



ECOLOGICAL ASSESSMENT REPORT

Synchroplex (Pty) Ltd
Areachap Prospecting Operation



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The Farm Areachap 426

District of Gordonia

Northern Cape Province

**Ecological Assessment Report in application for Environmental
Authorisation related to a Prospecting Right Application (Ref: NC
30/5/1/1/2/11895 PR) that was lodged with the Department of
Mineral Resources**

November 2018

EXECUTIVE SUMMARY

Synchroplex (Pty) Ltd has been prospected for copper, zinc, sulphur, silver and iron on The Farm Areachap 426 since 2011. The prospecting right however expired in 2016 at which point they lodged a renewal application, but more recently, they also applied for a Section 102 to include bulk sampling. The prospecting right area is located within the Gordonia District Municipality of the Northern Cape Province. This ecological assessment report describes the characteristics of habitats in the proposed prospecting area, identifies the source of impacts from the prospecting operation and assesses these impacts, as well as the residual impacts after closure.

A desktop study and field investigation was performed to obtain ecological information for the proposed study area and identify the ecological characteristics and sensitivity of the site. Four plant communities were identified on site of which the shrubland on sandy, rocky soil is included in the earmarked area to be affected by prospecting activities. This unit is considered to be of medium sensitivity. Although it hosts a number of species of conservation concern, a high density of encroaching species are also found in places. Impacts are likely to be largely local and activities within this area can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken. The most profound impacts are expected to be related to the proliferation of alien vegetation, such as *Prosopis* spp. that threaten surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area.

Species of conservation concern that are found in the earmarked habitats will most likely also be lost locally. These include *Boscia foetida*, *Euphorbia spinea*, *Prenia tetragona* and *Psilocaulon subnodosum*. Similarly, the prospecting operation will result in the large-scale clearance of indigenous vegetation. A permit application regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.

Furthermore, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries prior to any potential disturbances to *Vachellia haematoxylon*. However, it is not foreseen that prospecting activities will take place in the dune veld of the study area, where this species occurs.

Authorisation can be granted, but the applicant should still commit to the adherence of effective avoidance, management, mitigation and rehabilitation measures.

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1. INTRODUCTION

1.1. Background information

Synchroplex (Pty) Ltd has been prospected for copper, zinc, sulphur, silver and iron on The Farm Areachap 426 (from hereon referred to as Areachap) since 2011. The prospecting right however expired in 2016 at which point they lodged a renewal application, but more recently, they also applied for a Section 102 to include bulk sampling. The prospecting right area is located within the Gordonia District Municipality of the Northern Cape Province and lies 30 km north-west of the town Upington on the R360 (Figure 1). The total extent of the prospecting right area is 1 9653.0822 ha.

An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecosystems of Areachap and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct an assessment and provide an ecological assessment report.

This assessment report describes the characteristics of habitats in the proposed prospecting area, identifies species of conservation concern, identifies invasive and encroaching species and their distribution, 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. These should all be included in the EMPR.

1.2. Scope of study

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

- conduct a desktop study and field investigation in order to identify and describe different ecological habitats and provide an inventory of communities/species/taxa and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;

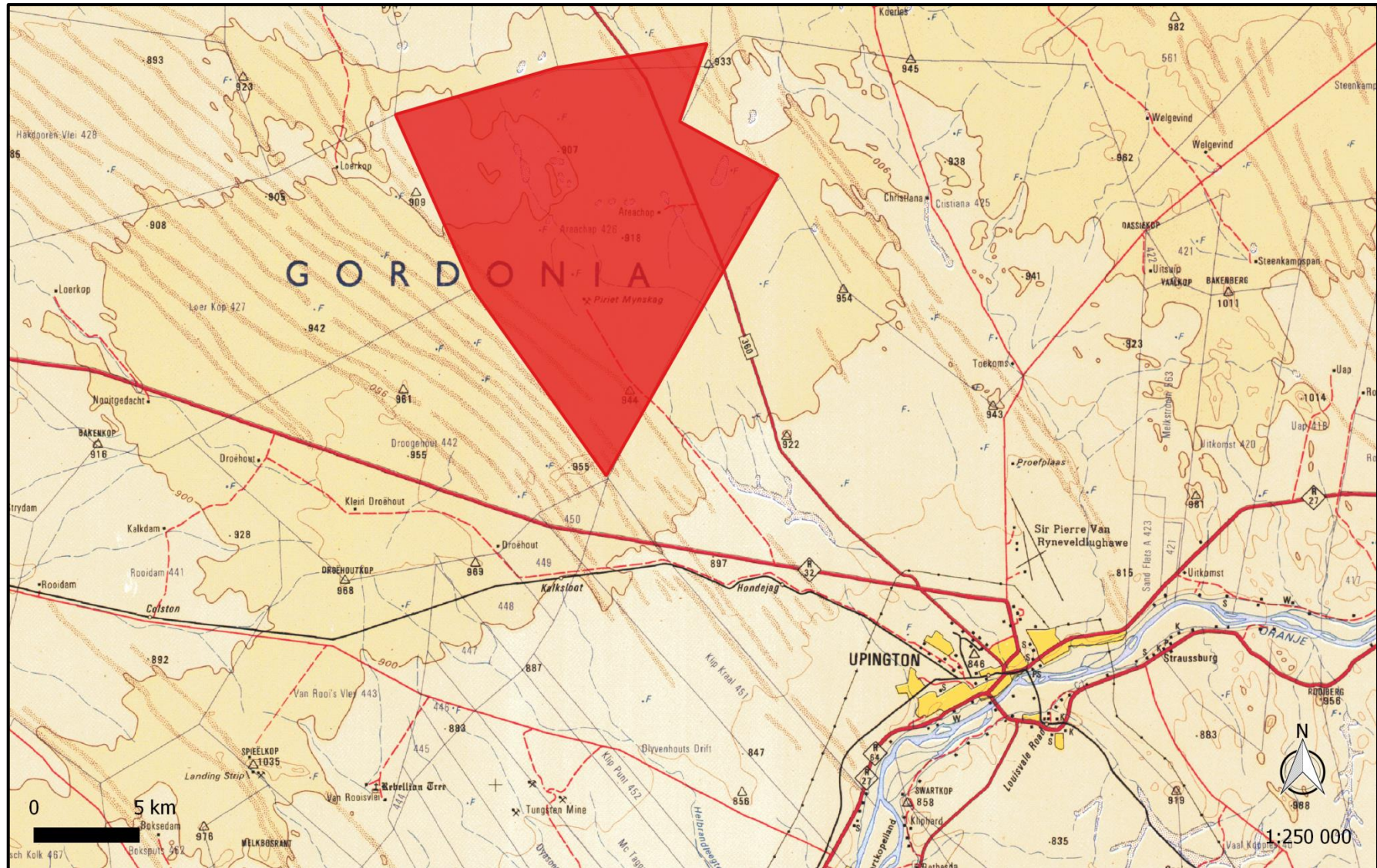



Figure 1. The location of the Areachap prospecting area is indicated in red.

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

1.3. Details of the specialist consultant

Company Name	Boscia Ecological Consulting cc	Registration no:	2011/048041/23
Address	PostNet Suite #194 Private Bag X2 Diamond 8305		
Contact Person	Dr Elizabeth (Betsie) Milne		
Contact Details	Cell: 082 992 1261	Email: BosciaEcology@gmail.com	
Qualifications	PhD Botany (Nelson Mandela Metropolitan University) Masters Environmental Management (University of the Free State) BTech Nature Conservation (Tshwane University of Technology)		
Declaration of independence	<p>I, Elizabeth (Betsie) Milne declare that I:</p> <ul style="list-style-type: none"> • act as the independent specialist in this application; • regard the information contained in this report as it relates to my specialist input/study to be true and correct; • 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; • have and will not have any vested interest in the activity proceedings; • have no, and will not engage in conflicting interest in the undertaking of the activities; • undertake to disclose to the component 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; • will provide the competent authority with access to all information at my disposal regarding the study. <div style="text-align: center;">  </div>		

1.4. Description of the proposed activity

The prospecting operation is based on copper-zinc volcanic hosted massive sulphide (VHMS) deposits. The Cu-Zn-S-Ag-Fe ore will primarily be extracted from an opencast trench, but also from an existing underground shaft. Furthermore, exploration boreholes to a depth of 350 m are planned. An estimated total volume of 102 000 m³ will be produced over four years.

Prospecting activities will primarily make use of existing roads and infrastructure, but additional roads will be created in order to access working and exploration areas. The full extent of all planned infrastructure and activities are not currently known, but existing features include an office and workshop complex, a series of shafts, mine dumps, excavations, ablutions, water storage, concrete surfaces and fence lines (Figure 2).

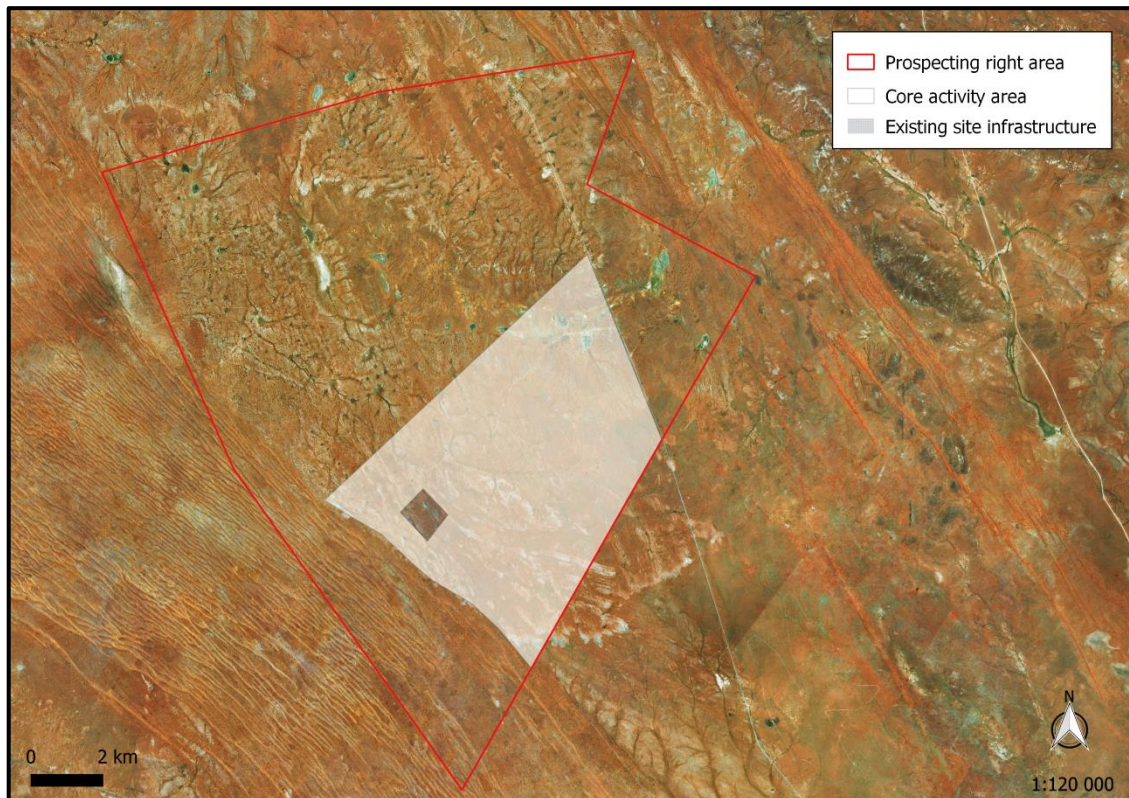


Figure 2. The locality of the core footprint for the Areachap prospecting operation.

2. METHODOLOGY

2.1. Data collection

The study comprised a combination of field and desktop surveys for data collection on fauna and flora in order to obtain the most comprehensive data set for the assessment. The fieldwork component was conducted on 27 October 2018 and most data for the desktop component was obtained from the quarter degree squares that include the study area (2820BB, 2820BD, 2821AA and 2821AC).

2.2. Flora

2.2.1. Field survey

For the field work component, satellite images were used to identify homogenous vegetation units within the proposed prospecting area. Representative sampling plots were allocated in these units and sampled with the aid of a GPS in order to characterise the species composition. The following quantitative data was collected:

- Species composition
- Species percentage cover
- Amount of bare soil and rock cover
- Presence of biotic and anthropogenic disturbances

Additional checklists of plant species were compiled during the surveys by traversing a linear route and recording species as they were encountered in each unit.

2.2.2. Desktop survey

For the desktop component, the South African National Vegetation Map (Mucina and Rutherford 2006) was used to obtain data on broad scale vegetation types 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 //Khara Hais Municipality (NC083), 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 quarter degree squares that include the study area. 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 2017).

2.3. Fauna

2.3.1. Desktop survey

A desktop survey was undertaken to obtain lists of mammals, reptiles, amphibians, birds and invertebrates which are likely to occur in the study area. These 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 and Picker et al. (2004) and Griffiths et al. (2015) for invertebrates. Additional information on faunal distribution was extracted from the various databases hosted by the ADU web portal, <http://adu.org.za>. A map of important bird areas (BirdLifeSA 2015) was also consulted. The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

The likelihood of Red Data species occurring on site has been determined using the distribution maps in the Red Data reference books (Friedmann and Daly 2004; Bates et al. 2014; Taylor et al. 2015; ADU 2016) and comparing their habitat preferences with the habitat described from the field survey. The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria (IUCN 2015) and/or the various red data books for the respective taxa.

2.3.2. Field survey

The faunal field survey was conducted concurrent with the vegetation survey. Habitats on site were assessed to compare with the habitat requirements of Red Data species. The presence of faunal species was determined using the following methods:

- Identification by visual observation,
- Identification of bird and mammal calls,
- Identification of signs (spoor, faeces, burrows and nests).

2.4. Sensitivity mapping and assessment

An ecological sensitivity map of the site was produced by integrating the information collected on site with the available ecological and biodiversity information available in the literature and various spatial databases.

The 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. The sensitivity of the different units identified in the mapping procedure increased with probability and was rated according to the following scale:

Low: 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.

Medium: Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

High: 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.

Very High: 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.

2.5. 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:

$$\begin{array}{c} \textit{CONSEQUENCE} \\ \text{(Severity + Spatial Scope + Duration)} \end{array} \quad \times \quad \begin{array}{c} \textit{PROBABILITY} \\ \text{(Frequency of activity + Frequency of impact)} \end{array}$$

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

2.6. Assumptions and limitations

Due to the brief duration of the survey and the lack of seasonal coverage, the species list obtained during the site visit cannot be regarded as comprehensive. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present is captured. However, this is rarely possible due to time and cost constraints. The survey was nevertheless conducted in such a manner to ensure all representative communities are included.

The site visit for the study took place during early summer, which is generally not a favourable time of the year for vegetation surveys; unless some early spring rain occurred. The best time to evaluate vegetation in the study area is after at least some summer rain when the vegetation has responded and is in an actively growing state. This was however not the case during this survey, so grasses, annuals and other flowering plants were not in the most suitable condition for the survey. The results presented here can therefore only reflect the condition of the vegetation. It is expected that some species of conservation concern were not visible during the time of sampling. Therefore, the timing of the site visit is considered to be a limiting factor. Nevertheless, most of the common and significant species encountered were identifiable.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. Current and historic land use

The major land uses in the region are livestock and game farming. The site is classified as non-arable land with low potential for grazing. The main agricultural enterprise in the region is sheep, with a proposed stocking rate of 28 Ha per large stock unit. The area is not suited for cultivation. Apart from the current prospecting activities by Synchroplex, historic diggings took place during the period of 1909 to 1917. Later, in the 1960's Iscor started exploration work at the same site. In 1971 Cape Asbestos, in a joint venture with Anglo American, obtained exploration rights but relinquished them back to Iscor in 1977 after they had failed to locate additional deposits. The farm is currently used for livestock farming and a public road (R360) which connects Upington with the Rietfontein border post to Namibia also traverses the property (Figure 3).

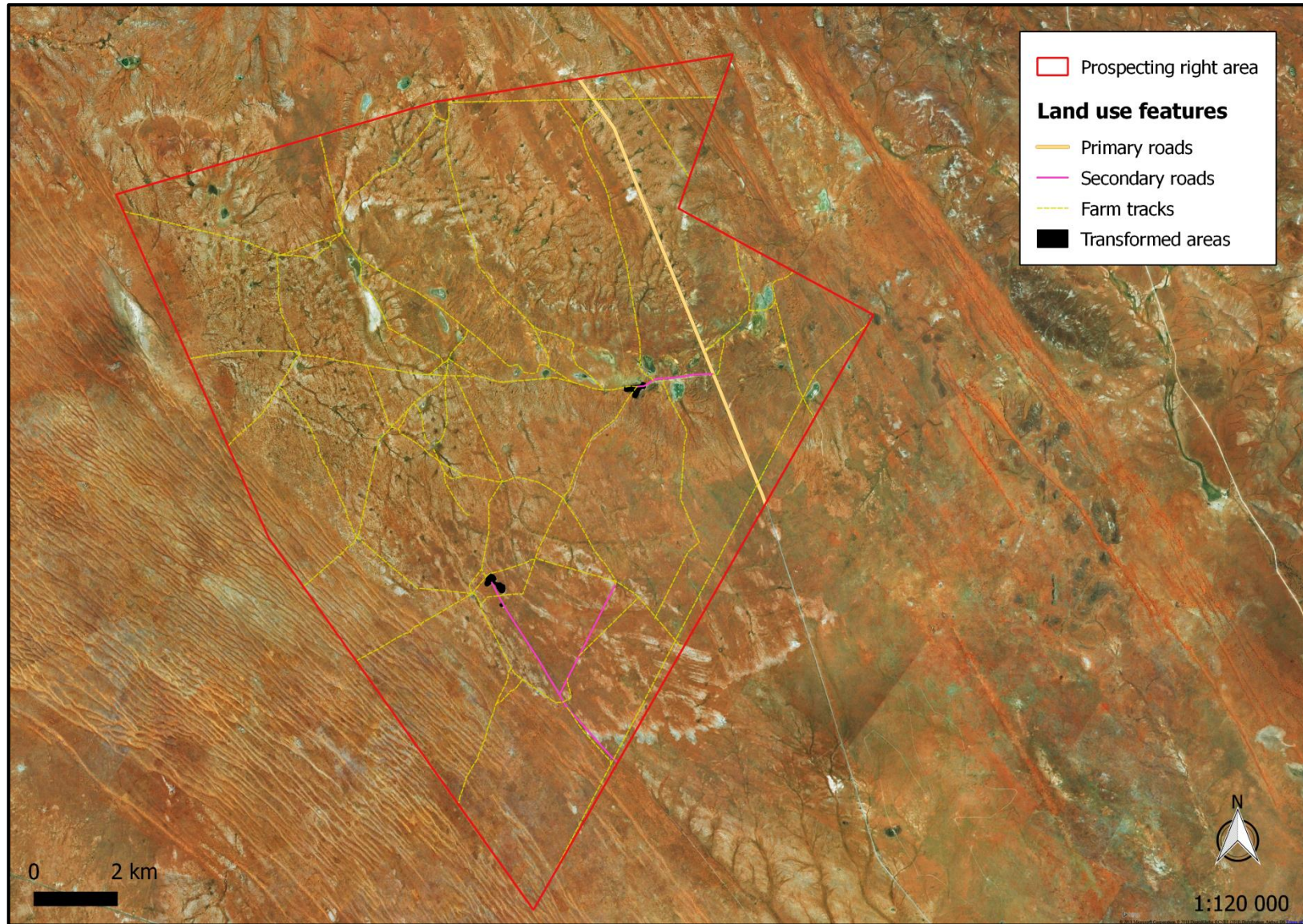


Figure 3. Evidence of the land use history on Areachap.

3.2. Drainage and Quaternary Catchment

The study area falls primarily within the Nossob-Molopo quaternary catchments D42E of the Lower Orange Water Management Area, but small sections in the east and south of the site extends into the Neusberg (D73E and D73F) catchments (Figure 4). These quaternary catchments have all been allocated a Present Ecological State (PES) of 'Moderately Modified' (C) by (Smook et al. 2002). Information regarding mean annual rainfall, evaporation potential and runoff for these catchments are provided in Table 2. Watercourses on the study site that have been formally mapped include numerous ephemeral pans and drainage lines (Figure 5).

Table 2. Catchment characteristics for the quaternary catchments, as presented by Smook et al. (2002).

Quaternary catchment	Catchment Area (km ²)	Mean Annual Rainfall (mm)	Mean Annual Evaporation (mm)	Mean Annual Runoff (10 ⁶ m ³)
D42E	4 208	148	2 750	0.28
D73E	3 867	183	2 650	13.29
D73F	4 630	158	2 650	9.62

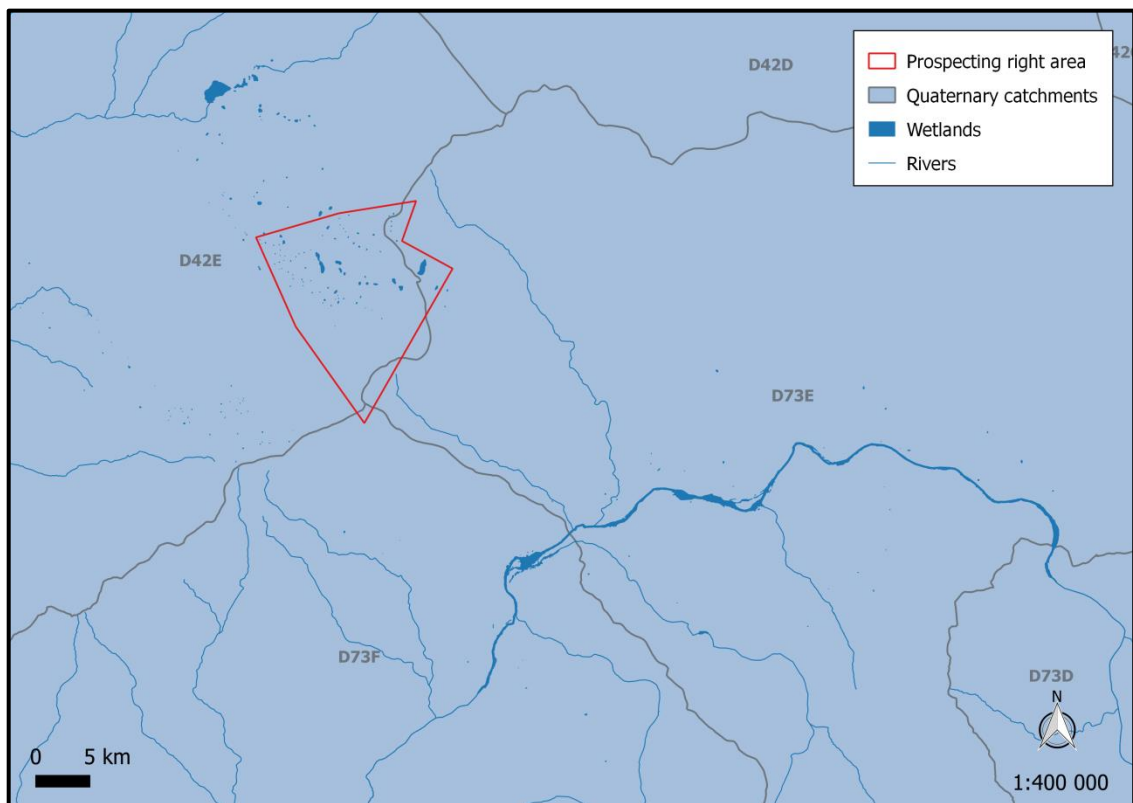


Figure 4. The locality of the proposed prospecting area in relation to the quaternary catchments of the Lower Orange Water Management Area.

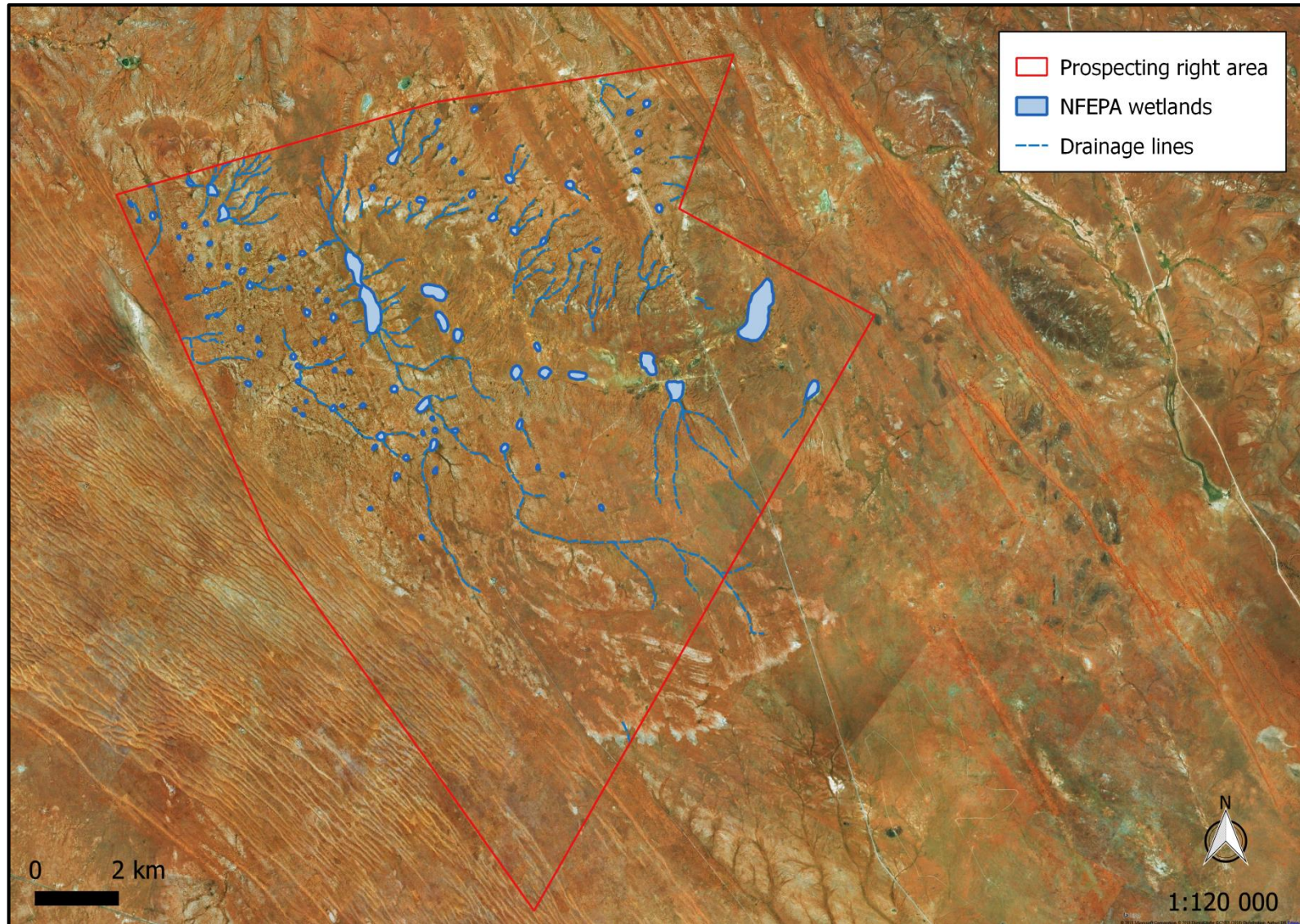


Figure 5. The location of formally mapped watercourses on the proposed prospecting right area.

3.3. Geology, soils and topography

According to Steyn (1988) the geological features on Areachap mainly comprise quaternary and carboniferous deposits. The site is primarily associated with shale and tillite from the Dwyka Formation of the Karoo Supergroup. Red-brown, wind-blown sand and dunes from the Gordonia Formation of the Kalahari Group occur scattered in the north, but is more prominent in the south (Figure 6). The Cu-Zn-S-Ag-Fe resource is associated with the amphibolite, biotite gneiss, polytic gneisses and lenses of calc-silicate rocks from the Jannelspan Formation of the Areachap Group.

The site is closely associated with the Ae10d, Ae112a, Af2g, Af8a and Af8b landtypes (Table 7). Here, red-yellow apedal, freely drained soils, as well as red with a high base status and a depth of more than 300 mm are found. The region is characterised by dune hills (parallel crests) and lowlands, with altitudes ranging between 920 m above sea level in the north and 940 m in the south. The terrain is indicated by a very gentle slope of 0.4 %.

3.4. Vegetation

3.4.1. Broad-scale vegetation patterns

The study area falls within the Savanna, Nama-Karoo and Azonal Vegetation biomes (Mucina and Rutherford 2006). According to the vegetation map of Mucina and Rutherford (2012), three broad-scale vegetation units are present on site (Figure 8), i.e. Gordonia Duneveld, Kalahari Karroid Shrubland and Southern Kalahari Salt Pans. This vegetation map however does not reflect the true character of the site, because it has not been mapped at a very fine scale.

Gordonia Duneveld is found in the Northern Cape at altitudes between 800 and 1 200 m. It comprises the largest part of the South African side of the Kgalagadi Transfrontier Park, is found south of the Molopo River border with Botswana (west of Van Zylsrus), interleaving the Kalahari Karroid Shrubland in the west (south of Rietfontein to the Orange River) and in the south (around Upington and north of Groblershoop). It also occurs as a number of loose dune cordons south of the Orange River near Keimoes and between Upington and Putsonderwater. The topography typically comprises parallel dunes about 3 – 8 m above the plains.

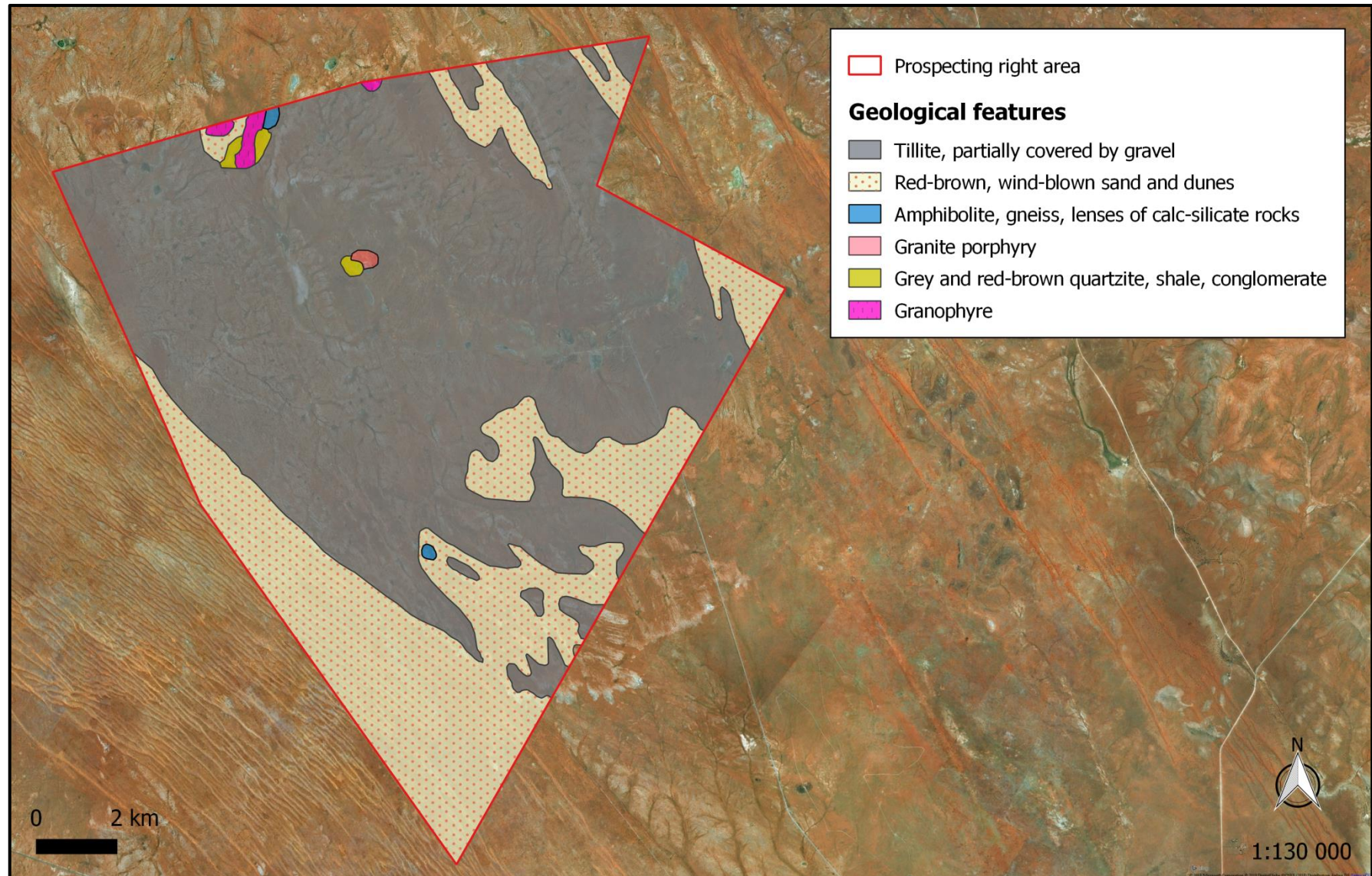


Figure 6. The distribution of geological features in the study area according to Steyn (1988).

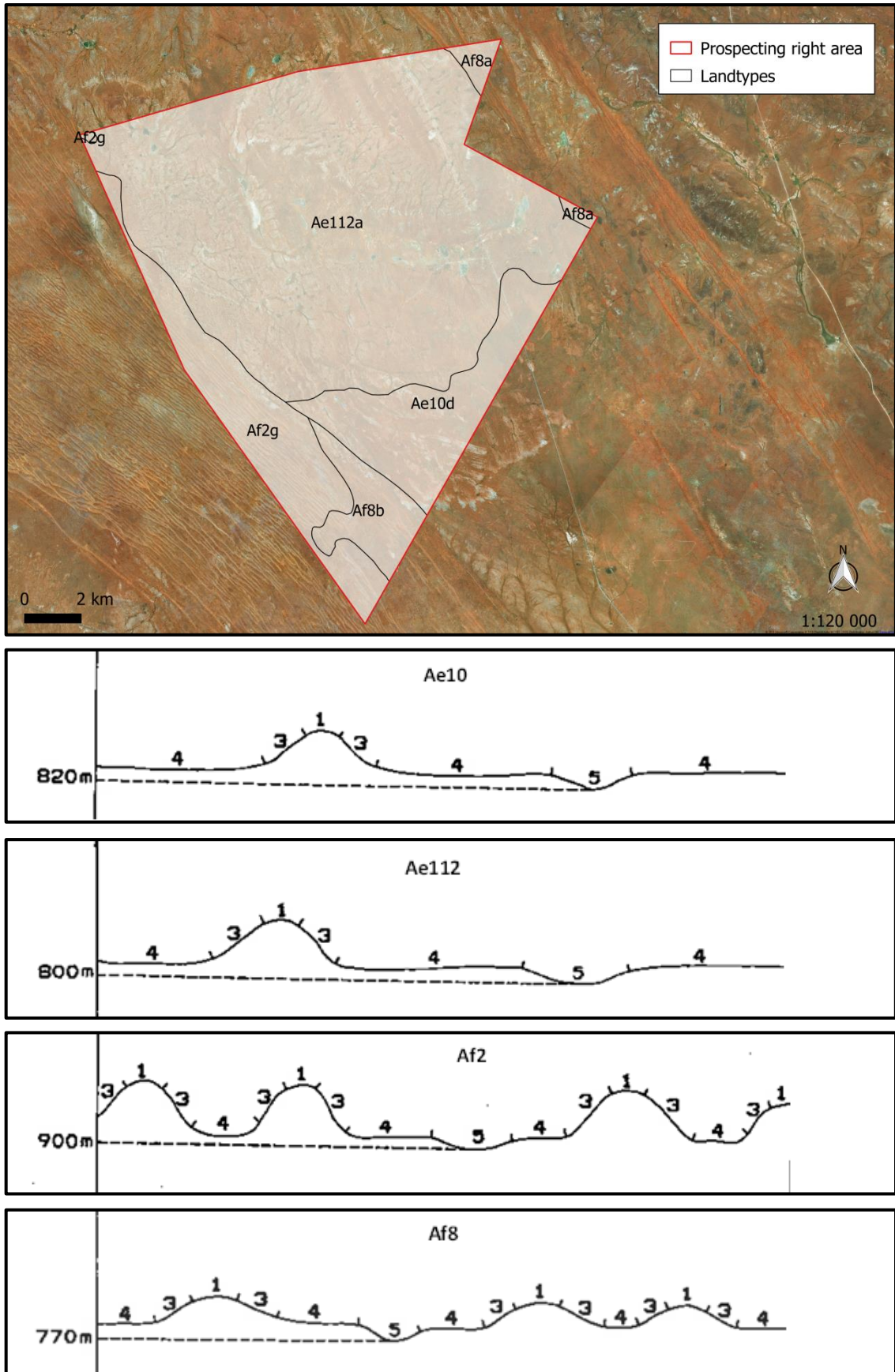


Figure 7. The distribution of landtypes on Areachap (top), and their terrain form sketches (bottom).

The vegetation occurs mainly as open shrubland with ridges of grassland dominated by *Stipagrostis amabilis* on the dune crests, *Vachellia haematoxylon* on the dune slopes, *Senegalia mellifera* on lower slopes and *Rhigozum trichotomum* in the interdune straaten. The geology and soil comprise aeolian sand underlain by superficial silcretes and calcretes of the Cenozoic Kalahari Group. The unit is classified as least threatened, with 14% being conserved in the Kgalagadi Transfrontier Park. Very little of this unit has been transformed and erosion is generally low. However, the destabilisation of normally vegetated dunes does occur in some areas due to local overstocking. Important taxa include those endemic to the Kalahari region, but none are limited to this unit.

Kalahari Karroid Shrubland is found in the Northern Cape, typically forming belts alternating with belts of *Gordonia* Duneveld on plains north-west of Upington through Lutzputs and Noenieput to the Rietfontein/Mier area in the north. Other patches occur around Kakamas and north of Groblershoop. The unit is also found in neighbouring Namibia. Altitudes vary between 700 and 1 100 m. The vegetation occurs mainly as low karroid shrubland on flat, gravel plains, with transitions to the Kalahari region and sandy soils. The geology and soil comprise Cenozoic Kalahari Group sands and small patches also on calcrete outcrops and screes on scarps of intermittent rivers. In places, Dwyka Group tillites outcrop. The soils are deep (>300 mm), red-yellow apedal, freely drained, with a high base status; which is typical of the Ae land type. The unit is classified as least threatened, with very little being conserved in the Augrabies Falls National Park. Very little of this unit has been transformed. However, this unit was preferred routes for early roads, which promoted the introduction of alien plants; about a quarter of this unit has scattered *Prosopis* spp. Erosion is very low. Important taxa include the grass *Dinebra retroflexa*.

Southern Kalahari Salt Pans are distributed in the Northern Cape and North-West Provinces as well as neighbouring Kalahari regions of Botswana and Namibia at altitudes between 800 and 1 500 m. The largest concentration of these pans in South Africa is found near Groot-Mier in western *Gordonia*. Although many of the pans are devoid of vegetation, the vegetation is typically presented as low grasslands on pan bottoms, dominated by *Sporobolus* sp. A mixture of dwarf shrubs dominated by *Lycium* and/or *Rhigozum* usually forms the outer belt in the salt pan zonation system. Most of the pans formed on the sandy sediments of the Cenozoic Kalahari Group, but in the south-east some formed on the dolomites of the Campbell Group (Vaalian-age Griqualand Wes Supergroup) and in the west some formed on diamicrites of the Dwyka Group (Karoo Supergroup).



Figure 8. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

The pan soil consist of white (washed) sand in shallow pans, rocky soils on calcrete outcrops and most typically of clays and sandy clays rich in Na, K and Mg. These soils are usually characterised by a high pH of 9. The pan bottoms are exposed for most of the year and carry shallow pools for a short time only after very good rains. The unit is classified as being least threatened, with about 8 % being statutorily conserved in the Kgalagadi Transfrontier Park. The vegetation on the pans is subject to natural degradation controlled by concentration of grazing animals. No endemic species are known from this unit.

3.4.2. Fine-scale vegetation patterns

The plant communities within the study area are delineated according to plant species correspondences, change in soil structure, topographical changes and disturbance regimes. The vegetation on site can be divided into four distinct units (Figure 9) and are described below. A complete plant species list, including those species likely to occur in the area is presented in Appendix 1.

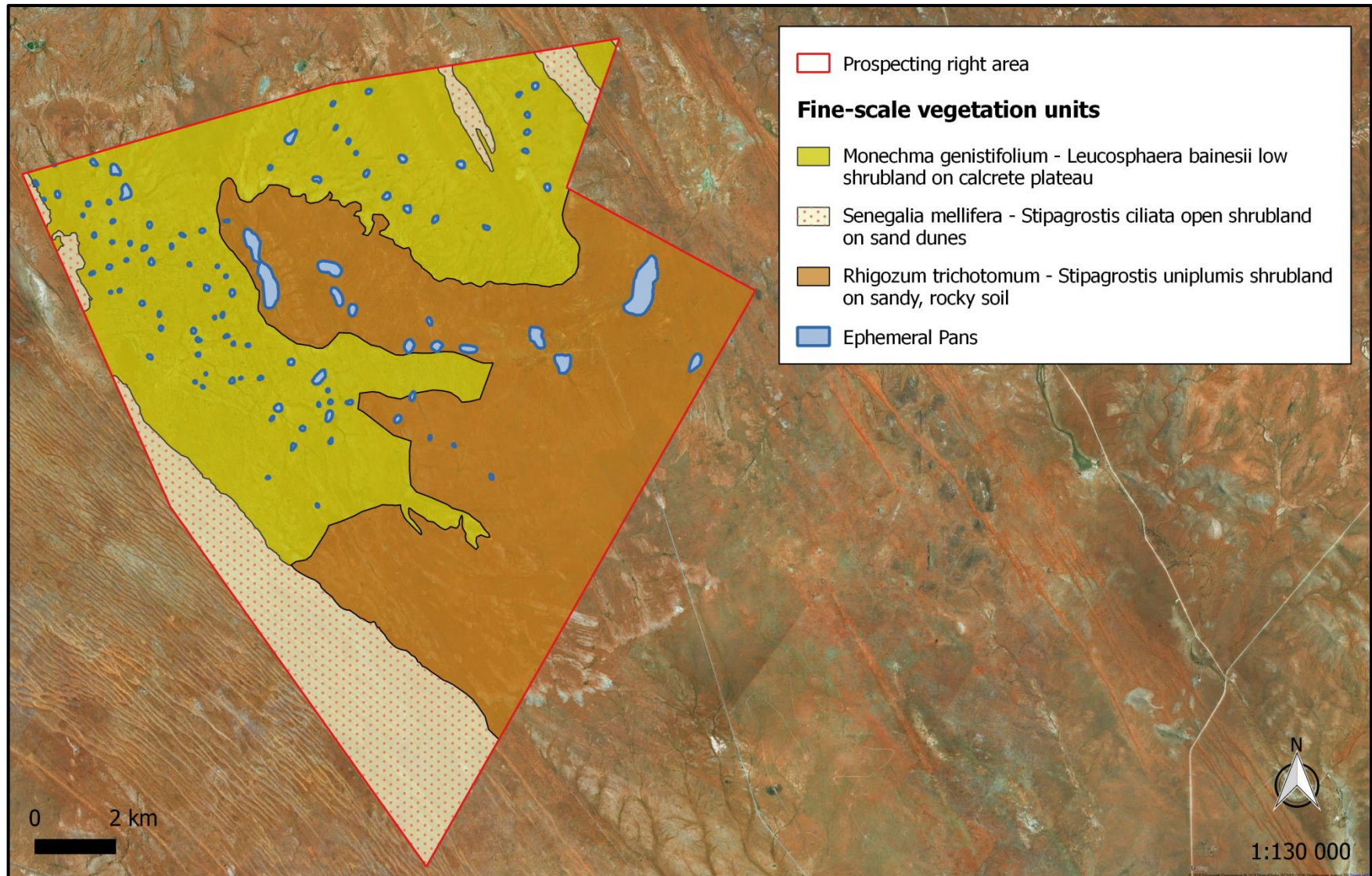


Figure 9. The distribution of fine-scale plant communities in the study area.

i) *Monechma genistifolium* - *Leucosphaera bainesii* low shrubland on calcrete plateau

This community comprises the north-western section of the study area (Figure 9). It is found on a calcrete plateau and resembles a typical karst landscape, where numerous solution cavities have filled with sediment to form ephemeral pans. The karstic nature of this unit presents a complex surface topography where shallow rock and deeper sandy patches alternates at a very small scale. Rock and red sand constitute about 30 % of the ground cover.

It is typically represented as a low shrubland dominated by *Monechma genistifolium* and *Leucosphaera bainesii* (Figure 10). However, a variety of other low shrubs are also found in abundance, such as *Barleria rigida*, *Blepharis mitrata*, *Aizoon schellenbergii*, *Pteronia mucronata* and *Aptosimum marlothii*. Other shrubs, including *Rhigozum trichotomum*, *Hoodia gordonii*, *Kleinia longiflora*, *Euphorbia spinea*, *Phaeoptilum spinosum*, *Aptosimum albomarginatum* and *Salsola* sp. occur more sparsely. The tree *Boscia foetida* is found scattered across the unit.

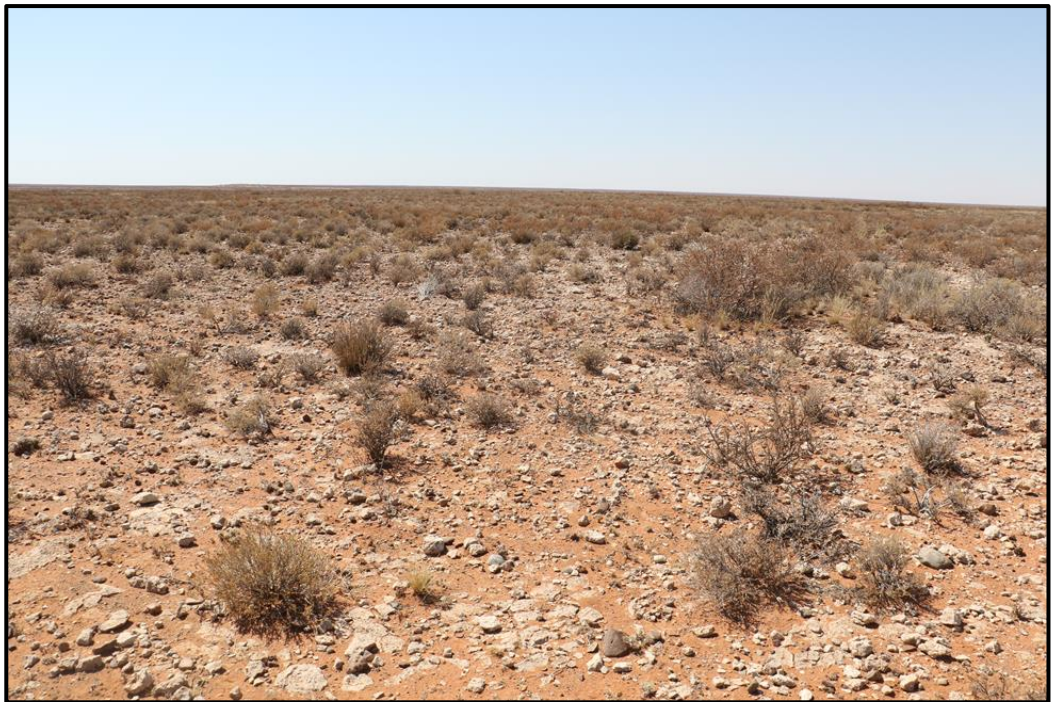


Figure 10. The shrubland on the calcrete plateau is dominated by numerous low shrubs.

The grass layer is very sparse and includes species such as *Stipagrostis uniplumis*, *S. obtusa*, *S. ciliata*, *Fingerhuthia africana* and *Enneapogon desvauxii*. The herb *Barleria lichtensteiniana* is also found here.

The sandy patches that intersect the calcrete surface resemble the shrubland on sandy soil and is typically characterised by *Rhigozum trichotomum*, *Stipagrostis ciliata*, *Aptosimum spinescens*, *Senegalia mellifera* and *Asparagus* sp.

ii) *Rhigozum trichotomum* – *Stipagrostis uniplumis* shrubland on sandy, rocky soil

This community comprises the eastern section of the study area (Figure 9). It is found on sandy, rocky soil which constitutes approximately 10 % of the ground cover. It is typically represented as a shrubland with a sparse grass layer in the rocky areas, but a more dense grass cover is found in those areas where deeper sand occurs (Figure 11).

The shrub layer is dominated by *Rhigozum trichotomum*, but *Phaeoptilum spinosum*, *Boscia foetida*, *Parkinsonia africana*, *Senegalia mellifera*, *Tapinanthus oleifolius*, *Eriocephalus ambiguus*, *Pentzia globosa* and *Salsola* sp. are also common. Other species found here include *Aptosimum albomarginatum*, *Barleria rigida*, *Kleinia longiflora*, *Euphorbia spinea*, *Plinthus sericeus*, *Monechma genistifolium*, *Galenia papulosa*, *Prenia tetragona*, *Psilocaulon subnodosum* and *Asparagus* sp.

The grass layer is dominated by *Stipagrostis uniplumis*, but *S. ciliata*, *S. obtusa*, *Enneapogon desvauxii* and *Cenchrus ciliaris* are also very common. Other grasses such as *Aristida adscensionis*, *Centropodia glauca* and *Enneapogon cenchroides* are also found here.

Common herbs include *Helichrysum argyrosphaerum*, *Geigeria ornativa*, *Dicoma capensis*, *Monsonia luederitziana*, *Tetraena simplex* and *Arctotis leiocarpa*



Figure 11. The shrubland in the east of the study area has a sparse grass layer in the rocky areas (top), but a denser grass cover is found in the sandy areas (bottom).

iii) *Senegalia mellifera* – *Stipagrostis ciliata* open shrubland on sand dunes

This community is primarily found in the southern corner of the study area, but a small portion also occurs in the north (Figure 9). It is found on deep red sand, which constitutes approximately 20 % of the ground cover. It is typically represented as duneveld, with distinct dune- and dune straat vegetation (Figure 12).

Overall, *Senegalia mellifera* is common across the unit, with *Vachellia haematoxylon* dominating the dune crests and *Rhigozum trichotomum* the dune straat. Other shrubs commonly found here include *Crotalaria orientalis*, *Lycium hirsutum*, *Tapinanthus oleifolius*, *Gomphocarpus fruticosus*, *Nolletia chrysocomoides* and *Asparagus* sp.

Stipagrostis ciliata is abundant across the unit, but *S. amabilis* dominate the dune crests. *Schmidtia kalahariensis* is also very common. Herbs include *Hirpicium echinus* and *Sesamum triphyllum*.



Figure 12. The open shrubland on sand dunes has distinct vegetation communities on the dunes and dune straat, respectively.

iv) Ephemeral pans

The ephemeral pans are primarily found in the north of the study area (Figure 9). Most have formed in solution cavities of the calcrete plateau and are endorheic. They are vegetated, with communities presented as grasslands (Figure 13) dominated by *Eragrostis rotifer* and *E. truncata*. Other grasses include *Aristida adscensionis*, *A. congesta* and *Setaria verticillata*. Common shrubs found in the pans include *Athanasia minuta*, *Lycium pumilum* and *Salsola* sp. The herb *Platycarphella carlinoides* is very abundant, but *Berkheya* sp. is also found.

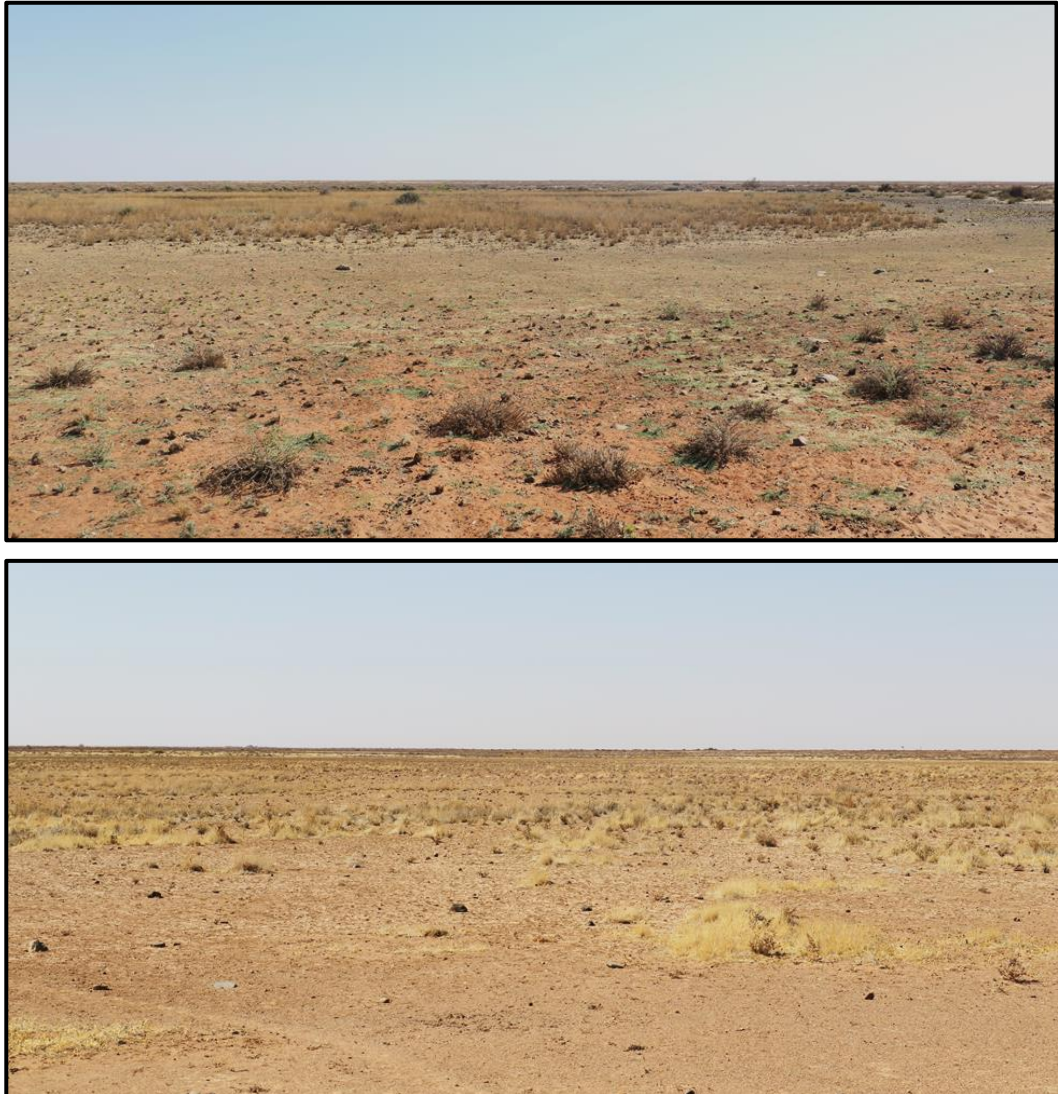


Figure 13. The ephemeral pans on Areachap are vegetated and presented as grasslands.

3.4.3. 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, 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 recorded in the area are classified as least concern; a category which includes widespread and abundant taxa (Table 3). However, three listed species have been recorded in the region, i.e. *Acanthopsis hoffmannseggiana* (DDT), *Hoodia gordonii* (DDD) and *Aloidendron dichotomum* (VU). Of these, *Hoodia gordonii* was recorded on site and was found to be restricted to the Calcrete Plateau. This species has undergone decline since 2001 as a result of indiscriminate harvesting for its appetite suppressant properties. Unfortunately, data do not exist to quantify the degree of decline to the population and as this species is widespread and can be locally common it is not possible to estimate overall population decline. Research on population recovery post harvesting and degree of impact of the harvesting over the past 10 years is required before this species can be accurately assessed.

One species from the study area, i.e. *Vachellia haematoxylon*, is protected in terms of the National Forests (NFA) Act No 84 of 1998. However, they are restricted to the open shrubland on sand dunes (Figure 14) and not expected to be found in the core prospecting area.

Specially protected species in terms of Schedule 1 and 2 of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009 is listed in Table 3. Those encountered on site, and not yet previously mentioned, include *Prenia tetragona*, *Psilocaulon subnodosum*, *Gomphocarpus fruticosus* subsp. *fruticosus*, *Boscia foetida* and *Euphorbia spinea*.

Table 3. Plant species found in the study region that are of conservation concern.

FAMILY	Scientific name	Status	NFA	NCNCA
ACANTHACEAE	<i>Acanthopsis hoffmannseggiana</i>	DDT		
AIZOACEAE	<i>Prenia tetragona</i>	LC		S2
	<i>Psilocaulon subnodosum</i>	LC		S2
AMARYLLIDACEAE	<i>Crinum bulbispermum</i>	LC		S2
	<i>Nerine laticoma</i>	LC		S2
APOCYNACEAE	<i>Adenium oleifolium</i>	LC		S2
	<i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i>	LC		S2
	<i>Hoodia gordonii</i>	DDD		S1
	<i>Larryleachia marlothii</i>	LC		S2
ASPHODELACEAE	<i>Aloe claviflora</i>	LC		S2
	<i>Aloe hereroensis</i> var. <i>hereroensis</i>	LC		S2
	<i>Aloidendron dichotomum</i>	VU		S1
BRASSICACEAE	<i>Boscia foetida</i>	LC		S2
BURSERACEAE	<i>Commiphora gracilifrons</i>	LC		S2
CELASTRACEAE	<i>Gymnosporia linearis</i> subsp. <i>lanceolata</i>	LC		S2
CRASSULACEAE	<i>Cotyledon orbiculata</i> var. <i>dactylopsis</i>	LC		S2
EUPHORBIACEAE	<i>Euphorbia spinea</i>	LC		S2
FABACEAE	<i>Vachellia haematoxylon</i>	LC	X	
IRIDACEAE	<i>Babiana flabellifolia</i>	LC		S2
	<i>Ferraria variabilis</i>	LC		S2
	<i>Lapeirousia littoralis</i>	LC		S2
	<i>Moraea polystachya</i>	LC		S2
	<i>Moraea venenata</i>	LC		S2
OXALIDACEAE	<i>Oxalis lawsonii</i>	LC		S2
SCROPHULARIACEAE	<i>Jamesbrittenia integerrima</i>	LC		S2
	<i>Jamesbrittenia megadenia</i>	LC		S2
	<i>Manulea schaeferi</i>	LC		S2

All of these species, except for *Gomphocarpus fruticosus* subsp. *fruticosus* was recorded in the core prospecting area. A photographic guide to species of conservation concern encountered on site is attached as Appendix 3.

In addition to those protected species listed above; 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.



Figure 14. The nationally protected tree, *Vachellia haematoxylon* is restricted to the open shrubland on sand dunes community of the study area.

3.4.4. 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 4). Declared weeds and invasive species that were recorded in and around the study area are listed in Table 5.

Table 4. The categorisation of weeds and invader plant species, according to NEMBA and CARA.

NEMBA		CARA	
1a	Listed invasive species that must be combatted or eradicated.	1	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.
1b	Listed invasive species that must be controlled.	2	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.
2	Listed invasive species that require a permit to carry out a restricted activity within an area.	3	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.
3	Listed invasive species that are subject to exemptions and prohibitions		

Table 5. A list of declared weeds and invasive species recorded in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Prosopis glandulosa</i>	Honey mesquite	2	3	S6
<i>Prosopis velutina</i>	Velvet mesquite	2	3	S6
<i>Salsola kali</i>	Tumbleweed	-	1b	-

3.4.5. 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. Declared indicators of bush encroachment in the Northern Cape, which were recorded in the study area, are listed in Table 6.

Table 6. A list of declared indicators of bush encroachment in the Northern Cape recorded in the study area.

Scientific name	Common name
<i>Senegalia mellifera</i>	Black thorn
<i>Rhigozum trichotomum</i>	Three-thorn rhigozum

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 or specially protected 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. The landscape features on Areachap does not provide a particularly diverse habitat opportunity to faunal communities, but those 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 five bat species have been recorded in the region (see Appendix 2). Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Twenty one mammal species of conservation concern potentially occur in the area (Table 7), of which fifteen are listed either in the IUCN or South African Red Data Book and an additional six species are specially protected according to Schedule 1 of NCNCA (Table 7).

The protected bat species, Bushveld Gerbil, Bushveld Sengi, Lesser Red Musk Shrew, Litledale's Whistling Rat, Aardvark, Aardwolf, African Wild Cat, Cape Fox, Bat-eared Fox, African Striped Weasel, Honey Badger and Striped Polecat all have a high chance of occurring in the core area, given their wide habitat tolerances or preference for the savannah habitat found here.

Table 7. Mammal species of conservation concern that are likely to occur in the region Conservation values are indicated in terms of the international (IUCN) Red List, the South African Red Data Book (SA RDB) and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SA RDB	NCNCA
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat		NT	
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat		NT	
<i>Elephantulus intufi</i>	Bushveld Sengi		DD	
<i>Orycteropus afer</i>	Aardvark			X
<i>Parotomys littledalei</i>	Littledale's Whistling Rat		NT	
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil		DD	
<i>Manis temminckii</i>	Ground Pangolin	VU	VU	X
<i>Crociodura hirta</i>	Lesser Red Musk Shrew	LC	DD	
<i>Atelerix frontalis</i>	South African Hedgehog		NT	X
<i>Proteles cristata</i>	Aardwolf			X
<i>Felis silvestris</i>	African Wild Cat			X
<i>Felis nigripes</i>	Black-footed Cat	VU		X
<i>Acinonyx jubatus</i>	Cheetah	VU	VU	X
<i>Panthera pardus</i>	Leopard	VU		X
<i>Vulpes chama</i>	Cape Fox			X
<i>Crocuta crocuta</i>	Spotted Hyaena		NT	X
<i>Hyaena brunnea</i>	Brown Hyena	NT		X
<i>Otocyon megalotis</i>	Bat-eared Fox			X
<i>Poecilogale albinucha</i>	African Striped Weasel		DD	X
<i>Ictonyx striatus</i>	Striped Polecat			X
<i>Mellivora capensis</i>	Honey Badger		NT	X

Ground Pangolin, South African Hedgehog and Black-footed cat may potentially occur on site on account of their preferences for arid areas. They are however rather skittish and therefore they will most likely occur very seldomly. The Brown Hyaena might be present, but has a low potential to be found on site mainly based on the fact that farm fences are restricting their occurrences across their natural distribution range.

Cheetah, Leopard and Spotted Hyaena have a very low chance to be found on site. Although they all have a wide habitat tolerance and the site occurs within their current known distribution range, these species are very seldomly seen outside nature reserves or national parks. In general, impacts on mammals arising from the prospecting activities will primarily be restricted to the core site, where most of the infrastructure and activities are planned.

3.5.2. Reptiles

The Areachap prospecting area lies within the distribution range of at least 30 reptile species (see Appendix 2) of which the western ground agama was encountered several times during the field survey (Figure 15). No listed species are known to occur in the area, but most reptiles of the study area are protected either according to Schedule 2 or 3 of NCNCA (see Appendix 2). Impacts on reptiles from the prospecting activities will primarily be restricted to the shrubland on sandy, rocky soil and will be very local.



Figure 15. The western ground agama was encountered several times during the site visit.

3.5.3. Amphibians

Eight amphibian species are known from the region (Appendix 2), indicating that the site does not potentially have a diverse frog community. This is however normal for an arid area. No natural permanent water was observed on site that would represent suitable breeding habitats for most of these species, but the ephemeral pan will be important during periods of inundation. As a result, only those species which are relatively independent of water are likely to occur regularly in the area.

The Giant Bull Frog (*Pyxicephalus adspersus*) 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 the known distribution of this species and the ephemeral pans on Areachap could therefore potentially provide the ideal habitat for it. Its presence will however only be confirmed after a good rainfall event causes inundation of the pans. All other amphibians of the study area are protected according to Schedule 2 of NCNCA (see Appendix 2).

In general, impacts on amphibians arising from the Areachap prospecting activities will primarily be restricted to the core site.

3.5.4. Avifauna

The study site does not fall within or near; i.e. within 70 km, of any of the Important Bird Areas (IBA) defined by Birdlife South Africa. A total number of 176 bird species have been recorded from the region and all of these species are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2).

As many as 18 listed bird species are known from the region, all of which are classified as Vulnerable, Near Threatened, Endangered or Critically Endangered (Table 8). 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. The ephemeral pans will potentially attract protected water birds, such as Chestnut-banded Plover, Black Stork, Marabou Stork, Lesser Flamingo and Greater Flamingo when inundated. The remaining species of conservation concern are expected to occur in the core prospecting area by residing on site or by occasionally passing over the area.

Table 8. Bird of conservation concern that are likely to occur on site. Species are indicated in terms of the IUCN, SA Bird Atlas and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SA Bird Atlas	NCNCA
<i>Aquila rapax</i>	Tawny Eagle		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 lacteus</i>	Verreaux's Eagle-Owl			X
<i>Buteo rufofuscus</i>	Jackal Buzzard			X
<i>Buteo vulpinus</i>	Steppe Buzzard			X
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar			X
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	X
<i>Ciconia nigra</i>	Black Stork		VU	X
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle			X
<i>Circus maurus</i>	Black Harrier	EN	EN	X
<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 chicquera</i>	Red-necked Falcon	NT		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>Gyps africanus</i>	White-backed Vulture	CR	CR	X
<i>Haliaeetus vocifer</i>	African Fish-Eagle			X
<i>Hieraaetus pennatus</i>	Booted Eagle			X
<i>Leptoptilos crumeniferus</i>	Marabou Stork		NT	X
<i>Melierax gabar</i>	Gabar Goshawk			X
<i>Milvus migrans</i>	Black Kite			X
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN	X
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT	X
<i>Phoenicopterus ruber</i>	Greater Flamingo		NT	X
<i>Polemaetus bellicosus</i>	Martial Eagle	VU	EN	X
<i>Polihierax semitorquatus</i>	Pygmy Falcon			X
<i>Polyboroides typus</i>	African Harrier-Hawk			X
<i>Ptilopusus granti</i>	Southern White-faced Scops-Owl			X
<i>Sagittarius serpentarius</i>	Secretarybird	VU	VU	X
<i>Spizocorys sclateri</i>	Sclater's Lark	NT	NT	X
<i>Tyto alba</i>	Barn Owl			X

3.5.5. 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). Their immense species diversity makes it almost impossible to list all species that may possibly occur on site. Nevertheless, key morphospecies as well as species of conservation concern are discussed here.

Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 9, along with species that are specially protected according to Schedule 1 of the NCNCA. All other invertebrates from the class Insecta and Arachnida are protected either according to Schedule 2 or 3 of the NCNCA.

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
INSECTA	COLEOPTERA	<i>Circellium bacchus</i>	Cape Dung Beetle	S1
		<i>Colophon</i> spp.	All Stag Beetles	S1
	LEPIDOPTERA	<i>Lepidochrysops penningtoni</i>	Pennington's Blue	DD
	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 karooensis</i>	Karoo Winter Katydid	VU
	<i>Brinckiella mauerbergerorum</i>	Mauerberger's Winter Katydid	VU	
ONYCHOPHORA		Velvet worms	S1	

Two major habitats delimit possible invertebrate communities on site, i.e. the ephemeral pans and a variety of terrestrial habitats collectively classified as Bushveld and Karoo vegetation for insect preference, according to Picker et al. (2004).

i. Ephemeral pans

Ephemeral pans host species specifically adapted to ephemerality. Crustaceans in particular are specialists of these pans and dominate them. Their eggs lie dormant in the soil until the pans are inundated. Not much is known about the species distribution or conservation status of species in the Northern Cape, but typical taxa to be expected in the pans of Areachap include Notostraca, Anostraca, Cladocera, Copepoda, Ostracoda and Conchostraca. Within a few days after the pans are wet these species will hatch out and attract a number of wetland birds. Therefore, these pans also act as important breeding and feeding links to birds in terms of connectivity, by providing stepping-stone corridors in an arid landscape. The disturbance or destruction of these pans will not only impact the specialised pan invertebrate communities locally, but will also have a regional and landscape-level effect.

ii. Terrestrial habitats

Bushveld vegetation

The sand dunes and shrubland on sandy, rocky soil are included in the bushveld vegetation. Invertebrate communities associated with this habitat are widely distributed and extremely diverse. Therefore, it is not possible to list specialised communities that occur here. However, those species of conservation concern listed in Table 9 are most likely to be associated with this habitat. Of all invertebrates on Areachap, those occurring in the bushveld vegetation are likely to be most affected, because the core activities will take place here. The most profound impacts will be in the form of habitat loss and the inevitable death of those that occur in the path of prospecting activities. These impacts are however expected to be largely local.

Karoo vegetation

The Calcrete Plateau represents Karoo vegetation. Invertebrate communities associated with this habitat represent unique species assemblages, with an above-average representation of beetles, grasshoppers, flies, wasps and lacewings. Insects in general are widely distributed and extremely diverse. Therefore, it is not possible to list specialised communities that occur here without a dedicated study. Those species of conservation concern listed in Table 10 is likely to be associated with this invertebrate habitat, but it has not been earmarked for the Areachap operation.

3.6. Critical biodiversity areas and broad-scale processes

The proposed prospecting site does not fall within any formally protected area or within a National Protected Areas Expansion Strategy Focus Area. Furthermore, the broad-scale vegetation units of the study area are all classified as least threatened and therefore no formal fine-scale conservation planning has been conducted. However, the site does contain a number of Ecological Support Areas in relation to the Northern Cape Critical Biodiversity Areas Map (Figure 16). These are all formally mapped ephemeral pans in the northern half of the study area. Furthermore, the Dawid Kruijer Spatial Development Framework also promotes the conservation of wetland areas as ecological corridors within the district.

The Mining and Biodiversity Guidelines (DENC et al. 2013) classifies the majority of the study area to have no Biodiversity Importance. However, a small portion in the southern corner is classified as having Highest Biodiversity Importance, which constitutes the highest risk for mining (Figure 17). These guidelines were developed to identify and categorize biodiversity priority areas sensitive to the impacts of mining in order to support mainstreaming of biodiversity issues in decision making in the mining sector.

All of the ephemeral pans of the study area have been classified by the Wetland Freshwater Priority Areas project as wetlands with a Present Ecological State (PES) of "AB", which means that the pans are in a Natural or Good condition. Furthermore, none of the pans have been identified as significant wetlands in terms of Ramsar sites, IUCN Frog localities, threatened water bird localities or Crane breeding grounds.

The prospecting operation itself is expected to cause habitat transformation at a very small scale if the activities are confined to its current proposed footprint. Therefore, the operation is not expected to contribute significantly to cumulative habitat loss and the disruption of the broad-scale landscape connectivity in the region.

3.7. Site sensitivity

The sensitivity map for the Areachap prospecting operation is illustrated in Figure 18. The ephemeral pans and drainage lines are considered to be of very high sensitivity due to their vital ecological and hydrological functionality and significance. All watercourses in the study area are also unique habitats protected in terms of the National Water Act (Act No 36 of 1998). These units are essentially no-go areas.

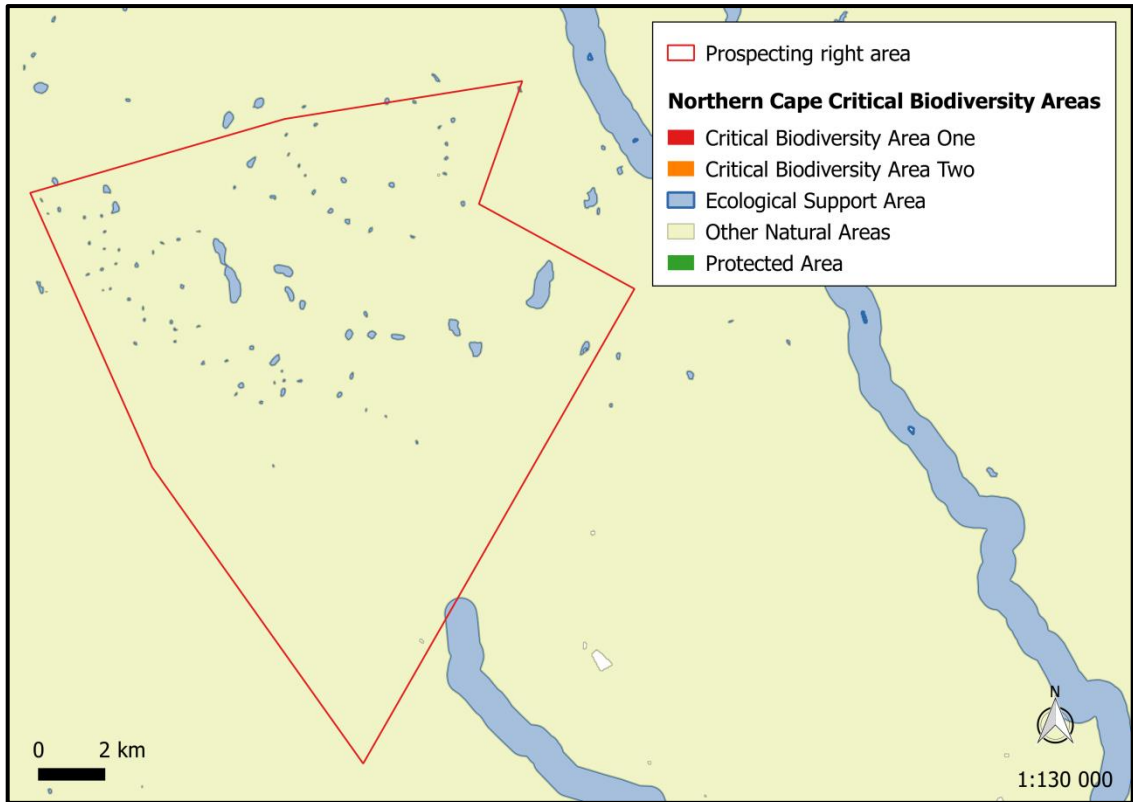


Figure 16. The study area in relation to the Northern Cape Critical Biodiversity areas.

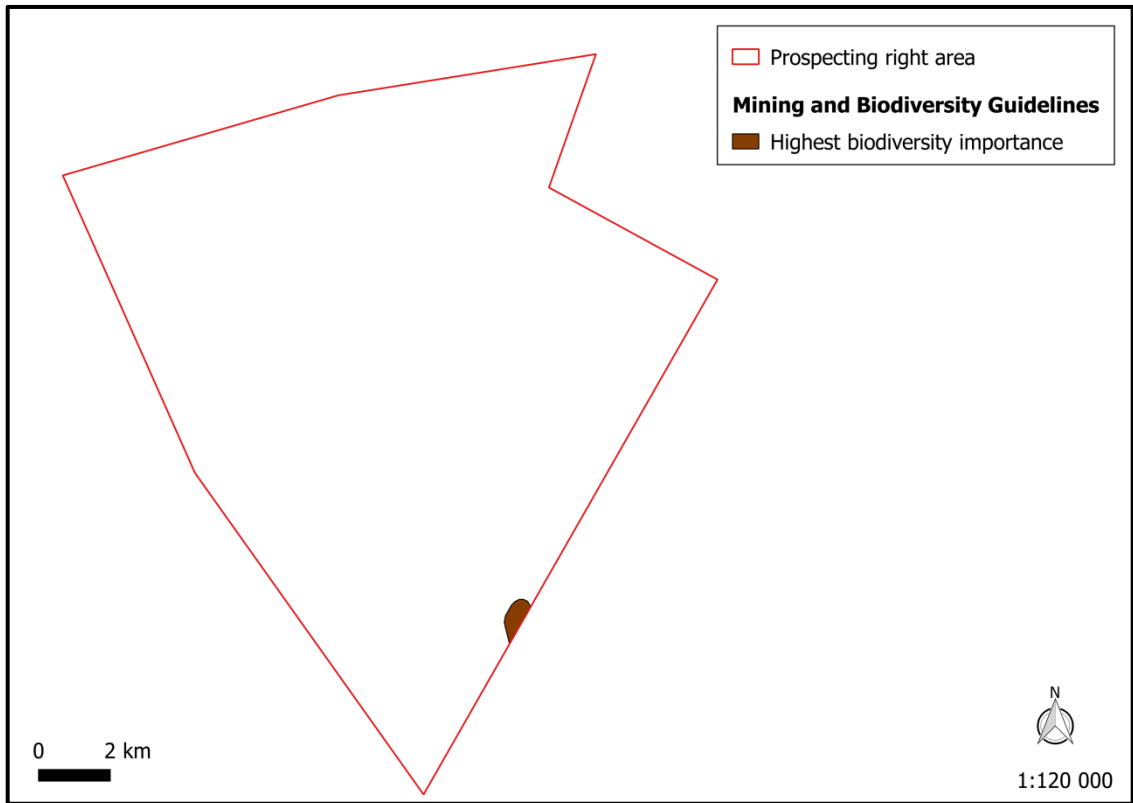


Figure 17. The study area in relation to the Mining and Biodiversity Guidelines.

The calcrete plateau is considered to be of high sensitivity. Although this area is not earmarked for prospecting activities its high sensitivity is attributable to the karst topography and association with ephemeral pans and drainage lines as well as listed species that have been found here, i.e. *Hoodia gordonii*.

The open shrubland on dunes as well as the shrubland on sandy, rocky soil are considered to be of medium sensitivity. The open shrubland on dunes is not expected to be affected by the prospecting operation, but the shrubland on sandy, rocky soil is earmarked for core activities. This area hosts a number of species of conservation concern, i.e. *Prenia tetragona*, *Psilocaulon subnodosum*, *Boscia foetida* and *Euphorbia spinea*, but a high density of the encroaching *Rhigozum trichotomum* and *Senegalia mellifera* is also found in places. Impacts are likely to be largely local. Activities within this area can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

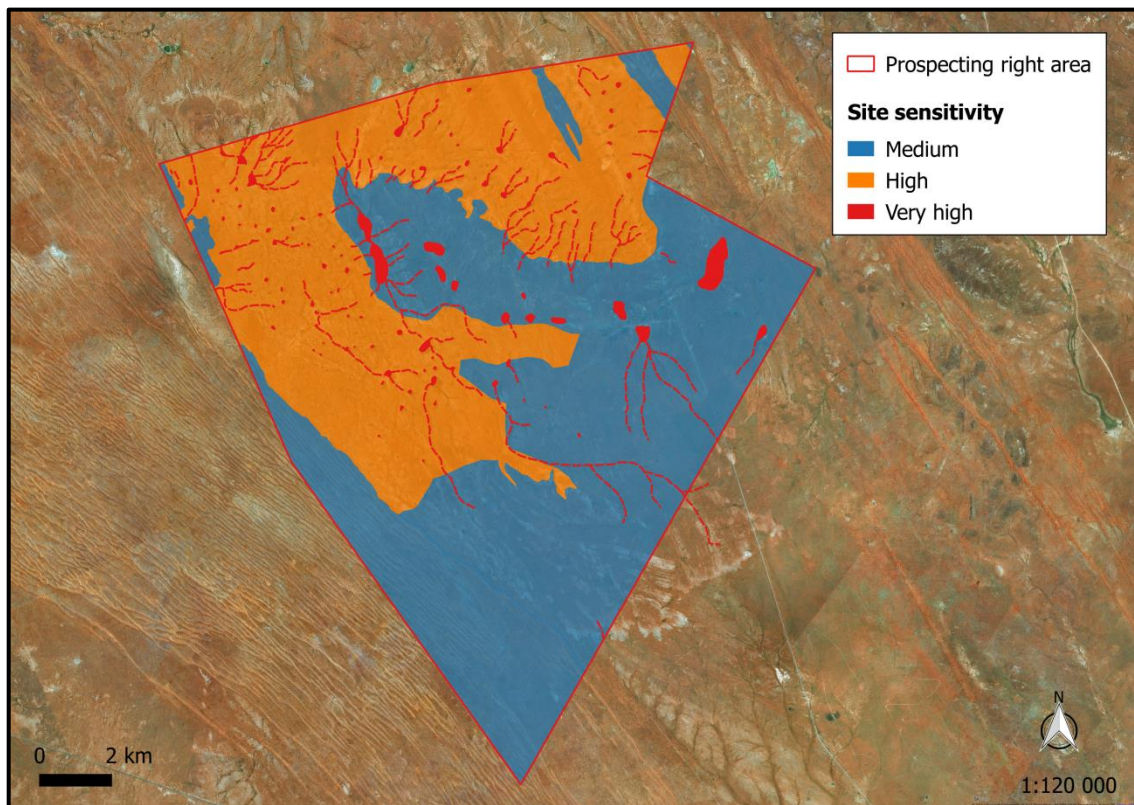


Figure 18. A sensitivity map for the Areachap prospecting area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Areachap 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. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the prospecting activities are listed.

4.1. Topography, soil erosion and associated degradation of landscapes

4.1.1. Loss of soil fertility

Source of the impact

During the removal of topsoil; stockpiling.

Description of the impact

Improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

Mitigation and monitoring

- 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 in order 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 be kept separate from sub-soils.
- The topsoil should be replaced as soon as possible on to the backfilled 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 Areachap prospecting operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Landscape	Loss of soil fertility	✓	✓	✓	Local (2)	Residual (4)	Medium (2)	Possible for life of operation (9)	Low-Medium (72)	Low
	Increase in soil erosion	✓	✓	✓	Local (2)	Decommissioning (3)	Medium (2)	Possible infrequently (7)	Low (49)	Very low
Flora	Loss of indigenous vegetation	✓	✓	✓	Local (2)	Decommissioning (3)	Medium (2)	Certain, but infrequent (8)	Low-Medium (56)	Low
	Loss of Red data and/or protected floral species	✓	✓		Local (2)	Residual (4)	Medium (2)	Possible, but infrequent (7)	Medium-High (56)	Low
	Introduction or spread of alien species	✓	✓	✓	Local (2)	Residual (4)	Medium (2)	Possible for life of operation (10)	Medium-High (80)	Low/Positive
	Bush encroachment			✓	On-site (1)	Residual (4)	Medium (2)	Possible for life of operation (10)	Low-Medium (70)	Very low/Positive

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Fauna	Habitat fragmentation	✓	✓	✓	Local (2)	Decommissioning (3)	Medium (2)	Possible for life of operation (9)	Low-medium (63)	Low
	Disturbance, displacement and killing of fauna	✓	✓	✓	On-site (1)	Decommissioning (3)	Medium (2)	Possible for life of operation (9)	Low-Medium (54)	Low
Ecological Processes	Compromise of ecological processes	✓	✓	✓	Regional (3)	Residual (4)	High (4)	Low likelihood, infrequent (6)	Low-Medium (66)	Low

4.1.2. Soil erosion

Source of the impact

Infrastructure; excavations; alterations of the beds and banks of the watercourses.

Description of the impact

Vegetation will be stripped in preparation for placement of infrastructure and excavations, and therefore the areas will be bare and susceptible to erosion. Topsoil and overburden that is stripped and piled on surrounding areas can be eroded by wind, rain and flooding. The soil/sediments will be carried away during runoff. The affected areas will be rehabilitated, but full restoration might only occur over a number of years, subsequent to the re-establishment of vegetation.

Mitigation and monitoring

- Re-establishment of plant cover on disturbed areas must take place as soon as possible, once activities in the area have ceased.
- Ground exposure should be minimised in terms of the surface area and duration.
- The operation must co-ordinate different activities in order to optimise the excavated trenches and thereby prevent repeated and unnecessary excavations.
- Construction/excavations during the rainy season (November to March) should be monitored and controlled.
- Run-off from exposed ground should be controlled with flow retarding barriers.
- All stockpiles must be kept as small as possible, with gentle slopes (18 degrees) in order to avoid excessive erosional induced losses.
- Excavated and stockpiled soil material are to be stored on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate.
- Regular audits carried out to identify areas where erosion is occurring (incl. linear activities such as roads and pipelines); followed by appropriate remedial actions.

4.2. Vegetation and floristics

4.2.1. Loss of indigenous vegetation

Source of the impact

Construction of roads and other necessary infrastructure; the placement of stockpiles; and the clearing of vegetation for excavations, materials storage and topsoil stockpiles; vehicular movement.

Description of the impact

Construction and prospecting activities on site will reduce the natural habitat for ecological systems to continue their operation. It is not expected that the areas of high ecological function will rehabilitate fully following disturbance events. Vehicle traffic generates lots of dust which can reduce the growth success and seed dispersal of many small plant species.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of excavated areas, by effective backfilling.
- Encourage the growth of natural plant species by sowing indigenous seeds or by planting seedlings.
- Ensure measures for the adherence to the speed limit to minimise dust plumes.

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

Source of the impact

Removal of listed or protected plant species; during the construction of roads and other necessary infrastructure; the placement of stockpiles; and the clearing of vegetation for excavations.

Description of the impact

There are a number of protected species present in the core prospecting area, such *Boscia foetida*, *Euphorbia spinea*, *Prenia tetragona* and *Psilocalon subnodosum*. It is highly likely that some of these species might be damaged or removed during the operation.

Furthermore, any illegal fire wood collection or illegal harvesting of the protected plants that occur in the other parts of the study area plants for trade or medicinal use by staff, contractors or secondary land users could potentially have a negative impact on the population of these species. It is possible that prospecting activities will destroy protected species and other species of conservation concern.

Mitigation and monitoring

- Footprint areas of the prospecting activities must be scanned for Red Listed and protected plant species prior to excavations.
- It is recommended that these plants are identified and marked prior to intended activity.
- These plants should, where possible, be incorporated into the design layout and left in situ.
- However, if threatened by destruction, these plants should be removed (with the relevant permits from DAFF and/or DENC) and relocated if possible.
- 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 appointment of a full-time ECO must 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. The environmental induction should occur in the appropriate languages for the workers who may require translation.
- All those working on site must be educated about the conservation importance of the flora occurring on site.

4.2.3. Introduction or spread of alien species

Source of the impact

Clearing of vegetation; prospecting activities.

Description of the impact

The extent of alien invasive species in the area is fairly low. However, while general clearing of the area and excavation activities destroy natural vegetation, invasive plants such as *Prosopis* spp. can increase due to their opportunistic nature in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the prospecting site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area. 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. With proper mitigation, the impacts can be substantially reduced.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of excavated areas.
- Encourage the growth of natural plant species.
- Mechanical methods of control to be implemented extensively.
- Annual follow-up operations to be implemented.

4.2.4. Encouraging bush encroachment

Source of the impact

Clearing of vegetation; disturbances through prospecting activities.

Description of the impact

The extent of bush encroaching species on site shows the possible moderate level of past disturbance interference in the natural ecosystem, primarily through grazing practises. While general clearing of the area and prospecting activities destroy natural vegetation, bush encroaching plants can increase due to their opportunistic nature in disturbed areas. If encroaching plants establish in disturbed areas, it may the lower potential for future land use and decrease biodiversity. With proper mitigation, the impacts can be substantially reduced.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of disturbed areas.
- Encourage the growth of a diverse selection of natural plant species.
- Mechanical methods of control to be implemented selectively.
- Annual follow-up monitoring to be implemented.

4.3. Fauna

4.3.1. Habitat fragmentation

Source of the impact

Clearance of vegetation; prospecting activities.

Description of the impact

Prospecting activities and associated infrastructure will result in the loss of connectivity and fragmentation of natural habitat. Fragmentation of habitat will lead to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This results in a subsequent loss of genetic variability between meta-populations occurring within the study site. Pockets of fragmented natural habitats hinder the growth and development of populations. Although this impact will be most profound if the ephemeral pans are disturbed, it is not expected that the prospecting operation will take place in or near these pans.

Mitigation and monitoring

- All activities associated with the prospecting operation must be planned, where possible in order 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 the demarcated area except those authorised to do so.
- Those 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.

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.

Description of the impact

The transformation of natural habitats will result in the loss of habitat, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats. Increased noise and vibration will also disturb and possibly displace birds and other 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 will negatively affect the local populations.

Mitigation and monitoring

- Careful planning of the operation is needed in order 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 to do so. Areas surrounding the earmarked site that are not part of the demarcated area should be considered as a no go zone.
- A full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related disturbance.
- Everyone on site must undergo environmental induction for awareness on not harming or collecting species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site.
- Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.
- Employ measures that ensure adherence to the speed limit.

4.4. Broad-scale ecological processes

Source of the impact

The construction of roads, prospecting site, as well as other necessary infrastructure; the clearing of vegetation for excavations; alterations of the beds and banks of the watercourses.

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. Any fragmentation of the watercourses will destroy connectivity of vital ecological and aquatic linkages. It is however not expected that any watercourses will be affected and transformation of natural habitats in the region is very low. Therefore the cumulative impact of the proposed prospecting operation is also insignificant.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of affected areas.
- Encourage the growth of natural plant species.
- Employ sound rehabilitation measures to restore the characteristics of the affected watercourses.

5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION

Four plant communities were identified on site of which the shrubland on sandy, rocky soil is included in the earmarked area to be affected by prospecting activities. This unit is considered to be of medium sensitivity. Although it hosts a number of species of conservation concern, a high density of encroaching species are also found in places. Impacts are likely to be largely local and activities within this area can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken. The most profound impacts are expected to be related to the proliferation of alien vegetation, such as *Prosopis* spp. that threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area.

Species of conservation concern that are found in the earmarked habitats will most likely also be lost locally. These include *Boscia foetida*, *Euphorbia spinea*, *Prenia tetragona* and *Psilocaulon subnodosum*. Similarly, the prospecting operation will result in the large-scale clearance of indigenous vegetation. A permit application regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.

Furthermore, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries prior to any potential disturbances to *Vachellia haematoxylon*. However, it is not foreseen that prospecting activities will take place in the dune veld of the study area, where this species occurs.

To conclude, it is clear that the destruction of the natural habitat within the study area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the prospecting area. The majority of the site is in a pristine condition and is not expected to be adversely affected. In my opinion, authorisation can be granted, but the applicant should still commit to the adherence of effective avoidance, management, mitigation and rehabilitation measures.

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APPENDICES

APPENDIX 1

Plant species list

Family	Scientific name	Status	NFA	NCNA
ACANTHACEAE	<i>Acanthopsis hoffmannseggiana</i>	DDT		
	<i>Barleria lichtensteiniana</i>	LC		
	<i>Barleria rigida</i>	LC		
	<i>Blepharis mitrata</i>	LC		
	<i>Justicia australis</i>	-		
	<i>Justicia spartioides</i>	LC		
	<i>Monechma genistifolium</i>	LC		
	AIZOACEAE	<i>Aizoon schellenbergii</i>	LC	
<i>Galenia papulosa</i>		LC		
<i>Galenia sarcophylla</i>		LC		
<i>Plinthus sericeus</i>		LC		
<i>Prenia tetragona</i>		LC		S2
<i>Psilocaulon subnodosum</i>		LC		S2
AMARANTHACEAE		<i>Atriplex semibaccata</i>	Exotic	
	<i>Leucosphaera bainesii</i>	LC		
	<i>Salsola barbata</i>	LC		
	<i>Salsola geminiflora</i>	LC		
	<i>Salsola kali</i>	Invasive		
	<i>Salsola sp.</i>	-		
	<i>Salsola tuberculata</i>	LC		
	<i>Sericocoma pungens</i>	LC		
	AMARYLLIDACEAE	<i>Crinum bulbispermum</i>	LC	
<i>Nerine laticoma</i>		LC		S2
ANACARDIACEAE	<i>Searsia ciliata</i>	LC		
	<i>Searsia lancea</i>	LC		
	<i>Searsia pendulina</i>	LC		
APOCYNACEAE	<i>Adenium oleifolium</i>	LC		S2
	<i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i>	LC		S2
	<i>Hoodia gordonii</i>	DDD		S1
	<i>Larryleachia marlothii</i>	LC		S2
ASPARAGACEAE	<i>Asparagus sp.</i>	-		
ASPHODELACEAE	<i>Aloe claviflora</i>	LC		S2
	<i>Aloe hereroensis</i> var. <i>hereroensis</i>	LC		S2
	<i>Aloidendron dichotomum</i>	VU		S1
ASTERACEAE	<i>Amellus tridactylus</i> subsp. <i>arenarius</i>	LC		
	<i>Arctotis leiocarpa</i>	LC		
	<i>Athanasia minuta</i>	LC		
	<i>Berkheya sp.</i>	-		
	<i>Bidens bipinnata</i>	Exotic		
	<i>Dicoma capensis</i>	LC		
	<i>Dimorphotheca pluvialis</i>	LC		
	<i>Dimorphotheca polyptera</i>	LC		
	<i>Eriocephalus ambiguus</i>	LC		
	<i>Felicia muricata</i> subsp. <i>muricata</i>	LC		

Family	Scientific name	Status	NFA	NCNA
ASTERACEAE	<i>Felicia namaquana</i>	LC		
	<i>Geigeria filifolia</i>	LC		
	<i>Geigeria ornativa</i> subsp. <i>ornativa</i>	LC		
	<i>Geigeria pectidea</i>	LC		
	<i>Helichrysum argyrosphaerum</i>	LC		
	<i>Helichrysum micropoides</i>	LC		
	<i>Hirpicium echinus</i>	LC		
	<i>Kleinia longiflora</i>	LC		
	<i>Nolletia annetjieae</i>	LC		
	<i>Nolletia chrysocomoides</i>	LC		
	<i>Pentzia globosa</i>	LC		
	<i>Platycarphella carlinoides</i>	LC		
	<i>Pteronia leucoclada</i>	LC		
	<i>Pteronia mucronata</i>	LC		
	<i>Senecio consanguineus</i>	LC		
BIGNONIACEAE	<i>Rhigozum obovatum</i>	LC		
	<i>Rhigozum trichotomum</i>	LC		
BORAGINACEAE	<i>Trichodesma africanum</i>	LC		
BRASSICACEAE	<i>Boscia foetida</i>	LC		S2
	<i>Heliophila minima</i>	LC		
BURSERACEAE	<i>Commiphora gracilifrons</i>	LC		S2
CAMPANULACEAE	<i>Wahlenbergia denticulata</i> var. <i>denticulata</i>	LC		
CELASTRACEAE	<i>Gymnosporia linearis</i> subsp. <i>lanceolata</i>	LC		S2
COLCHICACEAE	<i>Ornithoglossum vulgare</i>	LC		
CRASSULACEAE	<i>Cotyledon orbiculata</i> var. <i>dactylopsis</i>	LC		S2
CUCURBITACEAE	<i>Citrullus lanatus</i>	LC		
	<i>Kedrostis capensis</i>	LC		
CYPERACEAE	<i>Cyperus usitatus</i>	LC		
EUPHORBIACEAE	<i>Euphorbia spinea</i>	LC		S2
FABACEAE	<i>Adenolobus garipensis</i>	LC		
	<i>Calobota linearifolia</i>	LC		
	<i>Crotalaria orientalis</i>	LC		
	<i>Indigastrum niveum</i>	-		
	<i>Indigofera alternans</i>	LC		
	<i>Melolobium macrocalyx</i>	LC		
	<i>Parkinsonia africana</i>	LC		
	<i>Pomaria lactea</i>	LC		
	<i>Prosopis chilensis</i>	Exotic		
	<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Exotic		
	<i>Prosopis glandulosa</i> var. <i>torreyana</i>	Invasive		
	<i>Prosopis velutina</i>	Invasive		
	<i>Requienia sphaerosperma</i>	LC		
	<i>Senegalia mellifera</i>	LC		
	<i>Senna italica</i> subsp. <i>arachoides</i>	LC		

Family	Scientific name	Status	NFA	NCNCA
FABACEAE	<i>Tephrosia dregeana</i> var. <i>dregeana</i>	LC		
	<i>Vachellia haematoxylon</i>	LC	X	
GERANIACEAE	<i>Monsonia luederitziana</i>	LC		
GISEKIACEAE	<i>Gisekia africana</i> var. <i>africana</i>	LC		
HYACINTHACEAE	<i>Albuca virens</i> subsp. <i>arida</i>	LC		
	<i>Dipcadi papillatum</i>	LC		
IRIDACEAE	<i>Babiana flabellifolia</i>	LC		S2
	<i>Ferraria variabilis</i>	LC		S2
	<i>Lapeirousia littoralis</i>	LC		S2
	<i>Moraea polystachya</i>	LC		S2
	<i>Moraea venenata</i>	LC		S2
LORANTHACEAE	<i>Tapinanthus oleifolius</i>	LC		
MALVACEAE	<i>Hermannia abrotanoides</i>	LC		
	<i>Hermannia bicolor</i>	LC		
	<i>Hermannia minutiflora</i>	LC		
	<i>Hermannia spinosa</i>	LC		
	<i>Radyera urens</i>	LC		
	<i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>	LC		
MELIACEAE	<i>Nymanina capensis</i>	LC		
NEURADACEAE	<i>Grielum sinuatum</i>	LC		
NYCTAGINACEAE	<i>Phaeoptilum spinosum</i>			
ONAGRACEAE	<i>Epilobium salignum</i>	LC		
OXALIDACEAE	<i>Oxalis lawsonii</i>	LC		S2
PEDALIACEAE	<i>Rogeria longiflora</i>	LC		
	<i>Sesamum triphyllum</i>	LC		
POACEAE	<i>Anthephora pubescens</i>	LC		
	<i>Aristida adscensionis</i>	LC		
	<i>Aristida congesta</i> subsp. <i>congesta</i>	LC		
	<i>Aristida vestita</i>	LC		
	<i>Brachiaria glomerata</i>	LC		
	<i>Cenchrus ciliaris</i>	LC		
	<i>Centropodia glauca</i>	LC		
	<i>Dinebra retroflexa</i>	LC		
	<i>Enneapogon cenchroides</i>	LC		
	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scaber</i>	LC		
	<i>Eragrostis annulata</i>	LC		
	<i>Eragrostis aspera</i>	LC		
	<i>Eragrostis biflora</i>	LC		
	<i>Eragrostis brizantha</i>	LC		
	<i>Eragrostis porosa</i>	LC		
	<i>Eragrostis procumbens</i>	LC		
	<i>Eragrostis rotifer</i>	LC		
	<i>Eragrostis truncata</i>	LC		

Family	Scientific name	Status	NFA	NCNA
POACEAE	<i>Fingerhuthia africana</i>	LC		
	<i>Melinis repens</i> subsp. <i>repens</i>	LC		
	<i>Panicum lanipes</i>	LC		
	<i>Phalaris canariensis</i>	Exotic		
	<i>Schmidtia kalahariensis</i>	LC		
	<i>Setaria italica</i>	Exotic		
	<i>Setaria verticillata</i>	LC		
	<i>Sporobolus ioclados</i>	LC		
	<i>Stipagrostis amabilis</i>	LC		
	<i>Stipagrostis ciliata</i> var. <i>capensis</i>	LC		
	<i>Stipagrostis obtusa</i>	LC		
	<i>Stipagrostis uniplumis</i> var. <i>uniplumis</i>	LC		
	<i>Tragus berteronianus</i>	LC		
	<i>Triraphis ramosissima</i>	LC		
	POLYGALACEAE	<i>Polygala seminuda</i>	LC	
<i>Oxygonum alatum</i> var. <i>alatum</i>		LC		
RUBIACEAE	<i>Kohautia cynanchica</i>	LC		
RUSCACEAE	<i>Eriospermum roseum</i>	LC		
SALICACEAE	<i>Salix mucronata</i> subsp. <i>mucronata</i>	LC		
SANTALACEAE	<i>Thesium hystricoides</i>	LC		
SCROPHULARIACEAE	<i>Aptosimum albomarginatum</i>	LC		
	<i>Aptosimum marlothii</i>	LC		
	<i>Aptosimum procumbens</i>	LC		
	<i>Aptosimum spinescens</i>	LC		
	<i>Jamesbrittenia integerrima</i>	LC		S2
	<i>Jamesbrittenia megadenia</i>	LC		S2
	<i>Manulea schaeferi</i>	LC		S2
	<i>Peliostomum leucorrhizum</i>	LC		
	<i>Selago divaricata</i>	LC		
	<i>Selago paniculata</i>	LC		
SOLANACEAE	<i>Lycium hirsutum</i>	LC		
	<i>Lycium pumilum</i>	LC		
	<i>Solanum burchellii</i>	LC		
THYMELAEACEAE	<i>Lasiosiphon polycephalus</i>	LC		
VERBENACEAE	<i>Chascanum garipense</i>	LC		
ZYGOPHYLLACEAE	<i>Augea capensis</i>	LC		
	<i>Roepera leptopetala</i>	-		
	<i>Tetraena simplex</i>	LC		
	<i>Tribulus pterophorus</i>	LC		
	<i>Tribulus terrestris</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	RDB	Habitat	Potential occurrence
CHIROPTERA	² <i>Neoromicia capensis</i>	Cape Bat	LC	LC	Wide habitat tolerance, but often found in arid areas, grassland, bushveld and <i>Acacia</i> woodland. Animals roost under the bark of trees and similar vegetation.	High
	² <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 woodland.	High
	² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT	Savanna habitats.	High
	² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	NT	Savanna habitats.	High
	² <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	RDB	Habitat	Potential occurrence
MACROSCOLIDIDAE	² <i>Macroselides proboscideus</i>	Round-eared Sengi	LC	LC	A habitat specialist occupying gravel plains associated with alluvial plains and relatively flat areas between higher elevation areas such as outcrops, scarps, hills, and mountains .	Low
	² <i>Elephantulus intufi</i>	Bushveld Sengi	LC	DD	Arid terrain, including dry savanna woodlands, grassland, and semi-deserts	High
	² <i>Elephantulus rupestris</i>	Western Rock Sengi	LC	LC	Arid habitats, including deserts, dry savannas, and dry shrublands. Typically associated with rocky ridges, outcrops or koppies (rocky hills), and boulder fields at the bases of mountains.	High
TUBULENTATA	¹ <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
LAGOMORPHA	² <i>Lepus capensis</i>	Cape Hare	LC	LC	Dry, open regions, with palatable bush and grass.	High
	² <i>Lepus saxatilis</i>	Scrub Hare	LC	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	Low
RODENTIA	² <i>Hystrix africae australis</i>	Cape Porcupine	LC	LC	Catholic in habitat requirements.	High
	² <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	High
	² <i>Pedetes capensis</i>	Springhare	LC	LC	Occurs widespread: open sandy ground, sandy scrub, overgrazed grassland, edges of vleis and dry river beds.	High
	² <i>Fukomys damarensis</i>	Damara Mole-rat	LC	LC	It is found in semi-arid thornscrub, woodland, savanna, grassland habitats associated with red Kalahari sands and sandy soils.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Zelotomys woosnami</i>	Woosnam's Desert Mouse	LC	LC	It is found in dry savanna on Kalahari sands. This species has very specific micro-habitat requirements, it occurs along river beds and around pans .	High
	² <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
	² <i>Dendromus melanotis</i>	Grey Climbing Mouse	LC	LC	Inhabits grasslands and savanna.	High
	² <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	High
	² <i>Rhabdomys dilectus</i>	Mesic Four-striped Grass Mouse	LC	<i>Not listed</i>	Wide habitat tolerance, from desert fringe to high-rainfall montane areas with grass cover.	High
	² <i>Mus indutus</i>	Desert Pygmy Mouse	LC	LC	Wide habitat tolerance in semi-arid savannas.	High
	⁶ <i>Mus musculus</i>	House Mouse	LC	<i>Not listed</i>	Wide habitat tolerance.	High
	² <i>Thallomys nigricauda</i>	Black-tailed Tree Rat	LC	LC	Arboreal species generally associated with <i>Acacia</i> bushland habitats.	Low

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Mastomys coucha</i>	Southern Multimammate Mouse	LC	LC	Wide habitat tolerance.	High
	² <i>Parotomys brantsii</i>	Brants's Whistling Rat	LC	LC	Restricted to consolidated sands in semi-desert.	High
	² <i>Parotomys littledalei</i>	Littledale's Whistling Rat	LC	NT	Occurs in shrublands and is not known to persist in disturbed or modified habitats.	High
	² <i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC	LC	Catholic habitat requirements, but prefer rocky hills, outcrops or boulder-strewn hillsides.	Low
	² <i>Aethomys chrysophilus</i>	Red Veld Rat	LC	LC	Typically a savanna species, but it is also found in cropland and secondary forests.	High
	² <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Gerbillurus paeba</i>	Pygmy Hairy-footed Gerbil	LC	LC	Associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover.	High
	² <i>Gerbillurus vullinus</i>	Brush-tailed Hairy-footed Gerbil	LC	LC	Associated with gravel plains, consolidated sand and dry river beds	High
	² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	DD	Sandy soils; wooded and more open grassland; areas of cultivation.	High
	² <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Sandy soils; wooded and more open grassland; areas of cultivation.	High
PRIMATES	⁴ <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Low
PHOLIDOTA	¹ <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.	Medium

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
EULIPOTYPHILA	² <i>Crocidura hirta</i>	Lesser Red Musk Shrew	LC	DD	Found in grassland, savanna and bush savanna.	High
	¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT	Generally found in semi-arid and sub-temperate environments with ample ground cover.	Medium
CARNIVORA	¹ <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes.	High
	⁴ <i>Caracal caracal</i>	Caracal	LC	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions.	High
	¹ <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	High
	¹ <i>Felis nigripes</i>	Black-footed cat	VU	LC	Associated with arid country, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	Medium
	¹ <i>Acinonyx jubatus</i>	Cheetah	VU	VU	Wide range of habitats.	Very Low
	¹ <i>Panthera pardus</i>	Leopard	VU	LC	Wide range of habitats.	Very Low
	² <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	RDB	Habitat	Potential occurrence
CARNIVORA	² <i>Suricata suricatta</i>	Suricate	LC	LC	Open arid country with hard and stony substrate. Occur in Nama- and Succulent Karoo but also fynbos.	Confirmed
	² <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	High
	² <i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC	Wide habitat tolerance, but areas with adequate cover.	High
	¹ <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
	¹ <i>Crocuta crocuta</i>	Spotted Hyena	LC	NT	Wide habitat tolerance.	Very Low
	¹ <i>Hyena 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
	⁴ <i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Wide habitat tolerance.	High
	¹ <i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC	Open country with mean annual rainfall of 100-600 mm.	High
¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	DD	Wide habitat tolerance, but most common in grassland areas.	High	

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
CARNIVORA	¹ <i>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed throughout the sub-region.	High
	¹ <i>Mellivora capensis</i>	Honey Badger	LC	NT	Wide habitat tolerance.	High
SUIFORMES	² <i>Phacochoerus africanus</i>	Common Warthog	LC	LC	Confined to savanna grasslands, open bushlands, and woodlands	Low
CETARTIODACTYLA	² <i>Taurotragus oryx</i>	Common Eland	LC	LC	Wide habitat tolerance.	Low
	² <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
	² <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Wooded savanna	Low
	² <i>Connochaetes taurinus</i>	Blue Wildebeest	LC	LC	Occurs in short-grass plains, and bordering Acacia savanna open bushland and woodland in drier areas.	Low
	² <i>Alcelaphus caama</i>	Red Hartebeest	LC	LC	Prefer the edge to the middle of open plains	Low
	² <i>Antidorcas marsupialis</i>	Springbok	LC	LC	Open arid plains with short vegetation	Confirmed
	² <i>Raphicerus campestris</i>	Steenbok	LC	LC	Inhabits open country.	Confirmed
² <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Presence of bushes are important.	Low	

LIST OF REPTILES

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

Family	Scientific name	Common name	IUCN status	
AGAMIDAE	³ <i>Agama aculeata aculeata</i>	Western Ground Agama	LC	
	³ <i>Agama anchietae</i>	Anchieta's Agama	LC	
AMPHISBAENIDAE	³ <i>Monopeltis mauricei</i>	Maurice's Worm Lizard	LC	
	³ <i>Zygaspis quadrifrons</i>	Kalahari Dwarf Worm Lizard	LC	
COLUBRIDAE	² <i>Telescopus beetzii</i>	Beetz's Tiger Snake	LC	
CORDYLIDAE	² <i>Platysaurus broadleyi</i>	Augrabies Flat Lizard	LC	
ELAPIDAE	³ <i>Naja nivea</i>	Cape Cobra	LC	
GEKKONIDAE	³ <i>Chondrodactylus angulifer angulifer</i>	Common Giant Gecko	LC	
	³ <i>Chondrodactylus bibronii</i>	Bibron's Gecko	LC	
	³ <i>Chondrodactylus turneri</i>	Turner's Gecko	LC	
	³ <i>Colopus wahlbergii furcifer</i>	Striped Ground Gecko	LC	
	³ <i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko	LC	
	³ <i>Pachydactylus capensis</i>	Cape Gecko	LC	
	³ <i>Pachydactylus punctatus</i>	Speckled Gecko	LC	
	³ <i>Ptenopus garrulus garrulus</i>	Common Barking Gecko	LC	
	LACERTIDAE	² <i>Heliobolus lugubris</i>	Bushveld Lizard	LC
		² <i>Meroles suborbitalis</i>	Spotted Desert Lizard	LC
² <i>Nucras tessellata</i>		Western Sandveld Lizard	LC	
² <i>Pedioplanis inornata</i>		Plain Sand Lizard	LC	
² <i>Pedioplanis lineocellata lineocellata</i>		Spotted Sand Lizard	LC	
² <i>Pedioplanis namaquensis</i>		Namaqua Sand Lizard	LC	
LAMPROPHIIDAE	² <i>Dipsina multimauculata</i>	Dwarf Beaked Snake	LC	
	³ <i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC	
SCINCIDAE	³ <i>Acontias garipeensis</i>	Mier Kalahari Legless Skink	LC	
	³ <i>Acontias kgalagadi kgalagadi</i>	Kgalagadi Legless Skink	LC	
	³ <i>Trachylepis occidentalis</i>	Western Three-Striped Skink	LC	
	³ <i>Trachylepis punctulata</i>	Speckled Sand Skink	LC	
	³ <i>Trachylepis sparsa</i>	Karasburg Tree Skink	LC	
	³ <i>Trachylepis sulcata sulcata</i>	Western Rock Skink	LC	
TESTUDINIDAE	³ <i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC	

LIST OF AMPHIBIANS

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

Family	Scientific name	Common name	IUCN status
BUFONIDAE	² <i>Amietophrynus poweri</i>	Western Olive Toad	LC
	² <i>Bufo gariensis</i>	Karoo Toad	LC
HYPEROLIIDAE	² <i>Kassina senegalensis</i>	Bubbling Kassina	LC
PIPIDAE	² <i>Xenopus laevis</i>	Common Platanna	LC
PYXICEPHALIDAE	² <i>Cacosternum boettgeri</i>	Boettger's Caco	LC
	¹ <i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT
	² <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC
	² <i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC

LIST OF BIRDS

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Acrocephalus baeticatus</i>	African Reed-Warbler		
² <i>Actitis hypoleucos</i>	Common Sandpiper		
² <i>Alario alario</i>	Black-headed Canary		
² <i>Alario leucolaema</i>	Damara Canary		
² <i>Alopochen aegyptiacus</i>	Egyptian Goose		
² <i>Amadina erythrocephala</i>	Red-headed Finch		
² <i>Anas capensis</i>	Cape Teal		
² <i>Anas erythrorhyncha</i>	Red-billed Teal		
² <i>Anas sparsa</i>	African Black Duck		
² <i>Anas undulata</i>	Yellow-billed Duck		
² <i>Anthoscopus minutus</i>	Cape Penduline-Tit		
² <i>Anthus cinnamomeus</i>	African Pipit		
² <i>Apus affinis</i>	Little Swift		
² <i>Apus apus</i>	Common Swift		
² <i>Apus bradfieldi</i>	Bradfield's Swift		
² <i>Apus caffer</i>	White-rumped Swift		
¹ <i>Aquila rapax</i>	Tawny Eagle		EN
¹ <i>Aquila verreauxii</i>	Verreaux's Eagle		VU
² <i>Ardea cinerea</i>	Grey Heron		
² <i>Ardea melanocephala</i>	Black-headed Heron		
² <i>Ardeotis kori</i>	Kori Bustard	NT	NT
² <i>Batis pririt</i>	Pririt Batis		
² <i>Bradornis infuscatus</i>	Chat Flycatcher		
² <i>Bradornis mariquensis</i>	Marico Flycatcher		
¹ <i>Bubo africanus</i>	Spotted Eagle-Owl		
¹ <i>Bubo lacteus</i>	Verreaux's Eagle-Owl		
² <i>Bubulcus ibis</i>	Cattle Egret		
² <i>Burhinus capensis</i>	Spotted Thick-knee		
¹ <i>Buteo rufofuscus</i>	Jackal Buzzard		
¹ <i>Buteo vulpinus</i>	Steppe Buzzard		
² <i>Calandrella cinerea</i>	Red-capped Lark		
² <i>Calendulauda africanoides</i>	Fawn-coloured Lark		
² <i>Calendulauda bradfieldi</i>	Bradfield's Lark		
² <i>Calidris alba</i>	Sanderling		
² <i>Calidris ferruginea</i>	Curlew Sandpiper		
² <i>Calidris minuta</i>	Little Stint		
¹ <i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar		
² <i>Cercomela familiaris</i>	Familiar Chat		
² <i>Cercomela tracterac</i>	Tracterac Chat		
² <i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin		

LIST OF BIRDS (continued)

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Cercotrichas paena</i>	Kalahari Scrub-Robin		
¹ <i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT
² <i>Charadrius pecuarius</i>	Kittlitz's Plover		
² <i>Charadrius tricollaris</i>	Three-banded Plover		
² <i>Chersomanes albofasciata</i>	Spike-heeled Lark		
² <i>Chrysococcyx caprius</i>	Diderick Cuckoo		
² <i>Ciconia ciconia</i>	White Stork		
¹ <i>Ciconia nigra</i>	Black Stork		VU
² <i>Cinnyris fusca</i>	Dusky Sunbird		
¹ <i>Circaetus pectoralis</i>	Black-chested Snake-Eagle		
¹ <i>Circus maurus</i>	Black Harrier	EN	EN
² <i>Cisticola aridulus</i>	Desert Cisticola		
² <i>Clamator jacobinus</i>	Jacobin Cuckoo		
² <i>Colius colius</i>	White-backed Mousebird		
² <i>Columba guinea</i>	Speckled Pigeon		
² <i>Columba livia</i>	Rock Dove		
² <i>Corvus capensis</i>	Cape Crow		
² <i>Coturnix coturnix</i>	Common Quail		
² <i>Creatophora cinerea</i>	Wattled Starling		
² <i>Cursorius rufus</i>	Burchell's Courser		VU
² <i>Dendropicos fuscescens</i>	Cardinal Woodpecker		
² <i>Dicrurus adsimilis</i>	Fork-tailed Drongo		
¹ <i>Elanus caeruleus</i>	Black-shouldered Kite		
² <i>Emberiza impetواني</i>	Lark-like Bunting		
² <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela		
² <i>Eremopterix australis</i>	Black-eared Sparrowlark		
² <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark		
² <i>Estrilda astrild</i>	Common Waxbill		
² <i>Euplectes orix</i>	Southern Red Bishop		
² <i>Eupodotis afraoides</i>	Northern Black Korhaan		
² <i>Eupodotis ruficrista</i>	Red-crested Korhaan		
² <i>Eupodotis vigorsii</i>	Karoo Korhaan		NT
¹ <i>Falco biarmicus</i>	Lanner Falcon		VU
¹ <i>Falco chicquera</i>	Red-necked Falcon	NT	
¹ <i>Falco naumanni</i>	Lesser Kestrel		
¹ <i>Falco peregrinus</i>	Peregrine Falcon		
¹ <i>Falco rupicolis</i>	Rock Kestrel		
¹ <i>Falco rupicoloides</i>	Greater Kestrel		
² <i>Fulica cristata</i>	Red-knobbed Coot		
¹ <i>Gyps africanus</i>	White-backed Vulture	CR	CR

LIST OF BIRDS (continued)

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

Scientific name	Common name	IUCN status	SA RDB
¹ <i>Haliaeetus vocifer</i>	African Fish-Eagle		
¹ <i>Hieraaetus pennatus</i>	Booted Eagle		
² <i>Himantopus himantopus</i>	Black-winged Stilt		
² <i>Hippolais icterina</i>	Icterine Warbler		
² <i>Hirundo albigularis</i>	White-throated Swallow		
² <i>Hirundo cucullata</i>	Greater Striped Swallow		
² <i>Hirundo dimidiata</i>	Pearl-breasted Swallow		
² <i>Hirundo fuligula</i>	Rock Martin		
² <i>Hirundo rustica</i>	Barn Swallow		
² <i>Hirundo spilodera</i>	South African Cliff-Swallow		
² <i>Lamprotornis nitens</i>	Cape Glossy Starling		
² <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike		
² <i>Lanius collaris</i>	Common Fiscal		
² <i>Lanius collurio</i>	Red-backed Shrike		
² <i>Lanius minor</i>	Lesser Grey Shrike		
¹ <i>Leptoptilos crumeniferus</i>	Marabou Stork		NT
² <i>Malcorus pectoralis</i>	Rufous-eared Warbler		
² <i>Melierax canorus</i>	Southern Pale Chanting		
¹ <i>Melierax gabar</i>	Gabar Goshawk		
² <i>Merops apiaster</i>	European Bee-eater		
² <i>Merops hirundineus</i>	Swallow-tailed Bee-eater		
¹ <i>Milvus migrans</i>	Black Kite		
² <i>Mirafra fasciolata</i>	Eastern Clapper Lark		
² <i>Monticola brevipes</i>	Short-toed Rock-Thrush		
² <i>Motacilla capensis</i>	Cape Wagtail		
² <i>Muscicapa striata</i>	Spotted Flycatcher		
² <i>Myrmecocichla formicivora</i>	Anteating Chat		
¹ <i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN
² <i>Nilaus afer</i>	Brubru		
² <i>Numenius phaeopus</i>	Common Whimbrel		
² <i>Numida meleagris</i>	Helmeted Guineafowl		
² <i>Oena capensis</i>	Namaqua Dove		
² <i>Oenanthe monticola</i>	Mountain Wheatear		
² <i>Oenanthe pileata</i>	Capped Wheatear		
² <i>Onychognathus naboroupp</i>	Pale-winged Starling		
² <i>Oriolus oriolus</i>	Eurasian Golden Oriole		
² <i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler		
² <i>Parus cinerascens</i>	Ashy Tit		
² <i>Passer diffusus</i>	Southern Grey-headed Sparrow		
² <i>Passer domesticus</i>	House Sparrow		

LIST OF BIRDS (continued)

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Passer melanurus</i>	Cape Sparrow		
² <i>Passer motitensis</i>	Great Sparrow		
² <i>Philetairus socius</i>	Sociable Weaver		
² <i>Philomachus pugnax</i>	Ruff		
¹ <i>Phoenicopus minor</i>	Lesser Flamingo	NT	NT
¹ <i>Phoenicopus ruber</i>	Greater Flamingo		NT
² <i>Phylloscopus trochilus</i>	Willow Warbler		
² <i>Plectropterus gambensis</i>	Spur-winged Goose		
² <i>Plocepasser mahali</i>	White-browed Sparrow-Weaver		
² <i>Ploceus velatus</i>	Southern Masked-Weaver		
¹ <i>Polemaetus bellicosus</i>	Martial Eagle	VU	EN
¹ <i>Polihierax semitorquatus</i>	Pygmy Falcon		
¹ <i>Polyboroides typus</i>	African Harrier-Hawk		
² <i>Prinia flavicans</i>	Black-chested Prinia		
² <i>Pterocles bicinctus</i>	Double-banded Sandgrouse		
² <i>Pterocles burchelli</i>	Burchell's Sandgrouse		
² <i>Pterocles namaqua</i>	Namaqua Sandgrouse		
¹ <i>Ptilopus granti</i>	Southern White-faced Scops-Owl		
² <i>Pycnonotus nigricans</i>	African Red-eyed Bulbul		
² <i>Pytilia melba</i>	Green-winged Pytilia		
² <i>Quelea quelea</i>	Red-billed Quelea		
² <i>Recurvirostra avosetta</i>	Pied Avocet		
² <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill		
² <i>Rhinoptilus africanus</i>	Double-banded Courser		
² <i>Riparia paludicola</i>	Brown-throated Martin		
² <i>Riparia riparia</i>	Sand Martin		
¹ <i>Sagittarius serpentarius</i>	Secretarybird	VU	VU
² <i>Scopus umbretta</i>	Hamerkop		
² <i>Serinus albogularis</i>	White-throated Canary		
² <i>Serinus atrogularis</i>	Black-throated Canary		
² <i>Serinus flaviventris</i>	Yellow Canary		
² <i>Spizocorys conirostris</i>	Pink-billed Lark		
¹ <i>Spizocorys sclateri</i>	Sclater's Lark	NT	NT
² <i>Spizocorys starki</i>	Stark's Lark		
² <i>Sporopipes squamifrons</i>	Scaly-feathered Finch		
² <i>Streptopelia capicola</i>	Cape Turtle-Dove		
² <i>Streptopelia senegalensis</i>	Laughing Dove		
² <i>Struthio camelus</i>	Common Ostrich		
² <i>Sylvia borin</i>	Garden Warbler		
² <i>Sylvietta rufescens</i>	Long-billed Crombec		

LIST OF BIRDS (continued)

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Scientific name	Common name	IUCN status	SA RDB
² <i>Tachybaptus ruficollis</i>	Little Grebe		
² <i>Tachymarptis melba</i>	Alpine Swift		
² <i>Tadorna cana</i>	South African Shelduck		
² <i>Telophorus zeylonus</i>	Bokmakierie		
² <i>Threskiornis aethiopicus</i>	African Sacred Ibis		
² <i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill		
² <i>Tricholaema leucomelas</i>	Acacia Pied Barbet		
² <i>Tringa glareola</i>	Wood Sandpiper		
² <i>Tringa nebularia</i>	Common Greenshank		
² <i>Tringa stagnatilis</i>	Marsh Sandpiper		
¹ <i>Tyto alba</i>	Barn Owl		
² <i>Upupa africana</i>	African Hoopoe		
² <i>Urocolius indicus</i>	Red-faced Mousebird		
² <i>Vanellus armatus</i>	Blacksmith Lapwing		
² <i>Vanellus coronatus</i>	Crowned Lapwing		
² <i>Zosterops pallidus</i>	Orange River White-eye		

APPENDIX 3

**A photographic guide for species of conservation concern that were
encountered on site**

Hoodia gordonii

(Listed as DDD and protected under Schedule 1 of the NCNCA)



Vachellia haematoxylon
(Protected under the NFA)



Leaves and young stems are grey-velvety; giving this species their characteristic grey appearance.
Spines are straight and slender



Boscia foetida
(Protected under Schedule 2 of the NCNCA)



Euphorbia spinea
(*Euphorbia* spp. are protected under Schedule 2 of the NCNCA)



Psilocaulon subnodosum
(Aizoaceae (Mesembryanthamaceae) spp. are protected under Schedule 2 of the NCNCA)



Prenia tetragona

(Aizoaceae (Mesembryanthamaceae) spp. are protected under Schedule 2 of the NCNCA)

