



## DESKTOP ECOLOGICAL ASSESSMENT REPORT

**Camel Thorn Group (Pty) Ltd**  
**Rietfontein Prospecting Operation**  
*Uranium (Thorium) & Rare Earths*



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**Camel Thorn Group (Pty) Ltd**

**Remaining Extent of Portion 1 (Draghoender Put), Portion 6 (a portion of Portion 1), Portion 10 (a portion of Portion 7 - Zouputs), Remaining Extent of Portion 14 (a portion of Portion 8), Portion 17 (a portion of Portion 1), Portion 18 (a portion of Portion 1), Portion 19 (a portion of Portion 1), Portion 23 (a portion of Portion 1), Portion 24 (a portion of Portion 1), and Portion 25 (a portion of Portion 14) of the Farm Rietfontein 11**

**Farm 20**

**District of Prieska**

**Northern Cape Province**

**Ecological Assessment Report in application for Environmental Authorisation related to a Prospecting Right Application ((NC) 30/5/1/1/2/13389 PR) that was lodged with the Department of Mineral Resources**

**March 2023**

## **EXECUTIVE SUMMARY**

Camel Thorn Group (Pty) Ltd is proposing the prospecting of Uranium (Thorium) and Rare Earths on Remaining Extent of Portion 1 (Draghoender Put), Portion 6 (a portion of Portion 1), Portion 10 (a portion of Portion 7 - Zoutputs), Remaining Extent of Portion 14 (a portion of Portion 8), Portion 17 (a portion of Portion 1), Portion 18 (a portion of Portion 1), Portion 19 (a portion of Portion 1), Portion 23 (a portion of Portion 1), Portion 24 (a portion of Portion 1), and Portion 25 (a portion of Portion 14) of the Farm Rietfontein 11, as well as Farm 20. The prospecting right area is located in the Prieska District of the Northern Cape Province. The applicant has submitted a Prospecting Right application, which triggers the requirement for Environmental Authorisation. An ecological assessment is needed to consider the impacts that the proposed activities might have on the ecological integrity of the property. This desktop terrestrial ecological assessment report describes the broad-scale ecological characteristics and biodiversity of the proposed prospecting area, identifies the source of impacts from the operation, and assesses these impacts, as well as the residual impacts after closure.

A desktop study was performed to obtain ecological and biodiversity information for the proposed study area and identify the ecological characteristics and sensitivity of the site. Two broad-scale terrestrial habitats comprising several micro-habitats, the Marydale River, at least four ephemeral pans, and numerous drainage lines occur in the Rietfontein prospecting area. Of these, the Marydale River, ephemeral pans and drainage lines are the most sensitive to prospecting based on their vital ecological functioning on a catchment scale. The terrestrial habitats potentially host a number of red listed flora and fauna species and are therefore considered to be of high sensitivity. Impacts associated with the proposed prospecting operation are primarily however expected to be low due to the nature of drilling activities. The most profound impacts are expected to be related to the loss of red listed species, alteration of water resources and the cumulative loss of intact habitat and biodiversity on a landscape level.

Ultimately, the significance of the impacts from the proposed operation will be affected by the success of the mitigation measures implemented during the operation. In my opinion, authorisation for the proposed operation can be granted. However, the applicant should still commit to the strict adherence of effective avoidance, management, mitigation, and rehabilitation measures.

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## **1. INTRODUCTION**

### **1.1. Background information**

Camel Thorn Group (Pty) Ltd is proposing the prospecting of Uranium (Thorium) and Rare Earths on Remaining Extent of Portion 1 (Draghoender Put), Portion 6 (a portion of Portion 1), Portion 10 (a portion of Portion 7 - Zoutputs), Remaining Extent of Portion 14 (a portion of Portion 8), Portion 17 (a portion of Portion 1), Portion 18 (a portion of Portion 1), Portion 19 (a portion of Portion 1), Portion 23 (a portion of Portion 1), Portion 24 (a portion of Portion 1), and Portion 25 (a portion of Portion 14) of the Farm Rietfontein 11, as well as Farm 20 (from hereon referred to as Rietfontein). The prospecting right area is located within the Prieska District of the Northern Cape Province. It lies 2 km north of the town Marydale, and 53 km south of Groblershoop, on the N10 (Figure 1). The total extent of the prospecting right area is  $\pm 4\,737$  ha, with the Marydale River cutting through it for  $\pm 6.5$  km.

Camel Thorn Group has submitted a Prospecting Right application, which triggers the requirement for Environmental Authorisation. An ecological assessment is required to consider the impacts that the proposed activities might have on the ecological integrity of the property and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct a desktop assessment and provide an ecological assessment report. This assessment report describes the broad-scale characteristics of habitats in the proposed prospecting area, identifies the potential biodiversity and species of conservation concern, identifies potential invasive and encroaching species, indicates the source of impacts from the prospecting operation and assesses these impacts as well as the residual impacts after closure. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the operation. Ecological responsibilities pertaining to relevant conservation legislation are also indicated in this report.

### **1.2. Scope of study**

The specific terms of reference for the study include the following:

- conduct a desktop study to identify and describe ecological habitats and provide an inventory of biodiversity (communities/species/taxa) and species of conservation concern within the environment that may be affected by the proposed activity



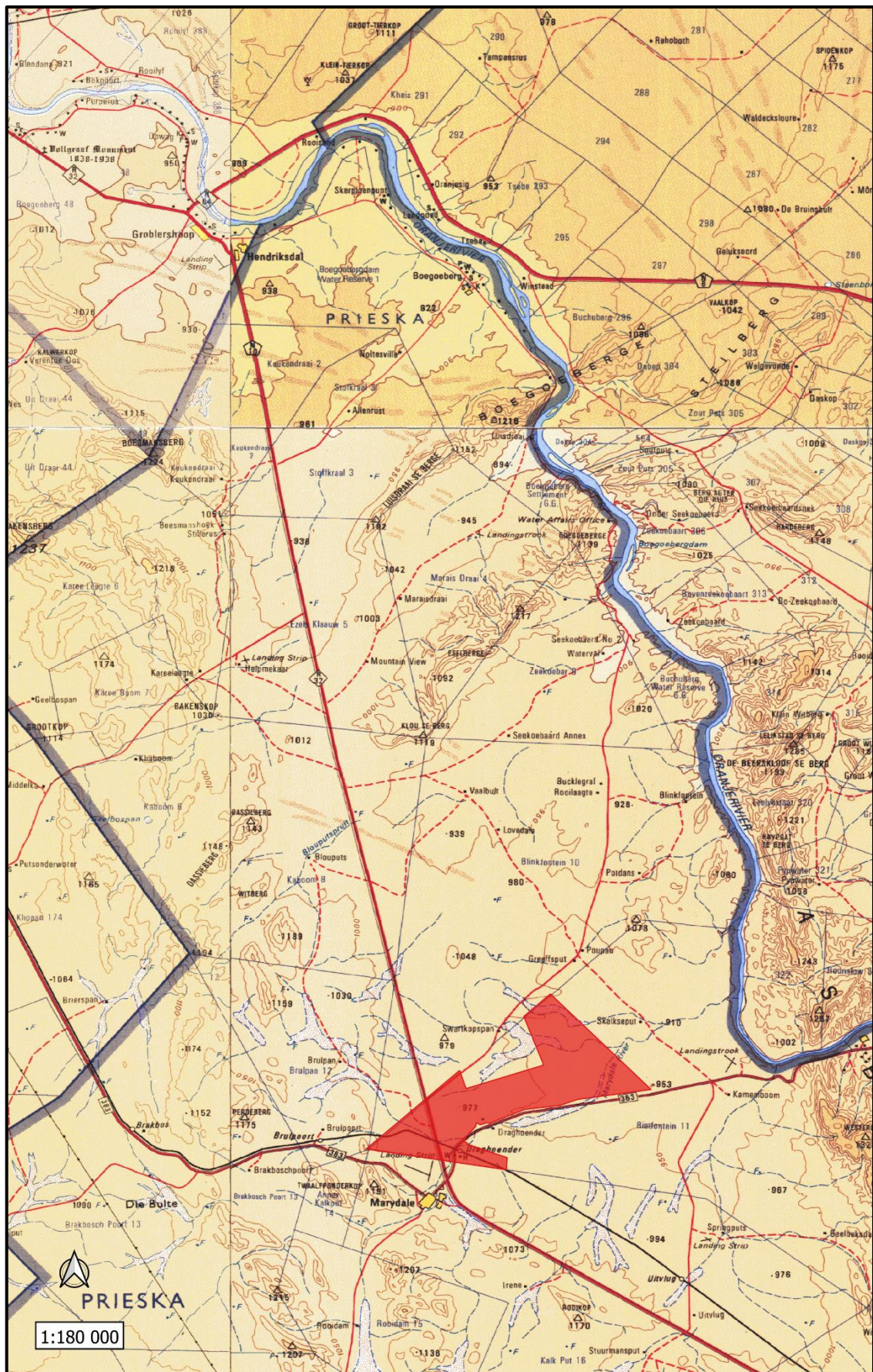



Figure 1. The location of the Rietfontein prospecting area in relation to the nearest towns.



- identify the relative ecological sensitivity of the project area
- produce an assessment report that:
  - indicates identified habitats and fauna and flora species,
  - indicates the ecological sensitivity of habitats and conservation values of species,
  - determines the potential impacts of the project on the ecological integrity,
  - provides mitigation measures and recommendations to limit project impacts,
  - indicate ecological responsibilities pertaining to relevant conservation legislation.

**1.3. Details of the specialist consultant**

<b>Company Name</b>	Boscia Ecological Consulting cc	<b>Registration no:</b>	2011/048041/23
<b>Contact Details</b>	Cell: 082 992 1261 Email: BosciaEcology@gmail.com	Address: 46 Marulani Lodge 755 Wapadrand Road Wapadrand 0081	
<b>Contact Person</b>	Dr Elizabeth (Betsie) Milne (Pr. Sci. Nat)		
<b>Qualifications</b>	Professional Natural Scientist - Ecological Science (Registration No: 131395) PhD Botany (Nelson Mandela Metropolitan University), Masters Environmental Management (University of the Free State), BTech Nature Conservation (Tshwane University of Technology)		
<b>Declaration of independence</b>	<p>I, Elizabeth (Betsie) Milne, owner of Boscia Ecological Consulting, declare that I:</p> <ul style="list-style-type: none"> <li>• act as the independent specialist in this application</li> <li>• regard the information contained in this report as it relates to my specialist input/study to be true and correct</li> <li>• do not have, and will not have any financial interest in the undertaking of the activity; other than the remuneration of work performed in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act</li> <li>• have and will not have any vested interest in the activity proceedings</li> <li>• have no, and will not engage in conflicting interest in the undertaking of the activities</li> <li>• undertake to disclose to the competent authority any material information that have or may have the potential to influence the decision of the competent authority, or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act</li> <li>• will provide the competent authority with access to all information at my disposal regarding the study</li> </ul> <div style="text-align: right;">               .....         </div>		

#### **1.4. Description of the proposed activity**

The prospecting operation is based on Uranium (Thorium) and Rare Earths that are restricted to the intrusive Draghoender and Skalkseput granitoid bodies (Figure 2). The deposits will be sampled by means of a three month drilling programme, during which six boreholes of 60 -76 mm in diameter and 20 - 50 m deep will be drilled across a pre-determined grid. A further 18 holes are planned if reserves prove to be viable. Prospecting activities will make use of existing roads where possible, but at least 5 km of new roads will be created to access the drilling grid. Vegetation will be cleared to establish each drill pad, which will consist of safety berms, wire fencing, lighting, and security. No permanent infrastructure will be established on site.

## **2. METHODOLOGY**

### **2.1. Data collection**

The study comprised a desktop survey for data collection on fauna and flora. Data was obtained from the quarter degree squares that includes the study area (2922AC).

### **2.2. Flora**

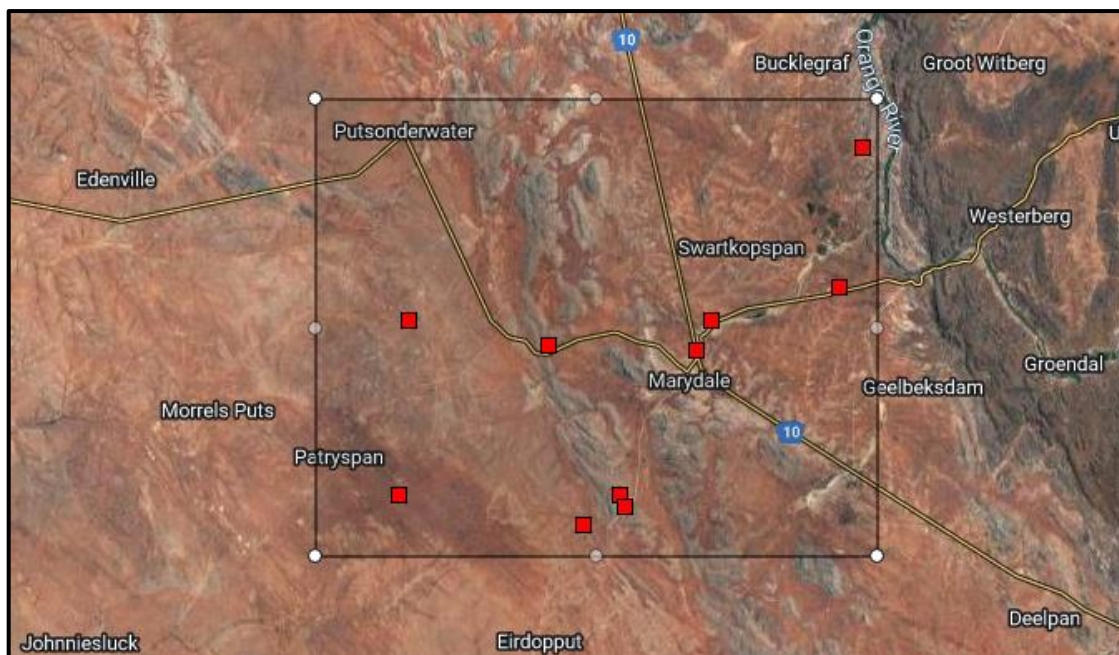
For the floral component, the South African National Vegetation Map (Mucina and Rutherford 2006) was used to obtain data on broad-scale vegetation types, associated species and their conservation status. The South African National Biodiversity Institute's (SANBI) BGIS database was also consulted to obtain information on biodiversity information for the Siyathemba (NC077) Local Municipality - Pixley ka Seme District Municipality, in which the study area falls.

Further searches were undertaken specifically for Red List plant species within the current study area. Historical occurrences of Red List plant species were obtained from the SANBI: POSA database for the broad geographical area that includes the study site (Figure 3). The IUCN conservation status of plants in the species list was also extracted from the SANBI database and is based on the Threatened Species Programme (SANBI 2020).



Figure 2. The proposed core footprint area for prospecting activities on Rietfontein.





**Figure 3.** The extent of the map filter applied on the POSA website to extract species information is shown by the large black square. The small red squares indicate historical data points.

### 2.3. Fauna

A lists of mammals, reptiles, amphibians, birds, fish and invertebrates which are likely to occur in the study area were derived based on distribution records from the literature, including Friedmann and Daly (2004) and Stuart and Stuart (2015) for mammals, Alexander and Marais (2007) and Bates et al. (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Gibbon (2006) for birds, Kleynhans (2007) for fish and Thirion (2007), Picker et al. (2004) and Griffiths et al. (2015) for invertebrates. A map of important bird areas (BirdLifeSA 2015) was also consulted. Additional information on faunal distribution was extracted from the various databases hosted by the ADU web portal, <http://adu.org.za>, the Freshwater Biodiversity Information System (FBIS) <https://freshwaterbiodiversity.org/>, and iNaturalist <https://www.inaturalist.org/>. The faunal species lists provided are based on species known to occur in the broad geographical area.

The likelihood of Red Data species occurring on site was determined using the distribution maps in the Red Data reference books (Friedmann and Daly 2004, Minter et al. 2004, Bates et al. 2014, Taylor et al. 2015, ADU 2016) and comparing their habitat preferences with potential habitats on site. The conservation status of each species is listed, based on the IUCN Red List Categories and Criteria (IUCN 2019) and the local red data books/red lists for the respective taxa.

## 2.4. Assumptions and limitations

The study took a desktop approach due to the low ecological impacts expected from the proposed drilling programme. Due to the nature of a desktop survey and the lack of ground-truthed information, the species lists, and habitat classifications reflected in this report cannot be regarded as accurate or comprehensive. Desktop information only provides a broad-scale understanding of a study area and is based on regional- and modelled data. Ideally, a site should be visited at least once to provide a fine-scale understanding of the area, and to ensure actual habitats and associated species present are verified. Nevertheless, an extensive desktop review was conducted to provide a fair representation of the study area, which should support the environmental authorisation of the drilling phase but will not suffice for invasive activities. Even though uranium mining generates hazardous waste and pose serious environmental risks, the drilling phase itself is not expected to produce hazardous waste. Therefore this assessment focusses on the effects of associated activities, assuming no hazardous waste will be produced.

## 2.5. Sensitivity mapping and assessment

An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases. Sensitivity mapping entails delineating different habitat units identified on the satellite images and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern, as well as their probability of being affected by proposed activities. Sensitivities of the different units were rated as follows:

<b>Low</b>	Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and biodiversity. Most types of activities can proceed within these areas with little ecological impact.
<b>Medium</b>	Areas of natural or previously transformed land where impacts are likely to be largely local and risks of secondary impact such as erosion low. Activities in these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
<b>High</b>	Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Activities within these areas are undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
<b>Very High</b>	Critical and unique habitats that serve as habitat for species of conservation concern or perform critical ecological roles. These areas are essentially no-go areas for activities and should be avoided as much as possible.



## 2.6. Impact assessment and mitigation

The criteria used to assess the significance of the impacts are shown in Table 1. The different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts. The limits were defined in relation to project characteristics. Those for severity, extent, duration and probability are subjective, based on rule-of-thumb and experience.

Natural and existing mitigation measures were considered. These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts.

The Consequence value of the impacts was calculated by using the following formula:

$$\frac{\text{CONSEQUENCE}}{(\text{Severity} + \text{Spatial Scope} + \text{Duration})} \times \frac{\text{PROBABILITY}}{(\text{Frequency of activity} + \text{Frequency of impact})}$$

Consequence of impacts is defined as follows:

**Very Low:** Impact would be negligible. Almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple.

**Low:** Impact would have little real effect. Mitigation and/or remedial activity would be either easily achieved or little would be required or both.

**Low – Medium:** Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and fairly easily possible.

**Medium – High:** Impact would be real and rather substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be feasible, but not necessarily possible without difficulty.

**High:** Impacts of substantial order. Mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these.

**Very High:** Of the highest order possible within the bounds of impacts which could occur. There would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted.

**Table 1.** Criteria used to assess the significance of the impacts.

Weight	Severity	Spatial scope (Extent)	Duration
5	Disastrous	Trans boundary effects	Permanent
4	Catastrophic / major	National / Severe environmental damage	Residual
3	High/ Critical / Serious	Regional effect	Decommissioning
2	Medium / slightly harmful	Immediate surroundings / local / outside mine fence	Life of operation
1	Minimal/potentially harmful	Slight permit deviation / on-site	Short term / construction (6 months – 1 yrs)
0	Insignificant / non-harmful	Activity specific / No effect / Controlled	Immediate (0 – 6 months)

Weight number		1	2	3	4	5
Frequency						
Probability	Frequency of impact	Highly unlikely	Rare	Low likelihood	Probable / possible	Certain
		Practically impossible	Conceivable but very unlikely	Only remotely possible	Unusual but possible	Definite
	Frequency of activity	Annually or less	6 monthly / temporarily	Infrequent	Frequently	Life of operation

CONSEQUENCE (Severity + Spatial Scope + Duration)															
PROBABILITY (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

Colour code	Significance rating	Value	Negative impact Management strategy	Positive Impact Management strategy
	VERY HIGH	126 – 150	Improve current management	Maintain current management
	HIGH	101 – 125	Improve current management	Maintain current management
	MEDIUM – HIGH	76 – 100	Improve current management	Maintain current management
	LOW – MEDIUM	51 – 75	Improve current management	Maintain current management
	LOW	26 – 50	Improve current management	Maintain current management
	VERY LOW	1 – 25	Improve current management	Maintain current management

### **3. DESCRIPTION OF THE AFFECTED ENVIRONMENT**

#### **3.1. Current and historic land use**

The major land use in the area is agriculture. According to AGIS, the land capability of the study site is low to moderate. Irrigation suitability is good to excellent, but soil and climate capability is low. The region is demarcated for sheep farming, with a grazing capacity of 32 ha/LSU.

Apart from the proposed prospecting activities, the prospecting right application area is mainly utilised for agricultural activities, primarily as natural pastures for livestock grazing, but there is also a small orchard in the north-east and the Marydale grain depot is located along the railway line in the south. The railway line runs through the property in the south and remnants from buildings surrounding the abandoned Draghoender railway station are still visible. The N10, R383 and a powerline also traverse the property, along with several farm roads. Disturbances relating to burrow pits and old diggings are also evident. Other infrastructure includes dwellings, homesteads and farm buildings (Figure 4).

#### **3.2. Geology, soils, and topography**

According to 1:250 000 Geological Map of 2922 Prieska, published by the Council for Geoscience in 1995, the geological features on Rietfontein comprise Quaternary sedimentary deposits, intrusive Randian deposits from the Kaapvaal Craton, as well as sedimentary deposits from the Namaqua Metamorphic Province. The majority of the study area is covered by red wind-blown sand and dunes of the Gordonia formation (Kalahari Group), which is broken by intrusive Skalkseput granite and Draghoender gneiss (Figure 5). Surface rubble and quartzites of the Kaboom and Spioenkop formations occur in the far western corner of the site (Figure 5). The thorium deposits are expected to be associated with the intrusive granite and gneiss.

The terrain is characterised by plains with open low hills or ridges. On the plains, altitude ranges from 920 m in the east to 1 000 m in the west. Altitude increases along the slopes of the hill in the far western corner from 1 020 - 1 110. The terrain on the plains is indicated by a gentle slope of 0.5 - 1 % on the plains, while very steep slopes of 38 % are found along the hill in the west.

Landtypes found on the property include Ae275 and Ib241 (Figure 6). The plains (Ae275) are characterised by red-yellow apedal, freely drained soils, red, with high base status and deeper than 300 mm. The hills (Ib241) are rocky, with miscellaneous soils.

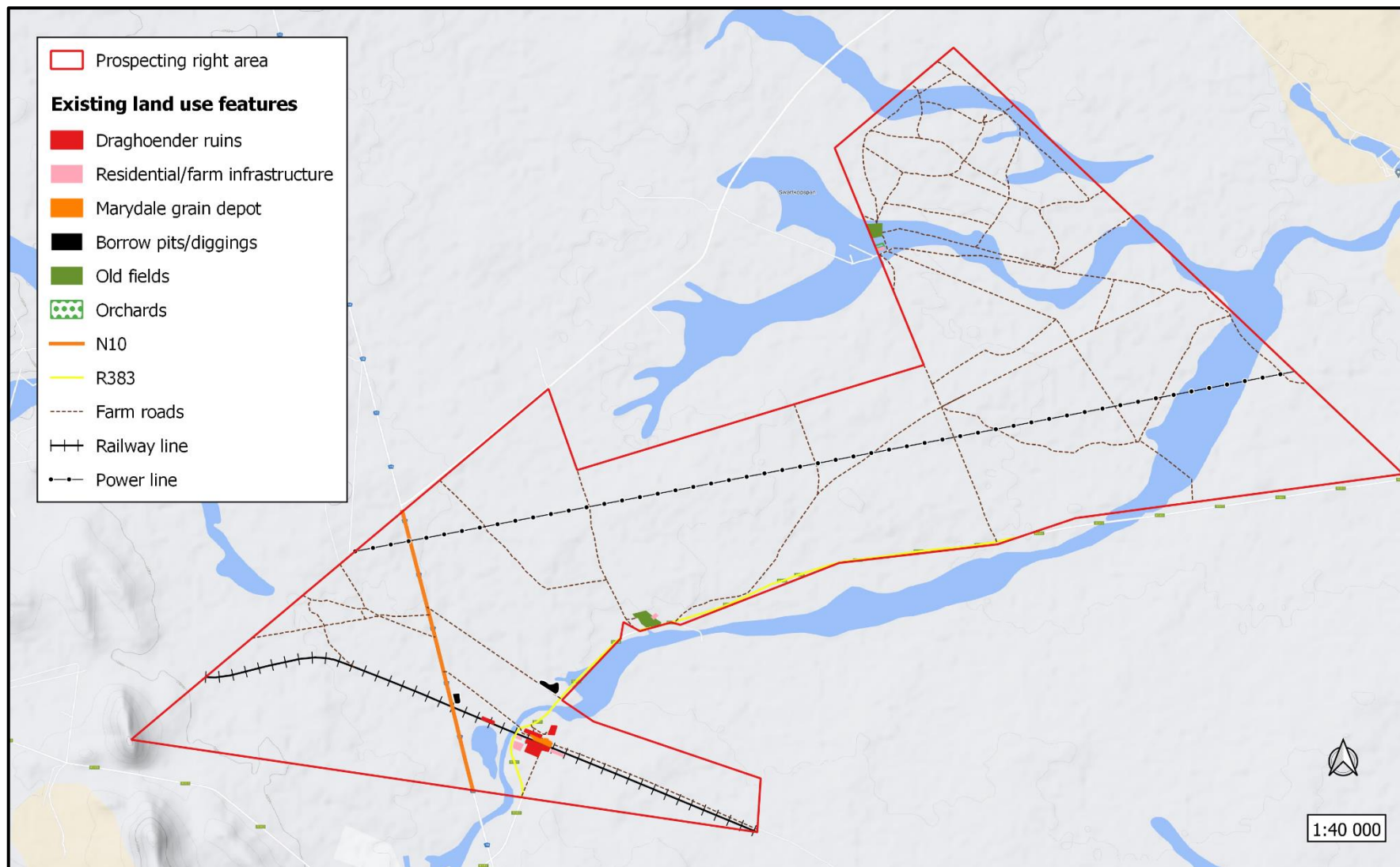


Figure 4. Evidence of existing infrastructure and past disturbances in the study area.



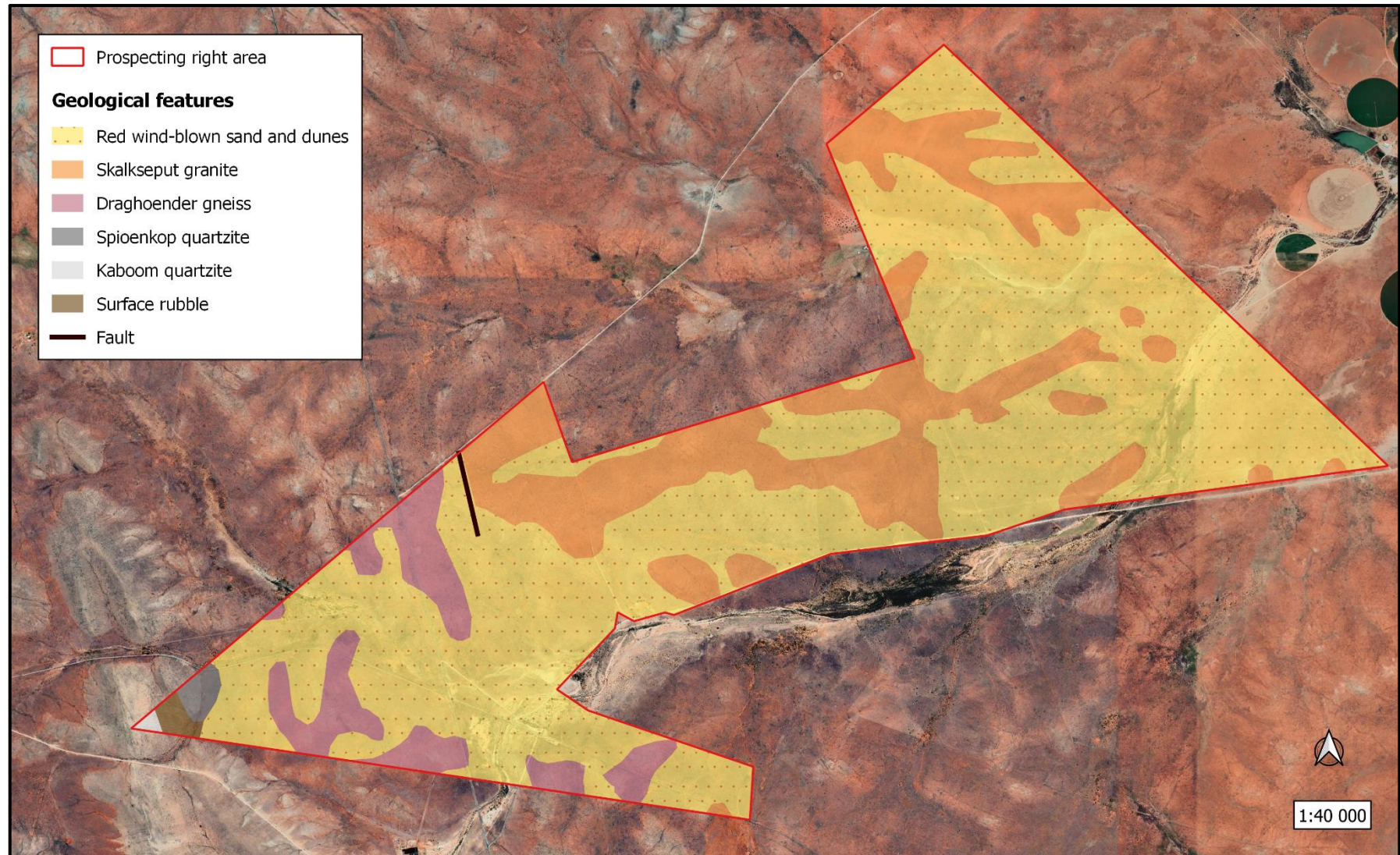


Figure 5. The distribution of geological features in the study area.



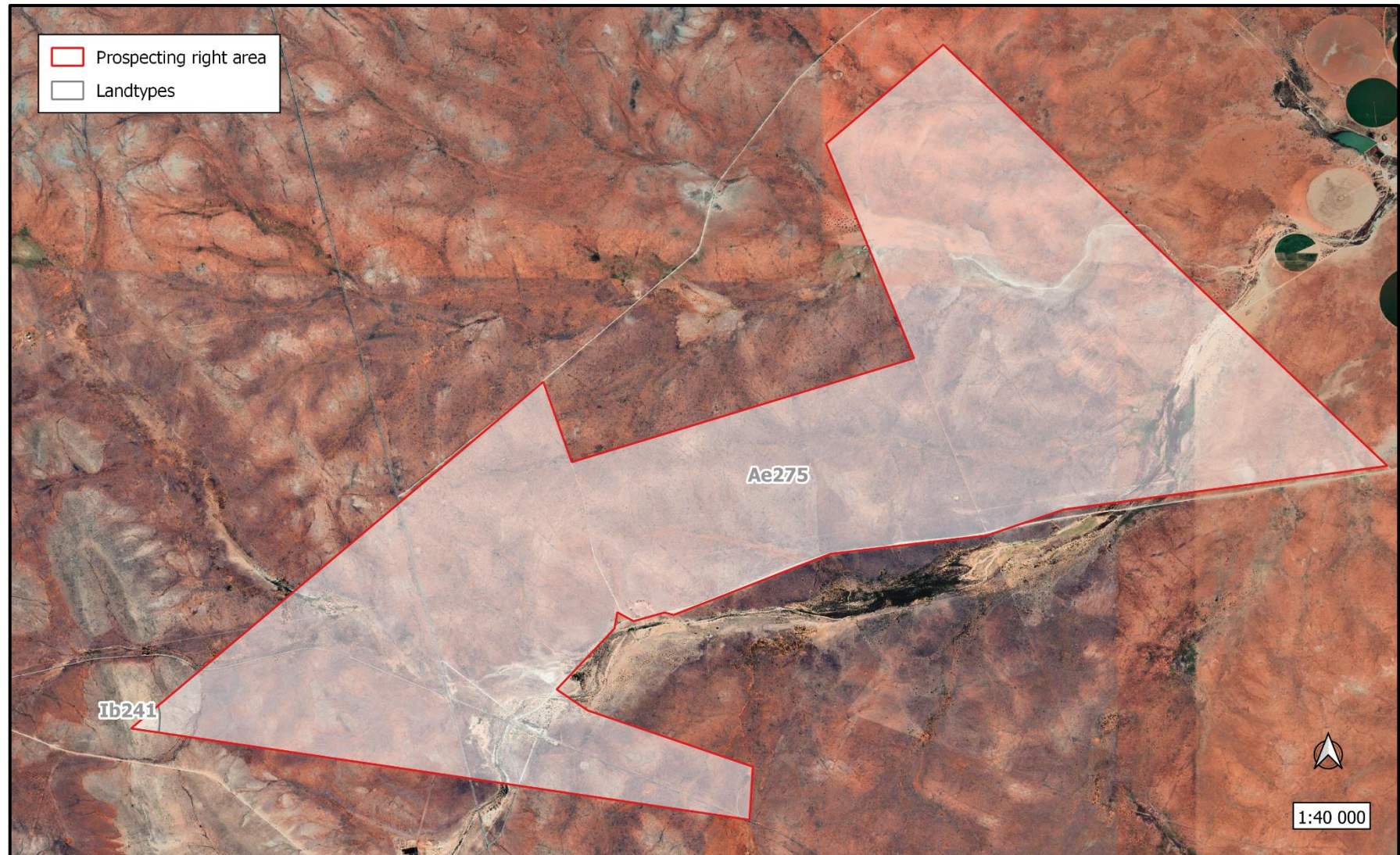


Figure 6. The distribution of land types in the study area.

Soils of the study area have moderately high wind erosion susceptibility. Water erosion susceptibility is moderate to high, but flooding hazards are low due to the arid climate. Crusting susceptibility is moderate to high and compaction susceptibility is high to very high.

### 3.3. Water resources

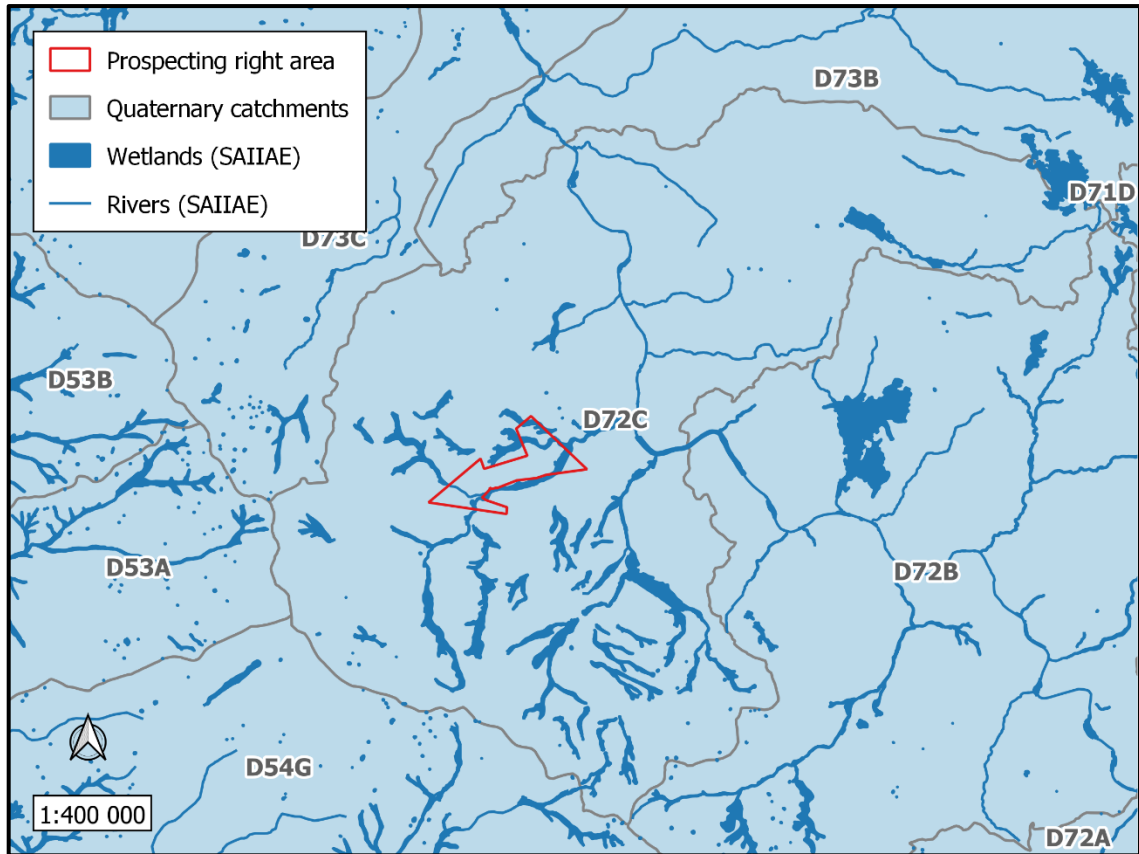
The National Water Act (36 of 1998) (NWA) provides a framework to protect water resources. According to this Act, a water resource includes a watercourse, surface water, estuary, or aquifer; whereas a water course includes:

- a) a river or spring,
- b) a natural channel in which water flows regularly or intermittently,
- c) a wetland, lake or dam into which, or from which, water flows, and
- d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.

Any reference to a watercourse includes its bed and banks and a water resource does not only include the water within the system, but also the entire water cycle; i.e. evaporation, precipitation, the habitats and processes. The purpose of this Act (Section 2) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors - (g) protecting aquatic and associated ecosystems and their biological diversity and (h) reducing and preventing pollution and degradation of water resources.

No activity may take place within a watercourse unless authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

The Rietfontein study area falls within the Boegoeberg quaternary catchment D72C of the Lower Orange Water Management Area (Figure 7). This catchment has been allocated a Present Ecological State (PES) of 'Largely Natural' (B) by Smook et al. (2002) and information regarding its mean annual rainfall, evaporation potential and runoff is provided in Table 2.



**Figure 7.** The locality of the proposed prospecting area in relation to the Boegoeberg quaternary catchment of the Lower Orange Water Management Area.

**Table 2.** Catchment characteristics for the Boegoeberg quaternary catchments in which the study area fall, as presented by Smook et al. (2002).

Quaternary catchment	Catchment Area (km <sup>2</sup> )	Mean Annual Rainfall (mm)	Mean Annual Evaporation (mm)	Mean Annual Runoff (10 <sup>6</sup> m <sup>3</sup> )
D72C	2 776	200	2 475	10.76

According to the South African Inventory of Inland Aquatic Ecosystems (SAIIAE), the study area falls within the Bushmanland Bioregion, where 4.2 % of the land area is covered by inland wetlands, including depressions, floodplains, seeps and valley-bottom wetland types (Van Deventer et al. 2019).

The spatial extent according to their present ecological status per wetland is depicted in Table 3. Depressional wetlands are most abundant in this bioregion, with the majority being severely modified. Most of the remaining wetland types in this Bioregion are also moderately- to severely modified.



**Table 3.** Percentage of inland wetland spatial extent according to the present ecological status per wetland type of the Bushmanland Bioregion.

Wetland type	Total Extent (%)	% Natural or near-natural (A/B)	% Moderately modified (C)	% Heavily to severely/critically modified (D/E/F)
Depression	74.9	16.0	33.6	50.4
Floodplains	10.3	1.9	29.4	68.7
Seeps	0.8	38.0	18.7	43.2
Valley-bottom	13.9	1.5	62.6	35.9

At least four ephemeral pans potentially occur in the study area (Figure 8). These waterbodies carry a similar signature to ephemeral pans but has not been formally mapped by SAIIE and cannot be verified without a field investigation. The Marydale River, an order-6 river, with its associated wetlands and riparian zone, flows through the prospecting right area in the south along two sections, i.e. 2.7 km in the north-east and for 1.8 km in the south-west (Figure 8). An extensive network of drainage lines also occurs across the site, with associated wetland areas identified by SAIIE for some (Figure 8).

### 3.4. Vegetation

The study area falls within the Nama Karoo Biome (Mucina and Rutherford 2006). According to the vegetation map compiled by Mucina and Rutherford (2012), the study site is represented by two broad-scale vegetation units, i.e. Bushmanland Arid Grassland and Lower Gariep Broken Veld (Figure 9). This vegetation map however does not reflect the true character of the site, because it has not been mapped at a very fine scale. A field investigation and subsequent vegetation classification is needed to provide a more accurate description of the plant communities and habitats on site.

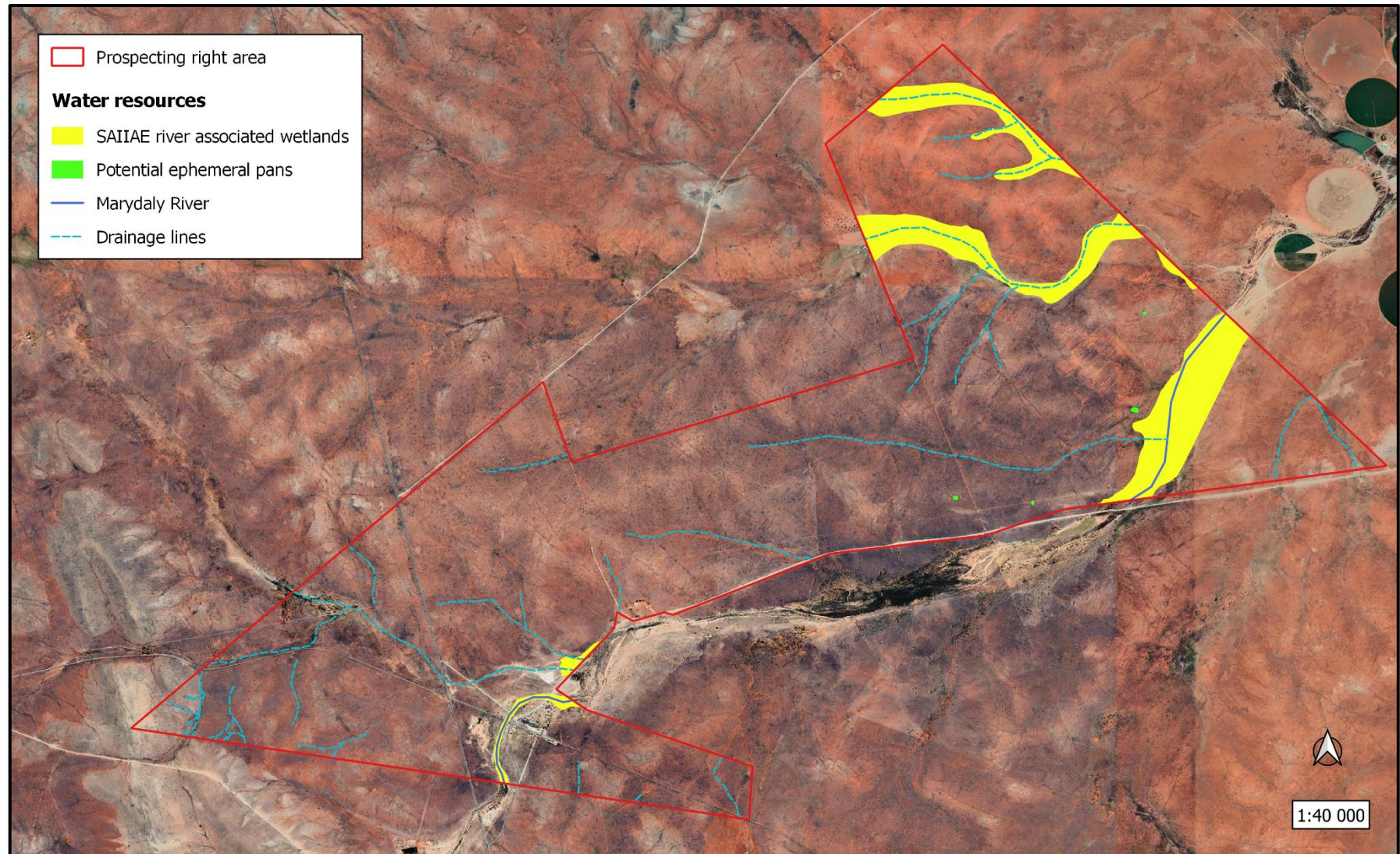
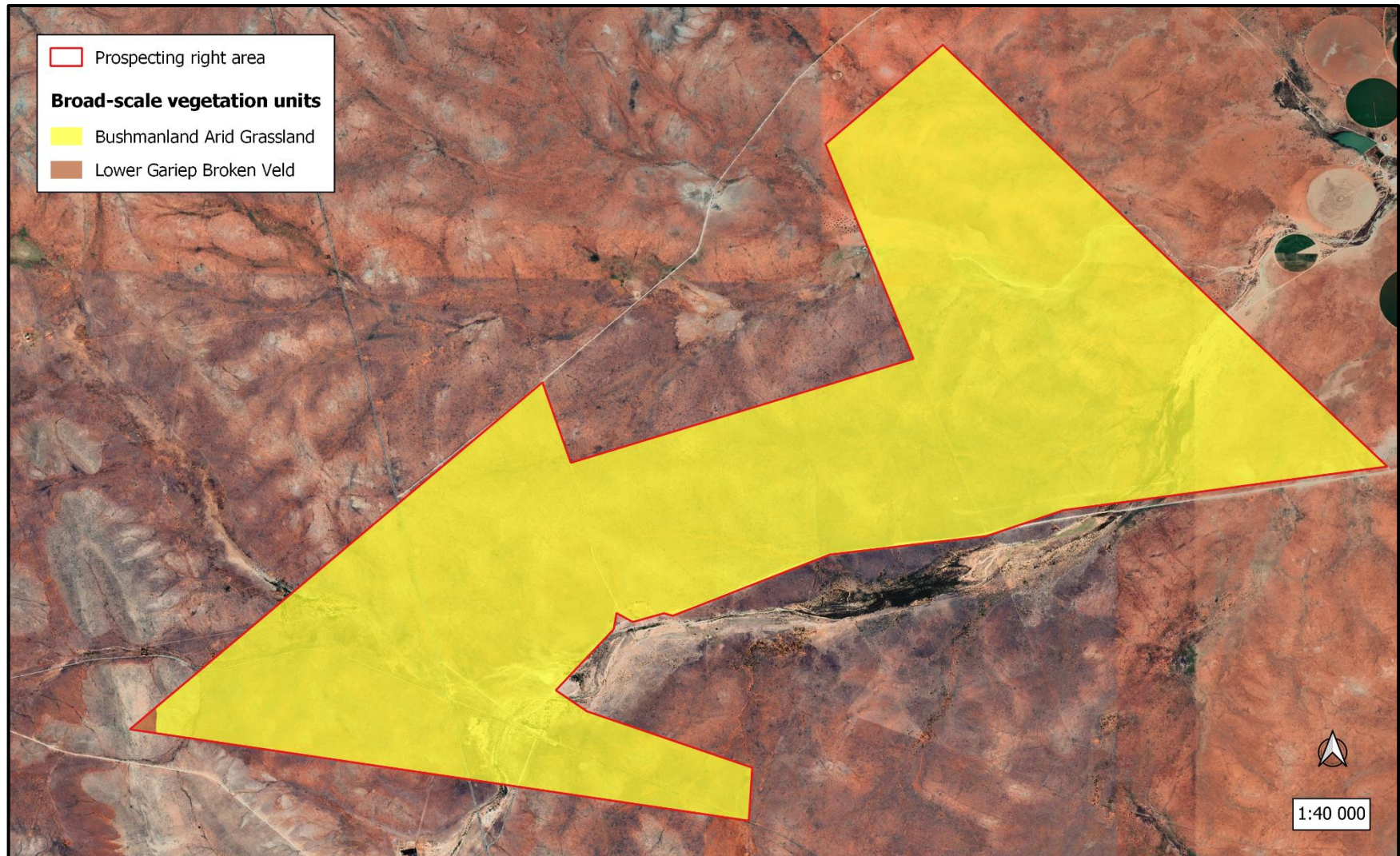


Figure 8. The location of SAIIE wetlands and drainage lines on the proposed prospecting right area.





**Figure 9.** The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

**Bushmanland Arid Grassland** is restricted to the Northern Cape. It spans from Aggeneys in the west to Prieska in the east, with its boundaries being defined by the edges of the Bushmanland Basin in the south, desert vegetation near Upington in the north and the edges of the Namaqualand hills in the west. Altitude varies from 600 to 1 200 m. The topography includes extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland, dominated by *Stipagrostis* spp. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich display of annual herbs can be expected. A third of the geology of this unit comprises recent (Quaternary) alluvium and calcrete. Superficial deposits of the Kalahari Group are also present in the east. The extensive Palaeozoic diamictites of the Dwyka Group also outcrop in the area, along with gneisses and metasediments of Mokolian age. The soils are primarily red-yellow apedal soils, freely drained, with a high base status and < 300 mm deep. However, about a fifth of the area comprises soils deeper than 300 mm. The land types include mainly Ag and Ae. The unit is classified as least threatened with very little being transformed. Small portions are conserved within the Augrabies Falls National Park and Goegap Nature Reserve. Endemic plant species include *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L. marlothii*, *Ruschia kenhardtensis*, *Lotononis oligocephala* and *Nemesia maxii*.

**Lower Gariiep Broken Veld** is restricted to the Northern Cape Province. It comprises Hardeveld along the Orange River from Onseepkans in the west, to Prieska in the east. The unit varies in altitude from 400 to 1 200 m. The topography includes hills and mountains, slightly irregular plains with sparse vegetation dominated by shrubs and dwarf shrubs. Scattered *Aloidendron dichotomum* individuals grow on the slopes of koppies, while *Senegalia mellifera* is typically found on the sandy soils of foot slopes. The geology of this unit includes Banded iron formation and amphibolites of the Asbestos Hills Subgroup, carbonates and cherts of the Campbell Group, Metamorphic rocks in the form of quartzites and gneisses of the Korannaland Subgroup as well as Riemvasmaak gneiss. The Uitdraai Formation and metamorphosed sediments and outcrops of the Namaqualand Metamorphic Complex are also found. The soils are typically shallow and skeletal, with Mispah and Glenrosa soil forms being dominant. The land types include mainly Ib and Ic, but Fb is also found. The unit is classified as least threatened and only a very small part has been transformed. Erosion risk is regarded as low, very low and moderate. Approximately 4 % is conserved within the Augrabies Falls National Park and *Ruschia pungens* is the only endemic plant species that is known from this unit.

### 3.4.1. Population of sensitive, threatened, and protected plant species

The SANBI Red List provides information on the national conservation status of South Africa's indigenous plants, which are protected under the National Environmental: Biodiversity Act (Act No. 10 of 2004) (NEMBA), while the National Forests Act (No. 84 of 1998) (NFA) and the Northern Cape Nature Conservation Act (Act No. 9 of 2009) (NCNCA) restricts activities regarding sensitive plant species. Section 15 of the NFA prevents any person to cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. Section 49 (1) and 50 (1) of the NCNCA states that no person may, without a permit pick, transport, possess, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) plants. Furthermore, Section 51(2) states that no person may, without a permit, pick an indigenous plant (Schedule 3) in such manner that it constitutes large-scale harvesting.

Most species that have been formally recorded in the region are classified as least concern (Table 4 and Appendix 1), a category which includes widespread and abundant taxa. However, three species are red listed:

*Aloidendron dichotomum* (**Vulnerable (VU)**) is predicted to decline by 36 - 73 % in its range in the next 100 years, with main threats including climate change, harvesting, and trampling by livestock. It is found on north-facing rocky slopes, but also occurs on any slopes and sandy flats. It therefore has a moderate chance to be found at low densities on the plains on site.

*Dinteranthus pole-evansii* (**VU**) is potentially threatened by overgrazing and habitat degradation, with a population of fewer than 1 000 mature individuals occurring at two locations in the region. It prefers well-drained, sandy soils associated with quartz stones and pebbles and therefore has a high likelihood to be found along the quartz outcrops in the far western corner of the study area.

*Tridentea virescens* (**Rare**) is a widespread species that occurs as sporadic small subpopulations of up to six plants. No threats are known to impact this species. It prefers stony ground, or hard loam in floodplains and therefore has a moderate potential to occur along the Marydale River, major drainage lines and their associated wetlands on site.

These records only reflect data from historical surveys in the broader region and the presence/absence of these red listed species on site can only be verified through a field survey.

**Table 4.** Plant species found in the region that are of conservation concern.

FAMILY	Scientific name	Status	NFA	NCNCA
AIZOACEAE	<b><i>Dinteranthus pole-evansii</i></b>	<b>VU</b>		S2
	<i>Mesembryanthemum coriarium</i>	LC		S2
	<i>Mesembryanthemum coriarium</i>	LC		S2
	<i>Mesembryanthemum crystallinum</i>	LC		S2
	<i>Mesembryanthemum noctiflorum</i>	LC		S2
	<i>Ruschia intricata</i>	LC		S2
AMARYLLIDACEAE	<i>Nerine laticoma</i>	LC		S2
APOCYNACEAE	<b><i>Tridentea virescens</i></b>	<b>Rare</b>		S2
ASPHODELACEAE	<i>Aloe hereroensis</i>	LC		S2
	<b><i>Aloidendron dichotomum</i></b>	<b>VU</b>		<b>S1</b>
	<i>Bulbine abyssinica</i>	LC		S2
	<i>Haworthiopsis nigra</i>	LC		S2
CAPPARACEAE	<i>Boscia albitrunca</i>	LC	<b>X</b>	S2
FABACEAE	<b><i>Lessertia pauciflora</i> var. <i>pauciflora</i></b>	LC		<b>S1</b>
	<i>Vachellia erioloba</i>	LC	<b>X</b>	
IRIDACEAE	<i>Lapeirousia plicata</i> subsp. <i>plicata</i>	LC		S2
MELIACEAE	<i>Nymania capensis</i>	LC		S2
OXALIDACEAE	<i>Oxalis lawsonii</i>	LC		S2
PEDALIACEAE	<b><i>Harpagophytum procumbens</i></b>	LC		<b>S1</b>
SCROPHULARIACEAE	<i>Jamesbrittenia canescens</i> var. <i>canescens</i>	LC		S2
	<i>Manulea schaeferi</i>	LC		S2

Species previously recorded in the region that are protected in terms of the National Forest Act include *Boscia albitrunca* (Table 4). Even though not formally recorded, it is likely that *Vachellia erioloba* also occurs on site, due to their association with deep dry sandy habitat. To damage or remove any protected trees (seedlings to adults) during the prospecting operation, a licence application must be submitted to the Northern Cape Department of Agriculture, Forestry and Fisheries (DAFF) at least three months prior to such activities.

In addition to these, specially protected species (Schedule 1) and protected species (Schedule 2) of the NCNCA known from the study region are also listed in Table 4. Specially protected species include *Lessertia pauciflora* var. *pauciflora* and *Harpagophytum procumbens*, of which both have a high potential to occur on site due to their affinity for sandy substrates.

Furthermore, according to Section 51(2) of NCNCA, a permit is required from the Northern Cape, Department of Environment and Nature Conservation (DENC) for any large-scale clearance of all indigenous (Schedule 3) vegetation, before such activities commence.



### 3.4.2. Weeds and invader plant species

Weeds and invasive species are controlled in terms of the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004, the Conservation of Agricultural Resources (CARA) Act 43 of 1993, as well as the NCNCA (Schedule 6). These are species that do not naturally occur in a given area and exhibit tendencies to invade that area, and others; at the cost of locally indigenous species. To govern the control of such species, NEMBA and CARA have divided weeds and invader species into categories (see Table 5).

All declared weeds and invasive species previously recorded in the study region are listed in Table 6, along with their categories according to CARA, NEMBA and NCNCA. Only one species has been recorded in the region, but due to the moderately high disturbance history of the study area it is expected that more species occur on site, which can only be verified through a field survey.

**Table 5.** The categorisation of weeds and invader plant species, according to NEMBA and CARA.

NEMBA	CARA
<b>1a</b> Listed invasive species that must be combatted or eradicated.	<b>1</b> Plant species that must be removed and destroyed immediately. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals and the environment.
<b>1b</b> Listed invasive species that must be controlled.	<b>2</b> Plant species that may be grown under controlled conditions. These plants have certain useful qualities and are allowed in demarcated areas. In other areas they must be eradicated and controlled.
<b>2</b> Listed invasive species that require a permit to carry out a restricted activity within an area.	<b>3</b> Plant species that may no longer be planted. These are alien plants that have escaped from or are growing in gardens and are proven to be invaders. No further planting is allowed. Existing plants may remain (except those within the flood line, 30 m from a watercourse, or in a wetland) and must be prevented from spreading.
<b>3</b> Listed invasive species that are subject to exemptions and prohibitions	

**Table 6.** A list of declared weeds and invasive species recorded in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Salsola kali</i>	Tumbleweed	-	1b	-

### 3.4.3. Indicators of bush encroachment

Bush encroacher species are controlled in terms of Regulation 16 of CARA; where land users of an area in which natural vegetation occurs and that contains communities of encroacher indicator plants are required to follow sound practices to prevent the deterioration of natural resources and to combat bush encroachment where it occurs.

No declared indicators of bush encroachment in the Northern Cape have been formally recorded in the region. However, the limited botanical records suggest that the study area is under-surveyed and therefore many of the common encroachers generally found in this region, i.e., *Rhigozum trichotomum*, *Senegalia mellifera* and *Grewia flava*, most likely do occur on site.

### 3.5. Faunal communities

According to Section 3(a) and 4(a) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009, no person may, without a permit by any means hunt, kill, poison, capture, disturb, or injure any protected (Schedule 2) or specially protected (Schedule 1) wild animals. Furthermore, Section 12 (1) of NCNCA states that no person may, on a land of which he or she is not the owner, hunt a wild animal without the written permission from the landowner. According to the act “wild animal” means a live vertebrate or invertebrate animal, and the egg or spawn of such animal.

The simple geology and moderate heterogeneity on Rietfontein provide moderately low habitat opportunities to faunal communities. Animals likely to be found in the study area are discussed in their respective faunal groups below.



### 3.5.1. Mammals

As many as 59 terrestrial mammals and seven bat species have been recorded in the region (see Appendix 2), of which eight are listed either in the IUCN or the Mammal Red List of South Africa, Lesotho and Swaziland (Table 7). Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Those that are specially protected (Schedule 1) are also indicated in Table 7.

**Table 7.** Mammals of conservation concern known from the region. Conservation values are indicated in terms of the international (IUCN) Red List, the Mammal Red List of South Africa, Lesotho and Swaziland (SAMRL) and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SAMRL	NCNCA
<i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT		
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat		NT	
<i>Orycteropus afer</i>	Aardvark			X
<i>Parotomys littledalei</i>	Littledale's Whistling Rat		NT	
<i>Manis temminckii</i>	Ground Pangolin	VU	VU	X
<i>Atelerix frontalis</i>	South African Hedgehog		NT	
<i>Proteles cristata</i>	Aardwolf			X
<i>Felis silvestris</i>	African Wild Cat			X
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	X
<i>Vulpes chama</i>	Cape Fox			X
<i>Hyaena brunnea</i>	Brown Hyena	NT	NT	X
<i>Otocyon megalotis</i>	Bat-eared Fox			X
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	
<i>Ictonyx striatus</i>	Striped Polecat			X
<i>Mellivora capensis</i>	Honey Badger			X

Honey Badger, Ground Pangolin, Aardwolf, African Wild Cat, Cape Fox, Bat-eared Fox, and Striped Polecat have a high chance of occurring across the site, given their wide habitat tolerances. Pangolins, however, are seldomly encountered due to their inconspicuous nature. Similarly, Black-footed Cat and South African Hedgehog also have a high chance of occurring on site based on their association with open, arid habitat. Aardvark has a high likelihood to be found on site and is expected to be common on the sandy plains.

Dent's Horseshoe Bat has a moderate chance to occur on site due to their affinity for savanna habitat and rocky outcrops. African Straw-coloured Fruit-bat, although having a wide habitat tolerance, requires fruit trees and therefore has a moderate chance to occur on site.

Brown Hyaena has a low potential to be found on site mainly since farm fences are restricting their occurrences across their natural distribution range. The Littledale's whistling rat is also not expected to occur on site based on their restricted distribution. The Cape Clawless Otter is expected to be restricted to the Orange River further east and is not expected to be found in the intermittent channels of the Marydale River.

Problem animals (Schedule 4) with a high likelihood to occur on site include Vervet Monkey, Black-backed Jackal and Caracal.

### **3.5.2. Reptiles**

The Rietfontein prospecting area lies within the distribution range of at least 52 reptile species (see Appendix 2), of which none are of international or national conservation concern. One species is endemic to South Africa, i.e. *Acontias gracilicauda* (Thin-tailed Legless Skink). It is fossorial, usually occupying moderately mesic soils in open or partly wooded habitats and is expected to be found on the sandy plains.

Most other reptiles are protected either according to Schedule 1, 2 or 3 of NCNCA (Appendix 2). Specially protected species include *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Chamaeleo dilepis dilepis* (Namaqua Chamaeleon). The Karusa Lizard is a rock-dwelling species inhabiting rocky outcrops and could potentially occur along the rocky hills in the west. The Common Flap-neck Chameleon is typically found high up in bushes or trees and could therefore potentially occur across the site. The Marydale River, drainage lines and ephemeral pans could potentially provide a special habitat for the Marsh Terrapin. Images of these reptile species of special importance are shown in Figure 10.

### **3.5.3. Amphibians**

Thirteen amphibian species are known from the region (Appendix 2). No permanent natural waterbodies occur on site for water-dependent species. The Marydale River, ephemeral pans and drainage lines are however expected to be important during wet periods for breeding. Those frog species that are fairly independent of water (i.e. Bushveld Rain Frog, Boettger's Caco) are expected to take refuge under rocks and logs, soil cracks, sandy substrates, leaf litter and abandoned mounds of termites.



Thin-tailed Legless Skink



Southern Karusa Lizard



Common Flap-neck Chameleon



Marsh Terrapin

**Figure 10.** Reptile species of special importance that are expected to occur in the study area.

The Giant Bull Frog (*Pyxicephalus adspersus*) (Figure 11) is listed as **Near Threatened** and is protected according to Schedule 1 of the NCNCA. They prefer seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna, but mainly remain buried up to 1 m underground until conditions become favourable. The site lies within their known distribution, and the ephemeral pans could potentially provide ideal habitat for them to occur on site.

All other amphibians of the study area are protected according to Schedule 2 of NCNCA (Appendix 2). Raucous Toad (*Amietophrynus rangeri*) and Southern Pygmy Toad (*Poyntonophrynus vertebralis*) (Figure 11) are endemic to South Africa and primarily occur in terrestrial habitats, but use temporary waterbodies (pans, roadside pools, dams, quarries) filled after rains to breed, and could potentially occur on site during the rainy season.



**Figure 11.** The Giant Bull Frog could potentially occur in the ephemeral pans on site (left), while the South African endemics, i.e., Raucous Toad (middle) and Southern Pygmy Toad (right) could potentially occur in any temporary waterbodies on site after rain events.

#### **3.5.4. Avifauna**

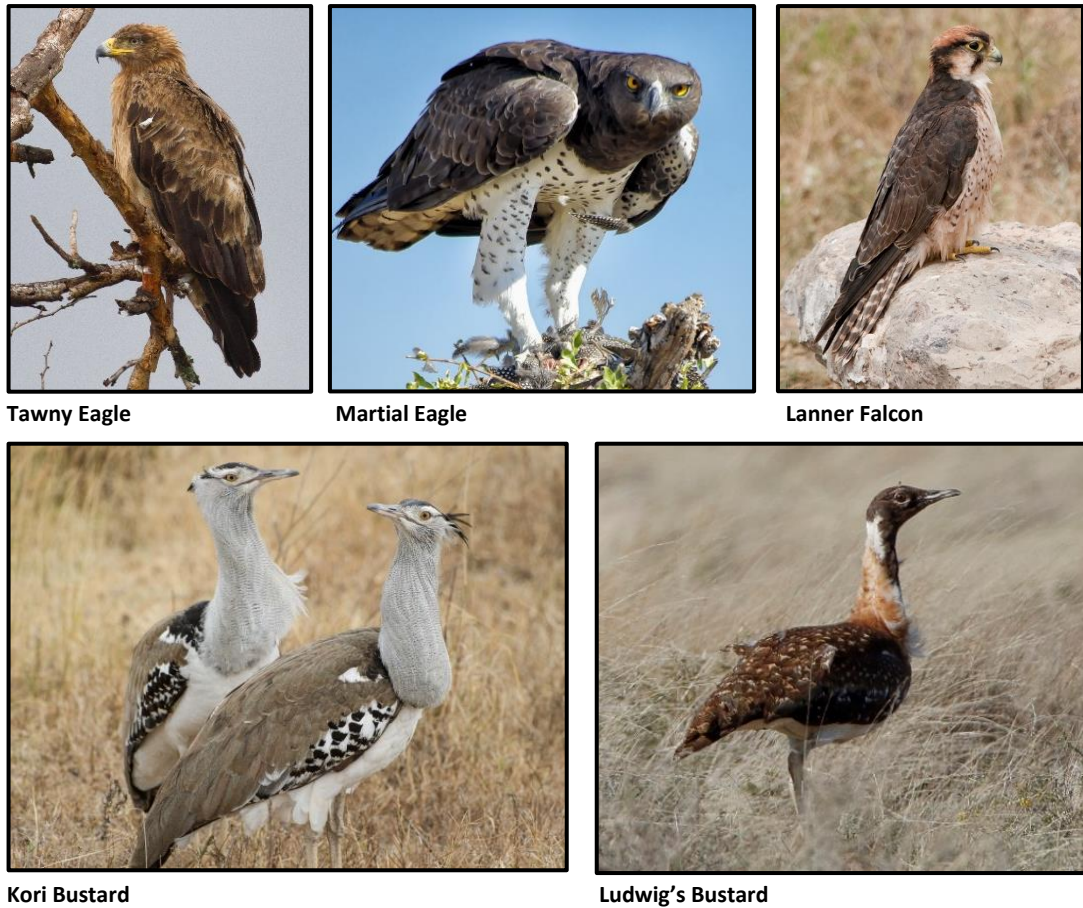
The study site does not fall within or near (< 180 km) any of the Important Bird Areas (IBA) defined by Birdlife South Africa. A total number of 247 bird species have been recorded from the region. As many as 23 listed bird species are known from the region, all of which are classified as Vulnerable, Near Threatened, Endangered or Critically Endangered (Table 8). Furthermore, all birds are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Those that are specially protected (Schedule 1) are also listed in Table 8.

Plants, from grass tufts to shrubs and trees, as well as rocky substrates provide important micro-habitats to birds and therefore the study area is expected to host a diverse avifauna community. The most common red listed species expected to occur on site include those associated with the sandy grassland habitat. Tawny Eagle (Vulnerable and Endangered), Martial Eagle (Endangered), Lanner Falcon (Vulnerable), Kori Bustard (Near Threatened) and Ludwig's Bustard (Endangered) prefer open savanna vegetation and are expected to be most common on the plains (Figure 12).

**Table 8.** Birds of conservation concern that are likely to occur on site. Species are indicated in terms of the IUCN, SA Red Data Book and Schedule 1 of the NCNCA.

Scientific name	Common name	IUCN	SA RDB	NCNCA
<i>Anthropoides paradisea</i>	Blue Crane	VU	NT	
<i>Aquila rapax</i>	Tawny Eagle	VU	EN	X
<i>Aquila verreauxii</i>	Verreaux's Eagle		VU	X
<i>Ardeotis kori</i>	Kori Bustard	NT	NT	
<i>Bubo africanus</i>	Spotted Eagle-Owl			X
<i>Bubo capensis</i>	Cape Eagle-Owl			X
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl			X
<i>Buteo rufofuscus</i>	Jackal Buzzard			X
<i>Buteo vulpinus</i>	Steppe Buzzard			X
<i>Calidris ferruginea</i>	Curlew Sandpiper	NT		X
<i>Caprimulgus europaeus</i>	European Nightjar			X
<i>Caprimulgus pectoralis</i>	Fiery-necked Nightjar			X
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar			X
<i>Caprimulgus tristigma</i>	Freckled Nightjar			X
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	X
<i>Ciconia abdimii</i>	Abdim's Stork		NT	
<i>Ciconia nigra</i>	Black Stork		VU	X
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle			X
<i>Circus maurus</i>	Black Harrier	EN		X
<i>Circus pygargus</i>	Montagu's Harrier			X
<i>Coracias garrulus</i>	European Roller		NT	
<i>Cursorius rufus</i>	Burchell's Courser		VU	
<i>Elanus caeruleus</i>	Black-shouldered Kite			X
<i>Eupodotis vigorsii</i>	Karoo Korhaan		NT	
<i>Falco biarmicus</i>	Lanner Falcon		VU	X
<i>Falco naumanni</i>	Lesser Kestrel			X
<i>Falco peregrinus</i>	Peregrine Falcon			X
<i>Falco rupicolis</i>	Rock Kestrel			X
<i>Falco rupicoloides</i>	Greater Kestrel			X
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet			X
<i>Gyps africanus</i>	White-backed Vulture	CR	CR	X
<i>Haliaeetus vocifer</i>	African Fish-Eagle			X
<i>Hieraetus pennatus</i>	Booted Eagle			X
<i>Leptoptilos crumeniferus</i>	Marabou Stork		NT	X
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk			X
<i>Milvus migrans</i>	Black Kite			X
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN	X
<i>Oxyura maccoa</i>	Maccoa Duck	VU	NT	
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT	X
<i>Phoenicopterus ruber</i>	Greater Flamingo		NT	X
<i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN	X
<i>Polihierax semitorquatus</i>	Pygmy Falcon			X
<i>Polyboroides typus</i>	African Harrier-Hawk			X
<i>Ptilopus granti</i>	Southern White-faced Scops-Owl			X
<i>Rostratula benghalensis</i>	Greater Painted-snipe		NT	X
<i>Sagittarius serpentarius</i>	Secretarybird	EN	VU	X
<i>Spizocorys sclateri</i>	Sclater's Lark	NT	NT	X
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN	EN	X
<i>Tyto alba</i>	Barn Owl			X





**Figure 12.** Bird species of conservation concern from the study region.

### 3.5.5. Fish

In addition to those regulations in the NCNCA pertaining to wild animals, Section 32 and 33 of the NCNCA states that no person may, without a permit and not immediately release, catch, import, export, transport, keep, possess, breed, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) fish.

No fish species are expected to be found in the drainage lines and although the intermittent channels of the Marydale River does not provide permanent habitat for fish, *Pseudocrenilabrus philander* (southern mouth-brooder) has been recorded here in the past. The Marydale River is a tributary of the Orange River further east, and it can potentially provide a migratory passage for fish during periods of high flow.

### 3.5.6. Invertebrates

Invertebrates dominate inland habitats and play a significant role in the overall function of the ecosystem (Kremen et al. 1993, Weisser and Siemann 2004). In general, they are widely distributed and extremely diverse, which makes it almost impossible to list all species that may possibly occur on site without a dedicated study. Invertebrates have also not been surveyed as comprehensively as plants, mammals and birds and therefore current available data on their distribution is much scarcer. Nevertheless, key morphospecies and species of conservation concern are discussed here, as well as the major habitats which delimit possible invertebrate communities on site.

Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 9. However, none of these species' distribution ranges overlap with that of the study area.

In addition, species that are specially protected according to Schedule 1 of the NCNCA include all Velvet worms as well as some baboon spider species, Stag Beetles and the Flightless Dung Beetle (Table 9). None of these taxa have been formally recorded in the study region either. All Rock- Creeping- and Burrowing Scorpions are protected according to Schedule 2 of the NCNCA, along with several beetles, butterflies, and moths (Table 9), all of which have a high likelihood to be found on site.

Three major habitats delimit possible invertebrate communities in the study area:

- i. **Terrestrial vegetation classified as Karoo (Picker et al. 2004)** includes all the terrestrial vegetation communities on site and represent unique species assemblages, with an above-average representation of beetles, grasshoppers, flies, wasps, and lacewings. Those protected butterflies and scorpions discussed above is expected to be associated with this habitat.
- ii. **Intermittent Marydale River** is expected to host many terrestrial species associated with the above-mentioned habitat during dry periods but will provide ideal habitat for aquatic macroinvertebrates once the river is flowing after sufficient rainfall events. Due to its ephemeral nature, it is expected to mainly host generalist species including damselflies, dragonflies, water boatmen, backswimmers, pygmy backswimmers, diving beetles, midges, mosquitoes, and flies.

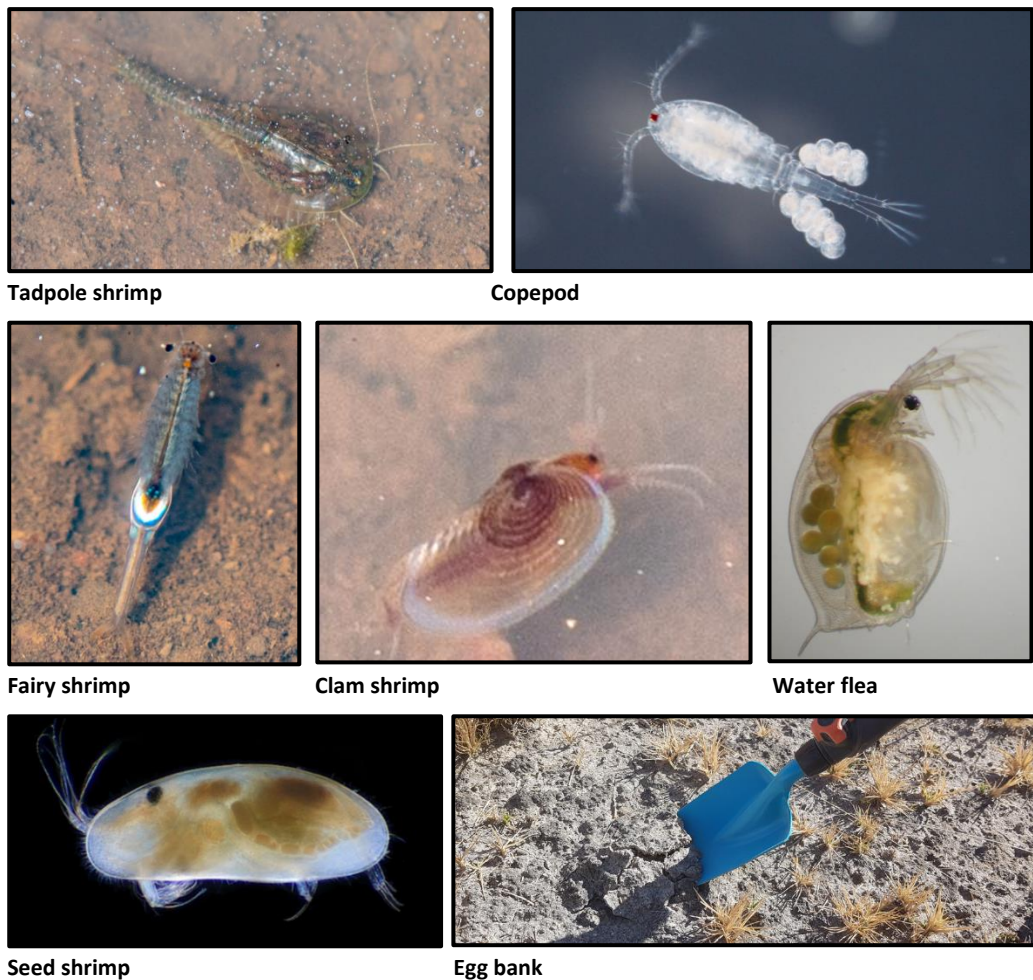
Camel Thorn Group – Rietfontein Ecological Assessment (Desktop Study)

**Table 9.** Invertebrate species found in the Northern Cape that are of conservation concern.

CLASS	ORDER	Scientific Name	Common name	Status
ARACHNIDA	MYGALOMORPHAE	<i>Ceratogyrus</i> spp.	Horned Baboon Spiders	S1
		<i>Harpactira</i> spp.	Common Baboon Spiders	S1
		<i>Pterinochilus</i> spp.	Goldenbrown Baboon Spiders	S1
	SCORPIONES	<i>Hadogenes</i> spp.	All Rock Scorpions	S2
		<i>Opisthacanthus</i> spp.	All Creeping Scorpions	S2
		<i>Opisththalmus</i> spp.	All Burrowing Scorpions	S2
INSECTA	COLEOPTERA	<i>Circellium bacchus</i>	Flightless Dung Beetle	S1
		<i>Colophon</i> spp.	All Stag Beetles	S1
		<i>Dromica</i> spp.	Tiger Beetles (all species)	S2
		<i>Graphipterus assimilis</i>	Velvet Ground Beetle	S2
		<i>Ichneostoma</i> spp.	All Fruit Chafer Beetles	S2
		<i>Manticora</i> spp.	All Monster Tiger Beetles	S2
		<i>Megacephala asperata</i>	Tiger Beetle	S2
		<i>Megacephala regalis</i>	Tiger Beetle	S2
		<i>Nigidius auriculatus</i>	Stag Beetle	S2
		<i>Oonotus adpersus</i>	Stag Beetle	S2
		<i>Oonotus interioris</i>	Stag Beetle	S2
		<i>Oonotus rex</i>	Stag Beetle	S2
		<i>Oonotus sericeus</i>	Stag Beetle	S2
		<i>Platychile pallida</i>	Tiger Beetle	S2
		<i>Prosopocoilus petictlerci</i>	Stag Beetle	S2
		<i>Prothyma guttipennis</i>	Tiger Beetle	S2
		LEPIDOPTERA	<i>Lepidochrysops penningtoni</i>	Pennington's Blue
	Lycaenidae		All Gossamer-winged Butterflies	S2
	Hepialidae		All Swift Moths	S2
	Hesperiidae		All Skippers	S2
Nymphalidae	All Brush-footed Butterflies		S2	
Satyridae	All Satyrs		S2	
ORTHOPTERA	<i>Africariola longicauda</i>	Richtersveld Katydid	VU	
	<i>Alfredectes browni</i>	Brown's Shieldback	DD	
	<i>Brinckiella serricauda</i>	Serrated Winter Katydid	DD	
	<i>Brinckiella arboricola</i>	Tree Winter Katydid	EN	
	<i>Brinckiella aptera</i>	Mute Winter Katydid	VU	
	<i>Brinckiella karoensis</i>	Karoo Winter Katydid	VU	
	<i>Brinckiella mauerbergerorum</i>	Mauerberger's Winter Katydid	VU	
ONYCHOPHORA		All Velvet worms	S1	



- iii. **Ephemeral wetlands (pans)** host aquatic invertebrate species that are specifically adapted to ephemerality, i.e., Crustaceans. Their eggs lie dormant in the soil until the pans are inundated. They then hatch and mature rapidly to produce eggs that accumulate in the top few centimetres of the sediment. These eggs are heat and drought resistant and ensure the continued existence of species in a habitat. Egg banks contains the biodiversity of the aquatic habitat during times of drought. Any disturbances to the soil will expose the eggs to erosion and crushing, which will result in species losses and possible extinction. Not much is known about the species distribution or conservation status of species in the Northern Cape, but typical taxa (Figure 13) to be expected in the pans on Rietfontein include Notostraca (Tadpole shrimps), Anostraca (Fairy shrimps), Spinicaudata (Clam shrimps), Cladocera (water fleas), Ostracoda (Seed shrimps) and Copepoda (Copepods). Insects that are common in the pans include Notonectidae (Backswimmers), Dytiscidae (Predacious diving beetles), and Odonata (Dragonfly) nymphs.



**Figure 13.** Crustacean taxa expected to be present in the pans of the study area. The first few centimetres of the soil hold the egg bank and any disturbances to this layer will expose the eggs to erosion and crushing, which might lead to major species losses.

### 3.6. Critical biodiversity areas and broad-scale processes

The proposed prospecting site falls within critical biodiversity areas (Figure 14), as defined by the Northern Cape Critical Biodiversity Areas Map (Holness and Oosthuysen 2016). This map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape. The Marydale River and two major drainage lines, along with their associated wetlands, are classified as *Ecological Support Areas* (Figure 14). The remaining areas are classified as *Other Natural Areas*, and no *Protected Areas* occur in or near the study area.

The Mining and Biodiversity Guidelines (DENC et al. 2013) also recognises the Marydale River and its associated buffer zone to have *Highest Biodiversity Importance* (Figure 15), which constitute a high risk for mining. The remainder of the site is not considered to have any biodiversity importance. These guidelines were developed to identify and categorize biodiversity priority areas sensitive to the impacts of mining to support mainstreaming of biodiversity issues in decision making in the mining sector.

Furthermore, according to the National Web based Environmental Screening Tool the study area is considered to have sensitive environmental features (Figure 16). This tool is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended), to screen their proposed site for any environmental sensitivity. According to the screening tool, the study area is of medium sensitivity based on the *Plant- and Animal Species Themes*. The sensitivity for plant biodiversity is based on suitable habitat- and distribution range overlap for red listed *Dinteranthus pole-evansii*, *Tridentea virescens* and *Aloidendron dichotomum*. The sensitivity for animal biodiversity is based on suitable habitat opportunity for red listed Ludwig's Bustard. The Marydale River is of very high sensitivity based on the *Terrestrial Biodiversity Theme*, which is a direct function of the Critical Biodiversity Areas according to the Northern Cape Critical Biodiversity Areas Map. This river and major drainage lines are also of very high sensitivity based on the *Aquatic Biodiversity Theme* due to their status as rivers and associated wetlands.

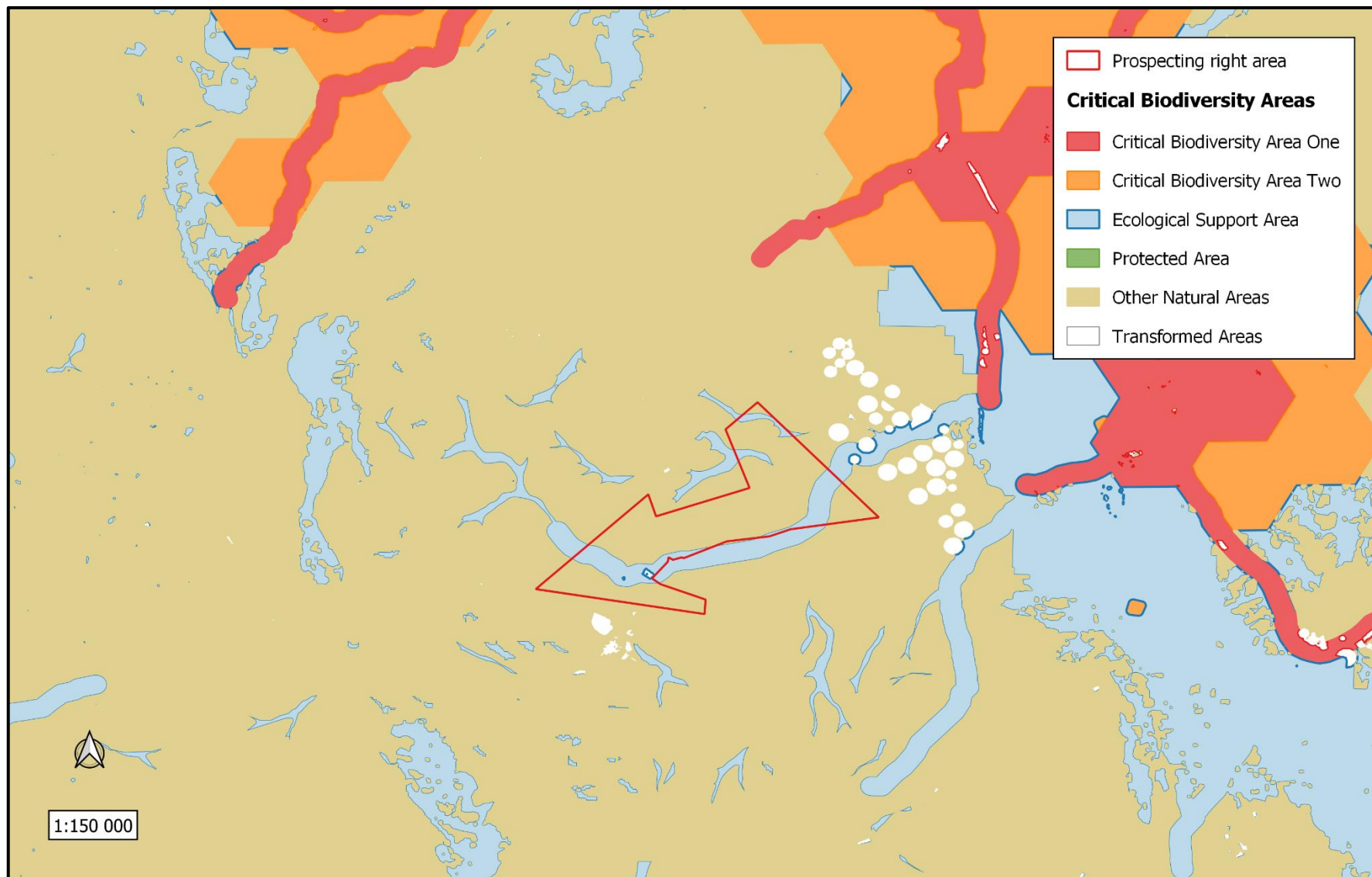


Figure 14. The study area in relation to the Northern Cape Critical Biodiversity Areas.



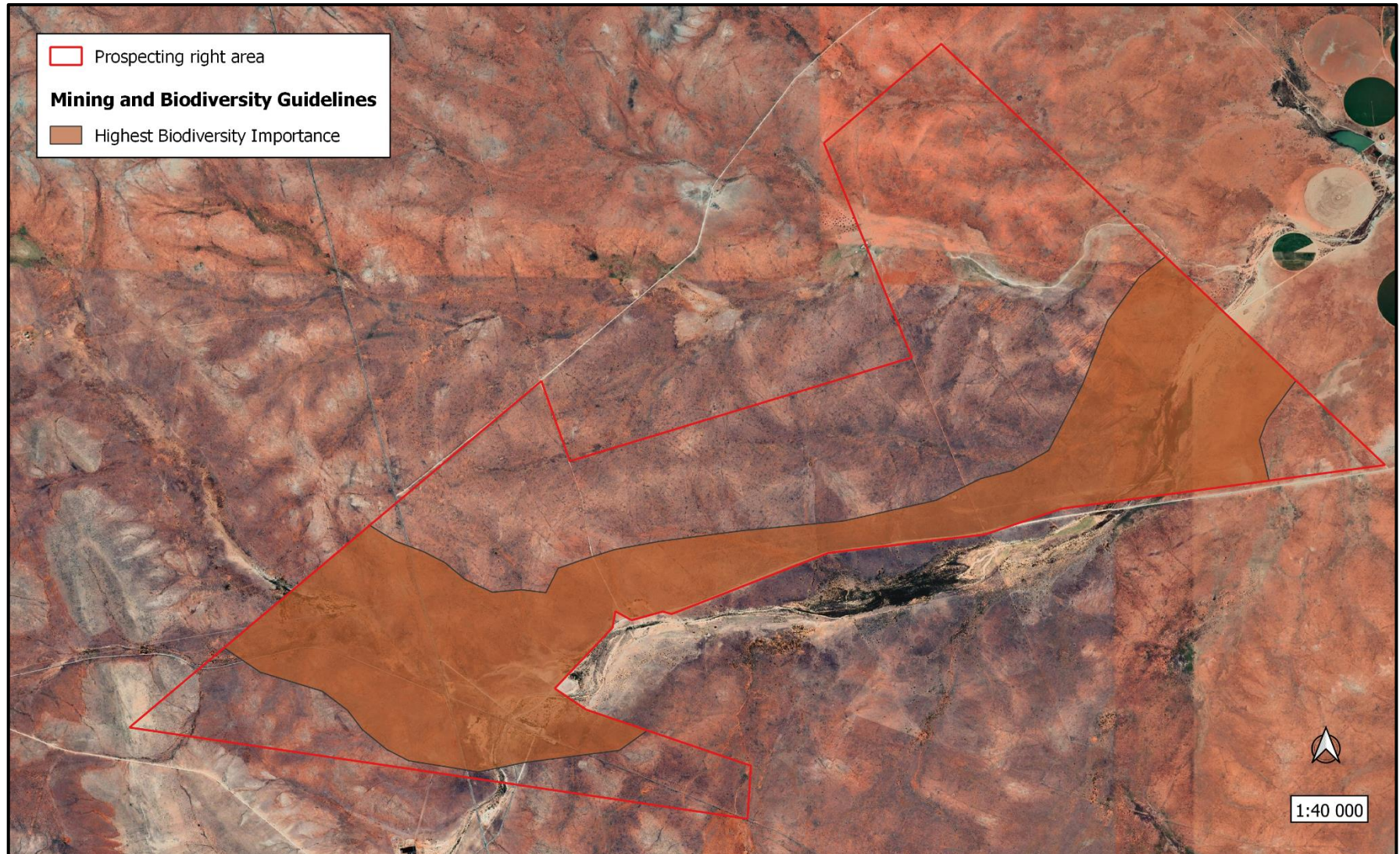
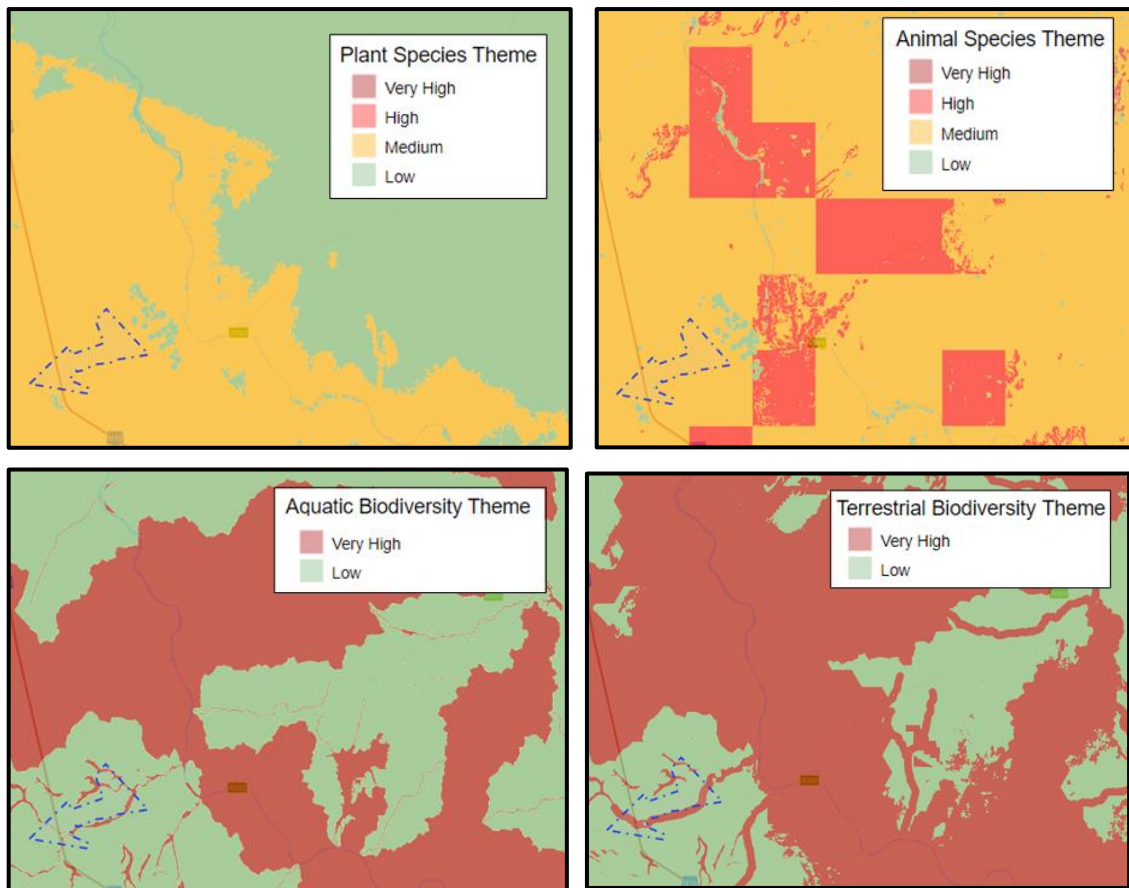


Figure 15. The study area in relation to the Mining and Biodiversity Guidelines.

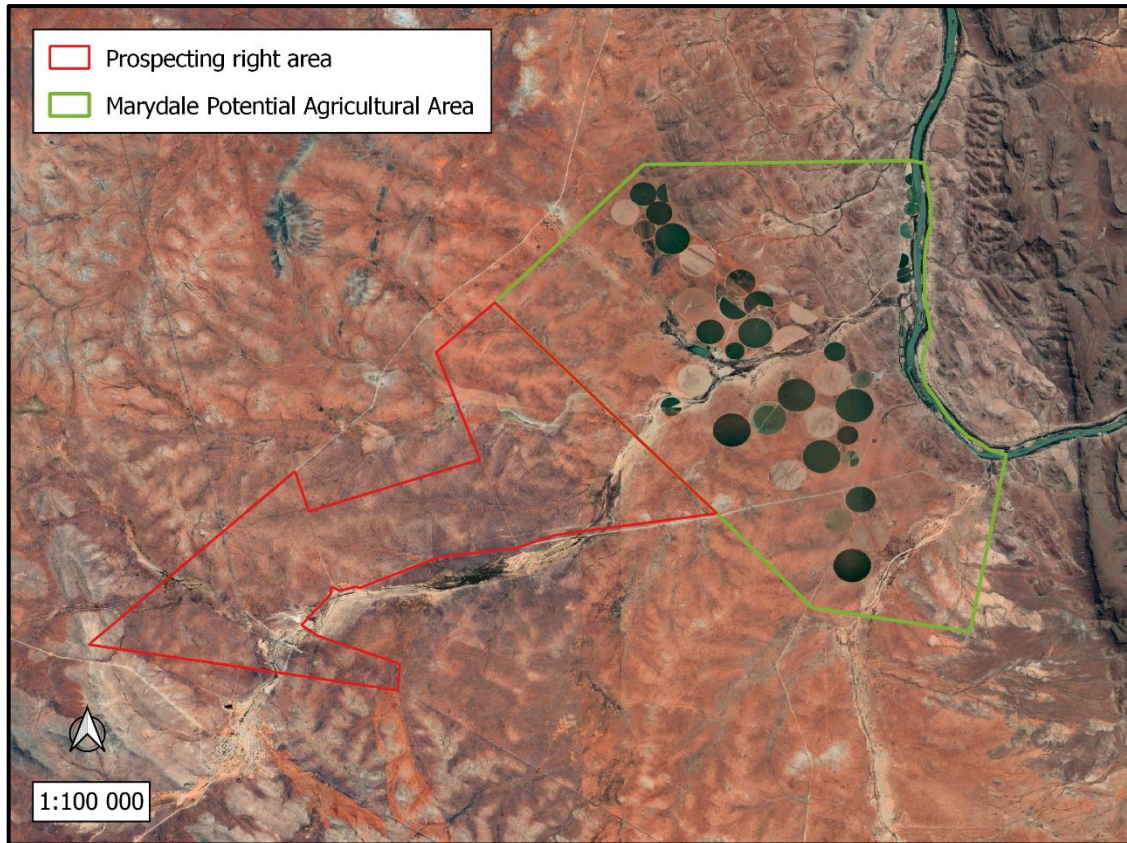


**Figure 16.** Environmental sensitivities in the study area, according to the National Web based Environmental Screening Tool.

According to the Pixley ka Seme Spatial Development Framework, all rivers and wetlands (ephemeral and perennial), including a generic buffer of 100m, are regarded as ecological corridors and sensitive. Their mandate is to conserve existing ecological corridors and rehabilitate any remnants of corridors.

Finally, the study area falls adjacent to a high potential agricultural area, i.e., the Marydale Potential Area (Figure 17), where high transformation of a similar habitat type has occurred due to irrigation. This could potentially increase the operation’s cumulative impacts. Asbestos deposits were also mined extensively in the region, but these mining activities primarily occurred along the Asbestos Mountains and has no cumulative effect potential on the habitat type found in the study area.





**Figure 17.** The extent of transformation through agriculture in the study region.

### 3.7. Site sensitivity

The ecological sensitivity map for Rietfontein is illustrated in Figure 18. The Marydale River and drainage lines, along with their riparian buffers, as well as the ephemeral pans are of **very high** sensitivity due to their vital ecological and hydrological functionality and significance. All watercourses are unique habitats protected in terms of the National Water Act (Act No 36 of 1998). These highly sensitive areas should be considered as **no-go areas**.

Most of the pristine terrestrial habitat is of **high** sensitivity, mainly based on the potential occurrence of red listed plant species, and the suitable habitat for red listed bird species, as discussed in this report. These areas are not regarded as no-go areas, but activities should proceed with caution as it may not be possible to mitigate all impacts.

Areas transformed by historic disturbances are of **low** sensitivity. There is likely to be a negligible impact on ecological processes and biodiversity here and most types of activities can proceed within these areas with little ecological impact.



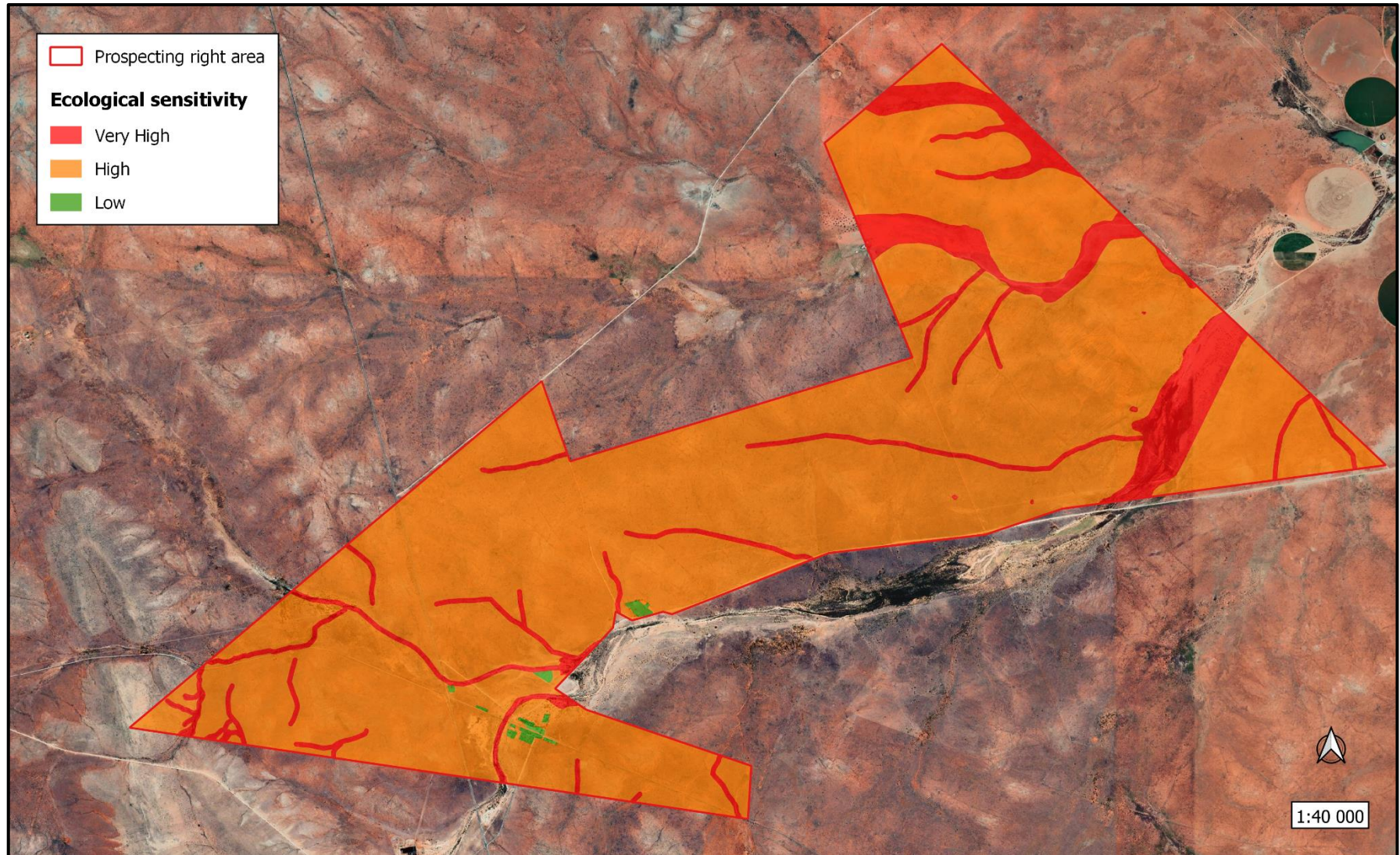


Figure 18. A sensitivity map relating to the ecological features on the Rietfontein prospecting right area.

## 4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Rietfontein prospecting operation are identified and described. A detailed analysis of each impact is provided in Table 10. The impacts are assessed in terms of the relevant ecological aspects and each impact is associated with an outline of specific mitigation measures, which with proper implementation, monitoring and auditing, will serve to reduce the significance of the impact.

### 4.1. Topography, soil erosion and associated degradation of landscapes

#### 4.1.1. Alteration of soil character and quality

##### *Source of the impact*

During clearing of an area for drilling and the construction of roads.

##### *Description of the impact*

Topsoil contains living organisms and seed banks that provide ecological resilience against disturbances, and any disturbances to the intact soil profile will change its ability to sustain natural ecological functioning. Vehicles and prospecting equipment may potentially leak hazardous fluids on the soil surface, which will cause soil pollution. Apart from the direct disturbances caused by the prospecting activities, soil compaction by drill pads, heavy machinery and vehicles will cause a decrease in large pores, and subsequently the water infiltration rate into soil.

##### *Mitigation and monitoring*

- Topsoil needs to be removed and stored separately during prospecting and the construction of roads.
- These topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must by no means be mixed with sub-soils.
- The topsoil should be replaced as soon as possible on to the disturbed areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.



**Table 10.** A detailed analysis of ecological impacts identified for the Rietfontein prospecting operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Soil	Alteration of soil character and quality	✓	✓	✓	On-site (1)	Residual (4)	Medium (2)	Possible, temporarily (6)	Low (42)	Very low
	Loss of topsoil and soil fertility	✓	✓	✓	On-site (1)	Residual (4)	Medium (2)	Possible, temporarily (6)	Low (42)	Very low
	Increase in soil erosion	✓	✓		On-site (1)	Decommissioning (3)	Medium (2)	Low likelihood, infrequently (6)	Low (36)	Very low
Flora	Loss of indigenous vegetation	✓	✓		On-site (1)	Residual (4)	Minimal (1)	Certain, temporarily (7)	Low (42)	Very low
	Loss of Red data and/or protected floral species	✓	✓		On-site (1)	Residual (4)	High (3)	Possible, infrequent (7)	Low-Medium (56)	Low
	Introduction or spread of alien species	✓	✓	✓	On-site (1)	Decommissioning (3)	Minimal (1)	Low likelihood, temporarily (5)	Very low (25)	Very low
	Bush encroachment	✓	✓	✓	On-site (1)	Decommissioning (3)	Minimal (1)	Low likelihood, temporarily (5)	Very low (25)	Very low
Fauna	Habitat fragmentation	✓	✓		Local (2)	Residual (4)	Minimal (1)	Certain, temporarily (7)	Low (49)	Low
	Disturbance, displacement and killing of fauna	✓	✓	✓	On-site (1)	Decommissioning (3)	Medium (2)	Possible, infrequent (7)	Low (42)	Low

**Table 10 (cont.).** A detailed analysis of ecological impacts identified for the Rietfontein prospecting operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Water resources	Alteration/destruction of watercourses	✓	✓		Regional (3)	Permanent (5)	Medium (2)	Possible, infrequent (7)	Low-Medium (70)	Low
	Siltation of surface water	✓	✓	✓	Regional (3)	Residual (4)	Minimal (1)	Possible, infrequent (7)	Low-Medium (56)	Low
Cumulative	Compromise of broadscale ecological processes	✓	✓		Regional (3)	Residual (4)	Medium (2)	Possible, infrequent (7)	Low-Medium (63)	Low

- For restoration of the affected areas without topsoil, soils can be sourced from other sustainable areas and chemically changed to match with the surrounding environment.
- To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.
- Vehicles and machinery should be regularly serviced and maintained.
- Refuelling and vehicle maintenance must take place in well demarcated areas and over suitable drip trays to prevent soil pollution.
- Drip trays must be available on site and installed under all stationary vehicles.
- Spill kits to clean up accidental spills from any accidental spillages must be well-marked and available on site.
- Workers must undergo induction to ensure that they are prepared for rapid clean-up.
- Any soil or area that is contaminated must be cleaned immediately by removing the soil and disposing it as hazardous waste in the correct manner.

#### **4.1.2. Loss of soil fertility**

##### ***Source of the impact***

During clearing of an area for drilling and the construction of roads.

##### ***Description of the impact***

Topsoil contains living organisms that naturally regulate the ecological functioning of a habitat. Therefore, any disturbances to the intact soil profile can result in soil sterilisation which will directly affect vegetation communities. Apart from the direct disturbances caused by the prospecting activities, loss of soil fertility can also occur through soil compaction by heavy machinery and vehicles.

##### ***Mitigation and monitoring***

- Topsoil needs to be removed and stored separately during prospecting and the construction of roads.

- These topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must by no means be mixed with sub-soils.
- The topsoil should be replaced as soon as possible on to the disturbed areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.
- For restoration of the affected areas without topsoil, soils can be sourced from other sustainable areas and chemically changed to match with the surrounding environment.
- To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.

#### **4.1.3. Soil erosion**

##### ***Source of the impact***

During clearing of an area for drilling and the construction of roads, as well as natural events.

##### ***Description of the impact***

Vegetation will be stripped for construction of new roads and drill pads and these areas will be bare and highly susceptible to erosion. Any topsoil can be eroded by wind, rain and flooding. Exposed sediments in the watercourses can be carried away during runoff causing downstream sediment deposition.

##### ***Mitigation and monitoring***

- Bare ground exposure should be minimised at all times regarding surface area and duration.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased.
- No new roads or drill pads should be developed over watercourses, including drainage lines.



- Disturbances during the rainy season should be monitored and controlled.
- Any potential run-off from exposed ground should be controlled with flow retarding barriers.
- Regular monitoring during the prospecting operation should be carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.

## **4.2. Vegetation and floristics**

### **4.2.1. Loss of indigenous vegetation**

#### ***Source of the impact***

During clearing of an area for drilling and the construction of roads.

#### ***Description of the impact***

The Rietfontein prospecting activities are expected to destroy only a very small area of natural vegetation. It is expected that the ecological functioning and biodiversity will not take too long to fully recover. Vehicle traffic and prospecting activities generate lots of dust which can reduce the growth success and seed dispersal of many small plant species in the adjacent pristine areas, but considering the nature of the proposed drilling programme, this impact is expected to be negligible.

#### ***Mitigation and monitoring***

- Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible.
- Implement effective avoidance measures to limit any activities in the highly sensitive areas, by applying the no-go principles.
- Ensure measures for the adherence to a maximum speed limit of 40 km/h to minimise dust fallout and associated effects on plants in the adjacent pristine areas.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.
- The setup of a small nursery is advisable to maximise translocation and re-establishment efforts of affected areas, where necessary.
- Apply for permits to authorise the large-scale clearance of indigenous plants from DENC at least three months before such activities will commence.

#### 4.2.2. Loss of Red data and/or protected floral species

##### ***Source of the impact***

Removal of plant species of conservation concern during clearing of an area for drilling and construction of roads. Intentional removal of these plant species for non-mine related purposes, e.g. illegal plant trade, fire-wood, medicinal, ornamental purposes.

##### ***Description of the impact***

There are a number of red listed plant species as well as numerous plant species that are provincially protected which potentially occur in the prospecting right area (as discussed in this report). Many of the species are expected to be found in the core prospecting area and therefore it is likely that the prospecting operation will impact on their population dynamics. The most significant concern is the loss of- or damage to red listed *Aloidendron dichotomum*, *Dinteranthus pole-evansii* and *Tridentea virescens*, as well as nationally protected trees *Vachellia erioloba* and *Boscia albitrunca*. Saplings of these protected trees are rarely visible during clearance operations and therefore the younger populations often get wiped out. Furthermore, any illegal harvesting of plant species of conservation concern for whatever reason by staff, contractors or secondary land users could have devastating effects on the population of these species.

##### ***Mitigation and monitoring***

- The footprint areas of the prospecting activities must be scanned for Red Listed and protected plant species prior to any destructive activities by means of a search-and-rescue operation.
- It is recommended that these plants are identified and marked prior to intended activity. These plants should ideally be incorporated into the design layout and left in situ. However, if it is unavoidable to remove such individuals, then the relevant permits from DAFF and/or DENC should be applied for at least three months before such activities will commence.
- The setup of a small nursery is advisable to maximise translocation and re-establishment efforts of all the rescued plants.
- A management plan should be implemented to ensure proper establishment of ex situ individuals and should include a monitoring programme for at least two years after re-establishment in order to ensure successful translocation.

- The designation of an environmental officer is recommended to render guidance to the staff and contractors with respect to suitable areas for all related disturbance and must ensure that all contractors and workers undergo environmental induction prior to commencing with work on site. Environmental inductions should occur in the appropriate languages for the workers.
- All those working on site must be educated about the conservation importance of the flora occurring on site as well as the legislation relating to protected species.
- Employ regulatory measures to ensure that no illegal harvesting takes place.

#### **4.2.3. Introduction or spread of alien species**

##### ***Source of the impact***

During clearing of an area for the drilling and construction of roads.

##### ***Description of the impact***

Not many weeds and invasive species have been formally recorded in the study region but considering the extent of historic disturbances on the property, it is highly likely that more species occur on site. Any anthropogenic disturbances to natural vegetation, especially the clearance of large areas of land, provide opportunities for invasive plants to increase. This is due to their opportunistic nature of dispersal and establishing in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the affected site, because they spread easily to neighbouring habitats where they outcompete indigenous species. Invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity as well as reduction in the ecological value and land use potential. Therefore, if alien invasive species are not controlled and managed, their propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. The nature of the proposed prospecting activities does not generally carry a high risk for the proliferation of alien species and with proper mitigation, any potential impacts can be substantially reduced.

##### ***Mitigation and monitoring***

- Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible.

- Mechanical methods of control should be implemented pro-actively as soon as invasive species start to emerge.
- Regular follow-up monitoring of invasive control areas needs to be implemented to ensure effective eradication.
- Encourage proper rehabilitation of disturbed areas through soil restoration and reseedling of indigenous plant species.

#### **4.2.4. Encouraging bush encroachment**

##### ***Source of the impact***

During clearing of an area for drilling and the construction of roads, improper rehabilitation practises.

##### ***Description of the impact***

The extent of bush encroaching species on site cannot be determined through a desktop study. Bush encroachment is a natural phenomenon characterised by the excessive expansion of certain indigenous shrub species at the expense of other indigenous plant species. Overgrazing is generally one of the main causes of bush encroachment, but any surface disturbances where the grassland matrix is removed can lead to the expansion of encroaching shrubs and trees. When the areas surrounding the shrubs area cleared, it causes an open niche for these competitive species to establish and outcompete the surrounding plants, eventually forming dense and impenetrable stands. This lowers the potential for future land use and decreases biodiversity. The nature of the proposed prospecting activities does not generally carry a high risk for encouraging bush encroachment.

##### ***Mitigation and monitoring***

- Mechanical methods of control should be implemented pro-actively when encroaching species form dense stands.
- Regular follow-up monitoring of encroached control areas needs to be implemented to ensure effective eradication.
- Encourage proper rehabilitation of disturbed areas through soil restoration and reseedling of indigenous plant species.



### 4.3. Fauna

#### 4.3.1. Habitat fragmentation

##### ***Source of the impact***

During clearing of an area for the construction of roads and drill pads.

##### ***Description of the impact***

Fragmentation of habitats typically leads to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This can be in the form of small-scale fragmentation for reptiles, amphibians, and invertebrates, to more large-scale fragmentation that hinder dispersal of birds and plants. It also includes the degradation of aquatic habitats, like the ephemeral pans, drainage channels and Marydale River, which has landscape-level connectivity. Fragmentation of habitats usually results in a subsequent loss of genetic variability between meta-populations occurring within the region. Pockets of fragmented natural habitats hinder the growth and development of populations. The nature of the proposed prospecting activities is not expected to result in the significant loss of connectivity and fragmentation of natural terrestrial habitats and is only possible on a local scale. However, it could have regional scale effects if any of the watercourses are severely impacted through improper construction of roads.

##### ***Mitigation and monitoring***

- All activities associated with the prospecting operation must be planned, where possible to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.
- The extent of the earmarked area should be demarcated on site layout plans. No staff, contractors or vehicles may leave demarcated area except those authorised to do so.
- Pristine areas surrounding the earmarked area that are not part of the demarcated area should be considered as a no-go zone for employees, machinery or even visitors.
- No new roads should be created across a water resource.
- No drilling should take place in the ephemeral pans, drainage channels or rivers.
- If water resource disturbances are unavoidable, a water use license or general authorization to alter the beds and banks of these water resources should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected terrestrial and aquatic habitats.

#### **4.3.2. Disturbance, displacement and killing of fauna**

##### ***Source of the impact***

Vegetation clearing; increase in noise and vibration; human and vehicular movement on site resulting from prospecting activities; intentional killing of fauna.

##### ***Description of the impact***

The transformation of natural habitats will result in the loss of micro habitats, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats, e.g. birds that nest in trees or animals residing in holes in the ground or among rocks. Increased noise and vibration will disturb and possibly displace wildlife. Fast moving vehicles cause road kills of small mammals, birds, reptiles, amphibians and a large number of invertebrates. Intentional killing of snakes, reptiles, vultures and owls due to religion, superstition, personal beliefs or fears will negatively affect their local populations.

##### ***Mitigation and monitoring***

- Careful planning of the operation is needed to avoid the destruction of pristine habitats and minimise the overall disturbance footprint.
- The extent of the prospecting activities should be demarcated on site layout plans, and no personnel or vehicles may leave the demarcated area except if authorised. Areas surrounding the earmarked site, not part of the demarcated area, should be considered as a no-go zone.
- No prospecting should take place in the ephemeral pans, drainage lines or rivers and no new roads should be created across these water resources. If unavoidable, a water use license or general authorization to alter the beds and banks of each earmarked water resource should be obtained from DWS prior to such activities.
- If any of the protected wildlife species are directly threatened by habitat destruction or displacement during the prospecting operation, then the relevant permits from DENC should be obtained followed by the relevant mitigation procedures stipulated in the permits.
- Everyone on site must undergo environmental induction for awareness on not capturing or harming species that are often persecuted out of superstition or fear and to be educated about the conservation importance of the fauna occurring on site.

- Reptiles, amphibians, mammals, special invertebrates, or active bird nests exposed during the clearing operations should be captured for later release or translocation by a qualified expert.
- Employ measures that ensure adherence to a speed limit of 40 km/h as well as driving mindfully to lower risks of animals being killed on the roads or elsewhere on site.

#### **4.4. Water resources**

##### **4.4.1. Alteration/destruction of watercourses**

###### ***Source of the impact***

During construction of roads and drill pads.

###### ***Description of the impact***

During prospecting activities there is a possibility that the water resources on site (Marydale River, ephemeral pans and drainage lines) might be altered or indirectly affected. This includes direct prospecting within the watercourses as well as development of roads within their channels, riparian areas, buffer zones or catchments. Such activities can alter the hydrologic regime or habitat conditions of the watercourses, which will not only compromise their ecological functioning, but also have downstream effects.

###### ***Mitigation and monitoring***

- All activities associated with the prospecting operation must be planned to avoid any disturbances to the water resources and their buffer zones.
- No new roads should be created across a water resource and no prospecting should take place in them. If this is unavoidable, a water use license or general authorization to alter the beds and banks of each earmarked water resource should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected water resources.

#### **4.4.2. Siltation of surface water**

##### ***Source of the impact***

During clearing of an area for the construction of roads and drill pads; topsoil placement.

##### ***Description of the impact***

Vegetation will be stripped in preparation for the prospecting areas and associated infrastructure. These bare areas will be very susceptible to water erosion without plants to stabilise the soil, creating potential sediment source zones. Similarly, any topsoil stored along drainage paths create additional sediment source zones. High runoff events could potentially cause the drainage lines and rivers to be filled with silt from prospecting areas if the sediment source zones lie along the drainage paths towards these water resources. This may lead to a change in hydrologic regime or character of the water resources.

##### ***Mitigation and monitoring***

- Bare ground exposure should always be minimised in terms of the surface area and duration.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased.
- No new roads or prospecting areas should be developed over water resources.
- Disturbances during the rainy season should be monitored and controlled.
- Any potential run-off from exposed ground should be controlled with flow retarding barriers.
- Regular monitoring during the prospecting operation should be carried out to identify areas where erosion is occurring and to identify potential sediment source zones; followed by appropriate remedial actions.

#### **4.5. Broad-scale ecological processes**

##### ***Source of the impact***

Clearing of vegetation and disturbance during the construction of roads and prospecting activities; alterations to water resource habitat characteristics.



***Description of the impact***

Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. The habitats on site are vulnerable to cumulative disturbances, due to the moderate extent of transformation through agricultural activities in the region. Fragmentation of these habitats through loss of keystone species will destroy connectivity of vital ecological corridors and it will disrupt the food web, which might have cascading effects on a landscape level over the long-term. The nature of the proposed prospecting operation however lowers the risk of causing significant impacts.

***Mitigation and monitoring***

- Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible.
- Apply for the relevant permits from DENC and DAFF.
- No new roads should be created across a water resource and no prospecting should take place in them. If this is unavoidable, a water use license or general authorization to alter the beds and banks of each earmarked water resource should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected habitats.
- For restoration of the affected areas without topsoil, soils can be sourced from other sustainable areas and chemically changed to match with the surrounding environment.
- To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.
- The setup of a small nursery is advisable to maximise translocation and re-establishment efforts of affected areas, where necessary.

## **5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION**

Two broad-scale terrestrial habitats comprising several micro-habitats, the Marydale River, at least four ephemeral pans, and numerous drainage lines occur in the Rietfontein prospecting area. Of these, the Marydale River, ephemeral pans and drainage lines and their buffer zones are the most sensitive to prospecting based on their vital ecological functioning on a catchment scale. The terrestrial habitats potentially host a number of red listed flora and fauna species and are therefore considered to be of high sensitivity. Impacts associated with the proposed prospecting operation are primarily however expected to be low due to the nature of drilling activities. The most profound impacts are expected to be related to the loss of red listed species, alteration of water resources and the cumulative loss of intact habitat and biodiversity on a landscape level.

Permit applications need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any removal of protected species. Similarly, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to the protected trees. If any of the water resources will be impacted, then a general authorisation or water use license should be obtained from Department of Water and Sanitation, prior to such activities.

The destruction of the natural plant species and habitats is expected to be negligible due to the nature of the proposed prospecting operation, but the significance of the impacts will ultimately be affected by the success of the mitigation measures implemented during the operation. In my opinion, authorisation for the proposed operation can be granted. However, the applicant should still commit to the strict adherence of effective avoidance, management, mitigation, and rehabilitation measures.

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## APPENDICES

## **APPENDIX 1**

### **Plant species list**

FAMILY	SPECIES	STATUS	NFA	NCNCA
ACANTHACEAE	<i>Barleria lichtensteiniana</i>	LC		
	<i>Blepharis mitrata</i>	LC		
	<i>Justicia incana</i>	LC		
	<i>Justicia spartioides</i>	LC		
AIZOACEAE	<b><i>Dinteranthus pole-evansii</i></b>	<b>VU</b>		S2
	<i>Galenia africana</i>	LC		
	<i>Mesembryanthemum articulatum</i>	LC		S2
	<i>Mesembryanthemum coriarium</i>	LC		S2
	<i>Mesembryanthemum crystallinum</i>	LC		S2
	<i>Mesembryanthemum noctiflorum</i> subsp. <i>stramineum</i>	LC		S2
	<i>Plinthus cryptocarpus</i>	LC		
	<i>Ruschia intricata</i>	LC		S2
	<i>Tetragonia reduplicata</i>	LC		
AMARANTHACEAE	<i>Salsola aphylla</i>	LC		
	<b><i>Salsola kali</i></b>	<b>Decl. Inv.</b>		
	<i>Sericocoma avolans</i>	LC		
AMARYLLIDACEAE	<i>Nerine laticoma</i>	LC		S2
ANACARDIACEAE	<i>Searsia pendulina</i>	LC		
APOCYNACEAE	<b><i>Tridentea virescens</i></b>	<b>Rare</b>		S2
ASPARAGACEAE	<i>Asparagus exuvialis</i>	LC		
ASPHODELACEAE	<i>Aloe hereroensis</i>	LC		S2
	<b><i>Aloidendron dichotomum</i></b>	<b>VU</b>		<b>S1</b>
	<i>Bulbine abyssinica</i>	LC		S2
	<i>Haworthiopsis nigra</i>	LC		S2
ASTERACEAE	<i>Chrysocoma ciliata</i>	LC		
	<i>Dicoma capensis</i>	LC		
	<i>Eriocephalus pauperrimus</i>	LC		
	<i>Felicia burkei</i>	LC		
	<i>Garuleum schinzii</i> subsp. <i>schinzii</i>	LC		
	<i>Geigeria ornativa</i> subsp. <i>ornativa</i>	LC		
	<i>Geigeria pectidea</i>	LC		
	<i>Helichrysum herniarioides</i>	LC		
	<i>Ifloga glomerata</i>	LC		
	<i>Pegolettia retrofracta</i>	LC		
	<i>Pentzia incana</i>	LC		
	<i>Pentzia spinescens</i>	LC		
	<i>Senecio niveus</i>	LC		
	CAPPARACEAE	<i>Boscia albitrunca</i>	LC	<b>X</b>
CARYOPHYLLACEAE	<b><i>Scleranthus annuus</i></b>	<b>Nat. Exot.</b>		
CLEOMACEAE	<i>Cleome gynandra</i>	LC		
	<i>Cleome monophylla</i>	LC		
CUCURBITACEAE	<i>Corallocarpus schinzii</i>	LC		
CYPERACEAE	<i>Cyperus indecorus</i>	LC		
FABACEAE	<i>Indigastrium niveum</i>	LC		
	<i>Indigofera alternans</i> var. <i>alternans</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
FABACEAE	<i>Indigofera damarana</i>	LC		
	<i>Indigofera heterotricha</i>	LC		
	<i>Leobordea platycarpa</i>	LC		
	<i>Lessertia pauciflora</i> var. <i>pauciflora</i>	LC		S1
	<i>Melolobium canescens</i>	LC		
	<i>Ptycholobium biflorum</i> subsp. <i>biflorum</i>	LC		
	<i>Tephrosia dregeana</i> var. <i>dregeana</i>	LC		
	<i>Vachellia erioloba</i>			
GERANIACEAE	<i>Monsonia salmoniflora</i>	LC		
GISEKIACEAE	<i>Gisekia africana</i> var. <i>africana</i>	LC		
	<i>Gisekia pharnaceoides</i> var. <i>pharnaceoides</i>	LC		
HYACINTHACEAE	<i>Albuca cooperi</i>	LC		
	<i>Drimia intricata</i>	LC		
IRIDACEAE	<i>Lapeirousia plicata</i> subsp. <i>plicata</i>	LC		S2
LAMIACEAE	<i>Leonotis pentadentata</i>	LC		
	<i>Ocimum americanum</i> var. <i>americanum</i>	LC		
LIMEACEAE	<i>Limeum aethiopicum</i>	LC		
	<i>Limeum arenicolum</i>	LC		
	<i>Limeum argute-carinatum</i> var. <i>argute-carinatum</i>	LC		
	<i>Limeum myosotis</i> var. <i>myosotis</i>	LC		
LOASACEAE	<i>Kissenia capensis</i>	LC		
LOPHIOCARPACEAE	<i>Lophiocarpus polystachyus</i>	LC		
MALVACEAE	<i>Hermannia abrotanoides</i>	LC		
	<i>Hermannia modesta</i>	LC		
	<i>Hermannia spinosa</i>	LC		
	<i>Hibiscus elliotiae</i>	LC		
	<i>Radyera urens</i>	LC		
	<i>Nymanina capensis</i>	LC		S2
NEURADACEAE	<i>Grielum humifusum</i> var. <i>parviflorum</i>	LC		
OXALIDACEAE	<i>Oxalis lawsonii</i>	LC		S2
PEDALIACEAE	<i>Harpagophytum procumbens</i>	LC		S1
	<i>Rogeria longiflora</i>	LC		
POACEAE	<i>Antheophora pubescens</i>	LC		
	<i>Aristida adscensionis</i>	LC		
	<i>Aristida congesta</i> subsp. <i>congesta</i>	LC		
	<i>Aristida meridionalis</i>	LC		
	<i>Enneapogon cenchroides</i>	LC		
	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scaber</i>	LC		
	<i>Eragrostis annulata</i>	LC		
	<i>Eragrostis brizantha</i>	LC		
	<i>Eragrostis curvula</i>	LC		
	<i>Eragrostis echinochloidea</i>	LC		
	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	LC		
	<i>Eragrostis macrochlamys</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Eragrostis porosa</i>	LC		
	<i>Eragrostis procumbens</i>	LC		
	<i>Hemarthria altissima</i>	LC		
	<i>Schismus barbatus</i>	LC		
	<i>Schmidtia kalahariensis</i>	LC		
	<i>Sporobolus ioclados</i>	LC		
	<i>Sporobolus nebulosus</i>	LC		
	<i>Sporobolus nervosus</i>	LC		
	<i>Stipagrostis ciliata</i> var. <i>capensis</i>	LC		
	<i>Stipagrostis namaquensis</i>	LC		
	<i>Stipagrostis obtusa</i>	LC		
	<i>Tragus racemosus</i>	LC		
	<i>Tricholaena capensis</i> subsp. <i>capensis</i>	LC		
	POLYGALACEAE	<i>Polygala leptophylla</i> var. <i>armata</i>	LC	
PTERIDACEAE	<i>Pellaea calomelanos</i> var. <i>calomelanos</i>	LC		
SAPINDACEAE	<i>Pappea capensis</i>	LC		
SCROPHULARIACEAE	<i>Aptosimum albomarginatum</i>	LC		
	<i>Aptosimum marlothii</i>	LC		
	<i>Aptosimum spinescens</i>	LC		
	<i>Jamesbrittenia canescens</i> var. <i>canescens</i>	LC		S2
	<i>Manulea schaeferi</i>	LC		S2
	<i>Peliostomum leucorrhizum</i>	LC		
SOLANACEAE	<i>Lycium cinereum</i>	LC		
	<i>Solanum capense</i>	LC		
THYMELAEACEAE	<i>Lasiosiphon polycephalus</i>	LC		
URTICACEAE	<i>Forsskaolea candida</i>	LC		
VERBENACEAE	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	LC		
ZYGOPHYLLACEAE	<i>Tetraena chrysopteros</i>	LC		
	<i>Tetraena rigida</i>	LC		
	<i>Tetraena simplex</i>	LC		
	<i>Tribulus zeyheri</i> subsp. <i>zeyheri</i>	LC		



## **APPENDIX 2**

### **Fauna species list**

## LIST OF MAMMALS

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
<b>CHIROPTERA</b>	<sup>2</sup> <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	<b>NT</b>	LC	Wide habitat tolerance.	Moderate
	<sup>2</sup> <i>Neoromicia capensis</i>	Cape Bat	LC	LC	Wide habitat tolerance, but found in arid areas, grassland, bushveld and <i>Acacia</i> woodland. Roosts under the bark of trees and similar vegetation.	High
	<sup>2</sup> <i>Nycteris thebaica</i>	Common Slit-faced Bat	LC	LC	Savanna species with wide habitat tolerance. Roosts in caves, mine adits, aardvark holes, rock crevices and hollow trees in open savanna.	High
	<sup>2</sup> <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	<b>NT</b>	Savanna habitats in broken country with rocky outcrops or suitable caves	Moderate
	<sup>2</sup> <i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	LC	LC	Wide habitat tolerance.	High
	<sup>2</sup> <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC	Savanna habitats.	Moderate
	<sup>2</sup> <i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC	Wide habitat tolerance.	High

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
MACROSCOLIDAE	<sup>2</sup> <i>Macroselides proboscideus</i>	Round-eared Sengi	LC	LC	Restricted to gravel plains associated with alluvial plains and relatively flat areas between higher elevation areas such as outcrops, hills and mountains.	Moderate
	<sup>2</sup> <i>Elephantulus rupestris</i>	Western Rock Sengi	LC	LC	Arid habitats, including deserts, dry savannas, and dry shrublands. Associated with rocky ridges, outcrops or koppies, and boulder fields at the bases of mountains.	Moderate
TUBULENTATA	<sup>1</sup> <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	High
HYRACOIDEA	<sup>2</sup> <i>Procavia capensis</i>	Rock Hyrax	LC	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies.	Moderate

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
<b>PRIMATES</b>	<sup>4</sup> <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Fynbos, montane grasslands, riverine courses in deserts. Only needs water and access to refuge.	Low
	<sup>4</sup> <i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	LC	Woodland savanna, riverine woodland, isolated stands of trees along rivers.	High
<b>LAGOMORPHA</b>	<sup>2</sup> <i>Lepus capensis</i>	Cape Hare	LC	LC	Dry, open regions, with palatable bush and grass.	High
	<sup>2</sup> <i>Lepus saxatilis</i>	Scrub Hare	LC	LC	Common in crop-growing areas or in fallow lands where there is some bush development.	High
	<sup>2</sup> <i>Pronolagus rupestris</i>	Smith's Red Rock Rabbit	LC	LC	Rocky habitats, from isolated outcrops to mountain ranges; in high and low rainfall areas but absent from true desert.	Moderate
<b>RODENTIA</b>	<sup>2</sup> <i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC	Catholic in habitat requirements.	High
	<sup>2</sup> <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	High
	<sup>2</sup> <i>Pedetes capensis</i>	Springhare	LC	LC	Occurs widespread: open sandy ground, sandy scrub, overgrazed grassland, edges of vleis and dry riverbeds.	High
	<sup>2</sup> <i>Graphiurus ocularis</i>	Spectacled Dormouse	LC	LC	Rocky habitats, but also trees.	High

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
<b>RODENTIA</b>	<sup>2</sup> <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	High
	<sup>2</sup> <i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Wide habitat tolerance but prefers soft, particularly sandy soils; can be found in open and dense vegetation and in rocky areas; annual rainfall of 250 - 1 200 mm.	High
	<sup>2</sup> <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	High
	<sup>2</sup> <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Occurs on hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	High
	<sup>2</sup> <i>Gerbillurus paeba</i>	Pygmy Hairy-footed Gerbil	LC	LC	Nama and Succulent Karoo, preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover.	High
	<sup>2</sup> <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC	Sandy soils; wooded and more open grassland; areas of cultivation.	High
	<sup>2</sup> <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Sandy soils; wooded and more open grassland; areas of cultivation.	High
	<sup>2</sup> <i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC	LC	Catholic habitat requirements, but prefer rocky hills, outcrops or boulder-strewn hillsides.	Low
	<sup>3</sup> <i>Rhodomys bechuanae</i>	Arid Four-striped Grass Mouse	LC	LC	Wide habitat tolerance in the Nama-Karoo and Savannah Biomes.	High



## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
RODENTIA	<sup>2</sup> <i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	LC	LC	Occurs in wide variety of habitats where there is good grass cover.	High
	<sup>2</sup> <i>Mastomys coucha</i>	Southern Multimammate Mouse	LC	LC	Wide habitat tolerance.	High
	<sup>2</sup> <i>Mus minutoides</i>	Pygmy Mouse	LC	LC	Wide habitat tolerance.	High
	<sup>3</sup> <i>Mus musculus</i>	House Mouse	LC	-	Wide habitat tolerance.	High
	<sup>2</sup> <i>Thallomys nigricauda</i>	Black-tailed Tree Rat	LC	LC	Arboreal species generally associated with <i>Acacia</i> bushland habitats.	Moderate
	<sup>2</sup> <i>Parotomys brantsii</i>	Brants' whistling rat	LC	LC	Prefers consolidated sands in semi-desert, but also found in pastureland.	High
	<sup>2</sup> <i>Parotomys littledalei</i>	Littledale's Whistling Rat	LC	NT	Shrublands, specifically in coastal hummocks, sand dunes, gravel plains and dry riverine systems. Avoids open habitat.	Low
	<sup>2</sup> <i>Myotomys unisulcatus</i>	Bush Karoo Rat	LC	LC	Shrub and fynbos associations in areas with rocky outcrops. Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Moderate
	<sup>2</sup> <i>Cryptomys hottentotus</i>	African Mole Rat	LC	LC	Occurs in a wide range of substrates and habitats	High

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
PHOLIDOTA	<sup>1</sup> <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU	Low to high rainfall areas, including open grassland, woodland and rocky hills, but excluding forest and true desert; nevertheless, present throughout the Kalahari sand country.	High
EULIPOTYPHILA	<sup>2</sup> <i>Crocidura cyanea</i>	Reddish-Grey Musk Shrew	LC	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	Moderate
	<sup>2</sup> <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	LC	Generally associated with termite mounds, grassland habitat.	High
	<sup>1</sup> <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT	Generally found in semi-arid and sub-temperate environments with ample ground cover.	High
CARNIVORA	<sup>1</sup> <i>Vulpes chama</i>	Cape Fox	LC	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub.	High
	<sup>1</sup> <i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC	Prefers short-grass plains, shrub lands and open arid savanna. Absent from true desert or afforested areas.	High

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
<b>CARNIVORA</b>	<sup>4</sup> <i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Wide habitat tolerance.	High
	<sup>2</sup> <i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	Rivers, marshes, dams and lakes; dry stream beds if pools of water exist.	Low
	<sup>1</sup> <i>Mellivora capensis</i>	Honey Badger	LC	LC	Wide habitat tolerance.	High
	<sup>1</sup> <i>Poecilogale albinucha</i>	African Striped Weasel	LC	NT	Wide habitat tolerance, but most common in grassland areas.	High
	<sup>1</sup> <i>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed throughout the sub-region.	High
	<sup>2</sup> <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	High
	<sup>2</sup> <i>Herpestes pulverulenta</i>	Cape (Small) Grey Mongoose	LC	LC	Wide habitat tolerance.	High
	<sup>2</sup> <i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC	Wide habitat tolerance, but areas with adequate cover.	High
	<sup>2</sup> <i>Suricata suricatta</i>	Suricate	LC	LC	Open arid country with hard and stony substrate. Occur in Nama- and Succulent Karoo but also fynbos.	High
<sup>2</sup> <i>Genetta genetta</i>	Common (Small-spotted) Genet	LC	LC	Occur in open arid habitats.	High	

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
CARNIVORA	<sup>1</sup> <i>Hyaena brunnea</i>	Brown Hyena	NT	NT	Found in dry areas, generally with annual rainfall of 100 - 700 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna.	Low
	<sup>1</sup> <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes. Absent from true desert and forests.	High
	<sup>1</sup> <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	High
	<sup>1</sup> <i>Felis nigripes</i>	Black-footed cat	VU	VU	Associated with arid country, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
	<sup>4</sup> <i>Caracal caracal</i>	Caracal	LC	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions.	High

## LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
SUIFORMES	<sup>2</sup> <i>Phacochoerus africanus</i>	Common Warthog	LC	LC	Open country, lightly wooded areas and savanna; also penetrates otherwise unsuitable country along watercourses.	Moderate
CETARTIODACTYLA	<sup>2</sup> <i>Oryx gazella</i>	Gemsbok	LC	LC	Semi-arid and arid bushland and grassland of the Kalahari and Karoo and adjoining regions of Southern Africa.	Low
	<sup>2</sup> <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Wooded savanna	High
	<sup>2</sup> <i>Antidorcas marsupialis</i>	Springbok	LC	LC	Open arid plains with short vegetation	Low
	<sup>2</sup> <i>Oreotragus oreotragus</i>	Klipspringer	LC	LC	Dependent on rocky and mountainous terrain.	Moderate
	<sup>2</sup> <i>Raphicerus campestris</i>	Steenbok	LC	LC	Inhabits open country.	High
	<sup>2</sup> <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Presence of bushes are important.	High

## LIST OF REPTILES

Reptiles protected according to NCNCA are indicated with their respective Schedule no. in superscript. South African endemics are indicated with <sup>E</sup>.

Family	Scientific name	Common name	IUCN status
AGAMIDAE	<sup>3</sup> <i>Agama aculeata aculeata</i>	Western Ground Agama	LC
	<sup>3</sup> <i>Agama anchietae</i>	Anchieta's Agama	LC
	<sup>3</sup> <i>Agama atra</i>	Southern Rock Agama	LC
AMPHISBAENIDAE	<sup>3</sup> <i>Monopeltis infuscata</i>	Dusky Worm Lizard	LC
CHAMAELEONIDAE	<sup>1</sup> <i>Chamaeleo dilepis dilepis</i>	Common Flap-neck Chameleon	LC
COLUBRIDAE	<sup>2</sup> <i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC
	<sup>2</sup> <i>Philothamnus semivariegatus</i>	Spotted Bush Snake	LC
	<sup>3</sup> <i>Telescopus beetzii</i>	Beetz's Tiger Snake	LC
CORDYLIDAE	<sup>1</sup> <i>Karusasaurus polyzonus</i>	Southern Karusa Lizard	LC
ELAPIDAE	<sup>3</sup> <i>Aspidelaps lubricus lubricus</i>	Coral Shield Cobra	LC
	<sup>3</sup> <i>Elapsoidea sundevallii media</i>	Sundevall's Garter Snake	LC
	<sup>3</sup> <i>Naja nigricincta woodi</i>	Black Spitting Cobra	LC
	<sup>3</sup> <i>Naja nivea</i>	Cape Cobra	LC
GEKKONIDAE	<sup>3</sup> <i>Chondrodactylus angulifer angulifer</i>	Common Giant Gecko	LC
	<sup>3</sup> <i>Chondrodactylus bibronii</i>	Bibron's Gecko	LC
	<sup>3</sup> <i>Pachydactylus capensis</i>	Cape Gecko	LC
	<sup>3</sup> <i>Pachydactylus latirostris</i>	Quartz Gecko	LC
	<sup>3</sup> <i>Pachydactylus purcelli</i>	Purcell's Gecko	LC
	<sup>3</sup> <i>Pachydactylus rugosus</i>	Common Rough Gecko	LC
	<sup>3</sup> <i>Ptenopus garrulus garrulus</i>	Common Barking Gecko	LC
	<sup>3</sup> <i>Ptenopus garrulus maculatus</i>	Spotted Barking Gecko	LC
LACERTIDAE	<sup>2</sup> <i>Heliobolus lugubris</i>	Bushveld Lizard	LC
	<sup>2</sup> <i>Meroles suborbitalis</i>	Spotted desert Lizard	LC
	<sup>2</sup> <i>Nucras tessellata</i>	Western Sandveld Lizard	LC
	<sup>2</sup> <i>Pedioplanis inornata</i>	Plain Sand Lizard	LC
	<sup>2</sup> <i>Pedioplanis lineoocellata lineoocellata</i>	Spotted Sand Lizard	LC
	<sup>2</sup> <i>Pedioplanis lineoocellata pulchella</i>	Common Sand Lizard	LC
	<sup>2</sup> <i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	LC
LAMPROPHIIDAE	<sup>3</sup> <i>Atractaspis bibronii</i>	Bibron's Stiletto Snake	LC
	<sup>2</sup> <i>Boaedon capensis</i>	Brown House Snake	LC
	<sup>3</sup> <i>Dipsina multimaculata</i>	Dwarf Beaked Snake	LC
	<sup>3</sup> <i>Psammophis notostictus</i>	Karoo Sand Snake	LC
	<sup>2</sup> <i>Pseudaspis cana</i>	Mole Snake	LC



## LIST OF REPTILES (continued)

Reptiles protected according to NCNCA are indicated with their respective Schedule no. in superscript. South African endemics are indicated with <sup>E</sup>.

Family	Scientific name	Common name	IUCN status
LEPTOTYPHLOPIDAE	<sup>3</sup> <i>Leptotyphlops scutifrons</i>	Peter's Thread Snake	LC
PELOMEDUSIDAE	<sup>3</sup> <i>Pelomedusa subrufa</i>	Marsh Terrapin	LC
SCINCIDAE	<sup>3</sup> <i>Acontias gracilicauda</i> <sup>E</sup>	Thin-tailed Legless Skink	LC
	<sup>3</sup> <i>Acontias lineatus</i>	Striped Dwarf Legless Skink	LC
	<sup>3</sup> <i>Trachylepis capensis</i>	Cape Skink	LC
	<sup>3</sup> <i>Trachylepis occidentalis</i>	Western Three-striped Skink	LC
	<sup>3</sup> <i>Trachylepis sparsa</i>	Karasberg Tree Skink	LC
	<sup>3</sup> <i>Trachylepis spilogaster</i>	Kalahari Tree Skink	LC
	<sup>3</sup> <i>Trachylepis sulcata sulcata</i>	Western Rock Skink	LC
	<sup>3</sup> <i>Trachylepis variegata</i>	Variegated Skink	LC
TESTUDINIDAE	<sup>3</sup> <i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC
	<sup>3</sup> <i>Psammobates tentorius</i>	Tent Tortoise	LC
	<sup>3</sup> <i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
TYPHLOPIDAE	<sup>3</sup> <i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	LC
	<sup>3</sup> <i>Rhinotyphlops schinzi</i>	Schinz's Beaked Blind Snake	LC
VARANIDAE	<sup>2</sup> <i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC
	<sup>2</sup> <i>Varanus niloticus</i>	Nile Monitor	LC
VIPERIDAE	<sup>3</sup> <i>Bitis arietans arietans</i>	Puff Adder	LC
	<sup>3</sup> <i>Bitis caudalis</i>	Horned Adder	LC

## LIST OF AMPHIBIANS

Amphibians protected according to NCNCA are indicated with their respective Schedule no. in superscript. South African endemics are indicated with <sup>E</sup>.

Family	Scientific name	Common name	IUCN status
BUFONIDAE	<sup>2</sup> <i>Amietophrynus gutturalis</i>	Guttural Toad	LC
	<sup>2</sup> <i>Amietophrynus poweri</i>	Western Olive Toad	LC
	<sup>2</sup> <i>Amietophrynus rangeri</i> <sup>E</sup>	Raucous Toad	LC
	<sup>2</sup> <i>Poyntonophrynus vertebralis</i> <sup>E</sup>	Southern Pygmy Toad	LC
	<sup>2</sup> <i>Bufo gariensis</i>	Karoo Toad	LC
HYPEROLIIDAE	<sup>2</sup> <i>Kassina senegalensis</i>	Bubbling Kassina	LC
MICROHYLIDAE	<sup>2</sup> <i>Breviceps adspersus</i>	Bushveld Rain Frog	LC
PIPIDAE	<sup>2</sup> <i>Xenopus laevis</i>	Common Platanna	LC
PYXICEPHALIDAE	<sup>2</sup> <i>Amietia fuscigula</i>	Common River Frog	LC
	<sup>2</sup> <i>Cacosternum boettgeri</i>	Boettger's Caco	LC
	<sup>1</sup> <i>Pyxicephalus adspersus</i>	<b>Giant Bullfrog</b>	<b>NT</b>
	<sup>2</sup> <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC
	<sup>2</sup> <i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC

## LIST OF BIRDS

Birds protected according to the NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Acrocephalus baeticatus</i>	African Reed-Warbler	LC	LC
<sup>2</sup> <i>Acrocephalus gracilirostris</i>	Lesser Swamp-Warbler	LC	LC
<sup>2</sup> <i>Actitis hypoleucos</i>	Common Sandpiper	LC	LC
<sup>2</sup> <i>Alario alario</i>	Black-headed Canary	LC	LC
<sup>3</sup> <i>Alario leucolaema</i>	Damara Canary	-	LC
<sup>2</sup> <i>Alcedo cristata</i>	Malachite Kingfisher	LC	LC
<sup>2</sup> <i>Alopochen aegyptiacus</i>	Egyptian Goose	LC	LC
<sup>2</sup> <i>Anas capensis</i>	Cape Teal	LC	LC
<sup>2</sup> <i>Anas erythrorhyncha</i>	Red-billed Teal	LC	LC
<sup>2</sup> <i>Anas hottentota</i>	Hottentot Teal	LC	LC
<sup>2</sup> <i>Anas smithii</i>	Cape Shoveler	LC	LC
<sup>2</sup> <i>Anas sparsa</i>	African Black Duck	LC	LC
<sup>2</sup> <i>Anas undulata</i>	Yellow-billed Duck	LC	LC
<sup>2</sup> <i>Anhinga rufa</i>	African Darter	LC	LC
<sup>2</sup> <i>Anthoscopus minutus</i>	Cape Penduline-Tit	LC	LC
<sup>2</sup> <i>Anthropoides paradisea</i>	Blue Crane	<b>VU</b>	<b>NT</b>
<sup>2</sup> <i>Anthus cinnamomeus</i>	African Pipit	LC	LC
<sup>2</sup> <i>Anthus vaalensis</i>	Buffy Pipit	LC	LC
<sup>2</sup> <i>Apus affinis</i>	Little Swift	LC	LC
<sup>2</sup> <i>Apus apus</i>	Common Swift	LC	LC
<sup>2</sup> <i>Apus bradfieldi</i>	Bradfield's Swift	LC	LC
<sup>2</sup> <i>Apus caffer</i>	White-rumped Swift	LC	LC
<sup>2</sup> <i>Apus horus</i>	Horus Swift	LC	LC
<sup>1</sup> <i>Aquila rapax</i>	Tawny Eagle	<b>VU</b>	<b>EN</b>
<sup>1</sup> <i>Aquila verreauxii</i>	Verreaux's Eagle	LC	<b>VU</b>
<sup>2</sup> <i>Ardea cinerea</i>	Grey Heron	LC	LC
<sup>2</sup> <i>Ardea goliath</i>	Goliath Heron	LC	LC
<sup>2</sup> <i>Ardea melanocephala</i>	Black-headed Heron	LC	LC
<sup>2</sup> <i>Ardea purpurea</i>	Purple Heron	LC	LC
<sup>2</sup> <i>Ardeola ralloides</i>	Squacco Heron	LC	LC
<sup>1</sup> <i>Ardeotis kori</i>	Kori Bustard	<b>NT</b>	<b>NT</b>
<sup>2</sup> <i>Batis pririt</i>	Pririt Batis	LC	LC
<sup>2</sup> <i>Bostrychia hagedash</i>	Hadedda Ibis	LC	LC
<sup>2</sup> <i>Bradornis infuscatus</i>	Chat Flycatcher	LC	LC
<sup>2</sup> <i>Bradornis mariquensis</i>	Marico Flycatcher	LC	LC
<sup>1</sup> <i>Bubo africanus</i>	Spotted Eagle-Owl	LC	LC
<sup>1</sup> <i>Bubo capensis</i>	Cape Eagle-Owl	LC	LC
<sup>1</sup> <i>Bubo lacteus</i>	Verreaux's Eagle-Owl	LC	LC
<sup>2</sup> <i>Bubulcus ibis</i>	Cattle Egret	LC	LC
<sup>2</sup> <i>Burhinus capensis</i>	Spotted Thick-knee	LC	LC
<sup>1</sup> <i>Buteo rufofuscus</i>	Jackal Buzzard	LC	LC

## LIST OF BIRDS (Cont.)

Birds protected according to the NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status	SA RDB
<sup>1</sup> <i>Buteo vulpinus</i>	Steppe Buzzard	LC	LC
<sup>2</sup> <i>Calandrella cinerea</i>	Red-capped Lark	LC	LC
<sup>2</sup> <i>Calendulauda africanoides</i>	Fawn-coloured Lark	LC	LC
<sup>2</sup> <i>Calendulauda bradfieldi</i>	Bradfield's Lark	-	LC
<sup>2</sup> <i>Calidris alba</i>	Sanderling	LC	LC
<sup>2</sup> <i>Calidris ferruginea</i>	Curlew Sandpiper	NT	LC
<sup>2</sup> <i>Calidris minuta</i>	Little Stint	LC	LC
<sup>2</sup> <i>Campethera abingoni</i>	Golden-tailed Woodpecker	LC	LC
<sup>1</sup> <i>Caprimulgus europaeus</i>	European Nightjar	LC	LC
<sup>1</sup> <i>Caprimulgus pectoralis</i>	Fiery-necked Nightjar	LC	LC
<sup>1</sup> <i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar	LC	LC
<sup>1</sup> <i>Caprimulgus tristigma</i>	Freckled Nightjar	LC	LC
<sup>2</sup> <i>Centropus burchellii</i>	Burchell's Coucal	LC	LC
<sup>2</sup> <i>Cercomela familiaris</i>	Familiar Chat	LC	LC
<sup>2</sup> <i>Cercomela schlegelii</i>	Karoo Chat	LC	LC
<sup>2</sup> <i>Cercomela sinuata</i>	Sickle-winged Chat	LC	LC
<sup>2</sup> <i>Cercomela tractrac</i>	Tractrac Chat	LC	LC
<sup>2</sup> <i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin	LC	LC
<sup>2</sup> <i>Cercotrichas paena</i>	Kalahari Scrub-Robin	LC	LC
<sup>2</sup> <i>Certhilauda subcoronata</i>	Karoo Long-billed Lark	LC	LC
<sup>2</sup> <i>Ceryle rudis</i>	Pied Kingfisher	LC	LC
<sup>2</sup> <i>Charadrius asiaticus</i>	Caspian Plover	LC	LC
<sup>2</sup> <i>Charadrius hiaticula</i>	Common Ringed Plover	LC	LC
<sup>1</sup> <i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT
<sup>2</sup> <i>Charadrius pecuarius</i>	Kittlitz's Plover	LC	LC
<sup>2</sup> <i>Charadrius tricollaris</i>	Three-banded Plover	LC	LC
<sup>2</sup> <i>Chersomanes albofasciata</i>	Spike-heeled Lark	LC	LC
<sup>2</sup> <i>Chlidonias hybridus</i>	Whiskered Tern	LC	LC
<sup>2</sup> <i>Chlidonias leucopterus</i>	White-winged Tern	LC	LC
<sup>2</sup> <i>Chrysococcyx caprius</i>	Diderick Cuckoo	LC	LC
<sup>2</sup> <i>Ciconia abdimii</i>	Abdim's Stork	LC	NT
<sup>2</sup> <i>Ciconia ciconia</i>	White Stork	LC	LC
<sup>1</sup> <i>Ciconia nigra</i>	Black Stork	LC	VU
<sup>2</sup> <i>Cinnyris fusca</i>	Dusky Sunbird	LC	LC
<sup>1</sup> <i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	LC	LC
<sup>1</sup> <i>Circus maurus</i>	Black Harrier	EN	LC
<sup>1</sup> <i>Circus pygargus</i>	Montagu's Harrier	LC	LC
<sup>2</sup> <i>Cisticola aridulus</i>	Desert Cisticola	LC	LC
<sup>2</sup> <i>Cisticola juncidis</i>	Zitting Cisticola	LC	LC
<sup>2</sup> <i>Cisticola subruficapillus</i>	Grey-backed Cisticola	LC	LC
<sup>2</sup> <i>Cisticola tinniens</i>	Levaillant's Cisticola	LC	LC

## LIST OF BIRDS (Cont.)

Birds protected according to the NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Clamator jacobinus</i>	Jacobin Cuckoo	LC	LC
<sup>3</sup> <i>Colius colius</i>	White-backed Mousebird	LC	LC
<sup>2</sup> <i>Columba guinea</i>	Speckled Pigeon	LC	LC
<sup>2</sup> <i>Columba livia</i>	Rock Dove	LC	LC
<sup>2</sup> <i>Coracias garrulus</i>	European Roller	LC	NT
<sup>3</sup> <i>Corvus albus</i>	Pied Crow	LC	LC
<sup>3</sup> <i>Corvus capensis</i>	Cape Crow	LC	LC
<sup>2</sup> <i>Cossypha caffra</i>	Cape Robin-Chat	LC	LC
<sup>2</sup> <i>Coturnix coturnix</i>	Common Quail	LC	LC
<sup>2</sup> <i>Creatophora cinerea</i>	Wattled Starling	LC	LC
<sup>2</sup> <i>Cursorius rufus</i>	Burchell's Courser	LC	VU
<sup>2</sup> <i>Cursorius temminckii</i>	Temminck's Courser	LC	LC
<sup>2</sup> <i>Cypsiurus parvus</i>	African Palm-Swift	LC	LC
<sup>2</sup> <i>Dendropicos fuscescens</i>	Cardinal Woodpecker	LC	LC
<sup>2</sup> <i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC	LC
<sup>2</sup> <i>Egretta garzetta</i>	Little Egret	LC	LC
<sup>1</sup> <i>Elanus caeruleus</i>	Black-shouldered Kite	LC	LC
<sup>2</sup> <i>Emberiza capensis</i>	Cape Bunting	LC	LC
<sup>2</sup> <i>Emberiza impetuani</i>	Lark-like Bunting	LC	LC
<sup>2</sup> <i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	LC	LC
<sup>2</sup> <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela	LC	LC
<sup>2</sup> <i>Eremopterix australis</i>	Black-eared Sparrowlark	LC	LC
<sup>2</sup> <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark	LC	LC
<sup>2</sup> <i>Estrilda astrild</i>	Common Waxbill	LC	LC
<sup>2</sup> <i>Estrilda erythronotos</i>	Black-faced Waxbill	LC	LC
<sup>3</sup> <i>Euplectes orix</i>	Southern Red Bishop	LC	LC
<sup>2</sup> <i>Eupodotis afraoides</i>	Northern Black Korhaan	LC	LC
<sup>2</sup> <i>Eupodotis ruficrista</i>	Red-crested Korhaan	LC	LC
<sup>2</sup> <i>Eupodotis vigorsii</i>	Karoo Korhaan	LC	NT
<sup>1</sup> <i>Falco biarmicus</i>	Lanner Falcon	LC	VU
<sup>1</sup> <i>Falco naumanni</i>	Lesser Kestrel	LC	LC
<sup>1</sup> <i>Falco peregrinus</i>	Peregrine Falcon	LC	LC
<sup>1</sup> <i>Falco rupicolis</i>	Rock Kestrel	LC	LC
<sup>1</sup> <i>Falco rupicoloides</i>	Greater Kestrel	LC	LC
<sup>2</sup> <i>Fulica cristata</i>	Red-knobbed Coot	LC	LC
<sup>2</sup> <i>Galerida magnirostris</i>	Large-billed Lark	LC	LC
<sup>2</sup> <i>Gallinago nigripennis</i>	African Snipe	LC	LC
<sup>2</sup> <i>Gallinula chloropus</i>	Common Moorhen	LC	LC
<sup>1</sup> <i>Glaucidium perlatum</i>	Pearl-spotted Owlet	LC	LC

## LIST OF BIRDS (Cont.)

Birds protected according to the NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Granatina granatina</i>	Violet-eared Waxbill	LC	LC
<sup>1</sup> <i>Gyps africanus</i>	White-backed Vulture	CR	CR
<sup>1</sup> <i>Haliaeetus vocifer</i>	African Fish-Eagle	LC	LC
<sup>1</sup> <i>Hieraaetus pennatus</i>	Booted Eagle	LC	LC
<sup>2</sup> <i>Himantopus himantopus</i>	Black-winged Stilt	LC	LC
<sup>2</sup> <i>Hirundo albigularis</i>	White-throated Swallow	LC	LC
<sup>2</sup> <i>Hirundo cucullata</i>	Greater Striped Swallow	LC	LC
<sup>2</sup> <i>Hirundo dimidiata</i>	Pearl-breasted Swallow	LC	LC
<sup>2</sup> <i>Hirundo fuligula</i>	Rock Martin	LC	LC
<sup>2</sup> <i>Hirundo rustica</i>	Barn Swallow	LC	LC
<sup>2</sup> <i>Hirundo semirufa</i>	Red-breasted Swallow	LC	LC
<sup>2</sup> <i>Hirundo spilodera</i>	South African Cliff-Swallow	LC	LC
<sup>2</sup> <i>Indicator indicator</i>	Greater Honeyguide	LC	LC
<sup>2</sup> <i>Indicator minor</i>	Lesser Honeyguide	LC	LC
<sup>2</sup> <i>Ixobrychus minutus</i>	Little Bittern	LC	LC
<sup>2</sup> <i>Lagonosticta senegala</i>	Red-billed Firefinch	LC	LC
<sup>2</sup> <i>Lamprotornis nitens</i>	Cape Glossy Starling	LC	LC
<sup>2</sup> <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike	LC	LC
<sup>2</sup> <i>Lanius collaris</i>	Common Fiscal	LC	LC
<sup>2</sup> <i>Lanius collurio</i>	Red-backed Shrike	LC	LC
<sup>2</sup> <i>Lanius minor</i>	Lesser Grey Shrike	LC	LC
<sup>2</sup> <i>Larus cirrocephalus</i>	Grey-headed Gull	LC	LC
<sup>1</sup> <i>Leptoptilos crumeniferus</i>	Marabou Stork	LC	NT
<sup>2</sup> <i>Malcorus pectoralis</i>	Rufous-eared Warbler	LC	LC
<sup>2</sup> <i>Megaceryle maxima</i>	Giant Kingfisher	LC	LC
<sup>1</sup> <i>Melierax canorus</i>	Southern Pale Chanting Goshawk	LC	LC
<sup>2</sup> <i>Merops apiaster</i>	European Bee-eater	LC	LC
<sup>2</sup> <i>Merops hirundineus</i>	Swallow-tailed Bee-eater	LC	LC
<sup>2</sup> <i>Milvus aegyptius</i>	Yellow-billed Kite	LC	LC
<sup>1</sup> <i>Milvus migrans</i>	Black Kite	LC	LC
<sup>2</sup> <i>Mirafraga fasciolata</i>	Eastern Clapper Lark	LC	LC
<sup>2</sup> <i>Monticola brevipes</i>	Short-toed Rock-Thrush	LC	LC
<sup>2</sup> <i>Motacilla aguimp</i>	African Pied Wagtail	LC	LC
<sup>2</sup> <i>Motacilla capensis</i>	Cape Wagtail	LC	LC
<sup>2</sup> <i>Muscicapa striata</i>	Spotted Flycatcher	LC	LC
<sup>2</sup> <i>Myrmecocichla formicivora</i>	Anteater Chat	LC	LC
<sup>1</sup> <i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN
<sup>2</sup> <i>Netta erythrophthalma</i>	Southern Pochard	LC	LC
<sup>2</sup> <i>Nilus afer</i>	Brubru	LC	LC
<sup>2</sup> <i>Numenius phaeopus</i>	Common Whimbrel	LC	LC
<sup>2</sup> <i>Numida meleagris</i>	Helmeted Guineafowl	LC	LC



## LIST OF BIRDS (Cont.)

Birds protected according to the NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	LC	LC
<sup>2</sup> <i>Oena capensis</i>	Namaqua Dove	LC	LC
<sup>2</sup> <i>Oenanthe monticola</i>	Mountain Wheatear	LC	LC
<sup>2</sup> <i>Oenanthe pileata</i>	Capped Wheatear	LC	LC
<sup>2</sup> <i>Onychognathus nabouroup</i>	Pale-winged Starling	LC	LC
<sup>2</sup> <i>Oriolus oriolus</i>	Eurasian Golden Oriole	LC	LC
<sup>2</sup> <i>Ortygospiza atricollis</i>	African Quailfinch	LC	LC
<sup>2</sup> <i>Oxyura maccoa</i>	<b>Maccoa Duck</b>	<b>VU</b>	<b>NT</b>
<sup>2</sup> <i>Parisoma layardi</i>	Layard's Tit-Babbler	LC	LC
<sup>2</sup> <i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler	LC	LC
<sup>2</sup> <i>Parus cinerascens</i>	Ashy Tit	LC	LC
<sup>2</sup> <i>Passer diffusus</i>	Southern Grey-headed Sparrow	LC	LC
<sup>3</sup> <i>Passer domesticus</i>	House Sparrow	LC	LC
<sup>3</sup> <i>Passer melanurus</i>	Cape Sparrow	LC	LC
<sup>2</sup> <i>Passer motitensis</i>	Great Sparrow	LC	LC
<sup>2</sup> <i>Phalacrocorax africanus</i>	Reed Cormorant	LC	LC
<sup>2</sup> <i>Phalacrocorax lucidus</i>	White-breasted Cormorant	LC	LC
<sup>2</sup> <i>Philetairus socius</i>	Sociable Weaver	LC	LC
<sup>2</sup> <i>Philomachus pugnax</i>	Ruff	LC	LC
<sup>1</sup> <i>Phoenicopterus minor</i>	<b>Lesser Flamingo</b>	<b>NT</b>	<b>NT</b>
<sup>1</sup> <i>Phoenicopterus ruber</i>	<b>Greater Flamingo</b>	LC	<b>NT</b>
<sup>2</sup> <i>Phragmacia substriata</i>	Namaqua Warbler	LC	LC
<sup>2</sup> <i>Phylloscopus trochilus</i>	Willow Warbler	LC	LC
<sup>2</sup> <i>Platalea alba</i>	African Spoonbill	LC	LC
<sup>2</sup> <i>Plectropterus gambensis</i>	Spur-winged Goose	LC	LC
<sup>2</sup> <i>Plegadis falcinellus</i>	Glossy Ibis	LC	LC
<sup>2</sup> <i>Plocepasser mahali</i>	White-browed Sparrow-Weaver	LC	LC
<sup>3</sup> <i>Ploceus velatus</i>	Southern Masked-Weaver	LC	LC
<sup>2</sup> <i>Podiceps nigricollis</i>	Black-necked Grebe	LC	LC
<sup>1</sup> <i>Polemaetus bellicosus</i>	<b>Martial Eagle</b>	<b>EN</b>	<b>EN</b>
<sup>1</sup> <i>Polihierax semitorquatus</i>	Pygmy Falcon	LC	LC
<sup>1</sup> <i>Polyboroides typus</i>	African Harrier-Hawk	LC	LC
<sup>2</sup> <i>Prinia flavicans</i>	Black-chested Prinia	LC	LC
<sup>2</sup> <i>Pternistis capensis</i>	Cape Francolin	LC	LC
<sup>2</sup> <i>Pterocles burchelli</i>	Burchell's Sandgrouse	LC	LC
<sup>2</sup> <i>Pterocles namaqua</i>	Namaqua Sandgrouse	LC	LC
<sup>1</sup> <i>Ptilopus granti</i>	Southern White-faced Scops-Owl	-	LC
<sup>3</sup> <i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC	LC
<sup>2</sup> <i>Pytilia melba</i>	Green-winged Pytilia	LC	LC
<sup>3</sup> <i>Quelea quelea</i>	Red-billed Quelea	LC	LC
<sup>2</sup> <i>Rallus caerulescens</i>	African Rail	LC	LC

## LIST OF BIRDS (Cont.)

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Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Recurvirostra avosetta</i>	Pied Avocet	LC	LC
<sup>2</sup> <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	LC	LC
<sup>2</sup> <i>Rhinoptilus africanus</i>	Double-banded Courser	LC	LC
<sup>2</sup> <i>Riparia paludicola</i>	Brown-throated Martin	LC	LC
<sup>2</sup> <i>Riparia riparia</i>	Sand Martin	LC	LC
<sup>1</sup> <i>Rostratula benghalensis</i>	Greater Painted-snipe	LC	<b>NT</b>
<sup>1</sup> <i>Sagittarius serpentarius</i>	Secretarybird	<b>EN</b>	<b>VU</b>
<sup>2</sup> <i>Scleroptila levaillantoides</i>	Orange River Francolin	LC	LC
<sup>2</sup> <i>Scopus umbretta</i>	Hamerkop	LC	LC
<sup>2</sup> <i>Serinus albogularis</i>	White-throated Canary	LC	LC
<sup>2</sup> <i>Serinus atrogularis</i>	Black-throated Canary	LC	LC
<sup>2</sup> <i>Serinus flaviventris</i>	Yellow Canary	LC	LC
<sup>2</sup> <i>Sigelus silens</i>	Fiscal Flycatcher	LC	LC
<sup>2</sup> <i>Spizocorys conirostris</i>	Pink-billed Lark	LC	LC
<sup>1</sup> <i>Spizocorys sclateri</i>	Sclater's Lark	<b>NT</b>	<b>NT</b>
<sup>2</sup> <i>Spizocorys starki</i>	Stark's Lark	LC	LC
<sup>2</sup> <i>Sporopipes squamifrons</i>	Scaly-feathered Finch	LC	LC
<sup>2</sup> <i>Spreo bicolor</i>	Pied Starling	LC	LC
<sup>2</sup> <i>Stenostira scita</i>	Fairy Flycatcher	LC	LC
<sup>2</sup> <i>Streptopelia capicola</i>	Cape Turtle-Dove	LC	LC
<sup>2</sup> <i>Streptopelia semitorquata</i>	Red-eyed Dove	LC	LC
<sup>2</sup> <i>Streptopelia senegalensis</i>	Laughing Dove	LC	LC
<sup>2</sup> <i>Struthio camelus</i>	Common Ostrich	LC	LC
<sup>2</sup> <i>Sylvia borin</i>	Garden Warbler	LC	LC
<sup>2</sup> <i>Sylvia communis</i>	Common Whitethroat	LC	LC
<sup>2</sup> <i>Sylvietta rufescens</i>	Long-billed Crombec	LC	LC
<sup>2</sup> <i>Tachybaptus ruficollis</i>	Little Grebe	LC	LC
<sup>2</sup> <i>Tachymarpis melba</i>	Alpine Swift	LC	LC
<sup>2</sup> <i>Tadorna cana</i>	South African Shelduck	LC	LC
<sup>2</sup> <i>Telophorus zeylonus</i>	Bokmakierie	LC	LC
<sup>2</sup> <i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC	LC
<sup>2</sup> <i>Tockus nasutus</i>	African Grey Hornbill	LC	LC
<sup>2</sup> <i>Trachyphonus vaillantii</i>	Crested Barbet	LC	LC
<sup>2</sup> <i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill	LC	LC
<sup>2</sup> <i>Tringa glareola</i>	Wood Sandpiper	LC	LC
<sup>2</sup> <i>Tringa nebularia</i>	Common Greenshank	LC	LC
<sup>2</sup> <i>Tringa stagnatilis</i>	Marsh Sandpiper	LC	LC
<sup>2</sup> <i>Turdus smithi</i>	Karoo Thrush	LC	LC
<sup>2</sup> <i>Turnix sylvatica</i>	Small Buttonquail	LC	LC
<sup>1</sup> <i>Tyto alba</i>	Barn Owl	LC	LC

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Scientific name	Common name	IUCN status	SA RDB
<sup>2</sup> <i>Upupa africana</i>	African Hoopoe	LC	LC
<sup>3</sup> <i>Urocolius indicus</i>	Red-faced Mousebird	LC	LC
<sup>2</sup> <i>Vanellus armatus</i>	Blacksmith Lapwing	LC	LC
<sup>2</sup> <i>Vanellus coronatus</i>	Crowned Lapwing	LC	LC
<sup>2</sup> <i>Vidua chalybeata</i>	Village Indigobird	LC	LC
<sup>2</sup> <i>Vidua macroura</i>	Pin-tailed Whydah	LC	LC
<sup>2</sup> <i>Vidua paradisaea</i>	Long-tailed Paradise-Whydah	LC	LC
<sup>2</sup> <i>Vidua regia</i>	Shaft-tailed Whydah	LC	LC
<sup>2</sup> <i>Zosterops pallidus</i>	Orange River White-eye	LC	LC