BIODIVERSITY ASSESSMENT

VENTERSBURG CONSOLIDATED PROJECT, VENTERSBURG, FREE STATE PROVINCE

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Report prepared by:

ENVIRONMENT RESEARCH CONSULTING

ERC forms part of **Benah Con cc**

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1 EXECUTIVE SUMMARY

INTRODUCTION

This study was undertaken for Shango Solutions by Environment Research Consulting (ERC) in support of a Basic Assessment for a prospecting right application by Western Allen Ridge Gold Mines (Pty) Ltd for the Ventersburg Consolidated Project over a number of farms comprising a total surface area of 7943.07 ha. The study area is situated about 14 km north and north-east of Ventersburg and 25 km south of Kroonstad and is bisected by the N1 highway. This report presents the findings of the floristic diversity assessment of which the fieldwork was conducted on site on 18 – 20 January 2018.

METHODOLOGY

A visual reconnaissance of the study area was undertaken before surveying commenced. Different homogenous vegetation units were identified and subsequently surveyed on foot and by vehicle in order to determine the floristic composition of each. A plotless sampling method was used to record data. The faunal assessment was done mainly on a desktop level, supported by on-site observations.

RECEIVING ENVIRONMENT

General

The study area is situated about 14 km north to north-east of Ventersburg and about 25 km south of Kroonstad and is bisected by the N1 highway.

The climate of the area includes mild to hot summers and extremely cold winters and receives summer rainfall.

Three vegetation types according to Mucina and Rutherford (2006) occur in or in close proximity to the studied area. The Vaal-Vet Sandy Grassland (Gh10) covers the largest part with smaller areas of Central Free State Grassland (Gh6) and Highveld Salt Pans (AZi10)

Fauna assessment

The main focus of the faunal assessment was to include every species with the slightest chance of occurring within the site in the species lists. The characteristics of the site and the prominent features surrounding it, as shortly discussed below, play a key role in whether an animal would theoretically inhabit the study area. In assessing species occurrence, their approximate distribution and habitat requirements were firstly considered. Therefore, only animal groups for which distribution data are available have been considered in this assessment.

Table A summarises the diversity of fauna that is expected to occur in the study area.

Table A: Animal groups considered in this study along with the total number of species possibly occurring in or near the study area.

Animal group	Total species
Mammals	52
Reptiles	35
Birds	79
Frogs	14
Butterflies	63
Dragonflies/damselflies	35
Spiders	57
Scorpions	1

It is not expected that all the animals with protected statuses (indicated in faunal species lists) will occur in the study area, but given its surface area and the remnant areas of natural vegetation the possibility of their occurrence cannot be totally excluded.

No official conservation assessment has been conducted to determine the protected status of South African spiders (Arachnida: Araneae) or scorpions (Arachnida: Scorpiones). However, according to the findings of this study there are 17 spider species endemic to South Africa and considered to be scarce that could possibly occur on or near the relevant locality. The distribution of only 1 scorpion species overlaps with the locality.

Table B presents the numbers of protected species per animal group that may occur in the study area.

Table B: Animal groups considered in this study along with the number of species with formal protected statuses.

Animal group	Number of protected species
Mammals	6
Reptiles	2
Birds	5
Frogs	1
Butterflies	0
Dragonflies / damselflies	0

Flora assessment

A total of 257 plant species (from 67 plant families and 173 genera) (Table C) were recorded in the studied area during the period of this study, which in my view indicates moderately high plant diversity in the studied area. Of this number, 35 are trees or woody shrubs (27 exotic), 58 are grasses (8 exotic), 15 are sedges (none exotic) and 149 are herbs or herbaceous climbers, creepers or shrubs (44 exotic). 178 (69%) of the plant species that were recorded are indigenous to South Africa. At least four of these species are Red Data listed and/or protected in some or other capacity.

Table C: Summary of the number of plant families, genera and species recorded in the study area.

	Families	Genera	Species
PTERIDOPHYTA (ferns):	1	1	1
GYMNOSPERMAE (conniferous plants):	2	3	3
ANGIOSPERMAE (seed plants): ***Dicotyledonae:***	47	115	156
Monocotyledonae:	17	54	97
Total:	**67**	**173**	**257**

Three broad vegetation units (VUs), two based on floristic differences of different topographical positions and natural habitat types, and one based on anthropogenic transformation, were recorded in the study area and are subsequently described. The VUs are as follows:

- Vegetation Unit 1 (VU1): Natural grassland
- Vegetation Unit 2 (VU2): Wetlands
- Vegetation Unit 3 (VU3): Transformed areas

Only four plant species of conservation significance were recorded during the study (Table D). Two of these species recorded are listed as Declining red data species, and all four species are listed as provincially protected. No plant species listed as threatened or protected by the National Environmental Management: Biodiversity Act's (Act No. 10 of 2004) list of Threatened or Protected Species (TOPS), nor any protected trees as listed by the National Forest Act, were recorded in the study area during the time of the study.

Table D: List of flora species of conservation significance recorded in different vegetation units (VU) in the study area.

SPECIES NAME	GROWTH FORM	SPECIES STATUS	VU		
			1	2	3
Ammocharis coranica	Herb, geophyte	P (FS)		X	
Boophone disticha	Herb, geophyte	D; P (FS)	X		
Eucomis autumnalis subsp. *clavata*	Herb, geophyte	D; P (FS)	X	X	
Schizocarphus nervosus	Herb, geophyte	P (FS)	X		

Descriptions of abbreviations used in Table D are as follows:

- P (FS) – Provincially protected species.
- D – Red listed species (Declining).

79 exotic plant species (27 trees/woody shrubs, 8 grasses and 44 herbs or herbaceous/succulent shrubs) were recorded, 36 of these species (22 trees/shrubs, 1 grass and 13 herbs) are classified as alien weed and invader species.

HABITAT SENSITIVITY AND CONSERVATION STATUS OF LOCAL ECOSYSTEMS

A sensitivity rating of High was attributed to VU1 (natural grasslands) and VU2 (Wetlands). VU1 still has a relatively natural character albeit somewhat degraded due to overgrazing, fragmentation and the edge effects of other neighboring transformed habitats. The portions of VU1 that still persist in the study area form part of an Endangered Ecosystem, which pushes its relative sensitivity higher than a moderate rating. VU2 has High sensitivity due to its important function as water drainage and storage habitat for surrounding ecosystems and the faunal assemblages that depend on it, as well as its relevant connectivity with VU1 habitats along its mostly linear distribution. VU3, on the other hand, is attributed a Low sensitivity due to its totally transformed nature and the large amount of alien weeds and invaders occurring in that habitat. A buffer zone is delineated for the highly sensitive area where one of the drill sites currently falls just inside a highly sensitive area. It is strongly suggested that that particular proposed drill site be moved about 65 m northwest from its currently proposed position.

According to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA, 2004): National List of Ecosystems That Are Threatened and In Need of Protection, The Vaal-Vet Sandy Grassland (Gh10) is an Endangered Ecosystem, which has to be protected. Historically, Gh10 covered the largest portion of the study area, but was virtually totally destroyed due to crop cultivation and other agricultural activities.

No specific guidelines are given for the Free State Province in terms of habitat sensitivity mapping. The 2015 Free State Biodiversity Plan (http://bgis.sanbi.org), however, provides a map of Critical Biodiversity Areas

(CBA's) and Ecological Support Areas (ESA's), which has conservation guidelines of different land-use areas in the province in mind.

IMPACT ASSESSMENT

Impact rating and mitigation

The assessment was conducted only for the six proposed drill sites with the focus on natural and sensitive habitats. From the assessments it is clear that no major impacts are expected from the currently proposed prospecting activities.

Two possible impacts and their mitigation measures were assessed:

- Impact 1: Loss of habitat for fauna and flora species.
- Impact 2: Loss of species of conservation significance.

Assessment of the no-go alternative

Currently there is no proposal from a biodiversity point of view of a no-go alternative. It is not expected that the currently proposed activities and the proposed positions of the activities will have any major impact on the biodiversity in the study area. If, however, the nature of the activities and the positioning of any proposed activities will encroach on any sensitive habitats, this option will have to be re-evaluated. It has also been proposed that the position of one of the proposed drill sites be moved in orded to avoid any direct impact on the natural grassland where it is currently proposed.

If for whatever reason the no-go alternative is enforced, it will see the present status of the biodiversity and the habitats it is associated to in the study area stay the same taking natural fluctuations in to consideration.

Monitoring requirements

No monitoring requirements are currently proposed, unless prospecting sites and activities change in such a way to encroach on natural and sensitive habitats.

FINAL COMMENTS

Based on the data presented in this report as well as observations made during the survey, the following is recommended in conclusion:

- Take note of and as far as possible comply with the mitigation measures and recommendations given in this report.
- During the planning, operational and rehabilitation phases all recommendations made and concerns raised in this document should be taken into consideration.

- It is strongly advised that an ecological specialist is appointed during the operational phase to monitor impacts and related mitigation measures regarding protected species as well as sensitive habitats from time to time.
- From a biodiversity point of view, there are no major objections against the proposed prospecting activities, as long as mitigation measures and recommendations are seriously considered and implemented, and as long as due diligence is practiced in terms of environmental legislation and other relevant policies and guidelines.

2 DECLARATION OF INDEPENDENCE AND SUMMARY OF EXPERTISE OF SPECIALIST INVESTIGATOR

2.1 Declaration of independence

The specialist investigator responsible for conducting this particular specialist vegetation study declares that:

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP).
- at the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity.
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favorable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being a member of the general public.
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data.
- I do not have any influence over decisions made by the governing authorities.
- should I, at any point, consider myself to be in conflict with any of the above declarations, I shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party.
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant.
- I have expertise and experience in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity.

- this document and all information contained herein is and will remain the intellectual property Environment Research Consulting and the specialist investigator responsible for conducting the study. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigator.
- I will comply with the Act, regulations and all other applicable legislation.

- All the particulars furnished by me in this document are true and correct.
- I realize that a false declaration is an offence in terms of Regulation 71 of NEMA and is punishable in terms of section 24F of the Act.

A.R. Götze (M.Sc.; *Pr.Sci.Nat.*)

2.2 Summary of expertise

Specialist investigator:	Albert R. Götze
Highest tertiary qualification:	M.Sc. *cum laude* (Phytosociology and Restoration Ecology, NWU, Potchefstroom).
Professional affiliation:	SACNASP (since 2008, Membership no: 400011/08).

I have been a professional ecologist, botanist and soil scientist since 2002. I gained valuable experience in the fields of vegetation classification, various restoration disciplines, faunal trapping and surveying, soil surveying and wetland delineations during my post graduate studies and later as fieldwork mentor for post graduate ecology students of the Northwest University (2008 - 2014), and on occasion for game ranch management students of the Tshwane University of Technology. I have experience in various types of scientific floral and faunal studies in the grassland and savannah in Gauteng, North West, Limpopo, Mpumalanga, Free State, Eastern and Northern Cape. I have also on occasion performed vegetation studies in the KwaZulu-Natal savannah and Indian Ocean Coastal Belt, the Eastern Cape thicket, the Western Cape fynbos, Namaqualand, the Karoo and Swaziland. I have 15 years' experience in specialist biodiversity, soil and wetland studies and have performed numerous (at least 120) such studies since 2002. I also have wide experience in monitoring of rehabilitated mine dumps, opencast and other similar areas for several large mining groups in South Africa. I have authored two and co-authored four scientific papers for various local scientific publications since 2004.

3 INTRODUCTION

This study was undertaken for Shango Solutions by Environment Research Consulting (ERC) in support of a Basic Assessment for a prospecting right application by Western Allen Ridge Gold Mines (Pty) Ltd for the Ventersburg Consolidated Project over a number of farms comprising a total surface area of 7943.07 ha. The study area is situated about 14 km north and north-east of Ventersburg and 25 km south of Kroonstad and is bisected by the N1 highway.

This report presents the findings of the floristic diversity assessment of which the fieldwork was conducted on site (Figures 1 and 2) on 18 – 20 January 2018.

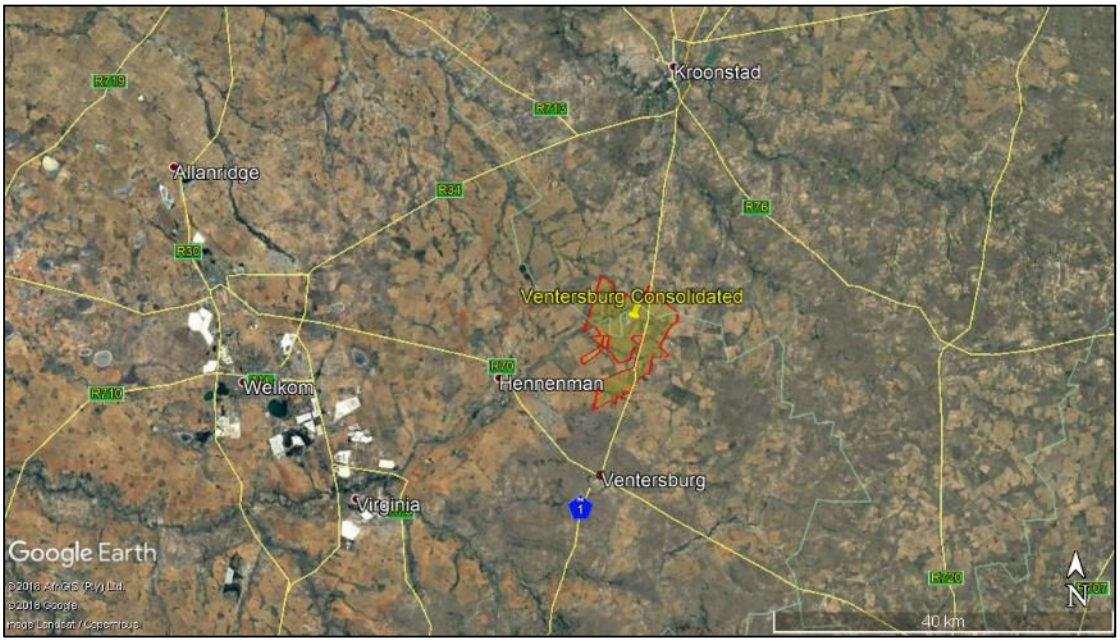

Figure 1: Google earth image indicating the regional setting of the study area.

Figure 2: Google earth image indicating the local setting of the study area.

3.1 Scope of work

- Description of the baseline receiving environment specific to the field of expertise (general surrounding as well as site specific environment).
    - General description of the ecology and biodiversity of the study area.
    - Description and mapping of the broad vegetation units and/or habitat types (if more than one) identified in the study area.
    - Determine the fauna and flora diversity of the study area and compilation of relevant species lists.
    - Record the presence and diversity of plant species of conservation significance (ToPS, Red data, Protected, etc.) in the study area.
- Identification and description of any sensitive receptors in terms of ecology (fauna and flora) that occur in the study area, and the manner in which these sensitive receptors may be affected by prospecting.
- Mapping of sensitive receptors in the study area, based on available maps, database information and site inspection.
- Screening to identify any critical issues pertaining to biodiversity (potential fatal flaws) that may result in project delays or rejection of the application.
- Identification and description of any impacts that may result from the proposed prospecting activities during all phases of the project, including cumulative, residual and latent impacts.
- Provide detailed mitigation/management measures for the management of the identified impacts for inclusion in the Environmental Management Programme.
- Identification of any legislated constraints (e.g., 'No-Go' areas or buffer zones) and preparation of a map illustrating No-Go areas and buffers where relevant.

3.2 Assumptions and Limitations

- It is assumed that plant species flowering only during specific times of the year could be confused with a very similar species of the same genus.
- Some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- Due to habitat conditions encountered during the time of this study some species could only be identified up to genus level and some could not be identified at all.
- In order to obtain a comprehensive understanding of the dynamics of the biodiversity of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this survey was conducted in one season during a once-off site visit of two and a half days.

- Data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.
- No quantitative data was collected or analysed for the calculation of ecological veld and/or habitat condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.
- No faunal trapping was conducted as part of this study. The faunal assessment relied heavily on desktop and literature studies, supported by on-site observations.
- During the fieldwork phase of this assessment, access to all farms was not possible due to lack of contact details at the time. The habitat mapping therefore relied somewhat on extrapolation form areas that were actually visited.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

3.3 Methodology

A visual reconnaissance of the study area was done before surveying commenced. Different homogenous habitat units were identified and subsequently surveyed on foot and by vehicle in order to determine the floristic composition of each. The following data was recorded:

- All identifiable indigenous and exotic plant species (Appendix A) in each identified vegetation unit.
- Sightings of faunal species.
- General ecological and habitat data that may assist in the description of the biodiversity of the study area.

A plotless sampling method was used to record floristic data. Taxa observed in the study area during the time of the study were recorded and included in the species lists (Appendices A and B). The floristic composition of each of the identified broad vegetation units are described and discussed. Species identification was done following reputable checklists and field guides. Where necessary, plant material was collected and/or photographs taken of specimens for identification purposes and if necessary, SANBI in Pretoria and other specialists were consulted in order to assist in species identification.

The faunal assessment was done mainly on a desktop level, which was supported by on-site observations. No faunal trapping or any other quantitative field species data capturing was, however, conducted.

No formal consultation process was conducted as part of this floristic study as it was not deemed necessary at the time of the study.

3.4 Legislative and policy framework

The following national and provincial legislative guidelines and requirements were followed as part of this study:

The National Environmental Management Act (107 of 1998) (NEMA)

This act embraces all three fields of environmental concern namely: resource conservation and exploitation; pollution control and waste management; and land-use planning and development. The environmental management principles include the duty of care for wetlands and special attention is given to management and planning procedures.

National Environmental Management Act. Regulation 543, Section 32

This report has been prepared in terms of the *National Environmental Management Act* (107 of 1998) (NEMA) and is compliant with Regulation 385 Section 33 – Specialist reports and reports on specialised processes under the Act. Relevant clauses of the above regulation are quoted below and reflect the required information in the "control sheet for specialist report".

Regulation 33 (1): An applicant or the Environmental Assessment Practitioner managing an application may appoint a person who is independent to carry out a specialist study or specialised processes.

Regulation 33 (2): A specialist report or a report on a specialised process prepared in terms of these Regulations must contain:

a. Details of the person who prepared the report and the expertise of that person to carry out the specialist study or specialised process.
b. A declaration that the person is independent in a form specified by the competent authority.
c. An indication of the scope of, and the purpose for which, the report was prepared.
d. A description of the methodology adopted in preparing the report or carrying out the specialised process.
e. A description of any assumptions made any uncertainties or gaps in knowledge.
f. A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment.
g. Recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority.
h. A description of any consultation process that was undertaken during the course of carrying out the study.
i. A summary and copies of any documents that were received during any consultation process.

j. Any other information requested by the competent authority.

Conservation of Agricultural Resources Act (43 of 1983) (CARA, 1983)

This act regulates the utilisation and protection of wetlands, soil conservation and all matters relating thereto; control and prevention of veld fires, control of weeds and invader plants, the prevention of water pollution resulting from farming practices and losses in biodiversity.

The National Forest Act (84 of 1998)

The National Forest Act (NFA, 1998):

- Promotes the sustainable management and development of forests for the benefit of all.
- Creates the conditions necessary to restructure forestry in South Africa.
- Provide special measures for the protection of certain forests and protected trees.
- Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.
- Promotes community forestry.
- Promotes greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination.

National Environmental Management: Biodiversity Act (10 of 2004)

The National Environmental Management: Biodiversity Act (10 of 2004), (NEMBA) was signed into law in mid-2004 and entered into effect on 1 September, 2004. The Act provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities.

Certain activities, known as Restricted Activities, are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the act are keeping, moving, having in possession, importing and exporting, and selling.

Also considered were:

- Free State Biodiversity Plan – 2015 (http://bgis.sanbi.org).
- Free State Nature Conservation Ordinance (Ordinance 8 of 1969).

4 RECEIVING ENVIRONMENT

4.1 General Description

The study area is situated about 14 km north to north-east of Ventersburg and about 25 km south of Kroonstad and is bisected by the N1 highway (Figures 1 and 2).

Three vegetation types according to Mucina and Rutherford (2006) occur in or in close proximity to the studied area. The Vaal-Vet Sandy Grassland (Gh10) covers the largest part with smaller areas of Central Free State Grassland (Gh6) and Highveld Salt Pans (AZi10) (Figure 3).

The descriptions of Gh6, Gh10 and AZi10 below (4.1.1, 4.1.2 and 4.1.3), are summarised from Mucina & Rutherford (2006).

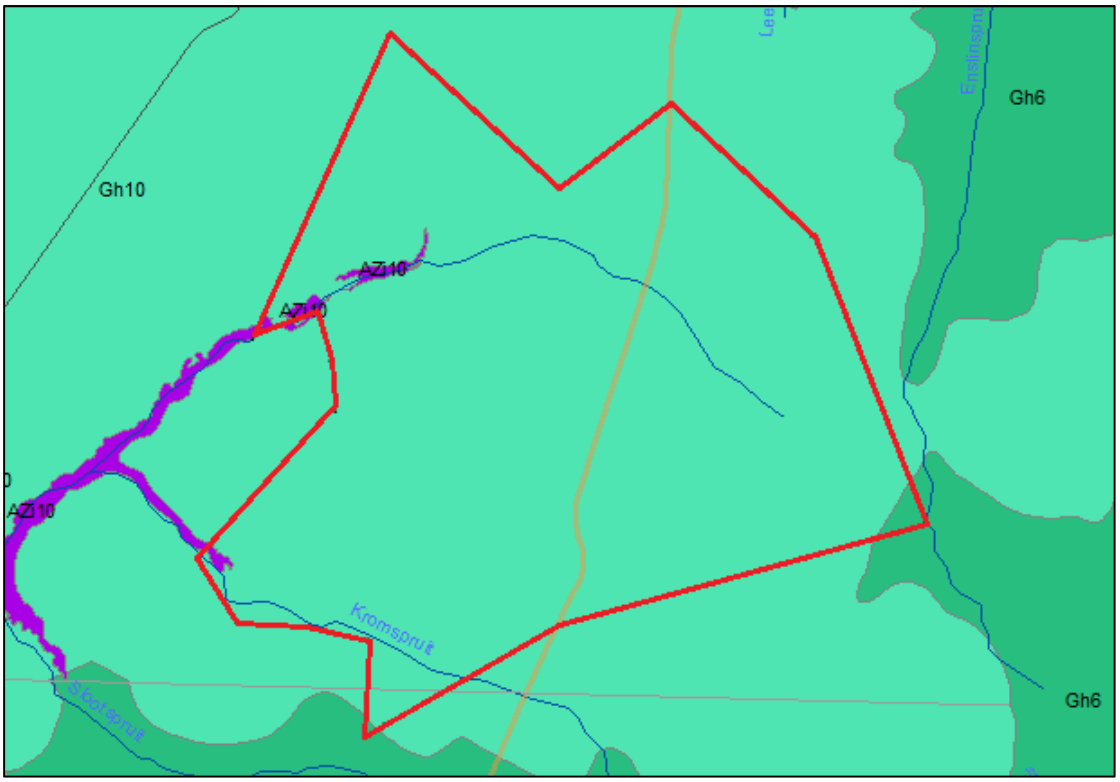

Figure 3: Distribution of vegetation types in and around the study area according to Mucina and Rutherford (2006).

4.1.1 Central Free State Grassland (Gh6)

Gh6 mostly occurs in the Free State Province and marginally into Gauteng Province in a broad zone from around Sasolburg in the north to Dewetsdorp in the south, also including towns such as Kroonstad, Ventersburg, Steynsrus. Lindley, Winburg and Edenvale in its distribution area. It is situated in the summer rainfall region of South Africa with a mean annual precipitation of ± 560 mm. Summers are generally mild and frost occurs frequently during winter months. The geology of this vegetation type is generally dominated by sedimentary mudstones and sandstone of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as those of the Ecca Group (Karoo

Supergroup). These rock formations give rise to vertic, melanic and red soils, typically of the Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg soil forms.

The landscape is charactersed by undulating plains supporting short grassland. Under natural conditions it is dominated by *Themeda triandra*, but is dominated by *Eragrostis curvula* and *E. chloromelas* in disturbed habitats. Dwarf Karoo-shrubs establish in severely degraded clayey bottomlands, and overgrazed and trampled low-lying areas are prone to *Vachellia karroo* encroachment. Dominant and other characteristic plant species include the grasses *Aristida adscensionis, A. congesta, A. bipartite, A. canescens, Andropogon appendiculatus, Agrostis lachnantha, Cynodon dactylon, C. transvaalensis, Cymbopogon pospischilii, Digitaria argyrograpta, Eragrostis curvula, E. chloromelas, E. lehmanniana, E. micrantha, E. plana, E. obtusa, E. racemosa, E. trichophora, Elionurus muticus, Heteropogon contortus, Microchloa caffra, Panicum coloratum, Setaria sphacelata, S. incrassata, Sporobolus discosporus, Themeda triandra* and *Tragus koelerioides*. Also, the herbs and low shrubs *Anthospermum rigidum, Berkheya onopordifolia, Conyza pinnata, Crabbea acaulis, Euphorbia inaequilatera, Felicia muricata, Geigeria aspera, Helichrysum dregeanum, Hermannia depressa, Hibiscus pusillus, Melolobium candicans, Oxalis depressa, Pentzia globosa, Pseudognaphalium luteo-album, Raphionacme dyeri* and *Tripteris aghillana*.

Gh6 is compared to Acocks' (1953) Dry Cymbopogon-Themeda Veld (VT 50) and also to Low and Rebelo's (1996) Dry Sandy Highveld Grassland (LR 37). From a conservation point of view, this unit is described as vulnerable due to almost a quarter of the area of it being transformed for crop cultivation and building of large dams such as Allemanskraal, Erfenis, Groothoek, Koppies, Weltevrede and Kroonstad Dams. Small portions are conserved in the Willem Pretorius, Rustfontein and Koppies Dam Nature Reserves as well as in some private nature reserves.

4.1.2 Vaal-Vet Sandy Grassland (Gh10)

Gh10 occurs in North-West and Free State Provinces from its northern distribution, in an area south of Lichtenburg and Ventersdorp, stretching to Klerksdorp, Leeudoringstad, Bothaville and Brandfort in the south. is situated in the summer rainfall region with a mean annual precipitation of ± 530 m, where summers are mild to hot and winters very cold with frequent frost. Aeolian and colluvial sand overlay sandstone, shale, and mudstone of the Karoo Supergroup (mostly Ecca Group) as well as older Ventersdorp Supergroup Andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh, and Clovelly.

The landscape is dominated by plains with some scattered, slightly irregular undulating plains and hills. Low-tussock grasslands with strong karroid elements and the relative dominance of the grass species *Themeda triandra* are important features of Gh10. Dominant and other significantly occurring grasses are *Anthephora pubescens, Aristida congesta, Brachiaria serrata, Chloris virgata, Cymbopogon caesius, C. pospischilii, Cynodon dactylon, Digitaria argyrograpta, D. eriantha, Elionurus muticus, Eragrostis curvula, E. chloromelas, E. lehmanniana, E. plana, E. obtusa, E. racemosa, E. superba, E. trichophora, Heteropogon contortus, Panicum coloratum, P. gilvum, Pogonarthria squarrosa, Setaria sphacelata, Themeda triandra Trichoneura grandiglumis, Triraphis andropogonoides* and *Tragus berteronianus.* Dominant and characteristic herbs and low shrubs generally include

Anthospermum rigidum, Berkheya onopordifolia, Bulbine narcissifolia, Euphorbia inaequilatera, Felicia muricata, Geigeria aspera, Helichrysum caespititium, H. dregeanum, H. paronychioides, Hermannia depressa, Hibiscus pusillus, Ledebouria marginata, Monsonia burkeana, Pentzia globosa, Rhynchosia adenodes, Selago densiflora, Tripteris aghillana, Vernonia oligocephala and *Ziziphus zeyheriana.*

This vegetation type is described as endangered because approximately 63% of it has been transformed for commercial crop cultivation and grazing pressure from cattle and sheep. Only 0.3% of this vegetation type is statutorily conserved in Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. Gh10 is comparable with Dry Cymbopogon-Themeda Veld (VT 50) (Acocks, 1953) and Dry Sandy Highveld Grassland (LR 37) (Low and Rebelo, 1996).

4.1.3 Highveld Salt Pans (AZi10)

AZi10 occurs over a wide distribution area that stretches from the Eastern Cape, Northern Cape, North-West, Gauteng and Free State Provinces and is characterised by depressions in the plateau landscape. The central parts of the pans are seasonally inundated, sometimes with floating macrophyte[1] vegetation, or the vegetation layer develops on drained bottoms of the pans with a zoned concentric pastern and open grassland to sparse grassy dwarf shrubland on the edges of the pans, which mostly develops when the pan is under continuous heavy grazing pressure. Geologically the depressions of AZi10 are usually formed by shales of the Ecca Group giving rise to vertic clayey soils.

From a vegetation point of view plant species that are significant in the pan habitat are the dominant graminoids[2] *Chloris virgata, Cynodon dactylon, C. transvaalensis, Cyperus laevigatus, C. marginatus, Eragrostis bicolor, E. chloromelas, E. plana, Hemarthria altissima, Juncus rigidus, Leptochloa fusca, Panicum coloratum, P. schinzii* and *Setaria incrassata.* Karoo shrubs and herbs include *Atriplex vestita, Alternanthera sessilis, Aponogeton rehmannii, Amaranthus praetermissus, Felicia filifolia, F. muricata, Lycium cinereum, Nenax microphylla, Phyla nodiflora, Pentzia globosa, P. incana, Platycarpha parvifolia, Salsola glabrescens, Suaeda fruticosa, Senecio reptans, Titanopsis hugoschlechteri* and *Zygophyllum simplex*. A biogeographcally important species that occur in these pans is the Highveld Endemic *Rorippa fluviatilis* var. *caledonica*, and also one species that is endemic to AZi10, the herb *Gnaphalium simii*.

Pans of AZi10 are inundated and/or saturated only during the wet summer months, which occurs in the summer months in the northeastern region and bimodal elsewhere in the distribution area of these pans. Winters are cold with frequent frost.

Only a very small portion of this vegetation type is statutorily conserved in the Vaalbos National Park and Bloemhof Dam, Soetdoring, Willem Pretorius, Baberspan and S.A. Lombard Nature Reserves. About 4% of AZi10 has been transformed as a result of agriculture, building of roads, mining and urbanization. All these threats are ever increasing and putting pressure on more areas of this vegetation type.

[1] aquatic plant that grows in or near water
[2] grass and grass like plants

4.2 Faunal assessment

The main focus of the faunal assessment was to include every species with the slightest chance of occurring within the site in the species lists (Appendix A, Tables 10 – 17). The characteristics of the site and the prominent features surrounding it, as shortly discussed below, play a key role in whether an animal would theoretically inhabit the study area. In assessing species occurrence, their approximate distribution and habitat requirements were firstly considered. Therefore, only animal groups for which distribution data are available have been considered in this assessment.

From satellite imagery (taken in 2016; earth.google.com), as well as on-site observations, it is clear that the natural habitat of the study area has been largely transformed through agriculture, specifically crop production, from this and on-site surveys it is therefore evident that the largest portion of the study area is more or less homogenous from a dominant habitat point of view. Given this homogeneity, one would not expect a large diversity of native animals to still occur in the area. Certain animals, such as the Blue crane (*Anthropoides paradiseus*), may inhabit croplands where natural short grasslands are unavailable (Allan 1995). Others, such as small rodents, are attracted to the abundance of food provided by the crop cultivars (Stenseth et al. 2003). These are not arguments that the croplands should be conserved, but rather that they may determine the abundance of animals on the site and play a role in species occurrence.

The most important natural elements that were observed are the natural drainage lines / seasonal tributaries, small pockets of natural grassland and agricultural field margins. The drainage lines may facilitate the creation of seasonal, stagnant pools which are important resources in frog and dragonfly / damselfly reproduction. Additionally, the small remnants of natural grassland and field margins have been proven to be important in harbouring native animal diversity (Dennis and Fry 1992; Vickery 2002). These two landscape elements should contain most of the natural vegetation and therefore most of the faunal diversity. I would therefore strongly advise that they be protected from initial disturbance. Although trees are sparsely distributed throughout the site they remain an important structural component of the ecosystem and are important especially for the occurrence of birds.

The occurrence of rocks / boulders and termite mounds is generally low, but where present these landscape elements may provide shelter, food and reproductive opportunities to a great diversity of animals (including all the animal groups considered in this study) and their disturbance should therefore be avoided as much as possible.

Regarding the faunal species lists, it is important to note that distribution maps are often constructed with limited ecological knowledge available for the species under question and are thus not consistently reliable in predicting a species' occurrence (Hernandez et al. 2006; Newbold 2010). Where literature allowed, a species was listed with regards to the number of sightings for that species near the relevant locality (i.e. Ventersburg). Furthermore, some uncertainty remains regarding the conservation priority for a great deal of southern African species as not all have been assessed and may classify as

"Not listed" or "Data deficient". No official assessment has been conducted on the conservation status of South African arachnids to date. Therefore, where information was available the commonality of each arachnid species was reported.

4.2.1 Faunal diversity of the study area

Table 1 summarises the diversity of fauna that is expected to occur in the study area.

Table 1: Animal groups considered in this study along with the total number of species possibly occurring in or near the study area.

Animal group	Total species
Mammals	52
Reptiles	35
Birds	79
Frogs	14
Butterflies	63
Dragonflies / damselflies	35
Spiders	57
Scorpions	1

4.2.2 Fauna species of conservation significance

It is not expected that all the animals with protected statuses (indicated in faunal species lists – Appendix A) will occur in the study area, but given its surface area and the remnant areas of natural vegetation the possibility of their occurrence cannot be totally excluded.

No official conservation assessment has been conducted to determine the protected status of South African spiders (*Arachnida: Araneae*) or scorpions (*Arachnida: Scorpiones*). However, according to the findings of this study there are 17 spider species endemic to South Africa and considered to be scarce that could possibly occur on or near the relevant locality. The distribution of only 1 scorpion species overlaps with the locality (Leeming 2003).

Table 2 presents the numbers of protected species per animal group that may occur in the study area.

Table 2: Animal groups considered in this study along with the number of species with formal protected statuses.

Animal group	Number of protected species
Mammals	6
Reptiles	2
Birds	5
Frogs	1
Butterflies	0
Dragonflies / damselflies	0

4.3 Flora assessment

4.3.1 Floristic diversity of the study area

A total of 257 plant species (from 67 plant families and 173 genera) (Table 3 and Appendix B, Table 18) were recorded in the studied area during the period of this study, which in my view indicates moderately high plant diversity in the studied area. Of this number, 35 are trees or woody shrubs (27 exotic), 58 are grasses (8 exotic), 15 are sedges (none exotic) and 149 are herbs or herbaceous climbers, creepers or shrubs (44 exotic). 178 (69%) of the plant species that were recorded are indigenous to South Africa. At least four of these species are Red Data listed and/or protected in some or other capacity.

From available literature (Pujol 1988; Pooley, 1998; Schmidt *et* al 2002; Shearing and Van Heerden 1994; Van Wyk *et al* 1997; Van Wyk and Gericke 2003) it was established that at least 83 of the recorded plant species in the studied areas are to some extent used for some or other social activities (medicinal, food/nourishment and/or cultural).

Table 3: Summary of the number of plant families, genera and species recorded in the study area.

	Families	Genera	Species
PTERIDOPHYTA (ferns):	1	1	1
GYMNOSPERMAE (conniferous plants):	2	3	3
ANGIOSPERMAE (seed plants): ***Dicotyledonae:***	47	115	156
Monocotyledonae:	17	54	97
Total:	**67**	**173**	**257**

During the survey, which was done on foot, taxa that were identifiable during the time of the study were noted and included in the species lists in Appendix B (Tables 19 – 25). The distinct possibility exists that some plant species that emerge and bloom during summer or another time of the year or under very specific circumstances, or species that are locally rare could have been missed during the latest survey.

The mentioned species lists contain the plant family name and scientific and common names of all plant species that were observed in the study area during the time of the study. Also included is, where applicable, the status of a species, which provides information on conservation status. Information on whether a species is utilised for medicinal, cultural or nutritional uses is also provided in the mentioned species lists.

Appendix B, Table 18 presents the diversity of plant families, genera and species recorded in the study area. A check list of plant species recorded during this study is included in Tables 19 – 25 of Appendix B.

4.3.2 Description of broad vegetation units in the study area

Three broad vegetation units (VUs), two based on floristic differences of different topographical positions and natural habitat types, and one based on anthropogenic transformation, were recorded in the study area and are subsequently described (Figure 4). The VUs are as follows:

- Vegetation Unit 1 (VU1): Natural grassland.
- Vegetation Unit 2 (VU2): Wetlands.
- Vegetation Unit 3 (VU3): Transformed areas.

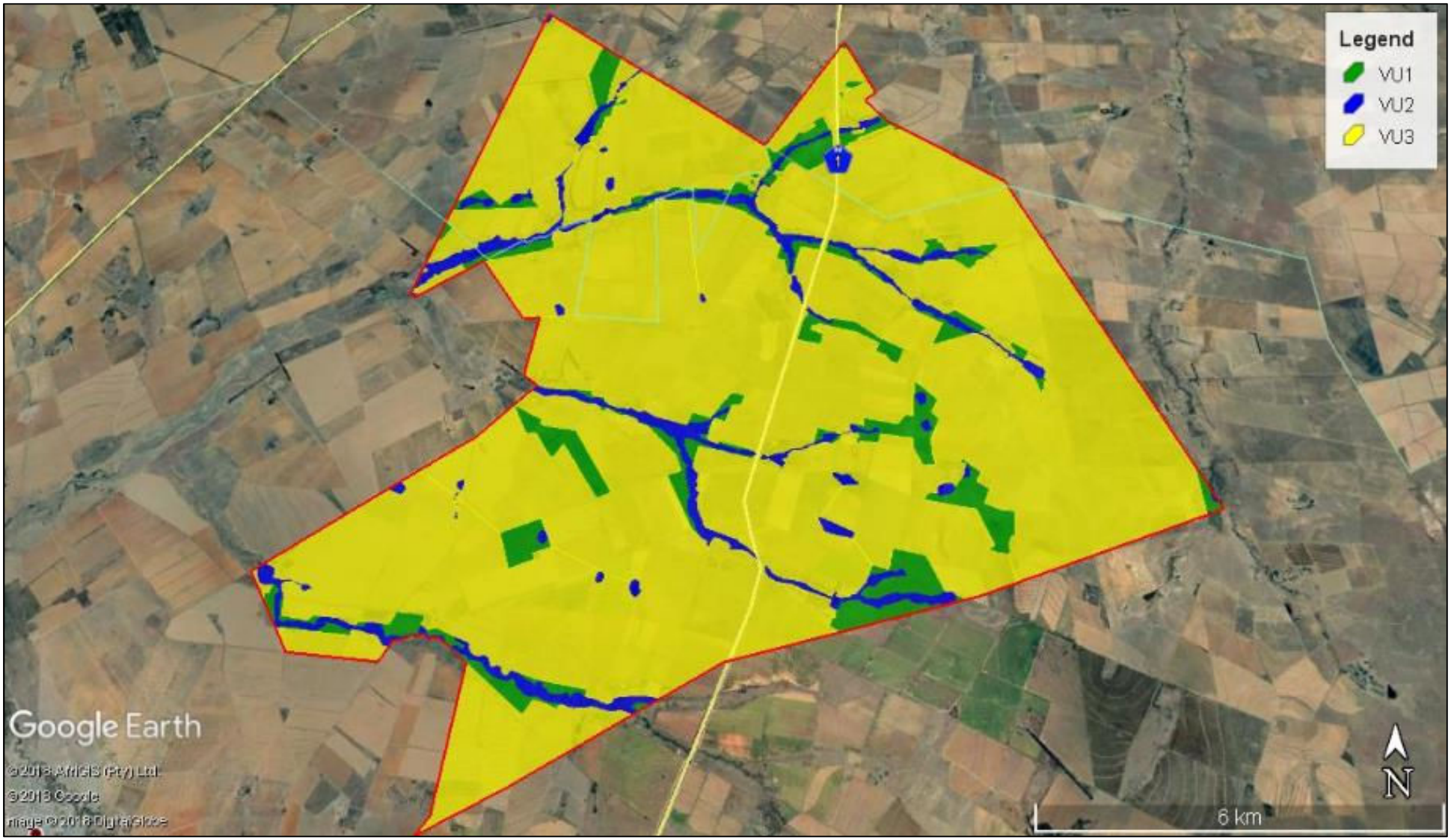

Figure 4: Image depicting the different Vegetation Units recorded in the study area.

4.3.2.1 VU1: Natural grassland vegetation

This VU (Figure 5) consists of patches and sometimes isolated fragments of natural grassland that once occurred all over the landscape, but was destroyed to make place for crop farming. These fragments generally occur on the edges of drainage lines, on the fringes of cultivated or old cultivated lands or close to homesteads as grazing for livestock. The overall estimated veld condition of these natural grassland fragments is generally moderate to poor.

Few woody plants occur, but where they do have some prominence in the landscape it mainly includes the indigenous trees *Vachellia karroo* and *Searsia pyroides*, the short shrub *Ziziphus zeyheriana* and the exotic tree *Prosopis glandulosa* in some localized areas. The herbaceous layer is generally dominated by grasses of which the most prominent are *Cymbopogon pospischilii, Cynodon dactylon, Eragrostis chloromelas, E. curvula, E. lehmanniana, E. obtusa, E. plana, Panicum coloratum, Setaria sphacelata* var*. torta* and *Themeda triandra.* Forbs and other herbs include *Berkheya onopordifolia, Commelina africana, Conyza podocephala, Helichrysum aureonitens, H. rugulosum, Hermannia depressa, Pentzia globosa, Salvia runcinata, Selago densiflora, Stachys hyssopoides* and the exotic *Verbena aristigera*.

127 plant species (5 woody plants – 2 exotics, 36 graminoid species – 1 exotic, and 86 herbaceous forbs, shrubs and succulents – 15 exotics) were identified in VU1 during the time of the study. From available literature (Pujol 1988; Pooley 1998; Schmidt *et al* 2002; Shearing and Van Heerden 1994; Van Wyk *et al* 1997; Van Wyk and Gericke 2003), it was established that at least 37 of the plant species recorded in VU1 are utilised for some or other social activity or use (medicinal, nourishment/food, and / or cultural).

Figure 5: VU1: Natural grassland with few trees in the background.

4.3.2.2 VU2: Wetland vegetation

VU2 consists of wetland vegetation that is associated with natural drainage lines (Figure 6), small natural pans (Figure 7) and man-made dams (Figure 8). The vegetation consists of water and moisture-loving plants. These areas are also general poor in terms of veld condition due to decades of over utilisation by livestock. The drainage lines that make out the largest portion of this VU general drain in a western and southern direction and no baseflow was observed during the time of the study, but some water accumulations in natural depressions was observed and most dams were also full of water at the time of the study.

Dominant graminoids include the reed *Phragmites australis*, the indigenous grasses *Andropogon appendiculatus, Agrostis lachnantha, Cynodon transvaalensis, Echinochloa holubii, Eragrostis micrantha, E. plana, Hemarthria altissima, Leersia hexandra, Paspalum distichum,* and the exotics *Bromus catharticus, Paspalum dilatatum* and *P. urvillei,* and also the sedges *Cyperus denudatus, C. fulgens, C. longus, Eleocharis dregeana, Juncus rigidus, Kyllinga erecta* and *Pycreus macranthus.* Forbs and other herbs that mostly occur are the indigenous *Falckia oblonga, Helichrysum acutatum, Mimulus gracilis, Persicaria decipiens, Potamogeton thunbergii, Salvia runcinata, Vahlia capensis, and the exotics Alternanthera sessilis, Aster squamatus, Cirsium vulgare, Oenothera rosea, Persicaria lapathifolia* and *Verbena officinalis.* Trees and woody shrubs do occur, but in low numbers and is dominated by exotics such as *Acer negundo, Eucalyptus camaldulensis, Populus deltoids, P. x canescens* and *Salix babylonica.*

Figure 6: VU2: A section of a south draining natural drainage line with typical wetland vegetation.

Figure 7: VU2: A small, isolated, natural pan filled with water from recent rains.

Figure 8: VU2: A large man-made dam situated in the course of a natural non-perennial drainage line.

During this study a total of 126 plant species (16 woody plants – 9 exotic, 44 graminoid species – 4 exotic, and 66 herbaceous forbs, shrubs and succulents – 25 exotic) were identified in VU2. From available literature (Pujol 1988; Schmidt *et* al 2002; Van Wyk *et al* 1997; Van Wyk and Gericke 2003) it

was established that at least 35 of these species are used for some or other social activities (medicine, food and/or cultural).

4.3.2.3 VU3: Transformed areas

VU3 represents all totally transformed areas in the study area, which mainly includes currently and old cultivated lands (Figure 7), major road infrastructure, and farm homesteads. Other than small fragmented pockets, individual trees and some areas where natural vegetation has spontaneously rehabilitated, no natural vegetation remains in VU3. Most lands are currently cultivated with a monoculture of summer grain crops such as maize (*Zea mays*) (Figure 9), soya beans (*Glycine max*) or sunflower (*Helianthus annuus*), others have been planted with perennial grazing crops such as Common Finger Grass (*Digitaria eriatntha*) or Weeping Love Grass (*Eragrostis curvula*), or a combination of fodder crops (Figure 10). Farm yards and homesteads (Figure 11) generally have a high variety of plant species and unfortunately exotics plants, many of them declared weeds or invaders, dominate these areas. Tall exotic trees such as *Eucalyptus camaldulensis, E. sideroxylon, Casuarina equisetifolia, Gleditsia triacanthos, Juniperus* species*, Melia azedarach, Populus deltoides, Schinus molle,* and many more, are common in these areas. Likewise, in the case of herbaceous vagetetaion many exotics also occur in a variety of dominance that differ from one area to the next, which makes it difficult to describe from a floristic point of view. Almost half (45%) of the plant species occurring in this VU are exotic.

Figure 9: VU3: crop field cultivated with *Zea mays* (maize).

Figure 10: VU3: a mixture of perennial grazing grass planted on a old cultivated land.

Figure 11: VU3: a typical farm homestead with tall exotic trees and other transformed habitats.

The highest diversity of plant species was recorded in VU3. 165 plant species (90 indigenous, 75 exotic) were recorded during the time of the study. It was established from available literature (Pujol 1988; Pooley 1998; Schmidt *et al* 2002; Shearing and Van Heerden 1994; Van Wyk *et al* 1997; Van Wyk and Gericke 2003), that at least 59 of the plant species recorded in VU3 are

utilised for some or other social activity or use (medicinal, nourishment/food, and/or cultural).

4.3.3 Flora species of conservation significance

Only four plant species of conservation significance were recorded during the study (Table 4). Two of these species recorded are listed as Declining red data species by Raimondo *et al* (2009), and all four species are listed as protected according to the Free State Nature Conservation Ordinance (Ordinance 8 of 1969) (FSNCO, 1969).

Regarding red listed species, according to (Raimondo *et al*, 2009), the following:

- A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes in South Africa causing a continuing decline in the population.

No plant species listed as threatened or protected by the National Environmental Management: Biodiversity Act's (Act No. 10 of 2004) list of Threatened or Protected Species (TOPS) as published in Government Gazette no. 36375 of 16 April 2013 (TOPS, 2013), nor any protected trees as listed by the National Forest Act (NFA, 1998), were recorded in the study area during the time of the study.

Descriptions of abbreviations used in Table 4 are as follows:

- P (FS) – Provincially protected species (FSNCO, 1969).
- D – Red listed species: Declining (Raimondo *et al*, 2009).

Table 4: List of flora species of conservation significance recorded in different vegetation units (VU) in the study area.

SPECIES NAME	GROWTH FORM	SPECIES STATUS	VU		
			1	2	3
Ammocharis coranica	Herb, geophyte	P (FS)		**X**	
Boophone disticha	Herb, geophyte	D; P (FS)	**X**		
Eucomis autumnalis subsp. *clavata*	Herb, geophyte	D; P (FS)	**X**	**X**	
Schizocarphus nervosus	Herb, geophyte	P (FS)	**X**		

4.3.4 Exotic Flora

A high number of exotic plants were recorded in the study area during the time of this study. 79 exotic plant species (27 trees/woody shrubs, 8 grasses and 44 herbs or herbaceous/succulent shrubs) were recorded. According to the Conservation of Agricultural Resources Act (Act No. 43 of 1983) in Henderson (2001) and the National Environmental Management Biodiversity

Act's 2014 list of proposed weeds and invaders (NEMBA, 2014), 36 of these species (22 trees/shrubs, 1 grass and 13 herbs) are classified as alien weed and invader species (Table 5) and the remaining 43 are common ruderal and agrestal weeds.

All exotic plant species in the species lists (Appendix B: Tables 18 – 25) are preceded by an asterisk (*) and/or indicated by the letter "E" in the Species Status column in the case of uncategorized exotic species. In the case of declared or proposed weeds or invaders the invasive status of the species, according to CARA (1983) (Table 6) and NEMBA (2014) (Table 7) are indicated in the Conservation Status column of the species lists in Appendix B as follows:

- C1 – declared weed category 1 (CARA, 1983).
- C2 – declared invader category 2 (CARA, 1983).
- C3 – declared invader category 3 (CARA, 1983).
- Cx1, Cx2 or Cx3 – proposed weed or invaders (CARA, 1983).
- C (T) – potential transformer (CARA, 1983).
- N1b – NEMBA (2014) category 1b.
- N2 – NEMBA (2014) category 2.
- N3 – NEMBA (2014) category 3.

Table 5: List of declared alien weeds and invaders recorded in the study area.

SPECIES NAME	INVASIVE STATUS	GROWTH FORM	VU		
			1	2	3
Acacia mearnsii	C2 / N2	Tree			X
Acer negundo	Cx3 / N3	Tree		X	X
Agave americana	Cx2	Tree			X
Argemone ochroleuca subsp. *ochroleuca*	C1 / N1b	Herb			X
Casuarina equisetifolia	C2 (T) / N2	Tree			X
Cereus jamacaru	C1 / N1b	Cactus / Tree			X
Cestrum laevigatum	C1 / N1b	Shrub / tree		X	X
Cirsium vulgare	C1 / N1b	Herb	X	X	X
Cuscuta campestris	C1 / N1b	Herb, parasite			X
Datura ferox	C1 / N1b	Herb			X
Datura stramonium	C1 / N1b	Herb		X	X
Echinopsis spachiana	C1 / N1b	Cactus / Tree			X
Eucalyptus camaldulensis	C2 / N1b	Tree		X	X
Eucalyptus sideroxylon	C2	Tree			X
Gleditsia triacanthos	C2 / N1b	Tree		X	X
Grevillea robusta	C3 / N1b	Tree			X

SPECIES NAME	INVASIVE STATUS	GROWTH FORM	VU		
			1	2	3
Melia azedarach	C3 / N3	Tree			X
Nicandra physalodes	N1b	Herb		X	X
Oenothera indecora	Cx3	Herb		X	X
Oenothera rosea	Cx3	Herb		X	X
Opuntia ficus-indica	C1 / N1b	Cactus / Tree	X		X
Opuntia imbricata	C1 / N1b	Cactus / shrub			X
Opuntia stricta	C1 / N1b	Cactus / shrub			X
Pinus species	C2 / N2	Tree			X
Populus deltoides subsp. *wislizenii*	Cx2 (T)	Tree		X	X
Populus x *canescens*	C2 / N2	Tree		X	
Prosopis glandulosa	C2 / N1b	Tree	X	X	X
Rumex crispus	Cx3	Herb		X	X
Salix babylonica var. *babylonica*	C2	Tree		X	
Salsola kali	C(T) / N1b	Herb			X
Schinus molle	Cx3	Tree			X
Solanum elaeagnifolium	C1 / N1b	Herbaceous shrub	X		X
Sorghum halepense	C2 / N2	Grass			X
Tamarix ramosissima	C3 / N1b	Tree		X	X
Xanthium spinosum	C1 / N1b	Herb		X	X
Xanthium strumarium	C1 / N1b	Herb		X	X

Table 6: Description of the invasive status of exotic plant species according to CARA (1983).

Invasive status (category)	Description
Declared weed (category 1) **– C1** Proposed weed **– CX1**	• Prohibited on any land or water surface in South Africa. • Must be controlled or eradicated were possible (except in biological control reserves).
Declared invader (category 2) **– C2** Proposed invader **– CX2**	• Allowed only in demarcated areas under controlled conditions. • Import of propagative material and trading allowed only by permit holders. • Outside demarcated areas, it must be controlled, or eradicated where possible (except in biological control reserves). • Prohibited within 30 m of the 1:50 year flood-line of watercourses or wetlands unless authorization is obtained.

Invasive status (category)	Description
Declared invader (category 3) **– C3** Proposed invader **– CX3**	• No further plantings of these species are allowed (except with special permission). • Trade of propagative material is strictly prohibited. • Existing plants may remain but must be prevented from spreading. • Prohibited within 30 m of the 1:50 year flood-line of watercourses or wetlands, or as directed.
Potential Transformer **– C (T)**	• Plants that are already invading natural or semi-natural habitats, and have the potential to dominate a vegetation layer but not yet having a marked effect. They are either transformers elsewhere in the world or showing signs of this ability in Southern Africa.

Table 7: Description of the invasive status of exotic plant species according to NEMBA (2014)

Invasive status (category)	Description
Category 1b **– N1b**	• Invasive species requiring compulsory control as part of an invasive species control program • Remove and destroy • These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management program • No permits will be issued
Category 2 **– N2**	• Invasive species regulated by area • A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants • No permits will be issued for these plants to exist in riparian zones
Category 3 **– N3**	• Invasive species regulated by activity • An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species

Invasive status (category)	Description
	• No permits will be issued for Cat 3 plants to exist in riparian zones

5 HABITAT SENSITIVITY

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses as far as possible. A development proposal should only to be considered compatible with the biodiversity sensitivities of the site if all sensitive areas are avoided and are incorporated into an open space system (GDARD, 2014). A number of criteria are generally used to determine habitat sensitivity of which the following are some of the main ones:

- Ecological function. This relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service (e.g. wetlands) or overall preservation of biodiversity. The potential of the habitat to deliver ecosystem services within itself and to other neighboring habitats are also taken in to consideration.
- Conservation importance. This relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation.
- Other factors.
    - Current diversity of exotic species.
    - Degree to which the natural habitat has been degraded due to various factors.
    - Degree of habitat transformation.
    - Degree of habitat fragmentation.
    - Degree of bush encroachment.

Three ratings were considered to describe the sensitivity of the study area:

High – sensitive ecosystem with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems or with high species diversity and usually provide suitable habitat for a number of species of conservation significance. These areas should be protected.

Moderate/Medium – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems or ecosystems with intermediate levels of species diversity but may include potential ephemeral habitat for species of conservation significance.

Low – Degraded and highly disturbed / transformed systems with little ecological function and are generally very poor in species diversity.

A sensitivity rating of High was attributed to VU1 (natural grasslands) and VU2 (Wetlands). VU1 still has a relatively natural character albeit somewhat degraded due to overgrazing, fragmentation and the edge effects of other neighboring transformed habitats. As described in the following chapter, however, the portions of VU1 that still persist in the study area form part of an Endangered Ecosystem, which pushes its relative sensitivity higher than a moderate rating. VU2 has High sensitivity due to its important function as water drainage and storage habitat for surrounding ecosystems and the faunal assemblages that depend on it, as well as its relevant connectivity with VU1 habitats along its mostly linear distribution. VU3, on the other hand, is attributed a Low sensitivity due to its totally transformed nature and the large amount of alien weeds and invaders occurring in that habitat.

Figures 12 and 13 presents the sensitivity of habitats in the study area relevant to the positions of six proposed drill sites and Figure 14 illustrates the distribution of habitat sensitivity over the whole study area.

A buffer zone is delineated for the highly sensitive area where drill site 2 (Figure 12) currently falls just inside a highly sensitive area. It is strongly suggested that this particular proposed drill site be moved about 65 m northwest from its currently proposed position as indicated in Figure 13. This will ensure that a 50 m buffer between the proposed drill site and the natural grassland can be sustained.

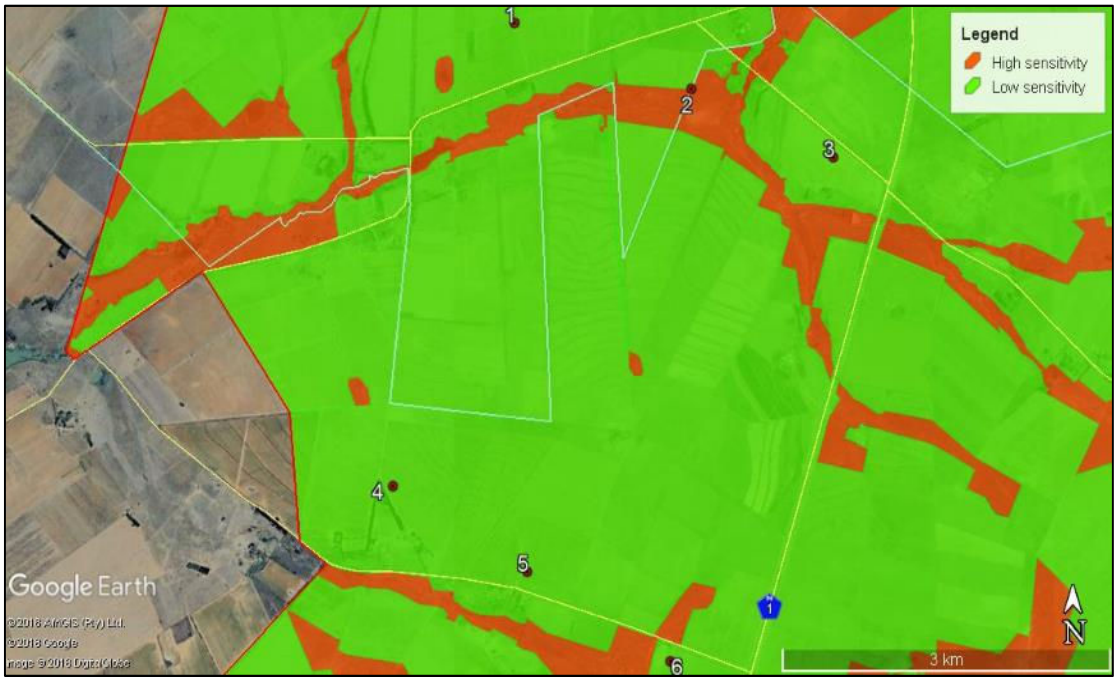

Figure 12: Sensitivity categories in relation to six proposed drill sites in the study area.

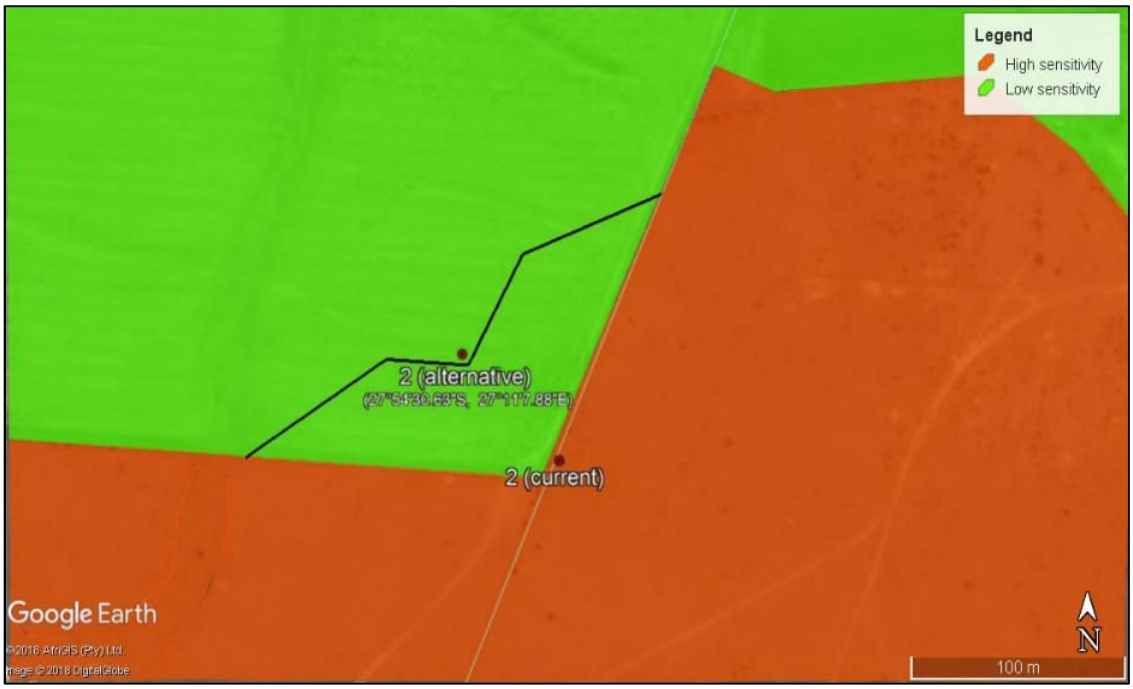

Figure 13: Sensitivity categories in relation to proposed drill site 2, which currently falls in a highly sensitive area, including a 50 m buffer zone (black line) and a newly proposed position for drill site 2.

Figure 14: Sensitivity categories in the whole study area.

6 CONSERVATION STATUS OF LOCAL ECOSYSTEMS

According to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA, 2004): National List of Ecosystems That Are Threatened and In Need of Protection, The Vaal-Vet Sandy Grassland (Gh10) (Figure 3) is an Endangered Ecosystem, which has to be protected. Historically Gh10 covered the largest portion of the study area, but was virtually totally destroyed due to crop cultivation and other agricultural activities.

No specific guidelines are given for the Free State Province in terms of habitat sensitivity mapping. The 2015 Free State Biodiversity Plan (http://bgis.sanbi.org), however, provides a map of Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESA's), which has conservation guidelines of different land-use areas in the province in mind. To my knowledge, different management criteria and recommendations for CBA's and ESA's are still under development and are expected to be published somewhere in 2018 (http://bgis.sanbi.org). It may, however be expected that these criteria and guidelines will be similar to that of other provinces where agriculture is one of the more important land uses. For this reason and in order to present some data in this regard, and excerpt of the criterion used by the Limpopo Conservation Plan – version 2 (LCPv2, Desmet *et al,* 2013) is presented below:

> "CBA's within the bioregion are the portfolio of sites that are required to meet the region's biodiversity targets, and need to be maintained in the appropriate condition for their category.
>
> "Based on the LCPv2, 40% of the province is designated as CBA. These CBA's have been split into CBA 1 and CBA 2 on the basis of selection frequency and the underlying characteristics of the biodiversity features which are being protected.
>
> "An additional 23% of the province is designated as ESA. This category has also been split on the basis of land-cover into ESA 1 (16%) and ESA 2 (7%), with ESA 1 being in a largely natural state while ESA 2 areas are no longer intact but potentially retain significant importance from a process perspective (e.g. maintaining landscape connectivity). Other Natural Areas make up 20% of the province and just over 11% is designated as formal Protected Areas.
>
> "Land-use guidelines are given to provide guidance on what types of land-use activities are compatible with the biodiversity management objectives of each CBA map category. These guidelines do not grant or take away existing land-use rights or the statutory requirement for permits and environmental authorizations. It is however recommended that any planned activity within the identified sensitive conservation areas, even those not requiring specified permits or authorisations, comply with the Duty of Care obligations of Section 28 of the National Environmental Management Act No 107 of 1998."

Figure 15 presents the distribution of CBA's and ESA's in the study area according to the 2015 Free State Biodiversity Plan.

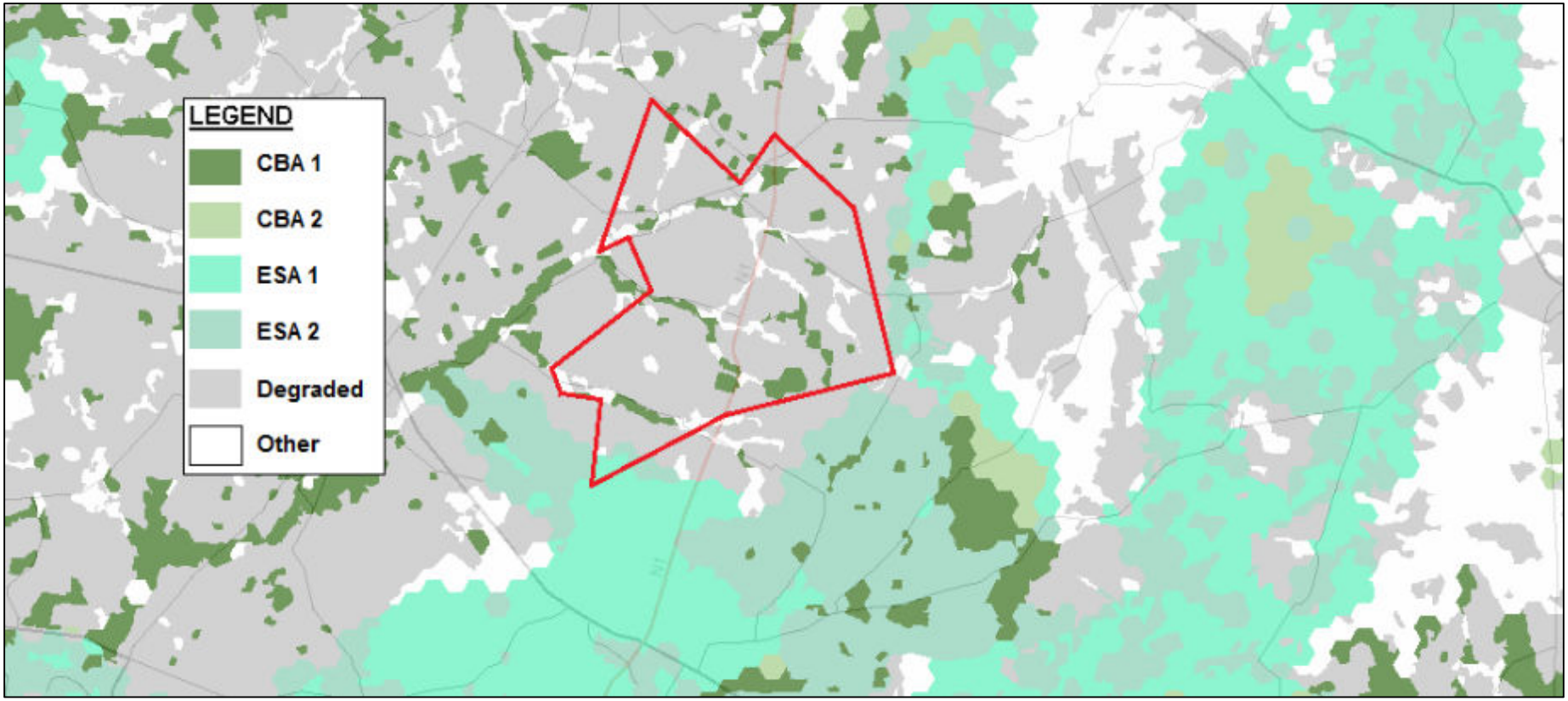

Figure 15: CBA and ESA image for the study area (red polygon) according to the 2015 Free State Biodiversity Plan

7 IMPACT ASSESSMENT

7.1 Impact rating and mitigation

The following impact assessment is supplied. The assessment was conducted only for the six proposed drill sites with the focus on natural and sensitive habitats. From the assessments it is clear that no major impacts are expected from the currently proposed prospecting activities. Tables 8 and 9 summarise the expected impacts.

Table 8: Impact 1: Loss of habitat for fauna and flora species.

Impact Name	**1. Loss of habitat for fauna and flora species.**				
Alternative	**Proposal**				
Phase	**All phases**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	3	2	Reversibility of Impact	2	2
Duration of Impact	2	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-6.75
Mitigation Measures					
Injudicious and unnecessary destruction of natural vegetation, other than the footprint area of the proposed development, must be avoided at all cost. Wherever possible, any soil that can serve as a growth medium for plants must be stripped and stockpiled for future landscaping and/or rehabilitation after or during the construction phase and should be used as soon as possible after "harvesting" to ensure that seed sources does not become worthless due to decomposition of the seed over time. It must be ensured that such topsoil stockpiles are located outside of any drainage lines, wetlands and areas susceptible to erosion or siltation. All soils compacted as a result of prospecting activities should be ripped and profiled after the operational phase. Special attention should be paid to alien and invasive control within impacted areas. Alien and invasive vegetation control should take place throughout all phases to prevent loss of natural habitat. Vehicles should be well maintained to prevent oil and other chemically based materials to enter the area. Refueling points should be well managed and if any soils are contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site.					
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4.08

Table 9: Impact 2: Loss of species of conservation significance.

Impact Name	**2. Loss of species of conservation significance.**				
Alternative	**Proposal**				
Phase	**All phases**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	3	1
Duration of Impact	3	2	Probability	2	1
Environmental Risk (Pre-mitigation)					-6.00
Mitigation Measures					
Destruction of natural wetland vegetation must be avoided at all cost. Special attention should be paid to alien and invasive control within the whole study area. Alien and invasive vegetation control should take place throughout all development phases to prevent loss of habitat of indigenous fauna and flora. Movement of vehicles and construction workers in wetlands and buffer zones should be strictly prohibited. No harvesting of plants or animals should be allowed. Any specimens of protected plant species known to occur in the wetlands and the delineated buffer zone and may potentially be impacted by the prospecting activities, are to be fenced off for the duration of the activity. Conservation of these specie and their natural habitat must be a high priority. If at any point prospecting activities encroach on wetlands, it is strongly advised that a wetland/aquatic specialist is appointed during all phases to monitor impacts and related mitigation measures regarding wetland habitats. Red Data listed and protected species as well as sensitive habitats related to wetlands should be strictly monitored. Any conservation recommendations and measures that aim to mitigate the impacts of this development must also be monitored by such a specialist during the construction, operational and decommissioning phases.					
Environmental Risk (Post-mitigation)					-1.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					3
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.50
Final Significance					-2.63

7.2 Assessment of the no-go alternative

Currently there is no proposal from a biodiversity point of view of a no-go alternative. It is not expected that the currently proposed activities and the proposed positions of the activities will have any major impact on the biodiversity in the study area. If, however, the nature of the activities and the positioning of any proposed activities will encroach on any sensitive habitats

(Chapter 5), this option will have to be re-evaluated. It has also been proposed that the position of proposed drill site 2 be moved in orded to avoid any direct impact on the natural grassland where it is currently proposed (Chapter 5).

If for whatever reason the no-go alternative is enforced, it will see the present status of the biodiversity and the habitats it is associated to in the study area stay the same taking natural fluctuations in to consideration.

7.3 Monitoring requirements

No monitoring requirements are currently proposed, unless prospecting sites and activities change in such a way to encroach on sensitive habitats.

In the event that the nature of the activities and the positioning of any proposed prospecting activities will encroach on the wetlands and the buffer zones in the study area, the following is strongly advised from a wetland point of view:

- Monitoring of the distribution of natural and sensitive habitats compared to the base line provided in this report.
- Populations of Red listed and other protected species must be recorded at all prospecting sites and monitored during all project phases.
- It is strongly advised that a biodiversity specialist is appointed during the construction, operational and decommissioning phases to monitor impacts and related mitigation measures regarding natural and sensitive habitats and the faunal and floral assemblages occurring there.
- If the no-go alternative is enforced no monitoring is advised at this stage.

8 FINAL COMMENTS AND RECOMMENDATIONS

The loss of topsoil and fragmentation of natural habitats that is virtually unavoidable with any type of development, has a negative impact on the regional ecosystem as it disrupts the natural flow of ecosystem services and affects all fauna and flora that are dependent on those habitats. Linear ridges, cliff lines, water courses, drainage lines, etc. are especially sensitive to and easily fragmented. A high conservation value is attributed to the plant communities and faunal assemblages of these areas as they contribute significantly to the biodiversity of a region. It is generally accepted that rocky ridges act as reservoirs of bio-diversity as they are less prone to degradation through overgrazing because of the general inaccessibility of grazing, especially to large animals like cattle, in these parts. Care should be taken not to unnecessarily clear or destroy natural vegetation and where possible the rehabilitation of transformed areas and restoration of degraded natural veld should take place in order to improve the ecological health of the floristic component on the property. Development and planned activities should therefore be planned in such a way that totally transformed areas are chosen

for major developments and natural veld and especially any highly sensitive areas are avoided as far as possible. These natural areas may be utilised and managed as areas of biodiversity conservation.

Based on the data presented in this report as well as observations made during the survey and comments above, the following is recommended in conclusion:

- Take note of and as far as possible comply with the mitigation measures and recommendations given in this report.
- During the planning, operational and rehabilitation phases all recommendations made and concerns raised in this document should be taken into consideration.
- It is strongly advised that an ecological specialist is appointed during the operational phase to monitor impacts and related mitigation measures regarding protected species as well as sensitive habitats from time to time.
- From a biodiversity point of view, there are no major objections against the proposed prospecting activities, as long as mitigation measures and recommendations are seriously considered and implemented, and as long as due diligence is practiced in terms of environmental legislation and other relevant policies and guidelines.

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10 APPENDIX A: lists of fauna species possibly occurring in the study area.

Table 10: Mammals.

Order	Family	Common name	Species Name	Status or commonality
Eulipotyphla	Erinaceidae	Southern African hedgehog	*Atelerix frontalis*	Near-threatened
	Soricidae	Forest shrew	*Myosorex varius*	Least concern
		Maquassie musk shrew	*Crocidura maquassiensis*	Vulnerable
		Tiny musk shrew	*Crocidura fuscomurina*	Least concern
		Reddish-grey musk shrew	*Crocidura cyanea*	Least concern
		Lesser dwarf shrew	*Suncus varilla*	Least concern
Chiroptera	Pteropodidae	Straw-coloured fruit bat	*Eidolon helvum*	Least concern
	Rhinolophidae	Geoffrey's horseshoe bat	*Rhinolophus clivosus*	Least concern
	Miniopteridae	Natal long-fingered bat	*Miniopteris natalensis*	Least concern
	Vespertilionidae	Cape serotine bat	*Neoromicia capensis*	Least concern
	Molossidae	Egyptian free-tailed bat	*Tadarida aegyptiaca*	Least concern
Lagomorpha	Leporidae	Cape hare	*Lepus capensis*	Least concern
		Scrub hare	*Lepus saxatilis*	Least concern
		Savanna hare	*Lepus microtis*	Least concern
		Smith's red rock rabbit	*Pronolagus rupestris*	Least concern
Rodentia	Sciuridae	Southern African ground squirrel	*Xerus inauris*	Least concern
	Myoxidae	Woodland dormouse	*Graphiurus murinus*	Least concern

Order	Family	Common name	Species Name	Status or commonality
	Pedetidae	Southern African springhare	*Pedetes capensis*	Least concern
	Bathyergidae	Common mole-rat	*Cryptomys hottentotus*	Least concern
	Hystricidae	Cape porcupine	*Hystrix africaeaustralis*	Least concern
	Muridae	White-tailed mouse	*Mystromys albicaudatis*	Vulnerable
		Kreb's fat mouse	*Steatomys krebsii*	Least concern
		Grey climbing mouse	*Dendromus melanotis*	Least concern
		Large-eared mouse	*Malacothrix typica*	Least concern
		Cape short-tailed gerbil	*Desmodillus auricularis*	Least concern
		Highveld gerbil	*Gerbilliscus brantsii*	Least concern
		Namaqua rock mouse	*Micaelamys namaquensis*	Least concern
		Tete veld rat	*Aethomys ineptus*	Least concern
		Mesic four-striped mouse	*Rhabdomys* spp.	Least concern
		Pygmy mouse	*Mus minutoides*	Least concern
		Multi-mammate mouse	*Mastomys* spp.	Least concern
		Angoni vlei rat	*Otomys angoniensis*	Least concern
		Southern African vlei rat	*Otomys irroratus*	Least concern
Carnivora	Canidae	Cape fox	*Vulpes chama*	Least concern
		Bat-eared fox	*Otocyon megalotis*	Least concern

Order	Family	Common name	Species Name	Status or commonality
		Black-backed jackal	*Canis mesomelas*	Least concern
	Mustelidae	Cape clawless otter	*Aonyx capensis*	Near-threatened
		Honey badger	*Mellivora capensis*	Least concern
		African striped weasel	*Poecilogale albinucha*	Near-threatened
		Striped polecat	*Ictonyx striatus*	Least concern
	Herpestidae	Cape grey mongoose	*Galerella pulverulenta*	Least concern
		Slender mongoose	*Galerella sanguinea*	Least concern
		Water mongoose	*Atilax paludinosus*	Least concern
		Yellow mongoose	*Cynictis penicillata*	Least concern
	Viverridae	Small-spotted genet	*Genetta genetta*	Least concern
	Hyaenidae	Aardwolf	*Proteles cristatus*	Least concern
	Felidae	African wild cat	*Felis silvestris cafra*	Least concern
		Black-footed cat	*Felis nigripes*	Vulnerable
Tubulidentata	Orycteropodidae	Aardvark	*Orycteropus afer*	Least concern
Hyracoidea	Procaviidae	Rock hyrax	*Procavia capensis*	Least concern
Cetartiodactyla	Bovidae	Steenbok	*Raphicerus campestris*	Least concern
		Common duiker	*Sylvicapra grimmia*	Least concern

Table 11: Reptiles.

Order	Family	Common name	Species Name	Status or commonality
Testudines	Pelomedusidae	Marsh terrapin	*Pelomedusa subrufa*	Least concern
Squamata	Gekkonidae	Cape gecko	*Pachydactylus capensis*	Least concern
		Marico gecko	*Pachydactylus mariquensis*	Least concern
	Laceritdae	Holub's sandveld lizard	*Nucras holubi*	Least concern
		Spotted sandveld lizard	*Nucras intertexta*	Least concern
		Burchell's sand lizard	*Pedioplanis burchelli*	Least concern
		Spotted sand lizard	*Pedioplanis lineoocellata lineoocellata*	Least concern
	Cordylidae	Giant girdled lizard	*Smaug giganteus*	Vulnerable
	Gerrhosauridae	Yellow-throated plated lizard	*Gerrhosaurus flavigularis*	Least concern
	Scincidae	Thin-tailed legless skink	*Acontias gracilicauda*	Least concern
		Wahlberg's snake-eyed skink	*Afroablepharus wahlbergii*	Least concern
		Cape skink	*Trachylepis capensis*	Least concern
		Speckled rock skink	*Trachylepis punctatissima*	Least concern
		Variable skink	*Trachylepis varia*	Least concern
	Agamidae	Eastern ground agama	*Agama aculeata distanti*	Least concern
		Southern rock agama	*Agama atra*	Least concern
	Typhlopidae	Delalande's beaked blind snake	*Rhinotyphlops lalandei*	Least concern
	Leptotyphlopidae	Peter's thread snake	*Leptotyphlops scutifrons*	Least concern
	Viperidae	Puff adder	*Bitis arietans arietans*	Least concern
	Lamprophiidae	Black-headed centipede eater	*Aparallactus capensis*	Least concern
		Striped harlequin snake	*Homoroselaps dorsalis*	Near-threatened
		Spotted harlequin snake	*Homoroselaps lacteus*	Least concern
		Common house snake	*Boaedon capensis*	Least concern
		Aurora snake	*Lamprophis aurora*	Least concern
		Brown water snake	*Lycodonomorphus rufulus*	Least concern
		Cape wolf snake	*Lycophidion capense capense*	Least concern

Order	Family	Common name	Species Name	Status or commonality
		Cross-marked grass snake	*Psammophis crucifer*	Least concern
		Fork-marked sand snake	*Psammophis trinasalis*	Least concern
		Spotted grass snake	*Psammophylax rhombeatus rhombeatus*	Least concern
		Sundevall's shovel snout	*Prosymna sundevallii*	Least concern
		Mole snake	*Pseudaspis cana*	Least concern
	Elapidae	Sundevall's garter snake	*Elapsoidea sundevallii*	Least concern
		Rinkhals	*Hemachatus haemachatus*	Least concern
	Colubridae	Red-lipped snake	*Crotaphopeltis hotamboeia*	Least concern
		Rhombic egg-eater	*Dasypeltis scabra*	Least concern

Table 12: Frogs.

Order	Family	Common name	Species Name	Status or commonality
Anura	Bufonidae	Guttural toad	*Amietophrynus gutturalis*	Not threatened
		Raucous toad	*Amietophrynus rangeri*	Not threatened
		Southern pygmy toad	*Poyntonophrynus vertebralis*	Not threatened
		Karoo toad	*Vandijkophrynus gariepensis*	Not threatened
	Hyperoliidae	Bubbling kassina	*Kassina senegalensis*	Not threatened
		Rattling frog	*Semnodactylus wealii*	Not threatened
	Phrynobatrachidae	Snoring puddle frog	*Phrynobatrachus natalensis*	Not threatened
	Pyxicephalidae	Boettger's caco	*Cacosternum boettgeri*	Not threatened
		Common river frog	*Amietia quecketti*	Not threatened
		Cape river frog	*Amietia fuscigula*	Not threatened
		Giant bullfrog	*Pyxicephalus adspersus*	Near-threatened
		Tremolo sand frog	*Tomopterna cryptotis*	Not threatened
		Natal sand frog	*Tomopterna natalensis*	Not threatened
		Tandy's sand frog	*Tomopterna tandyi*	Not threatened

Table 13: Birds.

Order	Family	Common name	Species Name	Status or commonality
Galliformes	Phasianidae	Orange river francolin	*Scleroptila levaillantoides*	Common
		Swainson's spurfowl	*Pternistis swainsonii*	Common
	Numididae	Helmeted guineafowl	*Numida meleagris*	Common
Anseriformes	Anatidae	Hottentot teal	*Anas hottentota*	Common
		Egyptian goose	*Alopochen aegyptiaca*	Common
		Spur-winged goose	*Plectropterus gambensis*	Common
Piciformes	Picidae	Red-throated wryneck	*Jynx ruficollis*	Common
	Lybiidae	Black-collared barbet	*Lybius torquatus*	Common
		Acacia pied barbet	*Tricholaema leucomelas*	Common
Bucerotiformes	Upupidae	African hoopoe	*Upupa africana*	Common
	Rhinopomastidae	Common scimitarbill	*Rhinopomastus cyanomelas*	Common
Coraciiformes	Dacelonidae	Brown-hooded kingfisher	*Halcyon albiventris*	Common
Coliiformes	Coliidae	White-backed mousebird	*Colius colius*	Common
		Red-faced mousebird	*Urocolius indicus*	Common
Apodiformes	Apodidae	Little swift	*Apus affinis*	Common
Strigiformes	Tytonidae	Barn owl	*Tyto alba*	Common
	Strigidae	Southern white-faced scops-owl	*Ptilopsis granti*	Common
		Spotted eagle-owl	*Bubo africanus*	Common
Columbiformes	Columbidae	Speckled pigeon	*Columba guinea*	Common
		Laughing dove	*Streptopelia senegalensis*	Common
		Cape turtle dove	*Streptopelia capicola*	Common
		Red-eyed dove	*Streptopelia semitorquata*	Common
		Rock dove	*Columba livia*	Common
		Namaqua dove	*Oena capensis*	Common
Otidiformes	Otididae	Northern black korhaan	*Afrotis afraoides*	Common
		Blue korhaan	*Eupodotis caerulescens*	Near-threatened
Gruiformes	Gruidae	Blue crane	*Anthropoides paradiseus*	Vulnerable
Charadriiformes	Burhinidae	Spotted thick-knee	*Burhinus capensis*	Common
	Charadriidae	Blacksmith lapwing	*Vanellus armatus*	Common
		Crowned lapwing	*Vanellus coronatus*	Common
	Glareolidae	Double-banded courser	*Rhinoptilus africanus*	Common

Order	Family	Common name	Species Name	Status or commonality
		Temminck's courser	*Cursorius temminckii*	Common
Accipitriformes	Accipitridae	Black-shouldered kite	*Elanus caeruleus*	Common
		Southern pale chanting goshawk	*Melierax canorus*	Common
	Sagittariidae	Secretarybird	*Sagittarius serpentarius*	Near-threatened
Falconiformes	Falconidae	Rock kestrel	*Falco rupicolis*	Common
		Greater kestrel	*Falco rupicoilodes*	Common
		Lanner falcon	*Falco biarmicus*	Near-threatened
Suliformes	Anhingidae	African darter	*Anhinga rufa*	Common
Pelecaniformes	Ardeidae	Great egret	*Egretta alba*	Uncommon
		Cattle egret	*Bubulcus ibis*	Common
		Black-headed heron	*Ardea melanocephala*	Common
	Threskiornithidae	Hadeda ibis	*Bostrychia hagedash*	Common
		African sacred ibis	*Threskiornis aethiopicus*	Common
Passeriformes	Malaconotinae	Bokmakierie	*Telophorus zeylonus*	Common
	Laniidae	Common fiscal	*Lanius collaris*	Common
	Paridae	Ashy tit	*Parus cinerascens*	Common
	Hirundinidae	Brown-throated martin	*Riparia paludicola*	Common
	Pycnonotidae	African red-eyed bulbul	*Pycnonotus nigricans*	Common
	Sylviidae	Chestnut-vented tit-babbler	*Parisoma subcaeruleum*	Common
	Cisticolidae	Rattling cisticola	*Cisticola chiniana*	Common
		Levaillant's cisticola	*Cisticola tinniens*	Common
		Cloud cisticola	*Cisticola textrix*	Common
		Zitting cisticola	*Cisticola juncidis*	Common
		Desert cisticola	*Cisticola aridulus*	Common
		Wing-snapping cisticola	*Cisticola ayresii*	Common
		Black-chested prinia	*Prinia flavicans*	Common
	Alaudidae	Melodious lark	*Mirafra cheniana*	Near-threatened
		Rufous-naped lark	*Mirafra africana*	Common
		Spike-heeled lark	*Chersomanes albofasciata*	Common
		Chestnut-backed sparrowlark	*Eremopterix leucotis*	Common
		Grey-backed sparrowlark	*Eremopterix verticalis*	Common
		Red-capped lark	*Calandrella cinereal*	Common
		Pink-billed lark	*Spizocorys conirostris*	Common
	Muscicapidae	Kalahari scrub-	*Cercotrichas*	Common

Order	Family	Common name	Species Name	Status or commonality
		robin	*paena*	
		African stonechat	*Saxicola torquatus*	Common
		Familiar chat	*Cercomela familiaris*	Common
		Capped wheateater	*Oenanthe pileata*	Common
	Sturnidae	Pied starling	*Spreo bicolor*	Common
	Ploceidae	Scaly-feathered finch	*Sporopipes squamifrons*	Common
		Cape weaver	*Ploceus capensis*	Common
		Southern red bishop	*Euplectes orix*	Common
		Long-tailed widowbird	*Euplectes progne*	Common
		Red-collared widowbird	*Euplectes ardens*	Common
	Estrildidae	Common waxbill	*Estrilda astrild*	Common
	Viduidae	Village indigobird	*Vidua chalybeata*	Common
	Motacillinae	Cape wagtail	*Motacilla capensis*	Common
		African pipit	*Anthus cinnamomeus*	Common
	Fringillidae	Black-throated canary	*Crithagra atrogularis*	Common

Table 14: Butterflies.

Order	Family	Common name	Species Name	Status or commonality
Lepidoptera	Nymphalidae	African monarch	*Danaus chrysippus aegyptius*	Common
		Evening brown	*Melanitis leda helena*	Common
		False silver-bottom brown	*Pseudonympha magoides*	Common
		Spotted-eye brown	*Paternympha narycia*	Common
		African ringlet	*Ypthima asterope*	Common
		Wandering donkey acraea	*Acraea neobule neobule*	Common
		Marsh acraea	*Hyalites rahira rahira*	Common
		Spotted joker	*Byblia ilithyia*	Common
		Yellow pansy	*Junonia hierta cebrene*	Common
		Eyed pansy	*Junonia orithya madagascariensis*	Uncommon
		Painted lady	*Vanessa cardui*	Common
	Lycaenidae	Basuto skolly	*Thestor basutus*	Common
		Brown playboy	*Deudorix antalus*	Common
		Silvery bar	*Cigaritis phanes*	Common
		Roodepoort	*Aloeides dentatis*	Scarce

Order	Family	Common name	Species Name	Status or commonality
		copper		
		Aranda copper	*Aloeides aranda*	Common
		Dull copper	*Aloeides pieris*	Common
		Trimen's copper	*Aloeides trimeni*	Uncommon
		Molomo copper	*Aloeides molomo*	Common
		Dusky copper	*Aloeides taikosama*	Common
		Silver-spotted grey	*Crudaria leroma*	Common
		Eastern sorrel copper	*Lycaena clarki*	Common
		Black-striped hairtail	*Anthene amarah amarah*	Common
		Geranium bronze	*Cacyreus marshalli*	Common
		Common blue	*Leptotes pirithous pirithous*	Common
		Short-toothed blue	*Leptotes brevidentatus*	Common
		Babault's blue	*Leptotes babaulti*	Common
		Long-tailed blue	*Lampides boeticus*	Common
		Salvia blue	*Harpendyreus notoba*	Common
		Ketsi blue	*Lepidochrysops ketsi*	Uncommon
		Free State blue	*Lepidochrysops letsea*	Uncommon
		Koppie blue	*Lepidochrysops ortygia*	Common
		Patrician blue	*Lepidochrysops patricia*	Common
		Common meadow blue	*Cupidopsis cissus cissus*	Common
		Rayed blue	*Actizera lucida*	Common
		Sooty blue	*Zizeeria knysna*	Common
		Dwarf blue	*Oraidium barberae*	Common
		Velvet-spotted blue	*Azanus ubaldus*	Common
		Topaz-spotted blue	*Azanus jesous jesous*	Common
		Thorn-tree blue	*Azanus moriqua*	Common
		Grass jewel blue	*Chilades trochylus*	Common
		Gaika blue	*Zizula hylax*	Common
	Pieridae	Zebra white	*Pinacopteryx eriphia eriphia*	Common
		Common orange tip	*Colotis evenina evenina*	Common
		Banded gold tip	*Colotis eris eris*	Common
		Lemon traveller	*Colotis subfasciatus subfasciatus*	Common
		Brown-veined white	*Belenois aurota aurota*	Common

Order	Family	Common name	Species Name	Status or commonality
		Meadow white	*Pontia helice helice*	Common
		Common dotted border	*Mylothris agathina agathina*	Common
		African clouded yellow	*Colias electo electo*	Common
		African migrant	*Catopsilia florella*	Common
		Broad-bordered grass yellow	*Eurema brigitta brigitta*	Common
	Papilionidae	Citrus swallowtail	*Papilio demodocus demodocus*	Common
	Hesperiidae	Two-pip policeman	*Coeliades pisistratus*	Common
		Small marbled elf	*Eretis umbra umbra*	Common
		Grassveld sandman	*Spialia agylia*	Uncommon
		Mafa sandman	*Spialia mafa mafa*	Common
		Common sandman	*Spialia deomus ferax*	Common
		Mountain sandman	*Spialia spio*	Common
		Green-marbled sandman	*Gomalia elma elma*	Uncommon
		Grassveld sylph	*Metisella malgacha*	Uncommon
		White-banded swift	*Pelopidas thrax inconspicua*	Common
		Dark hottentot skipper	*Gegenes pumilio gambica*	Common

Table 15: Dragonflies and damselflies.

Order	Family	Common name	Species Name	Status or commonality
Odonata	Lestidae	Highland spreadwing	*Lestes plagiatus*	Common
		Pallid spreadwing	*Lestes pallidus*	Common
	Platycnemididae	Common threadtail	*Elattoneura glauca*	Common
	Coenagrionidae	Slate sprite	*Pseudagrion salisburyense*	Common
		Mountain sprite	*Pseudagrion draconis*	Common
		Yellow-faced sprite	*Pseudagrion citricola*	Common
		Masai sprite	*Pseudagrion massaicum*	Common
		Tropical bluetail	*Ischnura senegalensis*	Common
		Swamp bluet	*Africallagma glaucum*	Common
		Sapphire bluet	*Africallagma sapphirinum*	Common

Order	Family	Common name	Species Name	Status or commonality
		Round-winged bluet	*Proischnura rotundipennis*	Scarce
		Pinhey's wisp	*Agriocnemis pinheyi*	Common
	Aeshnidae	Blue emperor	*Anax imperator*	Common
		Vagrant emperor	*Anax ephippiger*	Common
		Friendly hawker	*Zosteraeschna miniscula*	Common
		Stream hawker	*Pinheyschna subpupillata*	Common
	Gomphidae	Common thorntail	*Ceratogomphus pictus*	Common
		Common hooktail	*Paragomphus genei*	Common
	Macromiidae	Darting cruiser	*Phyllomacromia picta*	Common
	Libellulidae	Little skimmer	*Orthetrum abbotti*	Common
		Two-striped skimmer	*Orthetrum caffrum*	Common
		Epaulet skimmer	*Orthetrum chrysostigma*	Common
		Julia skimmer	*Orthetrum julia falsum*	Common
		Long skimmer	*Orthetrum trinacria*	Common
		Eastern blacktail	*Nesciothemis farinosa*	Common
		Yellow-veined widow	*Palpopleura jucunda*	Common
		Black-percher	*Diplacodes lefebvrii*	Common
		Broad scarlet	*Crocothemis erythraea*	Common
		Little scarlet	*Crocothemis sanguinolenta*	Common
		Orange-winged dropwing	*Trithemis kirbyi*	Common
		Nomad	*Sympetrum fonscolombii*	Common
		Red-veined dropwing	*Trithemis arteriosa*	Common
		Jaunty dropwing	*Trithemis stictica*	Common
		Navy dropwing	*Trithemis furva*	Common
		Wandering glider	*Pantala flavescens*	Common

Table 16: Spiders.

Order	Family	Common name	Species Name	Status or commonality
Araneae	Agelenidae	Funnel-web spider	*Benoitia ocellata*	Common
	Ammoxenidae	Termite feeding spider	*Ammoxenus amphalodes*	Common
	Araneidae	Garbage-line spider	*Cyclosa insulana*	Common
		Hedgehog spider	*Pycnacantha tribulus*	Common
	Atypidae	Purse-web spider	*Calommata meridionalis*	Scarce
	Corinnidae	Dark sac spider	*Afroceto martini*	Common
		Dark sac spider	*Fuchibotulus kigelia*	Common
		Dark sac spider	*Poachelas striatus*	Common
		Dark sac spider	*Thysanina absolva*	Scarce
	Ctenizidae	Cork-lid trapdoor spider	*Stasimopus oculatus*	Common
	Cyrtaucheniidae	African wafer-lid trapdoor spider	*Ancylotrypa nigriceps*	Scarce
	Eresidae	Ground velvet spider	*Dresserus kannemeyeri*	Scarce
	Gnaphosidae	Flat-bellied ground spider	*Asemesthes purcelli*	Common
		Flat-bellied ground spider	*Drassodes bechuanicus*	Common
		Flat-bellied ground spider	*Drassodes splendens*	Common
		Flat-bellied ground spider	*Drassodes stationis*	Common
		Flat-bellied ground spider	*Leptodrassex* spp.	Scarce
		Flat-bellied ground spider	*Setaphis arcus*	Common
		Flat-bellied ground spider	*Xerophaeus appendiculatus*	Common
		Flat-bellied ground spider	*Xerophaeus aridus*	Common
		Flat-bellied ground spider	*Xerophaeus rostratus*	Scarce
		Flat-bellied ground spider	*Zelotes frenchi*	Common
		Flat-bellied ground spider	*Zelotes reduncus*	Common
		Flat-bellied ground spider	*Zelotes sclateri*	Common
	Hersiliidae	Long-spinnered desert spider	*Tyrotama australis*	Common
	Idiopidae	Shield-bum trapdoor spider	*Galeosoma coronatum*	Scarce
		Spurred trapdoor spider	*Idiops fryi*	Scarce
	Lycosidae	Bushy-legged	*Evippomma*	Common

Order	Family	Common name	Species Name	Status or commonality
		wolf spider	*squamulatum*	
		Long-legged wolf spider	*Pardosa crassipalpis*	Common
		Wolf spider	*Proevippa albiventris*	Common
	Miturgidae	Long-legged sac spider	*Cheiramiona florisbadensis*	Common
	Palpimanidae	Palp-footed spider	*Palpimanus transvaalicus*	Common
	Philodromidae	Small running spider	*Philodromus browningi*	Common
	Pholcidae	Daddy-long-legs spider	*Quamtana lotzi*	Scarce
		Daddy-long-legs spider	*Smeringopus natalensis*	Common
	Phyxelididae	Hackled-meshweb weaver	*Vidole sothoana*	Common
	Salticidae	Jumping spider	*Cyrba nigrimana*	Common
		Jumping spider	*Evarcha flagellaris*	Scarce
		Jumping spider	*Evarcha vittula*	Scarce
		Jumping spider	*Heliophanus nanus*	Scarce
		Jumping spider	*Heliophanus pistaciae*	Common
		Jumping spider	*Heliophanus proszynski*	Scarce
		Jumping spider	*Heliophanus termitophagus*	Scarce
		Jumping spider	*Heliophanus transvaalicus*	Scarce
		Jumping spider	*Menemerus transvaalicus*	Common
		Jumping spider	*Nigorella hirsuta*	Common
		Jumping spider	*Pellenes bulawayoensis*	Common
		Jumping spider	*Phlegra karoo*	Common
		Jumping spider	*Pellenes tharinae*	Common
		Jumping spider	*Pignus simoni*	Common
		Jumping spider	*Pseudicius gracilis*	Scarce
	Sparassidae	Large huntsman spider	*Olios correvoni*	Common
	Theraphosidae	Baboon spider	*Harpactira hamiltoni*	Common
	Theridiidae	Button spider	*Latrodectus rhodesiensis*	Common
	Thomisidae	Crab spider	*Monaeses austrinus*	Common
	Zodariidae	Igloo-nest spider	*Diores femoralis*	Scarce
		Igloo-nest spider	*Diores poweri*	Common

Table 17: Scorpions.

Order	Family	Common name	Species Name	Status or commonality
Scorpiones	Buthidae	Highveld lesser-thicktail	*Uroplectes triangulifer*	Status unknown

11 APPENDIX B: lists of flora families, genera and species recorded in the study area.

Abbreviations used in Tables 19 – 25 of Appendix B are declared as follows:

Under the column SPECIES STATUS:

D	Declining (Raimondo *et al*, 2009)
P(FS)	Protected in Free State Province (FSNCO, 1969)
E	Exotic – no formal invasive status (ruderal and agrestal weeds)
C1	Exotic – Declared weed category 1 (CARA, 1983)
C2	Exotic – Declared invader category 2 (CARA, 1983)
C3	Exotic – Declared invader category 3 (CARA, 1983)
Cx1, Cx2, Cx3	Exotic – Proposed weed or invader (CARA, 1983)
C (T)	Exotic – Potential Transformer (CARA, 1983)
N1b	Exotic – Category 1b (NEMBA, 2014)
N2	Exotic – Category 2 (NEMBA, 2014)
N3	Exotic – Category 3 (NEMBA, 2014)

Under the column SOCIAL USE:

F – Food/nourishment

M – Medicinal

C – Cultural

NOTE: All exotic taxa in the flora species lists are preceded by an asterisk (*).

Table 18: Plant Families and Genera recorded in the study area

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
PTERIDOPHYTA							
MARSILEACEAE	1	1	*Marsilea*	1		1	
Total:	**1**	**1**		**1**	**0**	**1**	**0**
GYMNOSPERMAE							
CUPRESSACEAE	1	2	**Cupressus*	1			1
			**Juniperus*	1			1
PINACEAE	1	1	**Pinus*	1			1
Total:	**2**	**3**		**3**	**0**	**0**	**3**
ANGIOSPERMAE							
MONOCOTYLEDONAE							
AGAVACEAE	1	2	**Agave*	1			1
			**Yucca*	1			1
ALLIACEAE	1	1	*Tulbaghia*	1	1		
AMARYLLIDACEAE	1	2	*Ammocharis*	1		1	
			Boophone	1	1		
ANTHERICACEAE	1	1	*Chlorophytum*	1	1		
ASPARAGACEAE	1	1	*Asparagus*	3	2	2	3
ASPHODELACEAE	1	1	*Bulbine*	1	1		1
COMMELINACEAE	1	1	*Commelina*	3	2	1	1
CYPERACEAE	1	6	*Carex*	1		1	
			Cyperus	8	2	7	2
			Eleocharis	1		1	
			Kyllinga	1		1	
			Pycreus	1		1	
			Schoenoplectus	1		1	1
HYACINTHACEAE	1	4	*Dipcadi*	1	1	1	
			Eucomis	1	1	1	
			Ledebouria	2	2		
			Schizocarphus	1	1		
HYDROCHARITACEAE	1	1	*Lagarosiphon*	1		1	
HYPOXIDACEAE	1	1	*Hypoxis*	1	1		
IRIDACEAE	1	1	*Moraea*	1		1	
JUNCACEAE	1	1	*Juncus*	2		2	
LEMNACEAE	1	1	*Lemna*	1		1	
POACEAE	1	28	*Agrostis*	1		1	

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
			Andropogon	1	1	1	1
			Aristida	2	1		2
			**Bromus*	1		1	1
			Chloris	1	1		1
			Cymbopogon	2	2		2
			Cynodon	3	2	2	2
			Digitaria	2	1	1	2
			Echinochloa	1		1	
			Elionurus	1	1		
			Eragrostis	12	10	4	8
			Hemarthria	1		1	
			Heteropogon	1	1		1
			Hyparrhenia	2	1		2
			Leersia	1		1	
			Leptochloa	1		1	
			Melinis	1	1		1
			Panicum	4	2	3	3
			**Paspalum*	4	1	4	2
			Phragmites	1		1	
			Setaria	6	3	5	4
			**Sorghum*	1			1
			Sporobolus	2	1	2	1
			Themeda	1	1		1
			Tragus	2	2	1	2
			Triraphis	1	1		
			Urochloa	1			1
			**Zea*	1			1
POTAMOGETONACEAE	1	1	*Potamogeton*	1		1	
TYPHACEAE	1	1	*Typha*	1		1	
Total:	**17**	**54**		**97**	**49**	**55**	**49**
DICOTYLEDONAE							
ACANTHACEAE	1	1	*Crabbea*	1	1	1	
AMARANTHACEAE	1	5	**Achyranthes*	1		1	1
			**Alternanthera*	1	1	1	1
			**Amaranthus*	1		1	1
			**Gomphrena*	1		1	1
			**Guilleminea*	1	1		1

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
ANACARDIACEAE	1	2	**Schinus*	1			1
			Searsia	3	1	2	3
APIACEAE	1	3	**Ciclospermum*	1	1	1	1
			Deverra	1	1		
			Pimpinella	1		1	1
APOCYNACEAE	1	2	*Asclepias*	1	1		
			Gomphocarpus	1	1	1	1
ASTERACEAE	1	29	**Aster*	1		1	
			Berkheya	4	4	2	1
			**Bidens*	1	1	1	1
			Chrysocoma	1	1		1
			**Cirsium*	1	1	1	1
			Conyza	2	2	2	2
			**Cosmos*	1			1
			Dimorphotheca	1			1
			Felicia	1	1		1
			Gazania	1	1		
			Geigeria	1	1		
			**Helianthus*	1			1
			Helichrysum	5	4	2	1
			**Hypochaeris*	1			1
			Lactuca	2	1		2
			Nidorella	2	2	1	
			Pentzia	1	1		1
			Platycarpha	1		1	
			Pseudognaphalium	1		1	1
			**Schkuhria*	1			1
			Senecio	4	2	3	2
			Seriphium	1	1		1
			Sonchus	3	2	2	2
			**Tagetes*	1	1	1	1
			**Taraxacum*	1		1	1
			Tolpis	1	1		
			**Tragopogon*	1	1		
			Vernonia	1			1
			**Xanthium*	2		2	2
BRASSICACEAE	1	2	**Lepidium*	1	1		1

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
			Sisymbrium	2	1	2	1
CACTACEAE	1	3	**Cereus*	1			1
			**Echinopsis*	1			1
			**Opuntia*	3	1		3
CAMPANULACEAE	1	1	*Wahlenbergia*	2	2	1	
CASUARINACEAE	1	1	**Casuarina*	1			1
CELASTRACEAE	1	1	*Gymnosporia*	1		1	
CHENOPODIACEAE	1	3	*Atriplex*	1	1		1
			**Chenopodium*	3	1		3
			**Salsola*	1			1
CONVOLVULACEAE	1	5	*Convolvulus*	1	1	1	1
			**Cuscuta*	1		1	1
			Falckia	1	1		1
			Ipomoea	1		1	1
			Xenostegia	1			1
CUCURBITACEAE	1	1	*Citrullus*	1			1
DIPSACACEAE	1	1	*Scabiosa*	1	1		
EBENACEAE	1	1	*Diospyros*	1		1	
EUPHORBIACEAE	1	1	*Euphorbia*	1	1		1
FABACEAE	1	12	**Acacia*	1			1
			Chamaecrista	1	1		1
			Crotalaria	1			1
			Elephantorrhiza	1	1		1
			**Gleditsia*	1		1	1
			**Glycine*	1			1
			Indigofera	2	1		1
			**Medicago*	1	1	1	1
			**Prosopis*	1	1	1	1
			Rhynchosia	1	1		
			Tephrosia	1	1		
			Vachellia	1	1	1	1
GERANIACEAE	1	1	*Pelargonium*	1	1		
ILLECEBRACEAE	1	1	*Pollichia*	1	1		1
LAMIACEAE	1	2	*Salvia*	1	1	1	1
			Stachys	1	1		1
LYTHRACEAE	1	1	**Punica*	1			1
MALVACEAE	1	2	*Hibiscus*	3	2	2	3

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
			Sida	1			1
MELIACEAE	1	1	**Melia*	1			1
MESEMBRYANTHEMACEAE	1	1	*Ruschia*	1	1		1
MYRTACEAE	1	1	**Eucalyptus*	3		1	3
ONAGRACEAE	1	1	**Oenothera*	2		2	2
OROBANCHACEAE	1	1	*Cycnium*	1		1	
OXALIDACEAE	1	1	**Oxalis*	1	1	1	1
PAPAVERACEAE	1	2	**Argemone*	1			1
			Papaver	1			1
PLANTAGINACEAE	1	1	*Plantago*	1		1	1
POLYGONACEAE	1	2	*Persicaria*	2		2	
			**Rumex*	1		1	1
PORTULACACEAE	1	1	*Portulaca*	1			1
PROTEACEAE	1	1	**Grevillea*	1			1
RHAMNACEAE	1	1	*Ziziphus*	2	1	1	1
ROSACEAE	1	1	**Prunus*	1			1
RUBIACEAE	1	1	*Rubia*	1	1	1	1
SALICACEAE	1	2	**Populus*	2		1	1
			**Salix*	1		1	
SAPINDACEAE	1	1	**Acer*	1		1	1
SCROPHULARIACEAE	1	4	*Jamesbrittenia*	1	1		
			Mimulus	1		1	
			Nemesia	1	1		1
			Selago	1	1		
SOLANACEAE	1	5	**Cestrum*	1		1	1
			**Datura*	2	2		1
			**Nicandra*	1		1	1
			Solanum	4	1	2	4
			Lycium	1		1	1
STERCULIACEAE	1	1	*Hermannia*	2	1		1
TAMARICACEAE	1	1	**Tamarix*	1		1	1
TILIACEAE	1	1	*Corchorus*	1			1
VAHLIACEAE	1	1	*Vahlia*	1	1	1	
VERBENACEAE	1	1	**Verbena*	3	3	3	3
ZYGOPHYLLACEAE	1	1	*Tribulus*	2	1		2
Total:	**47**	**115**		**156**	**77**	**71**	**113**

FAMILY	No. of families	No. of genera per family	GENUS	No. of species per genus	No. of species per VU		
					1	2	3
TOTAL:	67	173		257	126	127	165

Table 19: Fern Species – PTERIDOPHYTA.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Marsilea capensis A. Braun	MARSILEACEAE	Herb, hydrophyte	Waterklaver	Water Clover				X	

Table 20: Woody Species – GYMNOSPERMAE.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		INVASIVE STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
**Cupressus* species	CUPRESSACEAE	Tree	*Tuinsipres	*Garden Cypress	E				X
**Juniperus* species	CUPRESSACEAE	Tree	*Tuinseder	*Garden Cedar	E				X
**Pinus* species	PINACEAE	Tree	*Den	*Slash Pine	C2 / N2	C			X

Table 21: Woody Species – ANGIOSPERMAE – Monocotyledonae.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		INVASIVE STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
**Agave americana* L.	AGAVACEAE	Tree	*Garingboom	*American agave	EX2	M/F/C			X
**Yucca* species	AGAVACEAE	Tree / shrub	*Garingplant	*Adam's needle	E	M/C			X

Table 22: Woody Species – ANGIOSPERMAE – Dicotyledonae.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
**Acacia mearnsii* De Wild.	FABACEAE	Tree	*Swartwattel	*Black Wattle	C2 / N2	C			**X**
**Acer negundo* L.	SAPINDACEAE	Tree	*Kaliforniese Esdoring	*Box Elder	Cx3 / N3			**X**	**X**
**Casuarina equisetifolia* L.	CASUARINACEAE	Tree	*Perdestertboom	*Horsetail Tree	C2 (T) / N2				**X**
**Cereus jamacaru* DC.	CACTACEAE	Cactus / Tree	*Nagblom Kaktus	*Queen of the Night Cactus	C1 / N1b	F			**X**
**Cestrum laevigatum* Schltdl.	SOLANACEAE	Shrub / tree	*Chileense Inkbessie	*Chilean Cestrum	C1 / N1b			**X**	**X**
Diospyros lycioides Desf. subsp. *guerkei* (Kuntze) De Winter	EBENACEAE	Tree	Bloubos	Bluebush		M/F/C		**X**	
**Echinopsis spachiana* (Lem.) Friedrich & Rowley	CACTACEAE	Cactus / Tree	*Orrelkaktus	*Torch Cactus	C1 / N1b				**X**
**Eucalyptus camaldulensis* Dehnh.	MYRTACEAE	Tree	*Bloekom	*River red gum	C2 / N1b	M/C		**X**	**X**
**Eucalyptus sideroxylon* A.Cunn. ex Woolls	MYRTACEAE	Tree	*Swartysterbasbloekom	*Black Ironbark / *Red Ironbark	C2	M/C			**X**
**Eucalyptus* species	MYRTACEAE	Tree			E	M/C			**X**
**Gleditsia triacanthos* L.	FABACEAE	Tree	*Soetpeulboom	*Honey Locust	C2 / N1b			**X**	**X**
**Grevillea robusta* A.Cunn. ex R.Br.	PROTEACEAE	Tree	*Australiese Silwereik	*Australian Silky Oak	C3 / N1b	G			**X**
Gymnosporia buxifolia (L.) Szyszyl.	CELASTRACEAE	Tree	Gewone Pendoring	Common Spike-thorn		M/C		**X**	
Lycium cinereum Thunb.	SOLANACEAE	Shrub / Dwarf shrub	Kleinkriedoring / Slangbessie	Small Honey-thorn		C		**X**	**X**
**Melia azedarach* L.	MELIACEAE	Tree	*Maksering	*Seringa	C3 / N3	M			**X**
**Opuntia ficus-indica* (L.) Mill.	CACTACEAE	Cactus / Tree	*Turksvy	*Prickly Pear	C1 / N1b	F	**X**		**X**

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
**Opuntia imbricata* (Haw.) DC.	CACTACEAE	Cactus / shrub	*Kabelturksvy	*Imbricate Prickly Pear	C1 / N1b				**X**
**Opuntia stricta* (Haw.) Haw.	CACTACEAE	Cactus / shrub	*Suurturksvy	*Australian Pest Pear	C1 / N1b				**X**
**Populus deltoides* Bartram ex Marshall subsp. *wislizenii* (S.Watson) Eckenw.	SALICACEAE	Tree	*Vuurhoutjie-populier	*Match Popular / Rio Grande Cottonwood	Cx2 (T)	C		**X**	**X**
**Populus* x *canescens* (Aiton) Sm.	SALICACEAE	Tree	*Vaalpopulier	*Grey Popular	C2 / N2	C		**X**	
**Prosopis glandulosa* Torr.	FABACEAE	Tree	*Prosopis / Suidwesdoring	*Mesquite	C2 / N1b		**X**	**X**	**X**
**Prunus persica* (L.) Batsch	ROSACEAE	Tree	*Perske	*Peach	E	F			**X**
**Punica granatum* L.	LYTHRACEAE	Tree / shrub	*Granaat	*Pomegranate	E	F			**X**
**Salix babylonica* L. var. *babylonica*	SALICACEAE	Tree	*Treurwilger	*Weeping Willow	C2			**X**	
**Schinus molle* L.	ANACARDIACEAE	Tree	*Peperboom	*Pepper Tree	Cx3				**X**
Searsia lancea L.f.	ANACARDIACEAE	Tree	Karee	Karee		C		**X**	**X**
Searsia pyroides Burch. var. *pyroides*	ANACARDIACEAE	Tree	Gewone Taaibos	Common Wild Currant		C	**X**	**X**	**X**
**Tamarix ramosissima* Ledeb.	TAMARICACEAE	Tree	*Pers-tamarisk	*Pink Tamarix	C3 / N1b			**X**	**X**
Vachellia karroo Hayne	FABACEAE	Tree	Soetdoring	Sweet Thorn		M/F/C	**X**	**X**	**X**
Ziziphus mucronata Willd. subsp. *mucronata*	RHAMNACEAE	Tree	Blinkblaar-wag-'n-bietjie	Buffalo-thorn		M/F/C		**X**	**X**
Ziziphus zeyheriana Sond.	RHAMNACEAE	Dwarf shrub	Klein Wag-'n-bietjie	Small Buffalo-thorn			**X**		

Table 23: Graminoids – ANGIOSPERMAE – Monocotyledonae.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Agrostis lachnantha Nees	POACEAE	Grass	Vink-agrostis	Bent Grass				X	
Andropogon appendiculatus Nees	POACEAE	Grass	Rooivleigras	Vlei Bluestem			X	X	X
Aristida adscensionis L.	POACEAE	Grass	Eenjarige steekgras	Annual three-awn					X
Aristida congesta Roem. & Schult. subsp. *congesta*	POACEAE	Grass	Katstertsteekgras	Tassel Three-awn			X		X
**Bromus catharticus* Vahl	POACEAE	Grass	*Reddingsgras	*Rescue Grass	E			X	X
Carex glomerabilis Krecz.	CYPERACEAE	Herb, cyperoid						X	
Chloris virgata Sw.	POACEAE	Grass	Witpluim-chloris	Feather-top chloris			X		X
Cymbopogon caesius (Hook. &Arn.) Stapf	POACEAE	Grass	Breëblaarterpentyn-gras	Broad-leaved Turpentine Grass		C	X		X
Cymbopogon pospischilii (K.Schum.) C.E. Hubb.	POACEAE	Grass	Smalblaarterpentyn-gras	Narrow-leaved Turpentine Grass			X		X
Cynodon dactylon (L.) Pers.	POACEAE	Grass	Kweekgras	Couch Grass			X	X	X
Cynodon hirsutus Stent	POACEAE	Grass	Transvaal-kweek	Red Quick Grass			X		X
Cynodon transvaalensis Burtt Davy	POACEAE	Grass	Transvaal-kweek	Transvaal Quick Grass				X	
Cyperus denudatus L.f.	CYPERACEAE	Herb, cyperoid		Winged Sedge				X	
Cyperus esculentus L.	CYPERACEAE	Herb, cyperoid	Geeluintjie	Yellow Nut Sedge			X	X	X
Cyperus fulgens C.B. Clarke var. *fulgens*	CYPERACEAE	Herb, cyperoid						X	
Cyperus laevigatus L.	CYPERACEAE	Herb, cyperoid						X	
Cyperus longus L.	CYPERACEAE	Herb, cyperoid	Waterbiesie					X	
Cyperus rotundus L.	CYPERACEAE	Herb, cyperoid	Rooi-uintjie	Purple Nutsedge				X	X

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Cyperus rupestris Kunth var. *rupestris*	CYPERACEAE	Herb, cyperoid	Roesbruinbiesie	Russet Rock-sedge			X		
Cyperus squarrosus L.	CYPERACEAE	Herb, cyperoid						X	
Digitaria eriantha Steud.	POACEAE	Grass	Gewone-vingergras	Common Finger Grass			X	X	X
**Digitaria sanguinalis* (L.) Scop.	POACEAE	Grass	*Kruisvingergras	*Crab Finger Grass	E				X
Echinochloa holubii (Stapf) Stapf	POACEAE	Grass	Kalahari Watergras	Kalahari Water Grass				X	
Eleocharis c.f. *dregeana* Steud.	CYPERACEAE	Herb, cyperoid						X	
Elionurus muticus (Spreng.) Kunth	POACEAE	Grass	Koperdraadgras	Wire Grass			X		
Eragrostis chloromelas Steud.	POACEAE	Grass	Smal Krulblaar	Narrow Curly Leaf			X	X	X
Eragrostis curvula (Schrad.) Nees	POACEAE	Grass	Oulandsgras	Weeping Love Grass		F	X		X
Eragrostis gummiflua Nees	POACEAE	Grass	Gomgras	Gum Grass			X		
Eragrostis heteromera Stapf	POACEAE	Grass	Rooikopergras	Bronze Love Grass				X	
Eragrostis lehmanniana Nees *var. lehmanniana*	POACEAE	Grass	Knietjiesgras	Lehmann's Love Grass		C	X		X
Eragrostis micrantha Hack.	POACEAE	Grass	Finessegras	Finesse Grass			X	X	
Eragrostis obtusa Munro ex Ficalho & Hiern	POACEAE	Grass	Douvatgras	Dew Grass			X		X
Eragrostis plana Nees	POACEAE	Grass	Taaipol	Tough Love Grass			X	X	X
Eragrostis racemosa (Thunb.) Steud.	POACEAE	Grass	Smalhartjiesgras	Narrow heart Love Grass			X		
Eragrostis superba Peyr.	POACEAE	Grass	Weeluisgras	Saw-tooth Love Grass			X		X
**Eragrostis tef* (Zucc.) Trotter	POACEAE	Grass	*Tefgras	*Tef	E				X
Eragrostis trichophora Coss. & Durieu	POACEAE	Grass	Harige Pluimgras	Hairy Love Grass			X		X
Eustachys paspaloides (Vahl) Lanza & Mattei	POACEAE	Grass	Bruinhoederspoor	Brown Rhodes Grass			X		

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Hemarthria altissima (Poir.) Stapf. & C.E.Hubb.	POACEAE	Grass	Rooikweek	Swamp Couch Grass				X	
Heteropogon contortus (L.) Roem. & Schult.	POACEAE	Grass	Assegaaigras	Spear Grass			X		X
Hyparrhenia c.f. *filipendula* (Hochst.) Stapf	POACEAE	Grass	Fyntamboekiegras	Fine Thatching Grass					X
Hyparrhenia hirta (L.) Stapf	POACEAE	Grass	Gewone-dekgras	Common Thatching Grass		C	X		X
Juncus effusus L.	JUNCACEAE	Herb, cyperoid	Steekbiesie	Spiny rush				X	
Juncus rigidus Desf.	JUNCACEAE	Herb, cyperoid						X	
Kyllinga erecta Schumach.	CYPERACEAE	Herb, cyperoid						X	
Leersia hexandra Sw.	POACEAE	Grass	Rysgras	Rice Grass				X	
Leptochloa fusca (L.) Kunth	POACEAE	Grass	Kuilgras	Swamp Grass				X	
Melinis repens (Willd.) Zizka subsp. *repens*	POACEAE	Grass	Fluweelgras / Natal Rooipluim	Natal Red Top			X		X
Panicum coloratum L. var. *coloratum*	POACEAE	Grass	Kleinbuffelsgras	Small Buffalo Grass			X		X
Panicum schinzii Hack.	POACEAE	Grass	Soetgras	Sweetgrass				X	X
Panicum species	POACEAE	Grass					X	X	
Panicum volutans J.G.Anderson	POACEAE	Grass	Rolgras	Tumble Weed				X	X
**Paspalum dilatatum* Poir.	POACEAE	Grass	*Gewone Paspalum	*Dallis Grass	E		X	X	X
Paspalum distichum L.	POACEAE	Grass	Waterkweek	Water Couch				X	
**Paspalum notatum* Flüggé	POACEAE	Grass	*Bahiagras	*Bahia Grass	E			X	
**Paspalum urvillei* Steud.	POACEAE	Grass	*Langbeen Paspalum	*Vasey Grass	E			X	X
Phragmites australis (Cav.) Steud.	POACEAE	Reed	Fluitjiesriet	Common Reed				X	

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Pycreus macranthus (Boeck.) C.B.Clarke	CYPERACEAE	Herb, cyperoid						X	
Schoenoplectus corymbosus (Roth. ex Roem. & Schult.) J. Raynal	CYPERACEAE	Herb, cyperoid				C		X	X
Setaria incrassata (Hochst.) Hack.	POACEAE	Grass	Vleimannagras	Vlei Bristle Grass				X	
Setaria nigrirostris (Nees) T.Durant & Schinz	POACEAE	Grass	Swartsaadmannagras	Black-seed Bristle Grass			X	X	
Setaria pumila (Poir.) Roem. & Schult.	POACEAE	Grass	Skadu- / Tuinmannagras	Shade- / Garden Bristle Grass				X	X
Setaria sphacelata (Schumach.) Moss var. *sphacelata*	POACEAE	Grass	Gewone-mannagras	Common Bristle Grass			X	X	X
Setaria sphacelata (Schumach.) Moss var. *torta* (Stapf) Clayton	POACEAE	Grass	Kruipmannagras	Creeping Bristle Grass			X		X
Setaria verticillata (L.) P.Beauv.	POACEAE	Grass	Klitsgras	Bur Bristle Grass				X	X
**Sorghum halepense* (L.) Pers.	POACEAE	Grass/Grain crop	*Johnson-gras	*Johnson Grass	C2 / N2	F			X
Sporobolus c.f. *pyramidalis* P.Beauv.	POACEAE	Grass	Katstert Taaipol	Catstail Dropseed				X	
Sporobolus fimbriatus (Trin.) Nees	POACEAE	Grass	Fynsaadgras	Dropseed Grass			X	X	X
Themeda triandra Forssk.	POACEAE	Grass	Rooigras	Red Grass			X		X
Tragus berteronianus Schult.	POACEAE	Grass	Kousklits	Carrot-seed Grass			X		X
Tragus racemosus (L.) All.	POACEAE	Grass					X	X	X
Triraphis andropogonoides (Steud.) E.Phillips	POACEAE	Grass	Perdegras	Broom Needle Grass			X		
Urochloa panicoides P.Beauv.	POACEAE	Grass	Tuinbeesgras	Garden Urochloa					X
**Zea mays* L.	POACEAE	Grass/Grain crop	*Mielie	*Mielie / Corn	E	F/M			X

Table 24: Herbaceous Shrubs & Forbs (Herbs) – ANGIOSPERMAE – Monocotyledonae.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Ammocharis coranica (Ker-Gawl.) Herb.	AMARYLLIDACEAE	Geophyte	Seeroogblom / Berglelie	Ground Lily	P (FS)	M		X	
Asparagus laricinus Burch.	ASPARAGACEAE	Herbaceous shrub	Bergkatbos	Cluster-leaved Asparagus		M/C	X	X	X
Asparagus setaceus (Kunth) Jessop	ASPARAGACEAE	Herbaceous shrub		Asparagus Fern				X	X
Asparagus suaveolens Burch.	ASPARAGACEAE	Herbaceous shrub	Gewone Katbos / Katdoring	Bushveld Asparagus		M/F/C	X		X
Boophone disticha (L.f.) Herb.	AMARYLLIDACEAE	Herb, geophyte	Kopseerblom / Gifbol	Poison Bulb	D; P (FS)	M/C	X		
Bulbine capitata Poelln.	ASPHODELACEAE	Geophyte, Succulent	Smalblaar Wildekopieva	Narrow-leaved Bulbine			X		
Bulbine narcissifolia Salm-Dyck	ASPHODELACEAE	Geophyte, Succulent	Wildekopieva			M			X
Chlorophytum cooperi (Baker) Nordal	ANTHERICACEAE	Herb					X		
Commelina africana L. var. *africana*	COMMELINACEAE	Herb	Geeleendagsblom	Yellow Commelina		M	X		
Commelina benghalensis L.	COMMELINACEAE	Herb	Blouselblommetjie	Benghal Wandering Jew		M		X	X
Commelina diffusa Burm.f. subsp. *Scandens* (C.B.Clarke) Oberm.	COMMELINACEAE	Herb					X		
Dipcadi viride (L.) Moench	HYACINTHACEAE	Geophyte	Gifbolletjie / Grootslymuintjie	Dainty Green Bells / Green Dipcadi		C/F	X	X	
Eucomis autumnalis (Mill.) Chitt. subsp. *clavata* (Bak.) Reyneke	HYACINTHACEAE	Geophyte	Wildepynappel	Pineapple flower	D; P (FS)	M	X	X	
Hypoxis iridifolia Bak.	HYPOXIDACEAE	Geophyte				M	X		
Lagarosiphon major (Ridl.) Moss ex Wager	HYDROCHARITACEAE	Hydrophyte	Growwe Babergras	Coarse Oxygen Weed				X	
Ledebouria apertiflora (Baker) Jessop	HYACINTHACEAE	Geophyte		Common Squill			X		

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Ledebouria cooperi (Hook.f.) Jessop	HYACINTHACEAE	Geophyte		Cooper's Squill		M	X		
Lemna gibba L.	LEMNACEAE	Hydrophyte	Damslyk	Duckweed				X	
Moraea c.f. *thomsonii* Baker	IRIDACEAE	Geophyte	Bloutulp					X	
Potamogeton thunbergii Cham. & Schltdl.	POTAMOGETONACEAE	Herb, hydrophyte	Breëblaar Fonteinkruid	Broad-leaved Pondweed		M		X	
Schizocarphus nervosus (Burch.) Van der Merwe	HYACINTHACEAE	Geophyte	Sandlelie	Wild Squill	P (FS)	M	X		
Tulbaghia c.f. *acutiloba* Harv.	ALLIACEAE	Geophyte	Wildeknoffel	Wild Garlic		F/C	X		
Typha capensis (Rohrb.) N.E.Br.	TYPHACEAE	Herb, hydrophyte	Papkuil	Bulrush		M/F/C		X	

Table 25: Herbaceous Shrubs & Forbs (Herbs) – ANGIOSPERMAE – Dicotyledonae.

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
**Achyranthes aspera* L. var. *aspera*	AMARANTHACEAE	Herb	*Langklits / Haak-en-steek-klitsbossie	*Burrweed / Chaff Flower	E	M		X	X
**Alternanthera pungens* Kunth	AMARANTHACEAE	Herb	*Kakiedubbeltjie	*Paper Thorns	E		X	X	X
**Alternanthera sessilis* (L.) DC.	AMARANTHACEAE	Herb			E			X	X
**Amaranthus hybridus* L.	AMARANTHACEAE	Herb	*Misbredie	*Pigweed	E	F		X	X
**Argemone ochroleuca* Sweet subsp. *ochroleuca*	PAPAVERACEAE	Herb	*Witblom-bloudissel	*White-flowered Mexican Poppy	C1 / N1b				X
Asclepias eminens (Harv.) Schltr.	APOCYNACEAE	Geophytic herb		Large Turret-flower		M/F	X		
**Aster squamatus* (Spreng.) Hieron.	ASTERACEAE	Herb			E			X	

SPECIES NAME	FAMILY	GROWTH FORM	COMMON NAME		SPECIES STATUS	SOCIAL USE	VU		
			AFRIKAANS	ENGLISH			1	2	3
Atriplex semibaccata R.Br.	CHENOPODIACEAE	Herb	Kruipsoutbos	Creeping Salt Bush			X		X
Berkheya c.f. *carlinopsis* Welw. ex O.Hoffm.	ASTERACEAE	Herb	Bergdisseldoring				X	X	X
Berkheya onopordifolia (DC.) O.Hoffm. ex Burtt Davy var. *onopordifolia*	ASTERACEAE	Herb					X		
Berkheya radula (Harv.) De Wild.	ASTERACEAE	Herb	Boesmansrietjie				X	X	
Berkheya zeyheri (Sond. & Harv.) Oliv. & Hiern subsp. *zeyheri*	ASTERACEAE	Herb					X		
**Bidens bipinnata* L.	ASTERACEAE	Herb	*Spaanse knapsekêrel	*Spanish Blackjack	E	F	X	X	X
Chamaecrista mimosoides (L.) Greene	FABACEAE	Herb	Boesmanstee	Fishbone Cassia			X		X
**Chenopodium album* L.	CHENOPODIACEAE	Herb	*Withondebossie	*White Goosefoot / Fat Hen	E	F			X
**Chenopodium carinatum* R.Br.	CHENOPODIACEAE	Herb	*Groenhondebossie	*Green Goosefoot	E				X
**Chenopodium multifidum* L.	CHENOPODIACEAE	Herb			E		X		X
Chrysocoma ciliata L.	ASTERACEAE	Dwarf shrub	Bitterbos				X		X
**Ciclospermum leptophyllum* (Pers.) Eichler	APIACEAE	Herb	*Wildeseldery	*Wild Celery	E		X	X	X
**Cirsium vulgare* (Savi) Ten.	ASTERACEAE	Herb	*Skotse-dissel	*Scottish Thistle	C1 / N1b		X	X	X
Citrullus lanatus (Thunb.) Matsum. & Nakai	CUCURBITACEAE	Herb, climber	Karkoer / Tsamma	Tsamma		F/C			X
Convolvulus sagittatus Thunb.	CONVOLVULACEAE	Herbaceous climber	Bobejaantoutjie				X	X	X
**Conyza bonariensis* (L.) Cronq.	ASTERACEAE	Herb	*Kleinskraalhans	*Flax-leaf fleabane	E		X	X	X
Conyza podocephala DC.	ASTERACEAE	Herb	Oondbos				X	X	X
Corchorus species	TILIACEAE	Herb							X

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			AFRIKAANS	ENGLISH			1	2	3
**Cosmos bipinnatus* Cav.	ASTERACEAE	Herb	*Kosmos	*Cosmos	E				X
Crabbea acaulis N.E.Br.	ACANTHACEAE	Herb					X	X	
Crotalaria sphaerocarpa Perr. ex DC. subsp. s*phaerocarpa*	FABACEAE	Herb	Mielie-crotalaria	Mealie Crotalaria					X
**Cuscuta campestris* Yunck.	CONVOLVULACEAE	Holo-parasite	*Dodder	*Dodder	C1 / N1b				X
Cycnium tubulosum (L.f.) Engl.	OROBANCHACEAE	Hemi-parasite						X	
**Datura ferox* L.	SOLANACEAE	Herb	*Grootstinkblaar	*Large Thorn Apple	C1 / N1b	M			X
**Datura stramonium L.*	SOLANACEAE	Herb	*Gewone- / Bloustinkblaar	*Common Thorn Apple	C1 / N1b	M		X	X
Deverra burchellii (DC.) Eckl. & Zeyh.	APIACEAE	Shrub	Wilde Seldery / Wilde Vinkel	Wild Celery			X		
Dimorphotheca spectabilis Schltr.	ASTERACEAE	Herb	Bloubietou						X
Elephantorrhiza elephantina (Burch.) Skeels	FABACEAE	Dwarf shrub	Baswortel	Dwarf Elephant-root		M/C	X		X
Euphorbia inaequilatera Sond. var. *inaequilatera*	EUPHORBIACEAE	Herb	Rooi-opslag	Smooth Creeping Milkweed			X		X
Falckia oblonga Bernh. ex C.Krauss	CONVOLVULACEAE	Herb						X	X
Felicia muricata (Thunb.) Nees subsp. *muricata*	ASTERACEAE	Herb				M/C	X		X
Gazania krebsiana Less.	ASTERACEAE	Herb	Botterblom			M	X		
Geigeria burkei Harv.	ASTERACEAE	Herb	Vermeersiektebossie				X		
**Glycine max* (L.) Merr.	FABACEAE	Herb, grain crop	*Soyaboon	*Soya bean	E	F			X
Gomphocarpus fruticosus (L.) Aiton f. subsp. *fruticosus*	APOCYNACEAE	Herbaceous shrub	Melkbos	Milkweed		M	X	X	X
**Gomphrena celosioides* Mart.	AMARANTHACEAE	Herb	*Mierbossie	*Batchelor's Button	E		X		X

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			AFRIKAANS	ENGLISH			1	2	3
**Guilleminea densa* (Willd. ex Roem. & Schult.) Moq.	AMARANTHACEAE	Herb		*Carrot Weed	E				X
**Helianthus annuus* L.	ASTERACEAE	Herb, grain crop	*Sonneblom	*Sunflower	E	F			X
Helichrysum aureonitens Sch. Bip.	ASTERACEAE	Herb	Gouesewejaartjie	Golden Everlasting		M/C	X	X	
Helichrysum acutatum DC.	ASTERACEAE	Herb	Taaisewejaartjie	Sticky Everlasting		M		X	
Helichrysum callicomum Harv.	ASTERACEAE	Herb					X		
Helichrysum nudifolium (L.) Less.	ASTERACEAE	Herb	Hottentotstee	Hottentot's Tea		M	X		X
Helichrysum rugulosum Less.	ASTERACEAE	Herb					X		
Hermannia depressa N.E.Br.	STERCULIACEAE	Herb	Rooi-opslag			M/C	X		
Hermannia floribunda Harv.	STERCULIACEAE	Herb							X
Hibiscus microcarpus Garcke	MALVACEAE	Herb					X		X
Hibiscus pusillus Thunb.	MALVACEAE	Herb		Dwarf Hibiscus		C	X		X
Hibiscus trionum L.	MALVACEAE	Herb	Terblansbossie	Bladder Hibiscus		M		X	X
**Hypochaeris radicata* L.	ASTERACEAE	Herb	*Skaapslaai	*Hairy Wild Lettuce	E	F			X
Indigofera c.f. *alternans* DC. var. *alternans*	FABACEAE	Herb	Skaapertjie / Klipertjie				X		
Indigofera cryptantha Benth. ex Harv. var. *cryptantha*	FABACEAE	Herb							X
Ipomoea oenotheroides (L.f.) Raf. ex Hallier f.	CONVOLVULACEAE	Herb	Krismisblom				X		X
Jamesbrittenia aurantiaca (Burch.) Hilliard	SCROPHULARIACEAE	Herb					X		
Lactuca inermis Forssk.	ASTERACEAE	Herb		Wild Lettuce		F	X		X
**Lactuca serriola* L.	ASTERACEAE	Herb	*Wildeslaai	*Wild lettuce	E				X
**Lepidium bonariense* L.	BRASSICACEAE	Herb	*Peperbossie	*Pepper Cress / Pepperweed	E		X		X

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			AFRIKAANS	ENGLISH			1	2	3
**Medicago laciniata* (L.) Mill. var. *laciniata*	FABACEAE	Herb	*Klitsklawer	*Bur Clover	E		X	X	X
Mimulus gracilis R.Br.	SCROPHULARIACEAE	Herb				M		X	
Nemesia fruticans (Thunb.) Benth.	SCROPHULARIACEAE	Herb	Wildeleeubekkie	Wild Nemesia			X		X
**Nicandra physalodes* (L.) Gaertn.	SOLANACEAE	Herb	*Basterappelliefie	*Apple of Peru	N1b			X	X
Nidorella anomala Steetz	ASTERACEAE	Herb					X		
Nidorella hottentotica DC.	ASTERACEAE	Herb					X	X	
**Oenothera indecora* Cambess.	ONAGRACEAE	Herb	*Aandblom	*Small Evening Primrose	Cx3			X	X
**Oenothera rosea* L'Hér. ex Aiton	ONAGRACEAE	Herb	*Pienkaandblom	*Rose Evening Primrose	EX3			X	X
**Oxalis corniculata* L.	OXALIDACEAE	Herb	*Ranksuring	*Creeping Sorrel	E		X	X	X
Papaver aculeatum Thunb.	PAPAVERACEAE	Herb	Wilde-, Doring- of Koringpapawer	Wild or Orange Poppy		F			X
Pelargonium luridum (Andr.) Sweet	GERANIACEAE	Herb	Wildemalva	Stork's Bill		M/F	X		
Pentzia globosa Less.	ASTERACEAE	Dwarf shrub	Vaalkaroo			M	X		X
Persicaria decipiens (R.Br.) Wilson	POLYGONACEAE	Herb, helophyte	Slangwortel / Duisendknoop / Hanekam	Slender Knotweed/Snake Root				X	
**Persicaria lapathifolia* (L.) Gray	POLYGONACEAE	Herb	*Hanekam	*Spotted Knotweed	E	M/C		X	
Pimpinella c.f. *transvaalensis* H.Wolff	APIACEAE	Herb	Wilde-anys					X	X
Plantago lanceolata L.	PLANTAGINACEAE	Herb	Smalweëblaar	Ribwort		M		X	X
Platycarpha parvifolia S.Moore	ASTERACEAE	Herb						X	
Pollichia campestris Ait.	ILLECEBRACEAE	Herbaceous shrub	Teesuikerbossie	Waxberry / Barley Sugar Bush		F	X		X
Portulaca quadrifida L.	PORTULACACEAE	Succulent	Porslein	Purslane / Pigweed					X

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Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt	ASTERACEAE	Herb	Roerkruid	Jersey Cudweed		C		X	X
Rhynchosia minima (L.) DC. var. *prostrata* (Harv.) Meikle	FABACEAE	Herb, climber					X		
Rubia horrida (Thunb.) Puff	RUBIACEAE	Herb, climber	Kleefrank			M/C	X	X	X
**Rumex crispus* L.	POLYGONACEAE	Herb	*Krultongblaar	*Curly Dock	EX3	F		X	X
Ruschia species	MESEMBRYANTHEMACEAE	Succulent herb					X		X
Salvia runcinata L.f.	LAMIACEAE	Herb	Wildesalie	Wild Sage		M	X	X	X
**Salsola kali* L.	CHENOPODIACEAE	Herb	*Russiese Rolbossie	*Russian Tumbleweed	C(T) / N1b				X
Scabiosa columbaria L.	DIPSACACEAE	Herb	Bitterbos / Meerjarige skurfkruid	Wild Scabiosa		M/C	X		
**Schkuhria pinnata* (Lam.) Cabrera	ASTERACEAE	Herb	*Kleinkakiebos	*Dwarf Marigold	E				X
Selago densiflora Rolfe	SCROPHULARIACEAE	Herb					X		
Senecio achilleifolius DC.	ASTERACEAE	Herb	Slootopdammer					X	
Senecio consanguineus DC.	ASTERACEAE	Herb	Hongerbos-senecio	Strarvation Senecio			X		X
Senecio erubescens Aiton var. *crepidifolius* DC.	ASTERACEAE	Herb					X	X	
Senecio harveianus MacOwan	ASTERACEAE	Herb	Geelopslag	Canary Weed				X	X
Seriphium plumosum L.	ASTERACEAE	Herbaceous shrub	Bankrotbos	Bankrupt Bush			X		X
Sida cordifolia L.	MALVACEAE	Herb	Verdompsterk	Flannel Weed					X
Sisymbrium species	BRASSICACEAE	Herb						X	
Sisymbrium thellungii O.E.Schulz	BRASSICACEAE	Herb	Wildemosterd	Wild Mustard			X	X	X
**Solanum elaeagnifolium* Cav.	SOLANACEAE	Herbaceous shrub	*Satansbos	*Silver-leaf Bitter Apple	C1 / N1b		X		X

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			AFRIKAANS	ENGLISH			1	2	3
Solanum c.f. *incanum* L.	SOLANACEAE	Herbaceous shrub	Bitterappel	Bitter Apple		M	X		X
**Solanum nigrum* L.	SOLANACEAE	Herb	*Nastergal	*Nightshade	E	F		X	X
Solanum rigescens Jacq.	SOLANACEAE	Herb	Wildelemoentjie				X		
Sonchus dregeanus DC.	ASTERACEAE	Herb					X		X
Sonchus nanus Sond. ex Harv.	ASTERACEAE	Herb		Thistle		F	X		
**Sonchus oleraceus* L.	ASTERACEAE	Herb	*Sydissel	*Sow Thistle	E	F			X
Sonchus wilmsii R.E. Fr.	ASTERACEAE	Herb	Melkdissel	Milk Thistle				X	
Stachys hyssopoides Burch. ex Benth.	LAMIACEAE	Herb	Pienksalie			M	X		X
**Tagetes minuta* L.	ASTERACEAE	Herb	*Kakiebos	*Khaki Weed	E		X	X	X
**Taraxacum officinale* Weber	ASTERACEAE	Herb	*Perdeblom	*Common Dandelion	E	M/F		X	X
Tephrosia c.f. *purpurea* (L.) Pers.	FABACEAE	Herb		Silver Tephrosia			X		
Tolpis capensis (L.) Sch. Bip.	ASTERACEAE	Herb					X		
**Tragopogon dubius* Scop.	ASTERACEAE	Herb	*Geelbokbaard	*Yellow Goat's Beard	E				X
Tribulus terrestris L.	ZYGOPHYLLACEAE	Herb	Dubbeltjie	Devil's Thorn			X		X
Tribulus zeyheri Sond. subsp. *zeyheri*	ZYGOPHYLLACEAE	Herb	Dubbeltjie	Devil's Thorn					X
Vahlia capensis (L.f.) Thunb. subsp. *vulgaris* Bridson var. *linearis* E. Mey. ex. Bridson	VAHLIACEAE	Herb					X	X	
**Verbena aristigera* S.Moore	VERBENACEAE	Herb	*Fynblaarverbena	*Fine-leaved Verbena	E		X	X	X
**Verbena bonariensis* L.	VERBENACEAE	Herb	*Blouwaterbossie	*Wild Verbena	E		X	X	X
**Verbena officinalis* L.	VERBENACEAE	Herb	*Europese Verbena	*European Verbena	E		X	X	X
Vernonia staehelinoides Harv.	ASTERACEAE	Herbaceous shrub / suffrutex					X		

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			AFRIKAANS	ENGLISH			1	2	3
Wahlenbergia denticulata (Burch.) A. DC. var. *denticulata*	CAMPANULACEAE	Herb					X		
Wahlenbergia undulata DC.	CAMPANULACEAE	Herb		Highveld Bellflower			X	X	
**Xanthium spinosum* L.	ASTERACEAE	Herb	*Boetebossie	*Burrweed	C1 / N1b			X	X
**Xanthium strumarium* L.	ASTERACEAE	Herb	*Kankerroos	*Large Cocklebur	C1 / N1b			X	X
Xenostegia tridentata (L.) D.F.Austin & Staples subsp. *angustifolia* (Jacq.) Lejoly & Lisowski	CONVOLVULACEAE	Herb, climber		Miniature Morning Glory				X	X