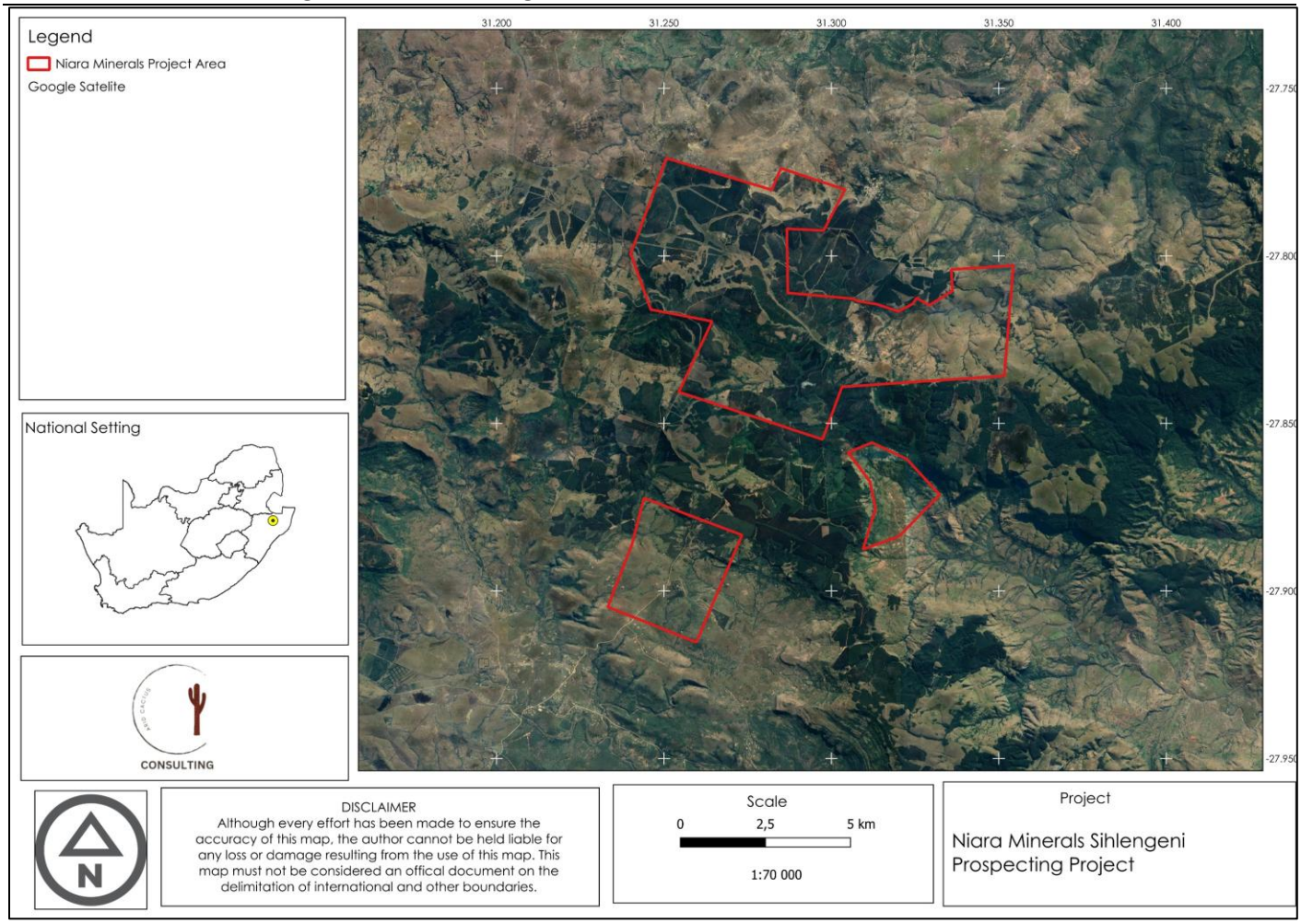


Figure 3-1: Location of the Project Area

3.1.1 Climate

The climate of Ngenetsheni, located in northern KwaZulu-Natal near Vryheid, can be classified as subtropical with distinct wet and dry seasons. The area experiences warm to hot summers and cool, dry winters. Summer months, typically from October to March, are characterized by high rainfall, averaging between 100 mm and 120 mm per month, with December and January being the wettest months. During this period, temperatures range between 25 °C and 28 °C during the day, while nighttime temperatures remain mild at around 15 °C to 19 °C. Rainfall is mainly associated with convective thunderstorms, and humidity levels can exceed 80% (Weatherspark, 2024; SAWS, 2023). In contrast, the winter season, spanning from May to August, brings dry conditions, with rainfall dropping to as low as 8 mm per month and an average of only 1–2 rainy days per month. Daytime temperatures in winter remain moderate at around 21 °C to 22 °C, but nighttime lows can fall to 6 °C to 8 °C, occasionally approaching frost conditions in low-lying areas (Weather-and-Climate, 2024).

The annual rainfall in the region ranges between 780 mm and 900 mm, placing the area in a sub-humid climatic zone, which supports both grassland and woodland vegetation. Sunshine is abundant in winter, with clear skies dominating from May to August, whereas

cloud cover increases significantly in summer, especially in November, which is often the cloudiest month. The region also experiences light to moderate wind activity year-round, with average wind speeds ranging from 11 to 14 km/h, peaking in spring (September) (Wanderlog, 2024). This climatic profile supports a range of land uses, including forestry, grazing, and rain-fed agriculture, though the reliance on summer rainfall makes the area vulnerable to seasonal droughts and climate variability.

4 Methodology

A desktop study was undertaken, aiming to identify:

- Potential species in the site area according to the South African National Biodiversity Institute (SANBI);
- Potential Red Data species and their current status; and
- Expected vegetation type and community structure, (Mucina and Rutherford 2006).

4.1 Site Visit

The project area was systematically traversed on foot and by vehicle (Figure 4-1) to identify and assess the general habitat types present throughout the investigation area. The site is characterized by rocky, steep terrain, in some parts that significantly limited accessibility to portions of the proposed development footprint. These physical features influenced both the extent of the field survey and the distribution of habitats across the site. Focus was placed on proposed borehole locations.

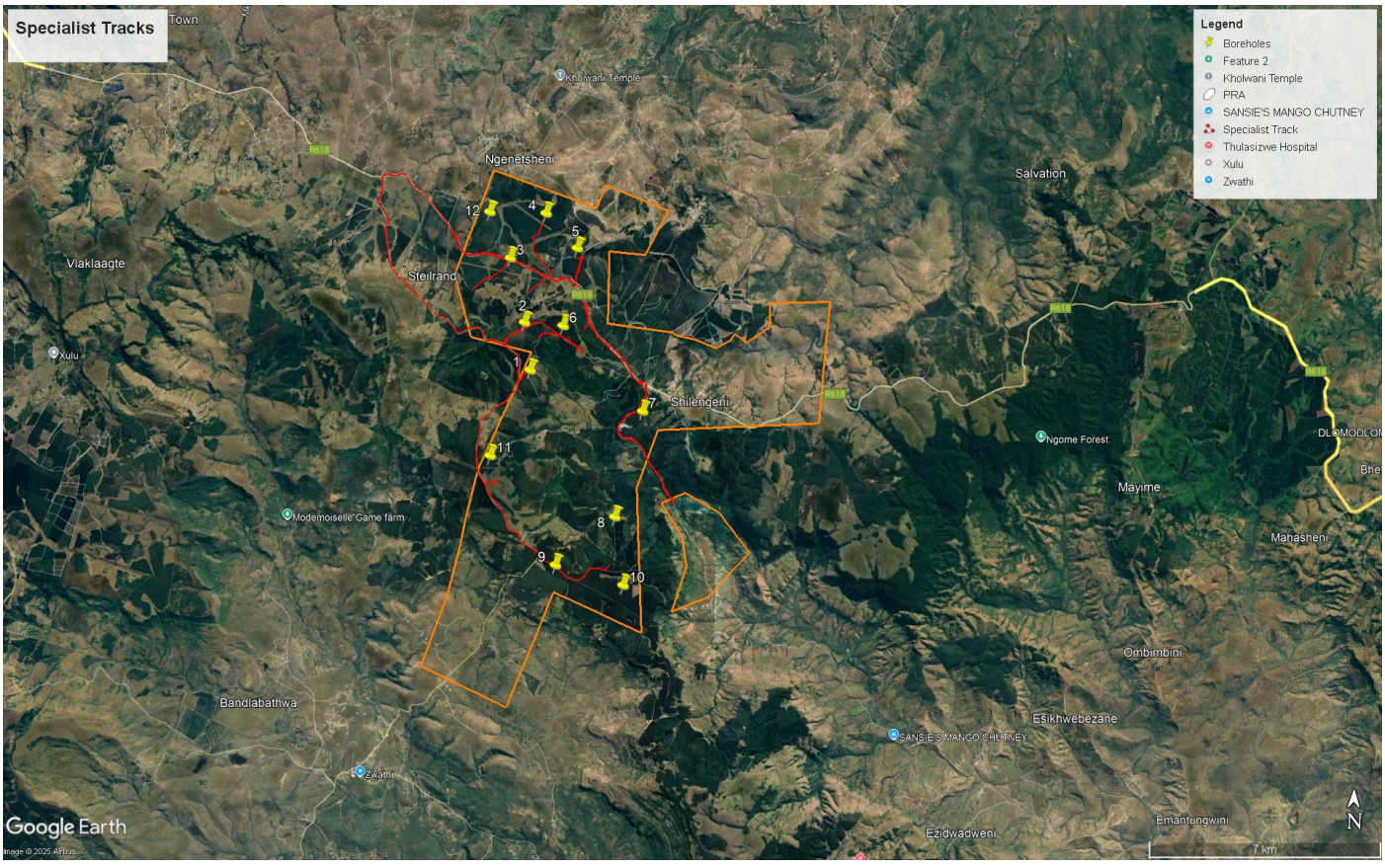


Figure 4-1: The specialist survey tracks for the project

4.2 Flora

Prior to the field visit, a record of floral SCC and their habitat requirements was acquired from SANBI for the Quarter Degree Square in which the investigation area is situated, as well as relevant regional, provincial and national lists. Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

4.2.1 Species List

The species list was compiled from both the description of the vegetation type of the study area supplied by Mucina and Rutherford (2006) as well as the South African National Biodiversity Institute National Herbarium Pretoria Computerised Information System (SANBI PRECIS) list. Lists of expected faunal species were drawn up from several different sources and the IUCN Red Data species likely to be found on site determined. Lists were drawn up for mammals, birds, reptiles, amphibians and invertebrates. The full list of expected species can be found in the appendices.

4.3 Fauna

The following lists and databases were consulted to complete the fauna desktop assessment, prior to the field visit:

- The SIBIS online interactive species distribution map was used to obtain data for the distribution of mammals, reptiles, amphibians and terrestrial invertebrates within the greater study area. Data was acquired for the Quarter Degree Squares (QDS) in which the study is located;
- The potential occurrence of mammals was supplemented by the species distribution maps in Friedman and Daly (2004), and Smithers (2002);
- Lists of birds found in the Quarter Degree Square (QDS) for the study area were determined using online data from the South African Bird Atlas Project (SABAP 2) for 2012;
- The Convention on International Trade of Endangered Species (CITES) species database;
- The IUCN Red-Data List for South African fauna;
- The International IUCN Red-Data List, and;
- National Environmental Management Biodiversity Act (NEMBA 10 of 2004) listed species.

4.3.1 Faunal Assessment Methodology

A reconnaissance 'walk through' on foot was undertaken to determine the general habitat types found throughout the investigation area. Special emphasis was placed on areas that may potentially support faunal SCC. Sites were investigated on foot in order to identify the occurrence of the dominant faunal communities, species and habitat diversities. The

presence of any faunal inhabitants of the investigation area was also assessed through direct visual observation or identifying such species through calls, tracks, scats and burrows.

It is important to note that faunal species have varied life cycles, breeding patterns, and are subject to seasonal fluctuations. As such, it is unlikely that all faunal species will have been recorded during the site assessment. However, even though some faunal species may not have been identified during the sight assessment, the habitat units and degree of transformation can be used to establish an accurate understanding of faunal assemblages most likely associated with the investigation area.

4.4 Sensitivity Mapping

All the ecological features associated with the proposed infrastructure areas were considered and sensitive areas were delineated with the use of a Global Positioning System (GPS). In addition, if any SCC and SANBI protected species were observed, their position was also marked by means of GPS. A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps.

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects, and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed, and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground-truth the larger scale assessments and put it into a more localised context.

The following assessments and assignations were taken into account in determining sensitivity:

- The occurrence of the site within an Internationally recognised Important Bird Area (IBA);
- The National List of Ecosystems that are Threatened and in need of Protection;
- The National Protected Areas Expansion Strategy;
- The National Spatial Biodiversity Assessment and the National Vegetation Map (Mucina and Rutherford, 2006).

The Sensitivity Assessment was conducted based on desktop studies as well as information obtained during the field investigations. Ecological sensitivity was quantified by subjectively assessing two factors, namely ecological function and conservation importance. These were defined as follows:

4.5 Ecological function

Ecological function is rated as described below:

- High ecological function: Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystem integrity (e.g. pristine grasslands, pristine wetlands and pristine ridges);
- Medium ecological function: Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem; and
- Low ecological function: Degraded and highly disturbed systems with little or no ecological function.

Functional Status refers to an indication of the services provided by an area and includes both ecological and human related services. Functional Status depends on the degree to which the area or system still provides a noticeable service.

4.6 Wetland Assessment

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis et al., 2013) as presented in Figure 4-2.

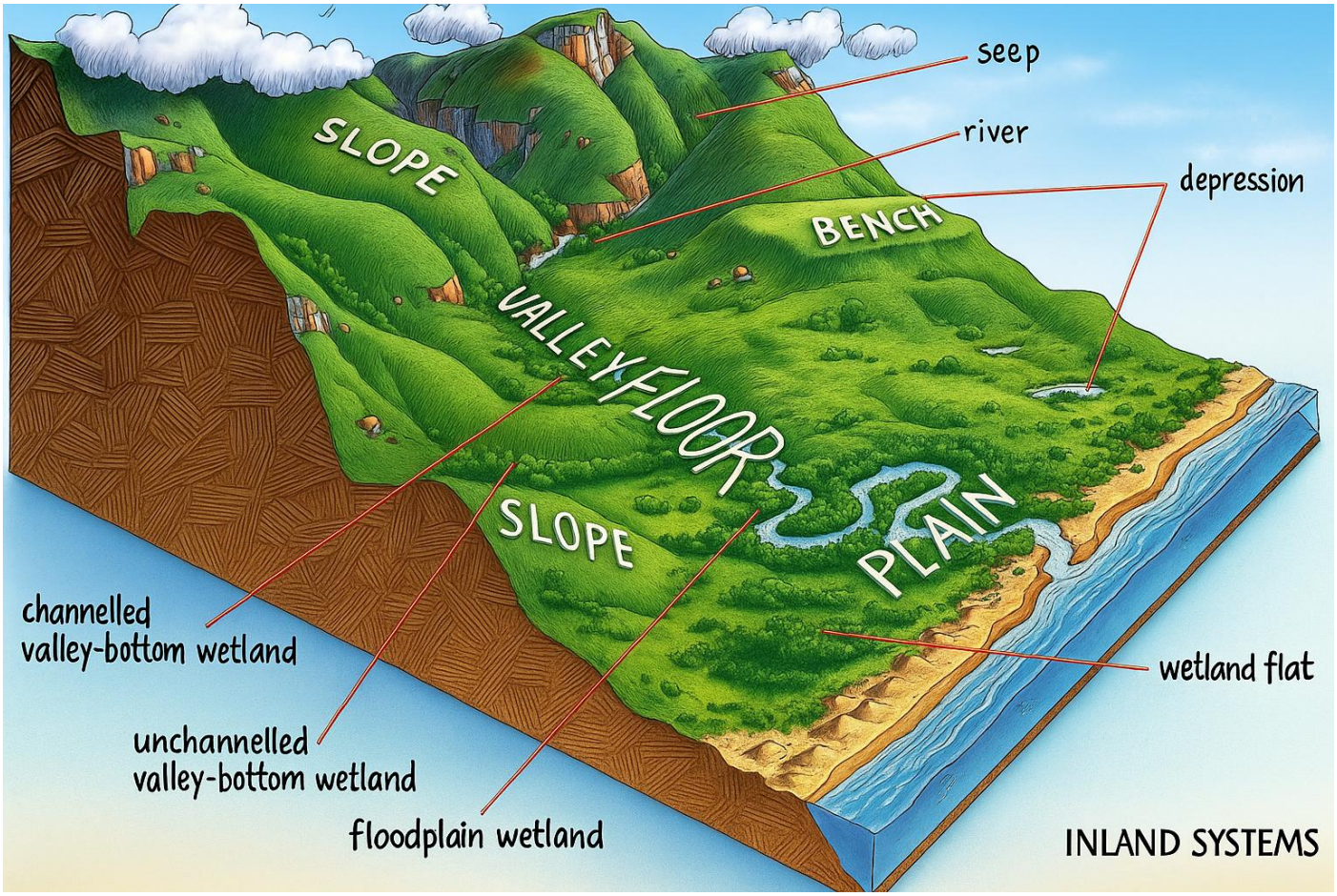


Figure 4-2: Wetland hydrogeomorphic (HGM) units (Ollis et al., 2013)

4.6.1 Delineation

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 4-3. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
    - The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

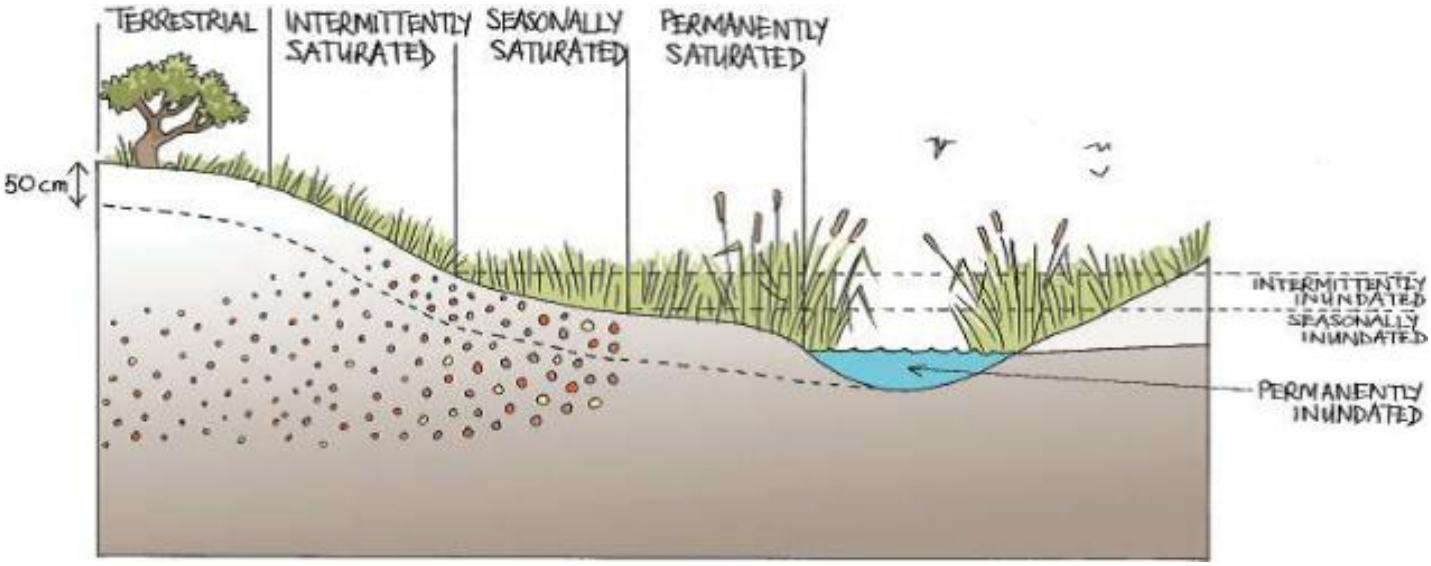


Figure 4-3: Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013)

4.6.2 Present Ecological Status (PES)

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 4-1.

Table 4-1: The PES categories (Macfarlane, et al., 2009)

Impact Category	Description	Impact Score Range	Present State Category
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	**Largely Natural** with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	**1.0 to 1.9**	**B**
Moderate	**Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	**2.0 to 3.9**	**C**
Large	**Largely Modified.** A large change in ecosystem processes and loss of natural habitat and biota has occurred.	**4.0 to 5.9**	**D**
Serious	**Seriously Modified.** The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	**6.0 to 7.9**	**E**
Critical	**Critical Modification.** The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	**8.0 to 10**	**F**

4.6.3 Ecosystem Services

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze, et al, 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 4-2).

Table 4-2: Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

4.6.4 Ecological Importance and Sensitivity (EIS)

The method used for the EIS determination was adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 4-3.

Table 4-3: Description of EIS categories.

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

4.7 Buffer Determination

A buffer zone is defined as "A strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another." (Macfarlane, et al., 2014).The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, et al., 2014) was used to determine the appropriate buffer zone for the proposed activity. This guideline was designed to assist in the determination of the appropriate buffer zones for water resources. The assessment procedure can be seen in Figure 4-4.

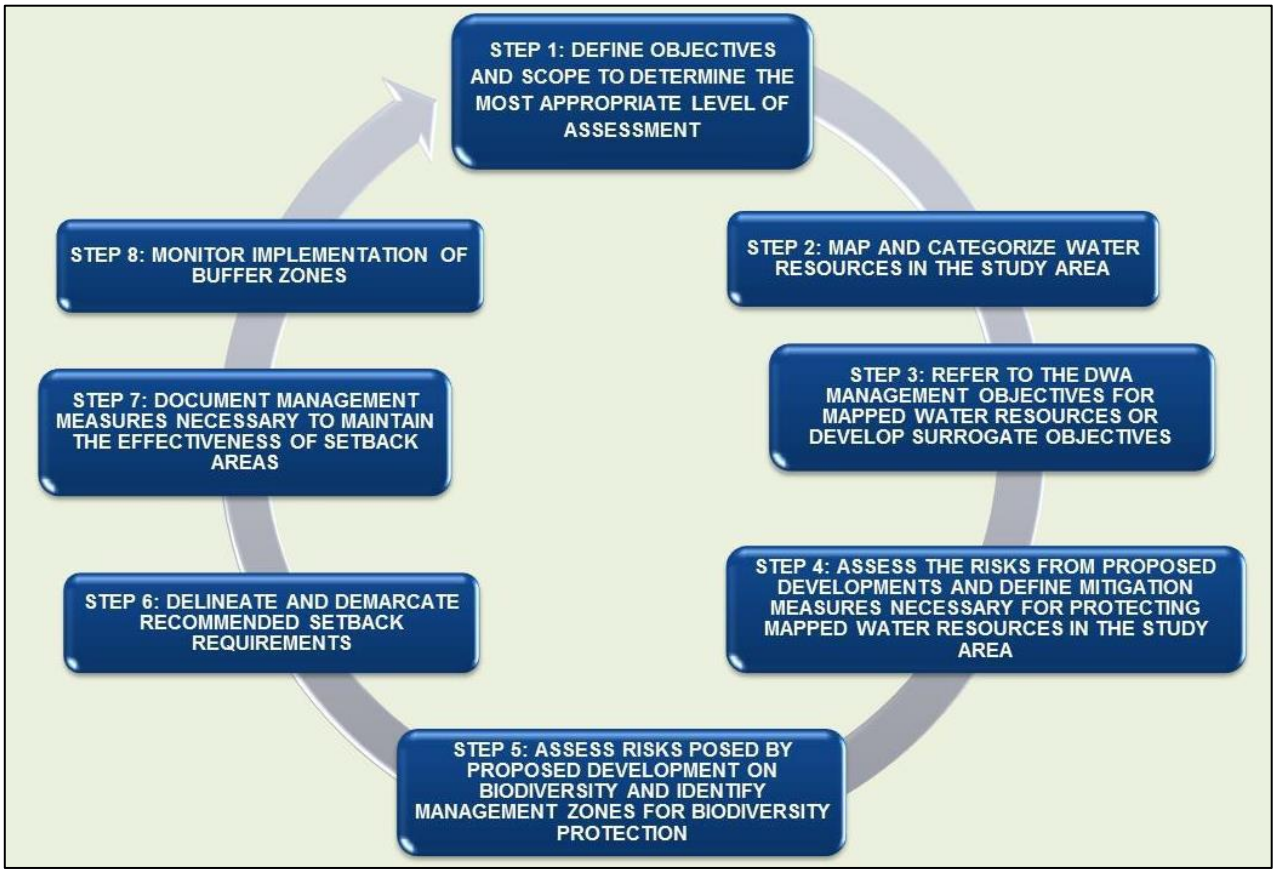


Figure 4-4: The assessment for the determination of the appropriate buffer zone follows this procedure

4.8 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the study area. The relevant impacts were then subjected to a

prescribed impact assessment methodology which is described below. Mitigation measures were only applied to impacts deemed relevant on the basis of the impact analysis. The likelihood and consequence descriptors are presented inTable 4-4 and Table 4-5. The significance rating matrix is presented in Table 4-7.

Table 4-4: Likelihood descriptors

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

Table 4-5: Consequence descriptors

Severity of impact	**RATING**
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	5
Severity of impact	**RATING**
One day to one month: Temporary	1
One month to one year: Short Term	2
One year to five years: Medium Term	3
Life of operation or less than 20 years: Long Term	4
Permanent	5

Table 4-6: Significance Rating Matrix

	CONSEQUENCE (Severity + Spatial Scope + Duration)

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

4.8.1 Level of Significance

Based on the above criteria, the significance of issues will be determined using the following formula:

Significance = Consequence × Probability

The significance of the impact is rated as follows:

Table 4-7: Impact Assessment Significant Rating

Description	Explanation	Scoring
No Impact	There is no impact	0 – 10
Low	Impacts are less important. Some mitigation is required to reduce the negative impacts.	11 – 30
Medium	Impacts are important and require attention. Mitigation is required to reduce the negative impacts.	31 – 60
High	Impacts are of high importance. Mitigation is essential to reduce the negative impacts.	61 – 89
Fatal Flaw	Impacts present a fatal flaw, and alternatives must be considered	90 – 100

5 Limitations and Assumptions

The following assumptions and limitations are applicable to this report:

- The ecological assessment is confined to the proposed Project area, and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- The assessment was confined to the proposed borehole location;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral and faunal communities have been accurately assessed and considered;
- Due to the nature and habits of most faunal taxa and the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed

during a site assessment of limited duration. Therefore, site observations were compared with literature studies where necessary; and

- The data presented in this report is based on a single assessment, undertaken in July 2025 which constitutes a dry season survey. Seasonal changes presenting dry season were observed in the field and this impacted on the ability to positively identify all plant species. However, on-site data was significantly augmented with all available desktop data, as well as previous studies conducted in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the proposed Project area.
- The site is characterized by rocky, steep terrain, in some parts that significantly limited accessibility to portions of the proposed development footprint.

6 Expertise of the Specialist

Ndumiso Dlamini obtained his BSc Honours degree in Botany from the University of Johannesburg in 2011. He is a registered Professional Natural Scientist (Pr. Sci. Nat) with the South African Council for Natural Scientific Professions (SACNASP) in both Botanical Science and Ecological Science (Registration No. 116579).

With over 10 years of experience as an Environmental Consultant, Ndumiso has been actively involved in conducting biodiversity, ecological, and freshwater resource assessments across a wide variety of landscapes and bioregions. His extensive fieldwork includes projects across all nine provinces of South Africa, as well as international assignments in Malawi, Mozambique, Mali, and Zambia. Through this regional experience, he has developed a keen understanding of national and cross-border regulatory frameworks related to freshwater ecosystems, including the application of the National Environmental Management Act (NEMA), National Water Act (NWA), and Department of Water and Sanitation (DWS) risk-based authorisation protocols.

Ndumiso has performed numerous ecological impact assessments for projects in the mining, residential development, linear infrastructure, and rehabilitation sectors. He has consistently delivered strong results for clients by providing technically sound, defensible specialist input that supports environmental compliance and sustainable project planning. This includes the development of comprehensive wetland offset strategies, the design and implementation of rehabilitation plans, and the provision of practical mitigation measures tailored to site-specific ecological conditions.

7 Desktop Findings

7.1 Regional Vegetation

The project area is located predominantly within the Northern Zululand Mistbelt Grassland, a mesic grassland ecosystem found on the escarpment and higher elevation zones of northern KwaZulu-Natal. This vegetation type is characterized by dense, species-rich grass cover, frequent mists, and high rainfall, with dominant grass species including *Themeda*

triandra, Tristachya leucothrix, and *Eragrostis capensis*, while forbs such as *Helichrysum spp*. and *Gerbera ambigua* are common (Mucina & Rutherford, 2006).

In decreasing order of spatial coverage, smaller areas of Paulpietersburg Moist Grassland are also present, which occur on higher, wetter terrain and are known for their high floral diversity, with grasses such as *Setaria sphacelata* and *Hyparrhenia hirta*, and scattered woody shrubs and geoxylic suffrutices. The KwaZulu-Natal Highland Thornveld, a semi-arid open savanna, is found in localized pockets and is dominated by thorny species such as *Vachellia sieberiana* and *Vachellia nilotica*, along with grasses like *Heteropogon contortus*. Northern Zululand Sourveld, also present in limited extents, consists of sour, tall grasslands maintained by regular fire, where *Themeda triandra* and *Aristida junciformis* are common, and is interspersed with patches of bush clumps. Lastly, small fragments of Scarp Forest occur in topographically sheltered, moisture-rich areas such as south-facing slopes and drainage lines. These forests are highly diverse and include canopy species such as *Celtis africana, Chaetachme aristata*, and *Trichilia dregeana*, with a well-developed understory of shade-tolerant shrubs and herbs. This mosaic of vegetation types reflects the area's complex topography, climate gradients, and fire regimes, and supports a high level of plant diversity and endemism, with important implications for conservation planning and habitat sensitivity (Mucina & Rutherford, 2006; Mucina et al., 2018). The vegetation occurring within the project area is presented in Figure 7-1 (Mucina and Rutherford, 2006 and 2018). Plant species of significance within the vegetation units are presented in Table 7-1.

Table 7-1: Plants of significance within the 3 prominent vegetation unit

Plant type	Northern Zululand Mistbelt Grassland	Northern Zululand Sourveld	Paulpietersburg Moist Grassland
Trees	*Vachellia nilotica, Vachellia karroo, Vachellia caffra*	*Vachellia nilotica, Vachellia karroo, Vachellia caffra*	*Vechelia sieberiana var. woodii, Vechelia nilotica, Vechelia karroo, Vechelia caffra, Diospyros lycoides*
Graminoids	*Themeda triandra, Tristachya leucothrix, and Eragrostis capensis, Cynodon dactylon, Eragrostis curvula, Eragrostis plana, Harpachloa falx Aristida congesta*	*Themeda triandra, Aristida junciformis, Cynodon dactylon, Eragrostis curvula, Eragrostis plana, Harpachloa falx Aristida congesta Sporobulus africana*	*Setaria sphacelata, Hyparrhenia hirta, Andropogon appendiculatis, Cynodon dactylon,* Themeda triandra, *Eragrostis curvula, Aristida congesta Sporobulus africana*

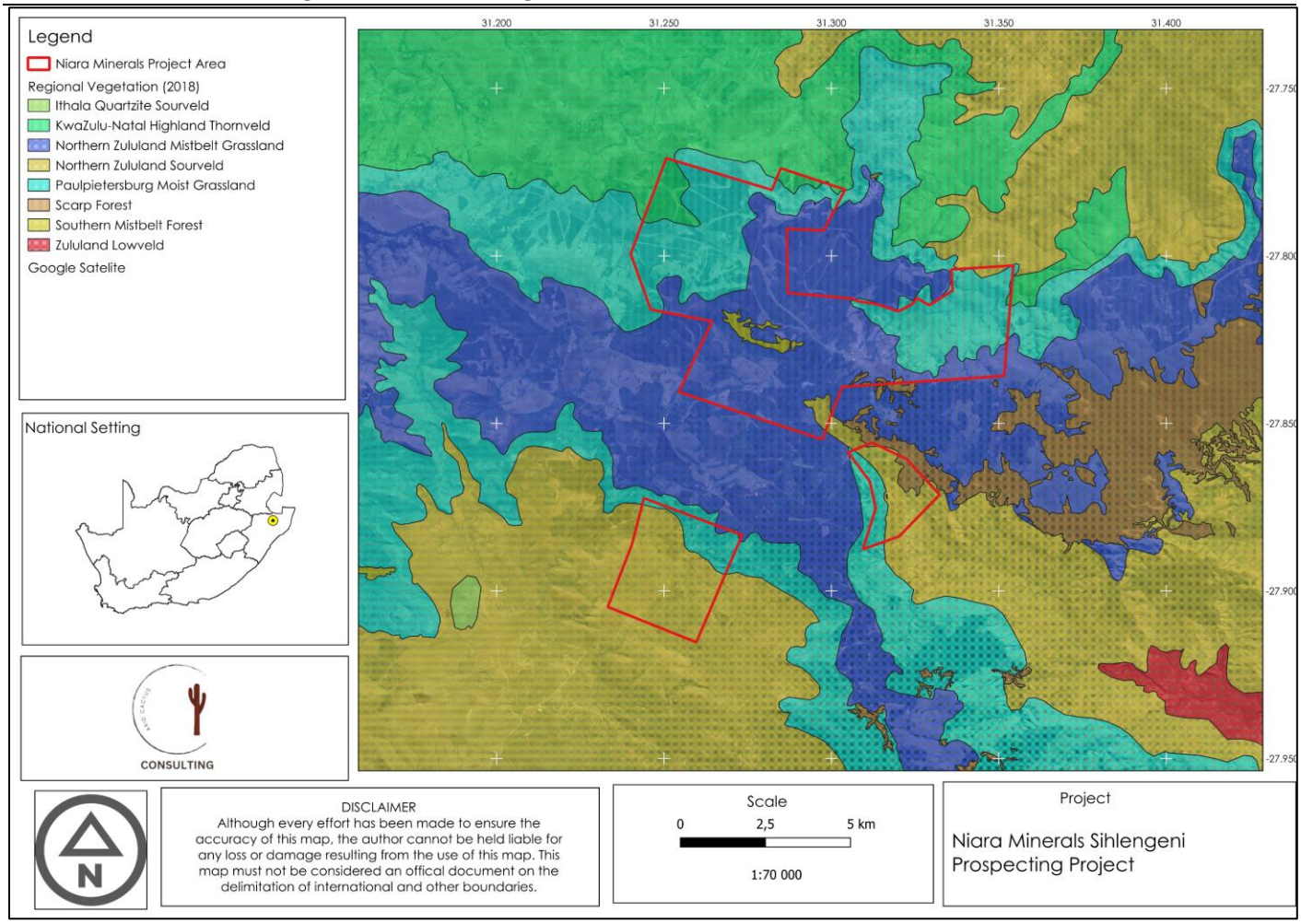


Figure 7-1: The regional vegetation associated with the project area

7.1.1 Plant Species List

The Plants of Southern Africa (POSA) Database was utilised to obtain a list of plant species that could occur within the project area. The plant presented in Table 7-2 presents plant species of conservation concern that may occur in the project area. A full list of expected plant species is presented in Appendix 1.

Table 7-2: The expected plant species of conservation concern within the project area (POSA, 2025)

Family	Species Name	Threat status
AMARYLLIDACEAE	*Crinum acaule*	NT
AMARYLLIDACEAE	*Crinum macowanii*	Declining
AMARYLLIDACEAE	*Crinum stuhlmannii*	Declining
ASPHODELACEAE	*Gasteria batesiana var. batesiana*	NT
CRASSULACEAE	*Kalanchoe longiflora*	VU
HYACINTHACEAE	*Drimia elata*	DDT
LAMIACEAE	*Plectranthus psammophilus*	Threatened
ORCHIDACEAE	*Ansellia africana*	Declining
ROSACEAE	*Prunus africana*	VU
SANTALACEAE	*Thesium jeanae*	Rare

ZAMIACEAE	*Encephalartos lebomboensis*	EN
ZAMIACEAE	*Encephalartos ngoyanus*	VU
ZAMIACEAE	*Encephalartos senticosus*	VU

7.2 Fauna

A desktop assessment was performed with the aid of The Animal Demographic Unit Virtual Museum (ADU) and South African Bird Atlas Project 2 (SABAP 2). The study identified avifaunal species that may occur within the study area. It must be noted that the desktop study presents data over the entire Quarter Degree Squares (QDS) 2830BB and 2730DD and is not limited to the study area. The assessment for mammal species was conducted at desktop level to determine the probability of occurrence of faunal species. The potential species that may occur within the project area are listed in Table 7-3. It must be noted that the possible species list is at desktop level and may include species that were previously recorded in the area and may possibly be no longer occurring within the project area such as Lions for example.

Table 7-3: The possible mammal species occurring within the project area (ADU, 2025)

Family	Scientific name	Common name	Conservation Status
Bovidae	Antidorcas marsupialis	Springbok	LC
Bovidae	Damaliscus pygargus phillipsi	Blesbok	LC
Bovidae	Raphicerus campestris	Steenbok	LC
Bovidae	Sylvicapra grimmia	Bush Duiker	LC
Bovidae	Tragelaphus angasii	Nyala	LC
Canidae	Vulpes chama	Cape Fox	LC
Herpestidae	Atilax paludinosus	Marsh Mongoose	LC
Herpestidae	Cynictis penicillata	Yellow Mongoose	LC
Herpestidae	Suricata suricatta	Meerkat	LC
Hystricidae	Hystrix africaeaustralis	Cape Porcupine	LC
Leporidae	Lepus sp.	Hares	LC
Leporidae	Lepus saxatilis	Scrub Hare	LC
Macroscelididae	Elephantulus sp.	Elephant Shrews	LC
Muridae	Aethomys sp.	Veld rats	LC
Muridae	Mastomys sp.	Multimammate Mice	LC
Muridae	Rhabdomys pumilio	Xeric Four-striped Grass Rat	LC
Mustelidae	**Aonyx capensis**	**African Clawless Otter**	**NT**
Mustelidae	Hydrictis maculicollis	Spotted-necked Otter	LC 2008)

A desktop avifaunal investigation was conducted to determine the bird species that may occur within the project area. A total of 200 bird species is expected to occur within the project area; however, a total of 8 were considered to be of conservation concern as listed in Table 7-4. A full list of potential bird species is presented in Appendix 2.

Table 7-4: Avifaunal species of conservation concern that may occur within the project area (SABAP, 2025)

Common Name	Species Name	Conservation Status
Swallow, Blue	*Hirundo atrocaerulea*	CR
Stork, Black	*Ciconia nigra*	NT
Secretarybird, Secretarybird	*Sagittarius serpentarius*	NT
Falcon, Lanner	*Falco biarmicus*	NT
Eagle, African Crowned	*Stephanoaetus coronatus*	NT
Kingfisher, Half-collared	*Alcedo semitorquata*	NT
Ground-thrush, Orange	*Zoothera gurneyi*	NT
Warbler, Broad-tailed	*Schoenicola brevirostris*	NT

The herpetofauna survey consisted of a desktop study and the field investigation. The desktop study determined that the species listed in Table 7-5. There were no herpetofauna of conservation concern expected for the project area.

Table 7-5: The possible herpetofauna within the project area (ADU, 2025)

Family	Scientific name	Common name	Conservation Status
Reptiles			
Agamidae	Agama atra	Southern Rock Agama	LC
Colubridae	Dasypeltis scabra	Rhombic Egg-eater	LC
Cordylidae	Cordylus vittifer	Common Girdled Lizard	LC
Elapidae	Hemachatus haemachatus	Rinkhals	LC
Lamprophiidae	Aparallactus capensis	Black-headed Centipede-eater	LC
Lamprophiidae	Boaedon capensis	Brown House Snake	LC
Lamprophiidae	Lycophidion capense capense	Cape Wolf Snake	LC
Lamprophiidae	Psammophylax rhombeatus	Spotted Grass Snake	LC
Lamprophiidae	Pseudaspis cana	Mole Snake	LC
Leptotyphlopidae	Leptotyphlops sp.		LC
Scincidae	Trachylepis punctatissima	Speckled Rock Skink	LC
Scincidae	Trachylepis varia sensu lato	Common Variable Skink Complex	LC
Typhlopidae	Afrotyphlops bibronii	Bibron's Blind Snake	LC
Frogs			
Bufonidae	Sclerophrys gutturalis	Guttural Toad	LC
Pipidae	Xenopus laevis	Common Platanna	LC
Pyxicephalidae	Amietia delalandii	Delalande's River Frog	LC
Pyxicephalidae	Amietia fuscigula	Cape River Frog	LC
Pyxicephalidae	Amietia poyntoni	Poynton's River Frog	LC
Pyxicephalidae	Cacosternum boettgeri	Common Caco	LC
Pyxicephalidae	**Pyxicephalus adspersus**	**Giant Bull Frog**	**NT**
Pyxicephalidae	Tomopterna natalensis	Natal Sand Frog	LC

7.3 KwaZulu-Natal Biodiversity Spatial Plan (KZNBSP) 2016

The KwaZulu-Natal Biodiversity Spatial Plan (KZN BSP) is a strategic planning tool developed to guide land-use decisions and promote the conservation of biodiversity across the province. It identifies Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) that are essential for the persistence of biodiversity, maintenance of ecosystem services, and long-term ecological sustainability. The KZN BSP serves as a key informant for environmental decision-making by highlighting priority areas where biodiversity should be maintained, restored, or sustainably managed. The categories of the ecological areas and their descriptions are presented in Table 7-6.

Table 7-6: The ecological categories, their descriptions and possible implications

CBA Categories	Description	Land Use Target	Project Implications	Recommendations
Critical Biodiversity Areas (CBAs) - Crucial for supporting biodiversity features and ecosystem functioning and are required to meet biodiversity and/or process targets				
Critical Biodiversity Areas: Irreplaceable	Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.	Maintain in a natural state with limited to no biodiversity loss	Not suitable for prospecting. Activities would likely compromise irreplaceable ecological features. Authorisation unlikely unless no alternatives and full mitigation/offsets are proven effective	Exclude entirely from prospecting; treat as a no-go area; if presence is unavoidable in wider planning, document alternatives analysis and ensure no loss of function.
Critical Biodiversity Areas: Optimal	Areas that represent an optimised solution to meet the required biodiversity conservation targets while avoiding high-cost areas as much as possible (Category driven primarily by process but is informed by expert input).	Maintain in a natural state with limited to no biodiversity loss	Very limited prospecting allowed. Subject to avoidance protocols, detailed impact assessments, and specialist studies. Only justifiable with minimal ecological impact and full rehabilitation plan.	Avoid where possible; if inclusion is necessary, undertake detailed ecological studies, confirm low impact potential, and prepare robust rehabilitation and monitoring plans.
Ecological Support Areas (ESAs) - Functional but not necessarily entirely natural areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within Critical Biodiversity Areas				
Ecological Support Areas	Functional but not necessarily entirely natural terrestrial or aquatic areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the Critical Biodiversity Areas. The area also contributes significantly to the maintenance of Ecosystem Services.	Maintain ecosystem functionality and connectivity allowing for some loss of biodiversity	Prospecting may be conditionally permitted. Must avoid disrupting corridors and ecological processes. Rehabilitation plans and specialist input are required	Limit disturbance, design prospecting to preserve ecological corridors, implement seasonal restrictions, and apply erosion control and restoration measures.
Ecological Support Areas: Species specific	Terrestrial modified areas that provide a critical support function to a threatened or protected	Maintain current land use or rehabilitate	Site-specific constraints apply. Prospecting may be restricted if activity	Avoid during breeding seasons; use low-impact methods; implement conservation measures

	species, for example agricultural land or dams associated with nesting/roosting sites	back to functional natural area	impacts habitat for key species. Must ensure no species persistence risk. Baseline ecological surveys essential	where species are confirmed.
Ecological Support Areas: Buffers	Terrestrial areas identified as requiring land-use management guidance not necessarily due to biodiversity prioritisation, but in order to address other legislation / agreements which the biodiversity sector is mandated to address, e.g. WHS Convention, Triggers Listing Notice criteria, etc.	Maintain or improve ecological and tourism functionality of a PA or WHS	Prospecting generally discouraged. Activities must align with buffer objectives and adjacent site protections. Requires coordination with heritage and tourism authorities. Visual, noise, and dust impacts must be mitigated	Design prospecting to avoid visual intrusion; implement dust suppression and noise mitigation; engage heritage/tourism stakeholders early. Avoid cumulative pressure on nearby conservation areas.

Irreplaceble and Optimal Critical Biodiversity Areas along with Ecologcal Support Areas were identified within the proposed project area (Figure 6 5) which indicates that there are potentially sensitive habitats within the project area. The management objective for these areas is "Maintain in a natural state with limited to no biodiversity loss" and avoid during prospecting.

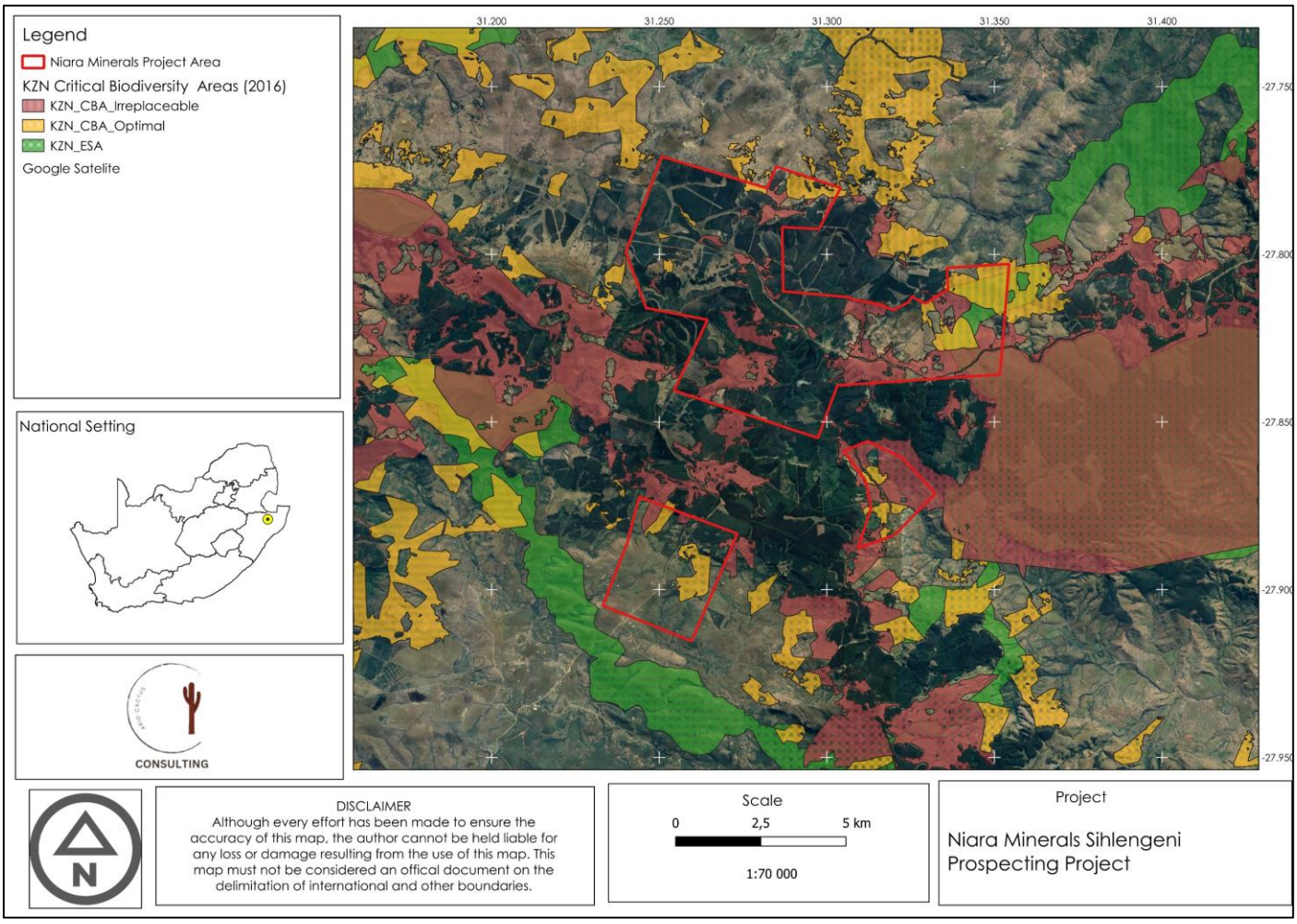


Figure 7-2: The KZN CBA areas associated with the study area

7.4 National Biodiversity Assessment

7.4.1 Ecosystem Status (2021)

The ecosystems within the project area have been classified as Endangered (EN) according to the National Ecosystem Threat Status (NESP, 2011; SANBI, 2021),as seen in Figure 7-3. This classification indicates that a significant proportion of the original natural habitat has already been lost, primarily due to land conversion for agriculture, settlement expansion, and infrastructure development. Furthermore, the remaining patches of intact habitat are highly fragmented and degraded, rendering them vulnerable to further ecological decline and irreversible transformation. The Endangered status also reflects a severe reduction in ecosystem function and resilience, which compromises the ability of these systems to provide essential ecological services such as biodiversity support, water regulation, soil retention, and carbon storage. This underscores the need for careful land-use planning and the implementation of strict mitigation and conservation measures to avoid further biodiversity loss and ensure the persistence of these sensitive vegetation types within the region (SANBI, 2019).

Furthermore, the Northern Zululand Mistbelt Grassland and Paulpietersburg Moist Grassland, have been listed as Endangered Threatened Ecosystems in the Revised National List of Terrestrial Ecosystems That Are Threatened and in Need of Protection, published in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (DFFE, 2022). This gazetted list provides the statutory basis for identifying ecosystems that are under significant pressure and require protection, and is a key tool used to inform biodiversity conservation and land-use planning in South Africa.

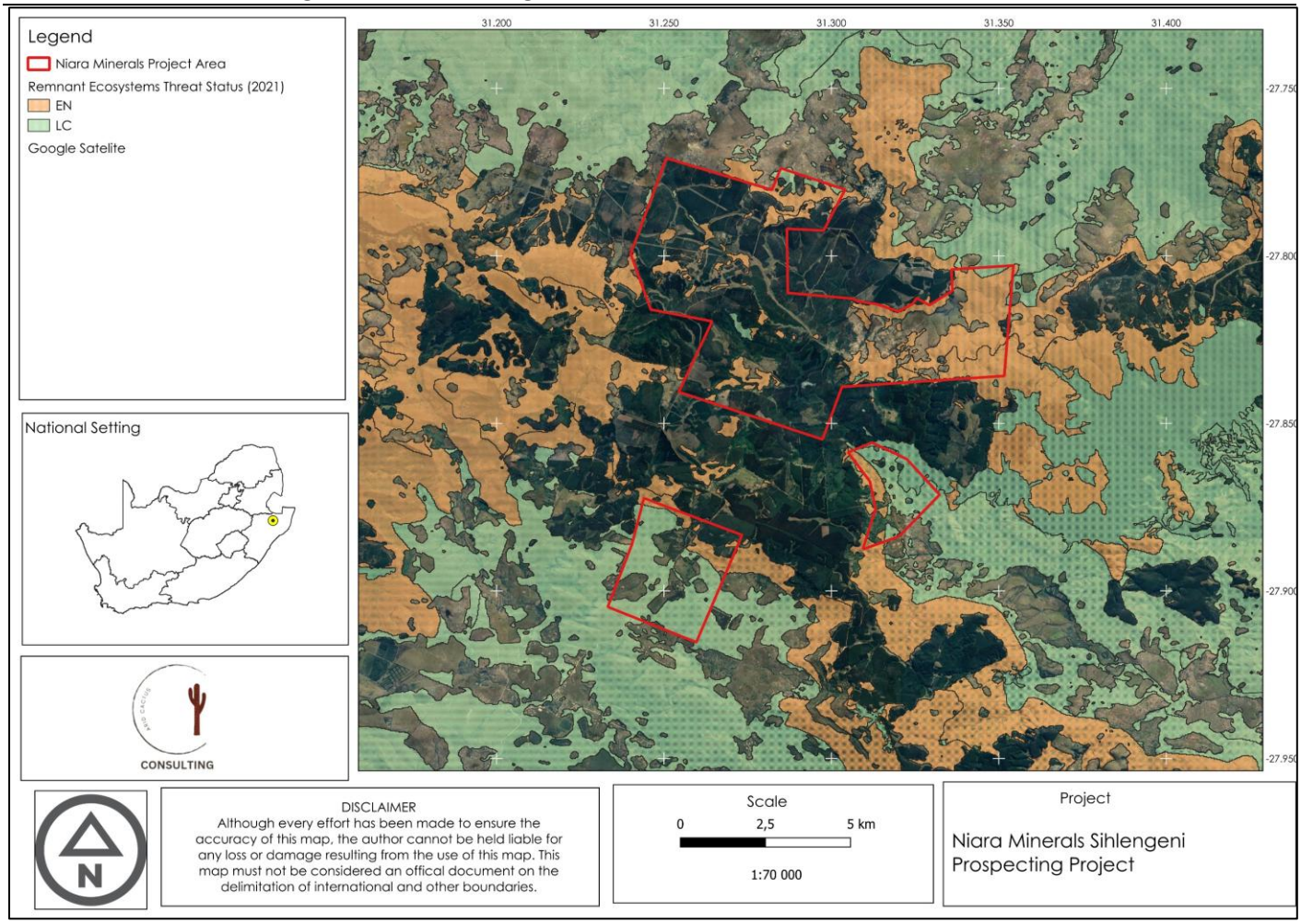


Figure 7-3: Threat status of ecosystems within the project area

7.4.2 Key Biodiversity Areas

The project falls partly within a Key Biodiversity Area named the Ngotshe Key Biodiversity Area. The Ngotshe Key Biodiversity Area (KBA) is of high conservation significance as it supports threatened and endemic species, particularly within the KwaZulu-Natal Mistbelt Grassland, an endangered vegetation type. The KBA contributes to ecological connectivity, facilitates species migration, and includes important wetland and headwater systems that provide critical ecosystem services.

In addition, the dominant vegetation types present within the project area, particularly the Northern Zululand Mistbelt Grassland and Paulpietersburg Moist Grassland, have been classified as Endangered ecosystems under the National Biodiversity Assessment due to high levels of habitat transformation and limited remaining intact areas. These ecosystems are known for their high species richness, endemism, and ecological sensitivity. Although not formally identified as KBAs, the presence of Endangered ecosystems, suggests that the project area holds significant conservation importance and should be treated with the same level of ecological caution typically afforded to designated KBAs. It is therefore recommended that all remaining natural grassland patches and undeveloped areas within and adjacent to the project site be formally designated as Key Biodiversity Areas (KBAs) to

ensure their ecological integrity. Furthermore, these sensitive habitats should be protected by implementing a minimum 100-meter buffer zone around the proposed prospecting activities. This buffer will help mitigate direct and indirect impacts such as habitat fragmentation, edge effects, dust deposition, and disturbance to wildlife (Figure 7-4).

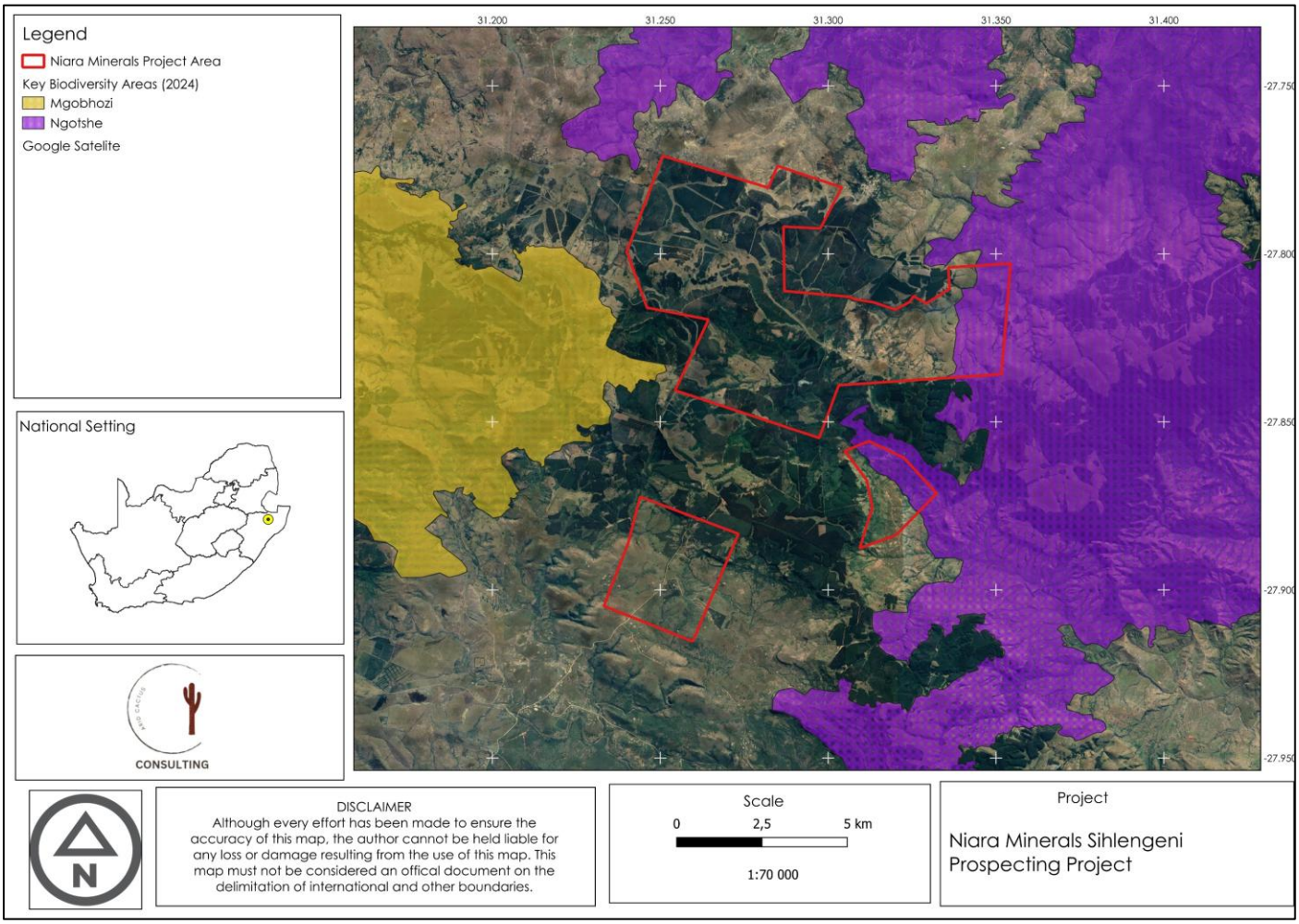


Figure 7-4: Key Biodiversity Areas and 100m buffer within the project area

7.4.3 National Wetlands Map 5 (NWM 5)

The National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. Mapping the locality of wetlands is essential so that they may be classified into the different wetland ecosystem types across the country, which in turn can be used along with other data to identify wetlands of conservation significance. The NWM 5 watercourses identified within were classified as SEEP (Seepage) wetlands (Figure 7-5). Two (2) FEPA Classified watercourses, namely the Sihlengeni and Sikwebezi Rivers were identified within the project area. The rivers were classified as having a Natural (Class A) condition. A 500m minimum buffer zone is recommended for the two FEPA rivers.

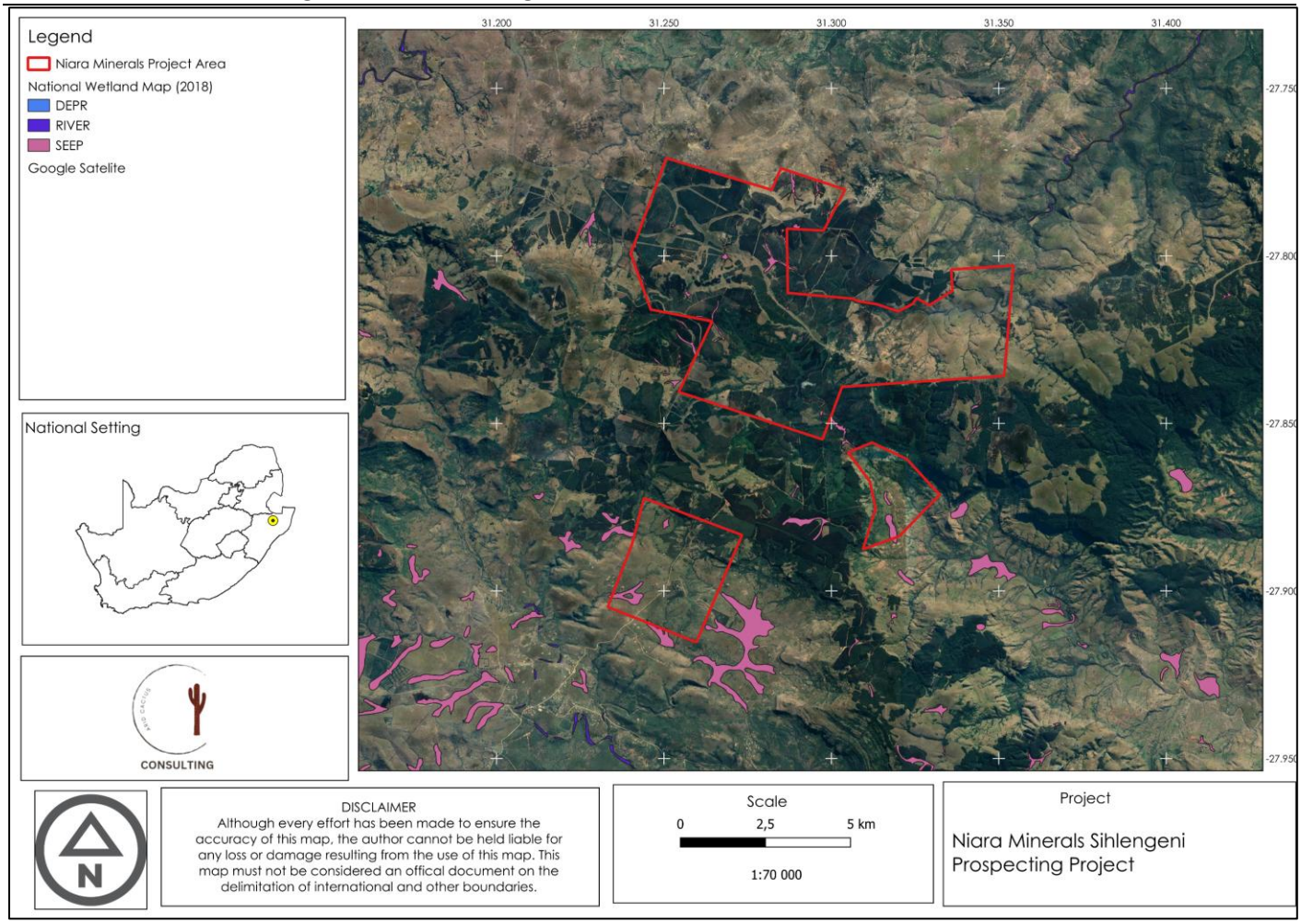


Figure 7-5: The National Wetland Map 5 areas within the project area

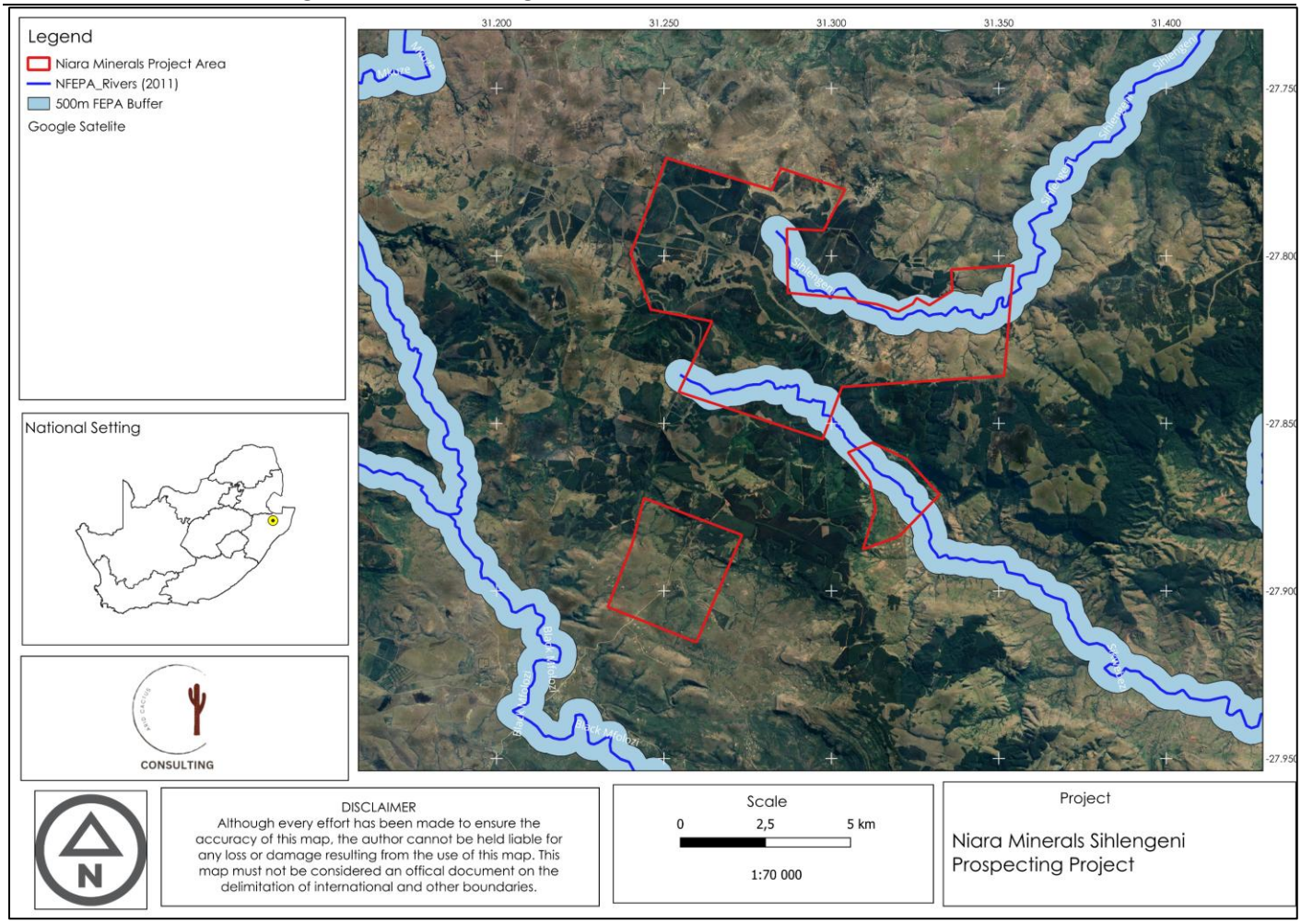


Figure 7-6: The FEPA Watercourse areas within the project area

7.5 Important Bird Areas

The project area was determined not to be within an Important Bird Area (IBA) and beyond 5km of any listed IBA; however, the project area lies within the Northern Zululand Mistbelt which is similar in characteristics to the KwaZulu-Natal Mistbelt Grasslands which is recognised as an Important Bird Area (IBA), which is recognised by BirdLife International for its support of globally threatened and regionally endemic avifauna. This includes species such as the Blue Swallow (*Hirundo atrocaerulea*), Southern Bald Ibis (*Geronticus calvus*), Blue Crane (*Anthropoides paradiseus*), and Grey Crowned Crane (*Balearica regulorum*), all of which are reliant on intact grassland habitat for breeding and foraging (BirdLife International, 2024).

7.6 Protected Areas

Protected areas are regions of conservation importance that have been formally declared as nature reserves. These areas are safeguarded to provide secure habitats for both fauna and flora species. The proposed project area was found to lie outside any proclaimed protected area; however, was within 5 km of the Ntendeka Wilderness Area, as presented in Figure 7-7. The project area intersects with land identified under the National Protected

Areas Expansion Strategy (NPAES) as suitable for future formal protection. These areas play a critical role in expanding South Africa's protected area network to meet national conservation targets and maintain ecological connectivity through functional corridors (DEA, 2016). The inclusion of this land in the NPAES underscores its biodiversity value and strategic importance for ensuring long-term ecological resilience and the persistence of threatened ecosystems and species.

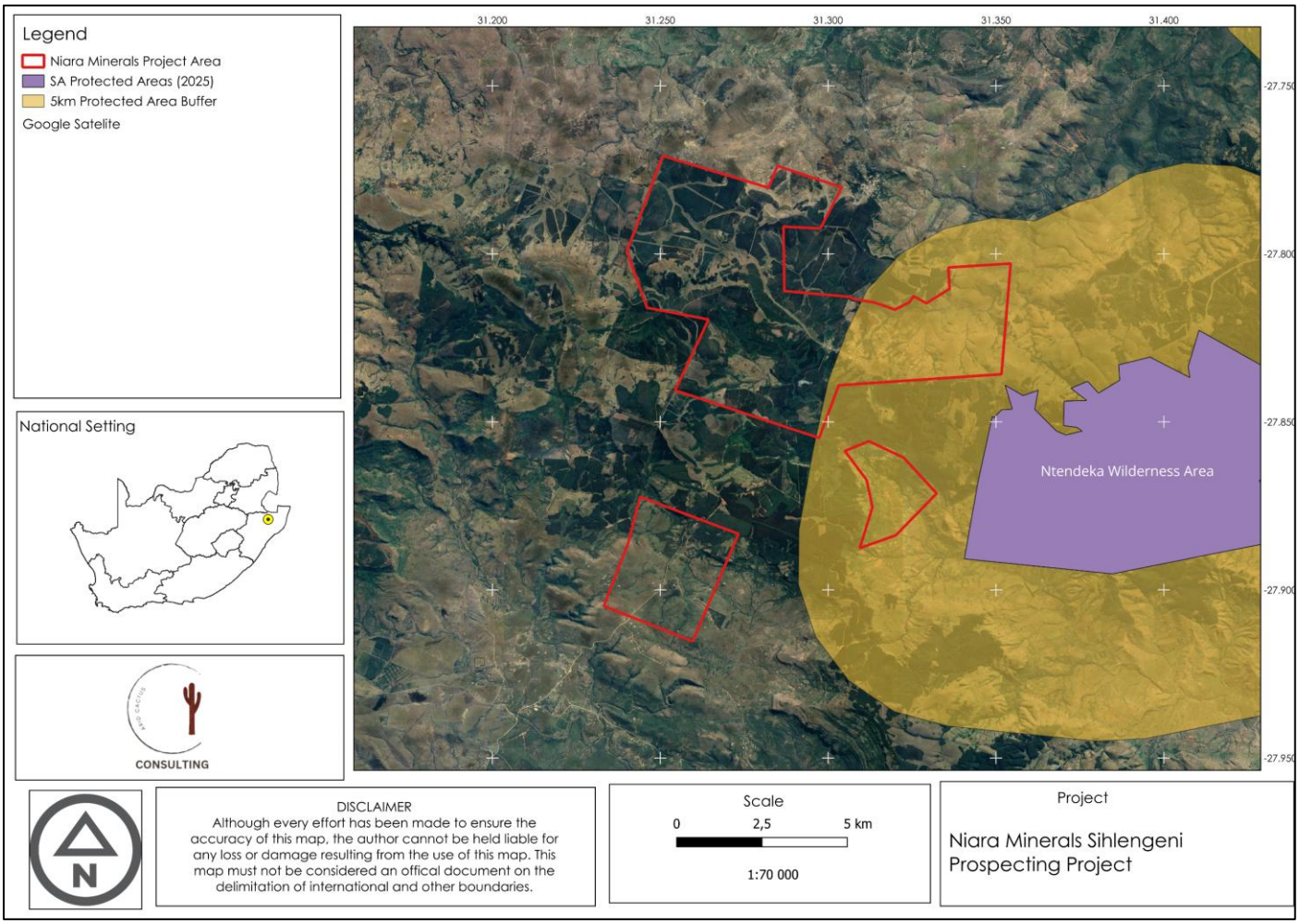


Figure 7-7: The protected areas associated with the study area

8 Exclusions

The desktop ecological sensitivity assessment identified several areas within the project footprint that must be excluded from all proposed prospecting activities due to their high conservation value and ecological sensitivity. These include delineated Key Biodiversity Areas (KBAs), the KZN CBA Areas, the 5 km buffer zones surrounding formally Protected Areas, and Freshwater Ecosystem Priority Areas (FEPAs), particularly FEPA-designated rivers. These features are recognised at both national and international levels for their ecological importance and ecosystem service provision, including habitat for threatened species, ecological connectivity, and water resource protection. In addition, a minimum buffer of 500 metres has been recommended around all FEPA rivers, wetlands, and associated riparian zones, to maintain aquatic ecosystem function and protect these systems from

potential disturbance, pollution, or erosion impacts linked to prospecting activitiesas presented in Figure 8-1. A minimum buffer zone of 100m is recommended for all CBA, KBA, and Threatened Ecosystems Remaining. These areas should be treated as "no-go" zones for the proposed prospecting activities.

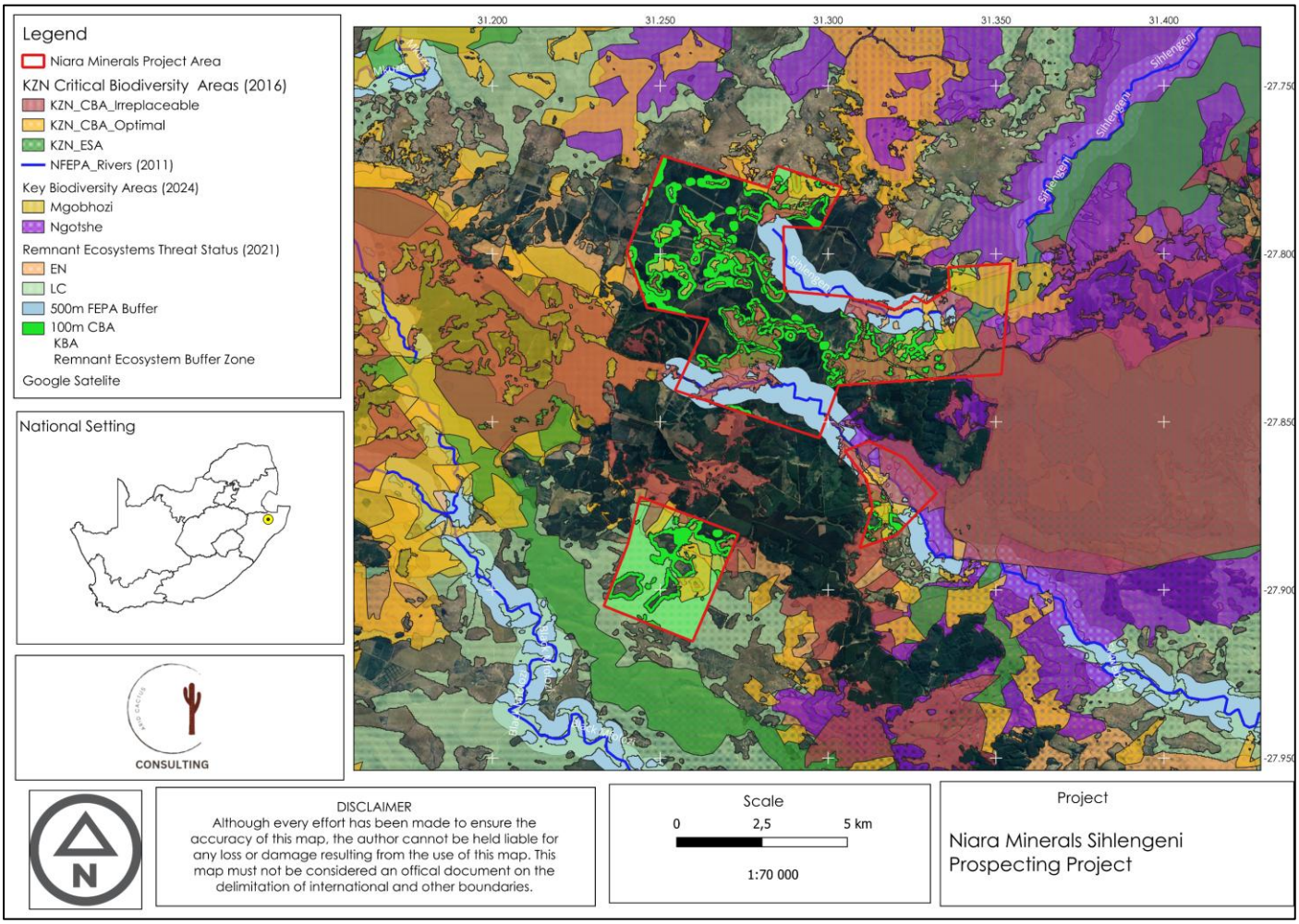


Figure 8-1: The areas for exclusion within the study area

9 Findings

9.1 Vegetation

The field investigation consisted of sampling at the possible prospecting borehole localities. Several units of vegetation were identified throughout the project area.

9.1.1 Transformed Vegetation

The vegetation within the project area was largely uniform and represented a modified grassland vegetation unit as presented in Figure 9-1a. The unit has been altered from the natural state with the grassland being dominated by short to medium grasses including *Sporobolus africanus, Melenis repens, Cymbopogon caesius, Paspalum scrobiculatum, Eragrostis capensis* and *Cynodon dactylon*. *Themeda triandra* patches were identified in areas of the vegetation. The woody layer was patchy and disjointed primarily represented

by *Vechelia sieberiana var. woodii, Vechelia nilotica*, and *Vechelia caffra* (Figure 9-1b). The overall plant diversity within the project area was considered low..

Figure 9-1: a) The transformed grassland vegetation occurring within the project area b) Woody vegetation

9.1.2 Forestry Plantations

The forestry plantations were identified in the majority of the project area and consisted of lines of *Pinus spp* trees as presented in Figure 9-2.

Figure 9-2: The Pinus spp forestry plantations

9.1.3 Residential Stands

The residential stands were scattered and varied in size and use. Larger stands were used for housing and livestock keeping whereas smaller stands were used for housing. The vegetation within these stands was varied; however, dominated by *Pennisetum clandestenum*. The area is presented in Figure 9-3.

Figure 9-3: The residential stands within the project area

9.1.4 Plant Species

The plant species observed within the project area are listed in Table 9-1. There were six (6) alien invasive species identified within the survey transects of the project area. Two the dominant identified plant species are presented in Table 9-1.

Table 9-1: Identified plant species within the project area

Species name	Common name	Conservation status
Aristida congesta	Buffalo grass	
Agave spp.		
Cymbopogon caesius	Terpentine grass	
Eragrostis capensis	Cape love grass	
Eragrostis curvula	Love grass	
Eucalyptus camaldulensis	Red river gum	Category 2 invasive
Gomphocarpus physocarpus	Balloonplant	
Imperata cylindrica	Cogon grass	
Indigofera spicata		
Juncus effusus	Common rush	
Melenis repens	Natal red top	

Species name	Common name	Conservation status
Paspalum scrobiculatum		
Perlagonium luridum		
Phragmites australis	Common reed	
Pinus spp.	Pine	Category 2 invasive
Populus alba	White poplar	Category 2 invasive
Salix babyonica	Weeping willow	Category 2 invasive
Solanum sisymbrifolum	Wild Tomato	Category 1b invasive
Sporobolus africanus	Rat's tail grass	
Themeda triandra	Red grass	
Vachelia natalitia		
Vachelia nilotica		
Vachelia siebieriana var. woodii	Paperbark tree	
Phoenix canariensis		
Yucca spp		
Solanum mauritianum	Bugweed	Category 1b invasive

9.2 Fauna

The field survey was primarily focused on the proposed borehole locations, and as such, the faunal assessment was opportunistic, relying on chance observations, indirect signs, and habitat suitability indicators encountered during the site inspection. No direct evidence of faunal activity was recorded within the immediate project area during the survey period. However, signs of livestock grazing were widespread, indicating ongoing anthropogenic use of the landscape. It is important to note that prevailing weather conditions and the timing of the site visit were not optimal for detecting fauna, particularly more cryptic, nocturnal, or seasonally active species. The project area is also heavily modified, primarily due to extensive commercial forestry plantations, which have significantly reduced natural habitat availability and ecological connectivity, thereby limiting the movement and presence of native fauna.

Commercial forestry plantations can have significant impacts on native faunal communities, primarily through habitat transformation, fragmentation, and loss of structural and floral diversity. The conversion of diverse natural grasslands, woodlands, or forests into monoculture plantations—typically of exotic species such as Pinus, Eucalyptus, or Acacia—results in a simplified habitat structure that supports fewer species and reduced trophic complexity (Geldenhuys, 1997; Armstrong & van Hensbergen, 1999). These plantations often provide poor foraging and breeding opportunities for native mammals, reptiles, amphibians, and birds, especially those with specialised habitat or dietary requirements (Castro-Arellano et al., 2007). Additionally, the chemical use, soil compaction, and frequent clear-felling associated with plantation forestry further degrade soil quality, water infiltration, and microclimatic conditions, which negatively affect invertebrates and ground-dwelling species (Schulze et al., 1997). Fragmentation of natural habitats by forestry blocks may also hinder the movement of wide-ranging species and disrupt ecological corridors essential for gene flow and seasonal migrations. In South Africa, studies have shown that grassland-dependent bird species and amphibians are particularly vulnerable

to displacement and localised extinction in forestry-dominated landscapes (Allan et al., 1997; O'Connor & Kuyler, 2009). While some generalist or edge-adapted species may persist or even increase, overall faunal diversity tends to decline compared to adjacent natural habitats.

9.3 Ecological Sensitivity

The assessment aided in identifying vegetation communities and delineating their respective boundaries, the various vegetation communities defined for the project area were further assessed qualitatively in terms of their ecological condition in order to estimate relative habitat sensitivity. The ecological function describes the structural and functional integrity of the vegetation communities/habitats which support the faunal communities. It also refers to the degree of ecological connectivity between the identified vegetation communities/habitats and other systems within the landscape (such as a combination of species composition; structural intactness and existing levels of anthropogenic disturbance, woody encroachment, etc.). The matrix presented in Table 9-2 was used to determine the ecological condition of the vegetation communities. The findings of the assessment are in bold and all caps throughout the matrix tables.

Table 9-2: Generic matrix used for the estimation and rating of vegetation ecological condition (using joint consideration of species composition and structural intactness).

		SPECIES COMPOSITION			
		Natural	Good	Fair	Poor
		Representative of reference vegetation type	>75% of expected species occur compared with an undisturbed site in a comparable vegetation type	<75% of expected species occur compared with an undisturbed site in a comparable vegetation type	<25% of expected species occur compared with an undisturbed site in a comparable vegetation type
Structural Intactness	Contiguous (reference)	Natural	Good	Fair	**POOR**
	Clumped	Good	Good	Fair	Poor
	Scattered/patchy cover	Fair	Fair	Poor	Poor
	Sparse	Poor	Poor	Poor	Very Poor

Systems with a high degree of landscape connectivity (i.e. high ecological function) amongst each other are perceived to be more sensitive. The generic matrix presented in Table 9-4 was used for the assessment of vegetation sensitivity.

Table 9-3: Generic matrix used for the estimation of habitat sensitivity (based on the joint consideration of habitat condition and threat status of the vegetation type).

			HABITAT/VEGETATION CONDITION			
		Natural	**Good**	**Fair**	**Poor**	**Very Poor/ Transformed**
Vegetation Threat Status	**CRITICALLY ENDANGERED**	High	High	High	Moderate	Low
	Endangered	High	High	High	Moderate	**LOW**
	Vulnerable	High	High	Moderate	Low	Low
	Near Threatened	Moderate	Moderate	Moderate	Low	Low
	Least Threatened	Moderate	Moderate	Low	Low	**VERY LOW**

Ecological Sensitivity can be summarized according to the criteria presented in Table 9-4.

Table 9-4: Ecological Sensitivity Categories

High –	Sensitive vegetation communities with either low inherent resistance or resilience towards disturbance factors or vegetation that are considered important for the maintenance of ecosystem integrity. Most of these vegetation communities represent late succession ecosystems with high connectivity with other important ecological systems.
Medium-	Vegetation communities that occur at disturbances of low-medium intensity and representative of secondary succession stages with some degree of connectivity with other ecological systems.
Low –	Degraded and highly disturbed vegetation with little ecological function.

The ecological sensitivity of the habitats within the project area is presented in Table 9-5.

Table 9-5. Summary of the ecological condition and sensitivity assessment for the vegetation within the project area

Vegetation Community	**Condition**	**Threat Status**	**Ecological Sensitivity**
Modified grassland	Poor	VU/EN	Moderate
Residential Stands	Poor	LC	Very Low
Forestry Plantations	Poor	LC	Very low

10 Watercourses

Several watercourses were identified within the project area. The watercourses in the project area were predominantly Channelled Valley Bottom (CVB) wetlands. Hillslope seeps, unchannelled valley bottom wetlands and drainage lines were identified in the project area. The identified wetlands are presented in Figure 10-1. The delineated watercourse areas are presented in Figure 10-2.

Figure 10-1: Identified wetland areas – a) Drainag line b) Channelled Valley Bottom b) Hillslope Seep

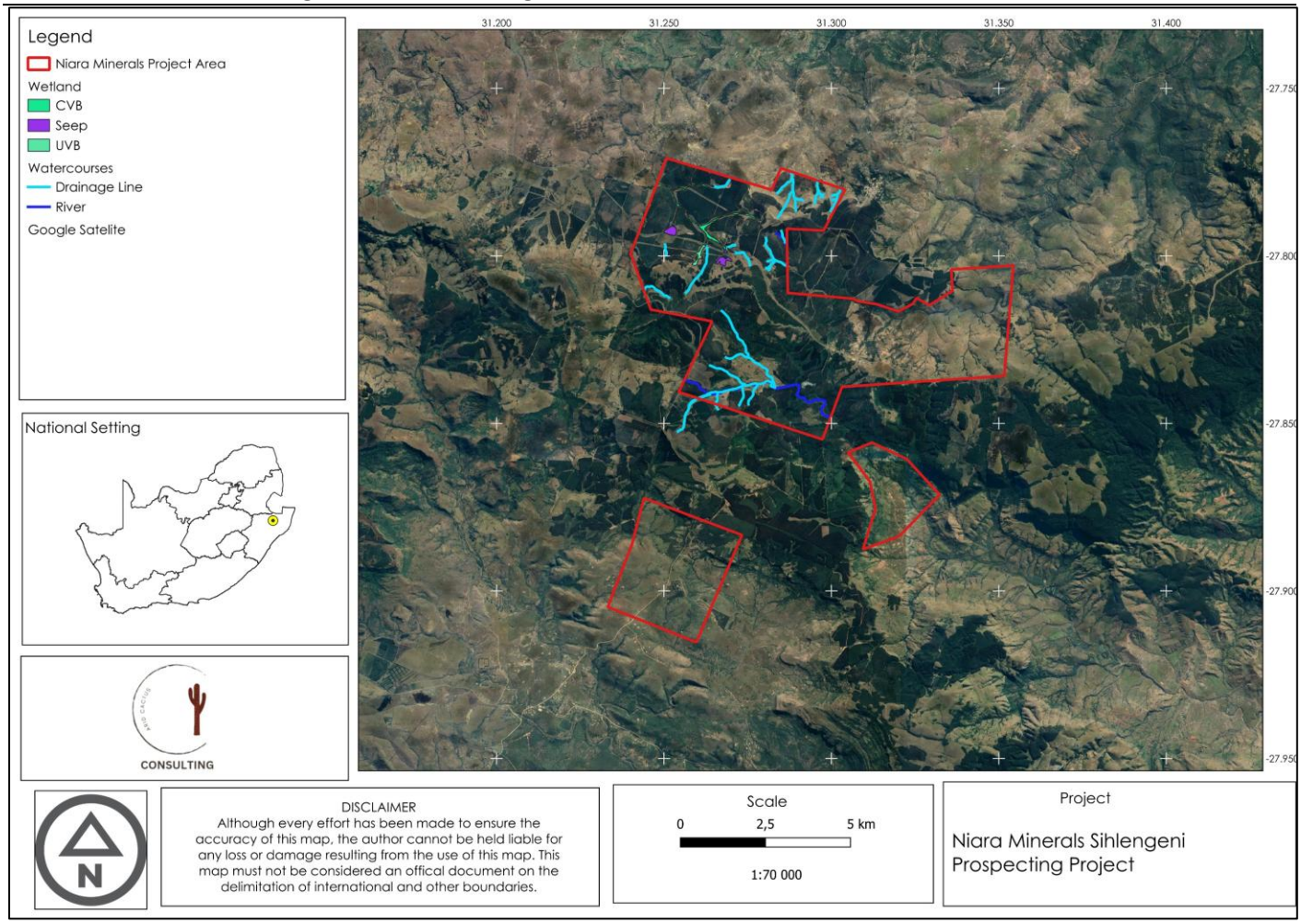


Figure 10-2: The delineated watercourse areas within the project area

10.1 Wetland Delineation

10.1.1 Wetland Unit Setting

The project area is characterised by a predominantly undulating topography with steep slopes and valleys. The wetlands within the area are predominantly valley bottom wetlands and seep zones scattered in the landscape and valley bottom wetland. The wetland landscape position observed in the project area was the slope and valley bottom landscape position for the wetland. The identified landscape positions are presented in Figure 10-3.

Figure 10-3: Identified wetland unit setting a) Slope b) Valley bottom (Besterspruit River)

10.1.2 Hydrogeomorphic (HGM) Units

The wetland was classified into its HGM unit based on the landscape position and relation to the project activities. The HGM units are as follows:

- HGM 1 – Channelled Valley Bottom
- HGM 2 – Unchannelled Valley Bottom
- HGM 3 – Hillslope Seep

The classification of the HGM units is presented in Table 10-1.

Table 10-1: The classification of HGM Units

Wetland Name	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland System	North Eastern Uplands	Mesic Grassland	Valley Bottom	Without channel	N/A	N/A
HGM 2	Inland System	North Eastern Uplands	Mesic Grassland	Valley Bottom	Without channel	N/A	N/A
HGM 3	Inland System	North Eastern Uplands	Mesic Grassland	Slope	Seep	Without Channelled Outflow	N/A

10.1.3 Wetland Soils

The observed soils within the wetland areas were the Katspruit, Kroonstad and Longlands soil forms. The identified soil forms and wetness indicators. The seep wetlands were dominated by the Longlands soil form. The valley bottom wetlands were characterised by Katspruit and Kroonstad soil forms. The identified wetland soils are presented in Figure 10-4.

Figure 10-4: Identified wetland soils and signs of wetness a) Katspruit b) Kroonstad

10.1.4 Wetland Vegetation

Wetland plants are classified as hydrophytic which refers to their adaptation to survive in highly saturated soils. The wetland plant species that were positively identified include

Schoeneplectus corymbosus, Imperata cylindrica and *Centella asiatica*. *Phragmites australis* dominated the valley bottom wetlands and *Imperata cylindrica* was identified within the seep zone. The plant species that were identified are presented in Figure 10-5. Alien invasive plant species such as *Cortodeira selloana, Melia azedarach* and *Acacia mearnsii* were identified within the valley bottom wetlands.

Figure 10-5: Identified plant species – Imperata cylindrica

10.2 Wetland Health

10.2.1 Present Ecological Status

The PES assessment measures the amount of alteration a wetland has undergone, as a result of impacts, and how much it has diverted from the reference state.

The PES assessment was performed for the identified HGM units. The wetlands were subjected to similar impacts in the area The following impacts were observed:

- Incised wetland areas – indicative of altered hydrology and flows;
- Excavated wetland area – indicative of anthropogenic effects;
- Vegetation alteration (overgrazing)
- Development in proximity to the wetland area;

The overall PES of the wetland area was determined to be Severely Modified (PES Class E). The scores for the respective modules can be seen in Table 10-2.

Table 10-2: The summary of the PES findings for the wetlands

Wetland	Hydrology	Geomorphology	Vegetation	Overall
HGM 1	D: Largely Modified	D: Largely Modified	D: Largely Modified	D: Largely Modified
Impacts	Alteration of vegetation in buffer zone and slopes due to grazing and baling Alteration of vegetation within the wetland Stormwater flow alterations Dam erection upstream of wetland	Altered flows and reduced catchment Vehicular tracks causing compaction and disturbance of soil Large scale soil exportation within wetland channel	Alteration of vegetation Wetland plants absent in wetland area Denunding of wetland area Overgrazing in wetland area Establishment of AIP species	Large alteration from the natural state due to existing impacts and pressures Alien invasive plant species in wetland
HGM 2	D: Largely Modified	D: Largely Modified	D: Largely Modified	D: Largely Modified
Impacts	Alteration of vegetation in buffer zone and slopes due to grazing and baling Alteration of vegetation within the wetland Stormwater flow alterations	Altered flows and reduced catchment Vehicular tracks causing compaction and disturbance of soil Large scale soil exportation within wetland channel	Alteration of vegetation Wetland plants absent in wetland area Overgrazing in wetland area Increase in non-wetland plants Establishment of AIP species	Large alteration from the natural state due to existing impacts and pressures Alien invasive plant species in wetland
HGM 3	C: Moderately Modified	C: Moderately Modified	D: Largely Modified	C: Moderately Modified
Impacts	Alteration of vegetation in buffer zone and slopes due to grazing and baling Alteration of vegetation within the wetland Stormwater flow alterations	Altered flows and reduced catchment Livestock grazing and disturbance of soil Large scale soil exportation within wetland channel (head cut erosion)	Alteration of vegetation Overgrazing in wetland area Increase in non-wetland plants	Moderate alteration from the natural state due to existing impacts and pressures

10.2.2 Ecosystem Services Assessment

The Ecosystem services provided by the HGM units present at each site were assessed and rated using the WET-EcoServices method (Kotze et al., 2009). The summarised results for the HGMs are shown in Table 10-3.

Table 10-3: The EcoServices being provided by the wetlands at the project area

Wetland Unit					HGM 1	HGM 2	HGM 3
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2,2	2,1	1,5
			Streamflow regulation		1,6	2,1	1,8
			Water Quality enhancement benefits	Sediment trapping	1,8	1,5	1,5
				Phosphate assimilation	1,6	1,6	1,6
				Nitrate assimilation	2,0	2,0	1,8
				Toxicant assimilation	1,8	1,8	1,6
				Erosion control	1,8	1,0	2,0
			Carbon storage		1,8	1,8	2,0
	Direct Benefits	**Biodiversity maintenance**			1,6	1,8	1,8
		Provisioning benefits	Provisioning of water for human use		1,7	2,0	1,5
			Provisioning of harvestable resources		2,1	2,1	1,8
			Provisioning of cultivated foods		0,6	0,6	0,6
		Cultural benefits	Cultural heritage		0,0	0,0	0,0
			Tourism and recreation		0,4	0,5	0,4
			Education and research		0,8	0,8	0,8
Overall					**22,5**	**22,7**	**20,7**
Average					1,6	1,7	1,4

10.2.3 Ecological Importance and Sensitivity

The Ecological Importance & Sensitivity (EIS) assessment was applied to the HGM units described in the previous section in order to assess the levels of sensitivity and ecological importance of the wetland. The results of the assessment are shown in Table 10-4. All the HGM units showed an overall EIS of Moderate. The Recommended Ecological Management Class for all the HGM units is Class C.

Table 10-4: The EIS results for the HGM units within the project area

HGM Unit	EIS Category	Recommended Ecological Management Class
HGM 1	Moderate	C (Improve)
HGM 2	Moderate	C (Improve)
HGM 3	Moderate	C (Maintain)

10.3 Water Resources Buffer Requirement

The Buffer Zone Tool was utilised to calculate a desktop buffer zone for the watercourse in the project area. The potential wetlands as were considered as wetland areas for the desktop buffer determination. Table 10-5 presents the risk associated with the proposed prospecting and the recommended desktop buffer zone (Figure 10-6) to protect watercourse areas.

Table 10-5: Buffer zone determination

Threat Posed by the proposed land use / activity		Desktop Threat Rating
Construction Phase	1. Alteration to flow volumes	N/A
	2. Alteration of patterns of flows (increased flood peaks)	VL
	3. Increase in sediment inputs & turbidity	H
	4. Increased nutrient inputs	N/A
	5. Inputs of toxic organic contaminants	N/A
	6. Inputs of toxic heavy metal contaminants	L
	7. Alteration of acidity (pH)	N/A
	8. Increased inputs of salts (salinization)	N/A
	9. Change (elevation) of water temperature	VL
	10. Pathogen inputs (i.e. disease-causing organisms)	VL
Operational Phase	1. Alteration to flow volumes	L
	2. Alteration of patterns of flows (increased flood peaks)	L
	3. Increase in sediment inputs & turbidity	L
	4. Increased nutrient inputs	L
	5. Inputs of toxic organic contaminants	L
	6. Inputs of toxic heavy metal contaminants	M
	7. Alteration of acidity (pH)	L
	8. Increased inputs of salts (salinization)	L
	9. Change (elevation) of water temperature	L
	10. Pathogen inputs (i.e. disease-causing organisms)	VL
Desktop buffer requirement (m)		**100**

A 100m Watercourse Buffer zone was applied to the drainage line to protect against intsensified flows and reduce the erosion risk.

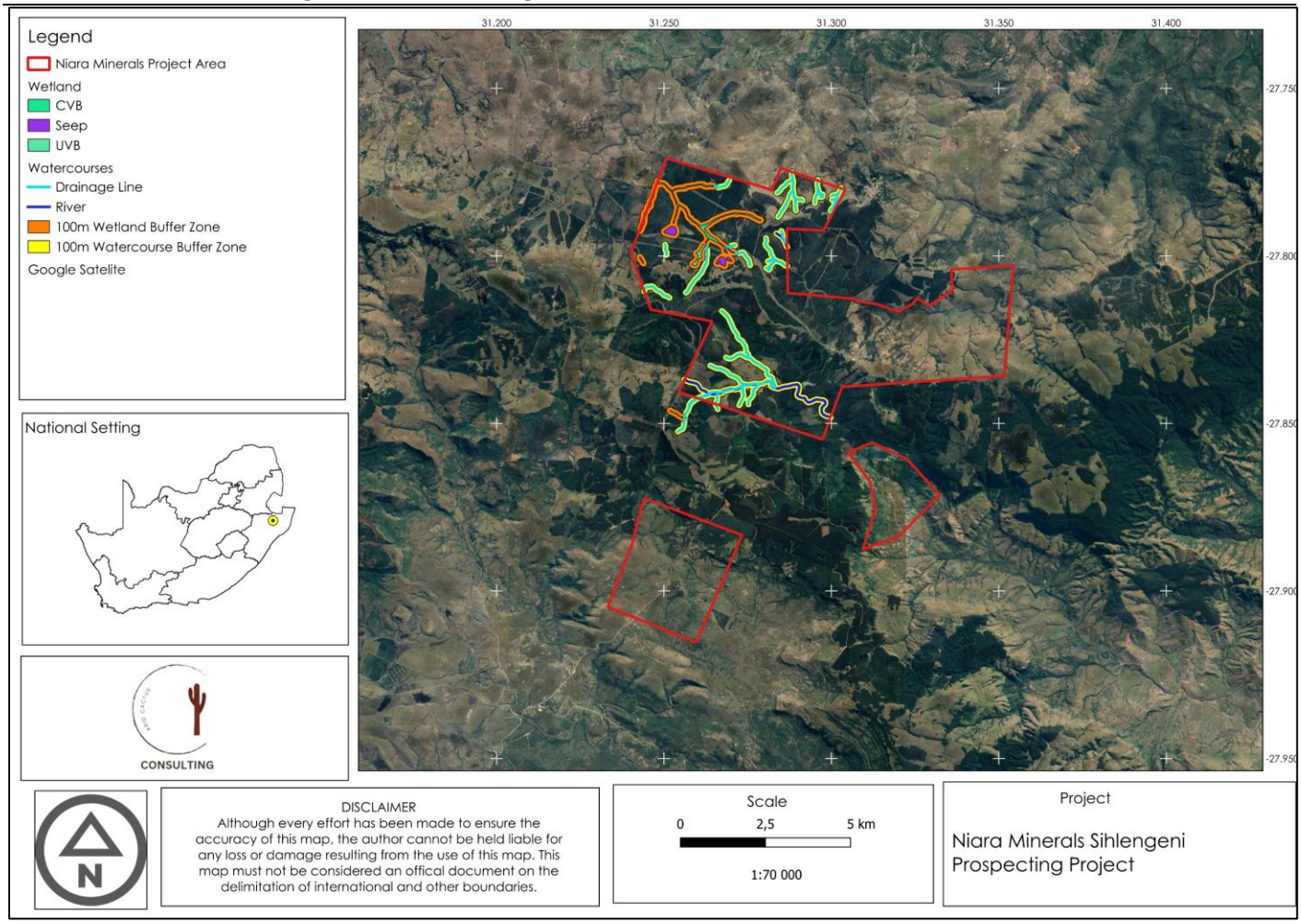


Figure 10-6: The delineated watercourse areas and buffer zones within the project area

11 Impact Assessment

11.1 Construction Phase

The impacts during the construction phase will be brought about by the site clearing and establishment activities. The expected impacts during the construction phase are:

- The clearing of vegetation
- Loss of species of conservation concern
- Displacement of faunal species
- Killing of faunal species.

11.2 Operational Phase

The impacts during the operational phase will be brought about by the operation of the mine, access roads and associated activities. The expected impacts during the operational phase are:

- Alien plant establishment
- Disturbance/Displacement of Faunal species
- Disturbance of vegetation communities

- Habitat fragmentation
- Killing of faunal species
- Continuous rehabilitation

11.3 Decommissioning and Closure Phase

Impacts during the closure and rehabilitation phase will be brought about by the activities relating to the removal of infrastructure, closing and sealing-off of pits and the final landscape shaping and revegetation. The expected impacts during the closure and rehabilitation phase are:

- Encroachment of alien invasive plant species
- Loss of species of conservation concern
- Impact on the growth and health of both fauna and flora.

11.4 Impact Evaluation

The impact assessment is presented in Table 11-1.

Table 11-1: Impact Assessment

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
Construction																
Biodiversity	Clearing of vegetation	Destruction of vegetation	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	Yes	Avoid sensitive areas and implement buffer zones Avoid areas in which plant species of conservation concern may occur; If some areas cannot be avoided implement rescue of plant species of conservation concern. Fence off the work area and demarcate clearly	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Biodiversity	Loss of plant SCC	Removal of vegetation	*Major -*	*Short Term < 18 months*	*Site or Local*	Medium	*Definite*	Medium	Yes	Limit the footprint area to the pit and infrastructure Avoid areas of remaining indigenous vegetation implement rescue of plant species of conservation concern.	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Biodiversity	Displacement of fauna species	Habitat disturbance	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	Yes	Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones. Implement training and awareness programs on human-wildlife conflict Limit working to daytime hours, no work or bright lights at night	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Biodiversity	Loss of faunal SCC	Habitat Destruction	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Definite*	Medium	Yes	Avoid areas of faunal habitat Implement training and awareness programs on human-wildlife conflict Limit working to daytime hours, no work or bright lights at night	*Moderate -*	*Short Term < 18 months*	*Site or Local*	Low	*Possible*	Low
Operation																
Biodiversity	Alien plant establishment	Degradation of vegetation	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Implementation of alien invasive plant management plan needs to be continued during	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
										operation to prevent the growth of invasive on cleared areas.						
Biodiversity	Disturbance/Displacement of Faunal species	Biodiversity loss	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Minimise footprint area Work only in clearly demarcated areas Implement training and awareness programs on human-wildlife conflict Limit working to daytime hours, no work or bright lights at night Monitor perimeter fences and carry out required maintenance immediately	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Biodiversity	Disturbance of vegetation communities	Habitat destruction	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Minimise footprint area Work only in clearly demarcated areas Establish on-site nursery to nurture indigenous plants and plants of conservation concern	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Biodiversity	Habitat fragmentation	Habitat degradation and loss	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Minimise footprint area Work only in clearly demarcated areas Rehabilitate disturbed areas	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Biodiversity	Killing of faunal species	Biodiversity loss	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Possible*	Medium	Yes	Minimise footprint area Work only in clearly demarcated areas Implement training and awareness programs on human-wildlife conflict	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Biodiversity	Continuous rehabilitation	Altered habitat	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Implement rehabilitation strategy and rehabilitation interventions	*Moderate -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Decommissioning and Closure																
Biodiversity	Encroachment of alien invasive plant species	Degradation of vegetation	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	Shaping of borrow pits to ensure free flowing topography and safety Rehabilitation of site with indigenous vegetation that occurs in the vicinity of project area.	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Unlikely*	Low
Biodiversity	Loss of species of conservation concern	Biodiversity loss	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	Yes	All infrastructure that could have a negative impact on faunal species (powerlines etc) needs to be	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Unlikely*	Low

Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION					
			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE
										decommissioned and removed.						
Biodiversity	Impact on the growth and health of both fauna and flora	Altered habitat	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Definite*	Medium	No	Implement rehabilitation strategy and rehabilitation interventions	*Moderate -*	*Medium Term > 18 months < 5 years*	*Site or Local*	Medium	*Unlikely*	Low

12 GN 4167 Risk Assessment

The risk assessment considered the nature of the project and the risks identified by the DWS Buffer Tool for the proposed sand mining development project.

Findings from the DWS aspect and impact register / risk assessment are provided in Table 12-1 and Table 12-2. The risk assessment considered the proposed activity and the current state of the wetlands.

Table 12-1: Potential impacts posed by the proposed project

Ndumiso Dlamini	**Pr. Sci. Nat.**	**116579**
Phase	**Activity**	**Impacts to Wetlands**
Construction	Site clearing and preparation	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants
	Establishment of access roads	
	Soil stockpiles and management	
	Operation of machinery and vehicles within watercourse area	
	Operation of machinery and vehicles in adjacent areas	
	Waste and ablutions facilities	
	Hydrocarbon spills	
Operational	Stormwater Management System	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants • Loss of aquatic species
	Excavation, open pit mining and stockpiling	
	Solid waste disposal (human presence)	
	Waste and ablution facilities	
	Sedimentation of wetland area	
	Aquatic habitat degradation (activities around watercourse)	
	Hydrocarbon spills	
Decommissioning	Alteration of patterns of flows (increased flood peaks	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants • Alteration of acidity (pH) • Inputs of toxic heavy metal contaminants • Alteration of acidity (pH)
	Increase in sediment inputs & turbidity	
	Operation of machinery and vehicles within watercourse area	
	Aquatic habitat degradation (activities around watercourse)	
	Final landscaping and shaping	
	Hydrocarbon spills	

Table 12-2: GN4167 Risk Assessment for the proposed project

Ndumiso Dlamini	Pr. Sci. Nat.	116579	
Phase	**Activity**	**Impacts to Wetlands**	**Risk Rating**
Construction	Site clearing and preparation	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants	**Low**
	Establishment of access roads		**Low**
	Soil stockpiles and management		**Low**
	Operation of machinery and vehicles within watercourse area		**Low**
	Operation of machinery and vehicles in adjacent areas		**Low**
	Waste and ablutions facilities		**Low**
	Hydrocarbon spills		**Low**
Operational	Stormwater Management System	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants • Loss of aquatic species	**Low**
	Excavation, open pit mining and stockpiling		**Low**
	Solid waste disposal (human presence)		**Low**
	Waste and ablution facilities		**Low**
	Sedimentation of wetland area		**Low**
	Aquatic habitat degradation (activities around watercourse)		**Low**
	Hydrocarbon spills		**Low**
Decommissioning	Alteration of patterns of flows (increased flood peaks	• Alteration to flow volumes • Alteration of patterns of flows (increased flood peaks) • Increase in sediment inputs & turbidity • Inputs of toxic organic contaminants • Alteration of acidity (pH) • Inputs of toxic heavy metal contaminants • Alteration of acidity (pH)	**Low**
	Increase in sediment inputs & turbidity		**Low**
	Operation of machinery and vehicles within watercourse area		**Low**
	Aquatic habitat degradation (activities around watercourse)		**Low**
	Final landscaping and shaping		**Low**
	Hydrocarbon spills		**Low**

13 Recommendations

Taking into consideration the limitations of the project, the following recommendations are provided:

- A 100m buffer zone must be applied to all watercourse areas and must be considered a no-go zone.
- A 500m buffer must be applied around the FEPA rivers;
- The Key Biodiversity areas must be treated as no go areas, along with a 100m buffer zone.

13.1 Mitigation Measures

The following are mitigation measures to be applied before commencement of the project:

- Any water resources within the project site area must be avoided where possible;
- The construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access;
- Laydown yards, camps and storage areas must be beyond the water resources and buffer zones. Where possible, the construction of the road and crossings must take place from the existing road and not from within the watercourse;
- The contractors used for the project should have action plans on site, spill kits and training to ensure that any fuel or oil spills are clean-up and discarded correctly;
- It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces;
- Prevent uncontrolled access of vehicles through the watercourses that can cause a significant adverse impact on the hydrology and soil structure of these areas;
- All chemicals and toxicants to be used for the road construction must be stored outside the water resources and in a bunded area;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);
- All removed soil and material must not be stockpiled within the system. Stockpiling should take place outside of the watercourse. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;

- Erosion and sedimentation into the channel must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed banks;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- No dumping of construction material on-site may take place; and
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.

14 Master Layout

The Master Layout for the proposed project is presented in Figure 14-1. All proposed borehole locations are beyond CBA Irreplaceable and Optimal areas, wetland areas, 500m buffer area around the FEPA and Key Biodiversity Areas. Furthermore, the borehole locations are situated adjacent to existing access roads.

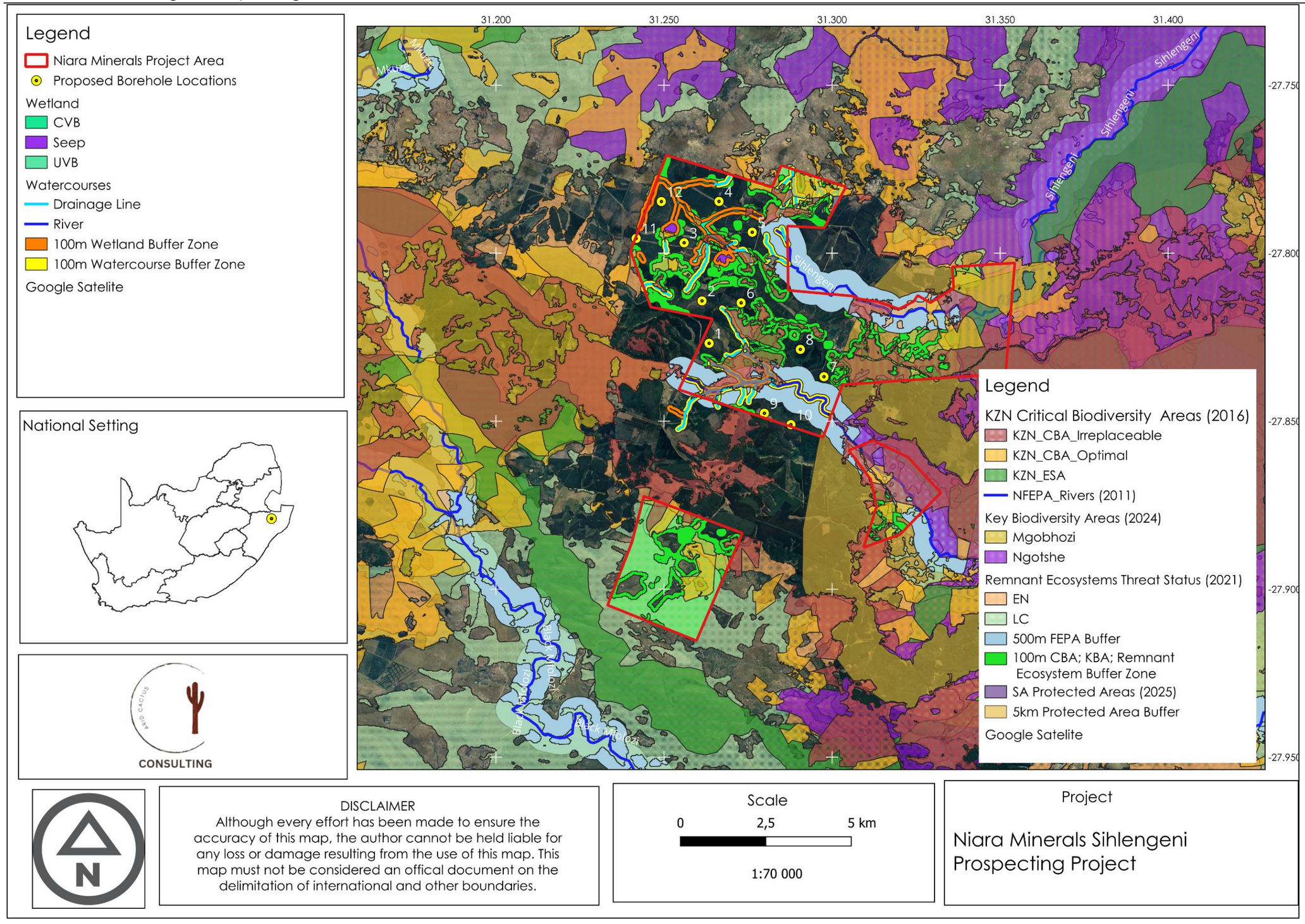


Figure 14-1: The master layout layout plan for the proposed project

15 Opinion of the Specialist

An impact statement is required as per the NEMA regulations with regards to the proposed development.

The impacts as described, rated and mitigated in this report pose a moderate negative risk to the ecogical features within the project area. The ecological sensitivity of the area is determined to be low to moderately sensitive. With firm adherence to all the mitigation measures prescribed in this report, the risks and impacts have been rated as low.

It is the opinion of the specialist that there are no identified fatal flaws with the proposed project and it may be authorised provided that all mitigation measures and recommendations are implemented, and the following conditions be included in the environmental authorisation for this project.

15.1 Conditions for Environmental Authorisation

- Any water resource areas and 100m buffer zones must be avoided for the duration of the project and all the proposed activities and secondary activities must be outside the wetland and buffer zones;
- A 500m buffer must be applied around the Sihlengeni and Sikwebezi Rivers;
- An Environmental Control Officer (ECO) must be appointed and be present for the duration of prospecting period;
- A rehabilitation plan must be compiled and implemented for the for all phases of the project. The rehabilitation plan must make provision for the rehabilitation and/or remediation of wetland areas and include an action plan (emergencies) for environmental hazards.

16 Conclusion

Three distinct habitat types were determined within the proposed project area, namely transformed grassland, residential stands and forestry plantations. The ecosystems within the project area, were considered as Endangered (EN) and therefore grassland areas were avoided for the proposed prospecting activities. The impacts identified for the proposed project were related to the habitats, vegetation units and fauna species in the project area.

The impacts to the vegetation are expected to be low as the project proposes to drill at several locations that are located within existing forestry plantations and adjacent to the roads. It is expected that impacts to terrestrial fauna will be low as the largest impact to fauna is the loss of habitat and displacement and the faunal activity was confirmed to be low.

The risk assessment determined that the most significant impact would be the loss of wetlands and wetland catchment area due to the activities of heavy machinery and drilling within wetland areas and in proximity to the wetland areas.

Mitigation measures were applied with the 100m buffer zone being the initial mitigation measure. No boreholes will be drilled within the wetland and buffer zones to mitigate losses to wetland area and functionality. All boreholes are to be placed beyond wetland areas, 100m buffer zones, beyond the Key Biodiversity Areas, beyond the FEPA Rivers and the minimum buffer zone of 500m and beyond any CBA areas including remaining grassland areas.

17 References

Allan, D.G., Harrison, J.A., Navarro, R.A., van Wilgen, B.W. & Thompson, M.W. (1997). The impact of afforestation on bird populations in South Africa. Forest Ecology and Management, 90(1), pp.103–111.

Armstrong, A.J. & van Hensbergen, H.J. (1999). The effects of afforestation on the bird populations of Mpumalanga grasslands. South African Forestry Journal, 185(1), pp.77–84.

BirdLife International (2024). KwaZulu-Natal Mistbelt Grasslands – Important Bird and Biodiversity Area (IBA). Available at: https://datazone.birdlife.org

Castro-Arellano, I., Lacher Jr, T.E., Willig, M.R. & Rangel, T.F. (2007). Assessment of mammal habitat use and species richness in a fragmented landscape. Biodiversity and Conservation, 16(2), pp.387–405.

DEA (2019). National Land Cover 2018. Department of Environmental Affairs, South Africa.

Department of Environmental Affairs (DEA). 2017. National Protected Area Expansion Strategy for South Africa: 2016–2020. Pretoria: DEA

Department of Forestry, Fisheries and the Environment. 2022. National Environmental Management: Biodiversity Act (Act No. 10 of 2004): Revised National List of Terrestrial Ecosystems That Are Threatened and In Need of Protection [Government Gazette No. 47526, Notice No. 2747, Schedule]. Pretoria: Government Printer

Department of Water Affairs and Forestry (DWS). (2005). A practical field procedure for identification and delineation of wetlands and riparian areas. Pretoria: Department of Water Affairs and Forestry.

DWA (Department of Water Affairs) 2013. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Draft. Compiled by RQS-RDM.

DWS (2016). National Water Resource Strategy, Second Edition. Department of Water and Sanitation, Pretoria.

Geldenhuys, C.J. (1997). Native forest regeneration in pine and eucalypt plantations in northern KwaZulu-Natal. South African Forestry Journal, 170(1), pp.49–58.

International Finance Corporation (IFC). 2012. Performance Standard 6: Biodiversity Conservation and sustainable Management of Living Natural Resources. IFC.

International Union for Conservation of Nature and Natural Resources (IUCN). 2015.3. Red list of threatened species. www.iucnredlist.org.

KZN COGTA (2023). KwaZulu-Natal Provincial Spatial Development Framework. Department of Cooperative Governance and Traditional Affairs, KwaZulu-Natal.

Mucina L. and Rutherford M.C. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

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

O'Connor, T.G. & Kuyler, P. (2009). Impact of land use on the biodiversity integrity of the moist sub-biome of the grassland biome, South Africa. Grassland Society of Southern Africa, 26(1), pp.35–45.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

Plants of Southern Africa (POSA) Database at http://posa.sanbi.org/

Rio Tinto. 2012. Rio Tinto and biodiversity: working towards net positive impact.

SANBI (2019). National Biodiversity Assessment 2018: The Status of South Africa's Ecosystems and Biodiversity. Synthesis Report. South African National Biodiversity Institute, Pretoria

SAWS (2023). Annual Climate Summary 2022/2023. South African Weather Service.

SAWS (2023). Annual Climate Summary for South Africa – 2022/2023. South African Weather Service.

Schulze, R.E., Maharaj, M. & Lynch, S.D. (1997). South African Atlas of Agrohydrology and Climatology. Pretoria: Water Research Commission

South African National Biodiversity Institute . 2022 Red List of Ecosystems (RLE) for terrestrial realm for South Africa - remnants [Vector] 2021

South African National Biodiversty Institute (SANBI). 2014c. Species Status Database. http://www.speciesstatus.sanbi.org/default.aspx

Stats SA (2022). Water Management Areas: Key Economic and Demographic Indicators. Statistics South Africa

Virtual Museum at: http://vmus.adu.org.za/

Wanderlog (2024). Weather in Vryheid by Month. Available at: https://www.wanderlog.com

Weather-and-Climate (2024). Average Monthly Climate for Vryheid, KwaZulu-Natal. Available at: https://www.weather-and-climate.com

Weatherspark (2024). Climate and Average Weather Year Round in Vryheid. Available at: https://www.weatherspark.com

World Business Council on Sustainable Development (WBCSD). 2012. Business Ecosystem Training (BT): Glossary of Terms and Acronyms. WBCSD