

# Ecological Management Services Ecological Management Services

---

## BIODIVERSITY ASSESSMENT REPORT FOR THE PROPOSED PIVOT DEVELOPMENT ON MIDDLEPLAATS NORTHERN CAPE

Prepared by Dr N. Birch *Pri.Sci.Nat*  
Ecological Management Services  
**P.O. Box 110470**  
**Hadison Park**  
**Kimberley**  
**8306**

For  
EIMS

April 2025

**DECLARATION OF CONSULTANT**

I Natalie Birch declare that I –

I Natalie Birch declare that I –

- act as the independent specialist in this study;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations 2014 amended, 2017;
- do not have and will not have any vested interest in the activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations 2014 amended 2017;
- will provide the competent authority with access to all information at my disposal regarding the study.



Natalie Birch Pr. Sci. Nat 400117/05

April 2025

## CONTENTS

<b>1.</b>	<b>INTRODUCTION.....</b>	<b>4</b>
1.1.	TERMS OF REFERENCE & SCOPE OF WORK .....	4
1.2.	DATA SOURCING AND REVIEW .....	4
1.3.	LIMITATIONS AND ASSUMPTIONS .....	7
<b>2.</b>	<b>REGULATORY AND LEGISLATIVE OVERVIEW.....</b>	<b>8</b>
<b>3.</b>	<b>METHODOLOGY .....</b>	<b>11</b>
<b>4.</b>	<b>DESCRIPTION OF THE AFFECTED ENVIRONMENT.....</b>	<b>13</b>
4.1.	BROAD-SCALE VEGETATION PATTERNS.....	13
4.2.	PLANT COMMUNITY DESCRIPTION .....	14
4.3.	POPULATIONS OF SENSITIVE AND/OR THREATENED SPECIES .....	15
4.4.	CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES .....	20
4.4.	ALIEN/INVASIVE SPECIES .....	21
<b>5.</b>	<b>SITE SENSITIVITY.....</b>	<b>22</b>
<b>6.</b>	<b>POTENTIAL IMPACTS.....</b>	<b>26</b>
<b>7.</b>	<b>RECOMMENDATIONS AND CONCLUSION.....</b>	<b>29</b>
<b>8.</b>	<b>REFERENCES .....</b>	<b>30</b>
<b>APPENDIX 1.....</b>	<b>32</b>	
SPECIES LISTS .....	32	
<b>APPENDIX 2.....</b>	<b>35</b>	
REGIONAL CONSERVATION PLANNING .....	35	
<b>APPENDIX 3.....</b>	<b>40</b>	
DETAILS OF SPECIALIST .....	40	
<b>APPENDIX 4.....</b>	<b>43</b>	
IMPACT ASSESSMENT METHODOLOGY .....	43	
<b>LIST OF FIGURES</b>		
<b>Figure 1</b>	The location of the Farm Middle Plaats .....	13
<b>Figure 2</b>	Examples of the vegetation that occur within the proposed development area .....	15
<b>Figure 3</b>	Site sensitivity map with proposed pivot layout .....	24
<b>LIST OF TABLES</b>		
<b>Table 1 :</b>	Potential and recorded Protected Plant species on site .....	15
<b>Table 2:</b>	Protected Reptile species .....	17
<b>Table 3:</b>	Protected Amphibians.....	17
<b>Table 4:</b>	Bird species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site .....	18
<b>Table 5:</b>	Mammal species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site .....	19
<b>Table 6:</b>	Alien invasive species that occur in and around the property .....	22

# 1. INTRODUCTION

Genade Boerdery wishes to create 8 new pivots for the cultivation of potatoes. The development of these pivots will occur in phases over the course of 5 years. The crops will be rotated to prevent blight and allow for conservation of the soil. Once the planting cycle for a pivot area is completed, the area will be reseeded with grazing grasses for cattle. Seven of the new cultivation areas will each cover 60 hectares and one will cover 50 hectares, resulting in a total of ~470 hectares of indigenous vegetation clearance by the end of the five year period.

An EIA process is required for this development, part of this process requires that a specialist biodiversity assessment of the site is undertaken. This report comprises the specialist biodiversity assessment for the site

The report was compiled by Dr N.V. Birch Pr. Sci Nat. (reg no 400117/05). Details of the specialist are attached in Appendix 3.

## 1.1. TERMS OF REFERENCE & SCOPE OF WORK

The scope of work for this Biodiversity Assessment study includes

- Review available information and documentation relating to the proposed development;
- A comprehensive investigation to identify potential floral species of special concern, this includes all IUCN listed species, TOPS listed species and species listed in schedule 1 and 2 of the NCNCA. These will be identified through the SANBI POSA database as well as other available literature and confirmed on site.
- A single field survey and literature review of the property to determine vegetation type and distribution. The survey will be undertaken to identify potential floral species of special concern.
- A single field survey and literature review to determine what red data faunal species could potentially occur within the study site. The habitat requirements of each red data species that could potentially occur on-site will be compared with the vegetation description. No onsite trapping of faunal species will be undertaken.
- Once the overall potential for occurrence of each red data species has been identified, each habitat type (based on the vegetation description and any factors identified as relevant to fauna) will be ranked in terms of conservation importance, as well as ecological sensitivity.
- The sites importance in terms of regional sensitivity will also be assessed
- The report and survey will comply with the assessment protocols.

## 1.2. DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following;

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (South African National Biodiversity Institute, 2006-2018)).

- Information on plant species recorded for the Quarter Degree Squares (QDS), was extracted from the POSA database hosted by SANBI. This is a much larger extent than the study area, but the data was extracted from a larger area to account for the fact that the area has probably not been well sampled in the past.
- The IUCN conservation status of the species in the list (Table 1.1) was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2020).
- Threatened Ecosystem data was extracted from the NBA Threat Status and Protection Level list (SANBI 2018).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2016 (NPAES).

## Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU Atlas, and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) *Bates et al.* (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Bird species lists for the area were extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:
  - **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
  - **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
  - **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
  - **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2021-1) (See Table 1.1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any

narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

**Table 1.** The IUCN Red List Categories for fauna and flora. Species that fall within the categories in red and orange below are of conservation concern.

---

**IUCN Red List Category**


---

Critically Endangered (CR)

Endangered (EN)

Vulnerable (VU)

---

Near Threatened (NT)

Critically Rare

Rare

Declining

Data Deficient - Insufficient Information (DDD)

---

Data Deficient - Taxonomically Problematic (DDT)

Least Concern

---

The report layout is as follows in accordance to the assessment protocols 2020

Section	Requirements/Protocol	Position in Report
1	A specialist report prepared in terms of these Regulations must contain—	
(a)	Details of -	
	(i) the specialist who prepared the report; and	Cover page
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 3
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Page 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; an indication of the quality and age of base data used for the specialist report; a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 1.3 & 3  Section 1.3 & 3  Section 6
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.2 & 3

(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4 and Section 5
(g)	an identification of any areas to be avoided, including buffers;	Section 5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Section 5
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 and 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 7
(l)	any conditions for inclusion in the environmental authorization;	Section 7
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 & 7
(n)	a reasoned opinion- <ul style="list-style-type: none"> <li>(i) whether the proposed activity, activities or portions thereof should be authorized;</li> <li>(ii) regarding the acceptability of the proposed activity or activities; and</li> <li>(iii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;</li> </ul>	Section 7
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A at this stage,
(q)	any other information requested by the competent authority.	N/A at this stage

### 1.3. LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due to time and cost constraints and therefore these surveys usually represent a "moment in time" survey. The survey represents the summer/wet season survey as it was conducted in February. A plant species list was compiled for the site from the site visit, this was augmented by a list of species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals

for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

## 2. REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

### **National Environmental Management Act (NEMA) (Act No 107, 1998):**

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied;
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

### **National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004):**

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.



- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

#### **National Forests Act (No. 84 of 1998):**

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: *"no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated"*. A permit is required for the destruction or transplant or transport of any protected tree species.

#### **National Veld and Forest Fire Act (Act No. 101 of 1998)**

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

#### **Conservation of Agricultural Resources Act (Act 43 of 1983):**

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

#### **Northern Cape Nature Conservation Act, No. 9 of 2009: (NCNCA)**

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences 19. No Person may –

*(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;*

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2. A permit obtainable from the DAERL permit office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.

### 3. METHODOLOGY

A site survey, was undertaken on 12 February 2025. During the site visit, the different biodiversity features, habitat, vegetation and landscape units present at the site were identified and mapped in the field. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbor or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

#### **Flora**

Satellite images were used to identify homogenous vegetation/habitat units within the study area. These were then sampled on the ground with the aid of a GPS to navigate in order to characterise the species composition. The following quantitative data was collected:

- species composition,
- cover estimation of each species according to the Braun-Blanquet scale,
- vegetation height,
- amount of bare soil and rock cover,
- slope, aspect
- presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Additional checklists of plant species were compiled by traversing a linear route and recording species as they were encountered. Searches for listed and protected plant species at the site were conducted and all listed plant species observed were recorded.

#### **Fauna**

The faunal study was undertaken as a desktop / literature survey combined with a field survey. The tasks included in each are given below.

##### Desktop/literature survey:

A desktop survey was undertaken to determine the red data reptile, amphibian, mammalian and bird species occurring in the quarter degree square in which the study area falls. The likelihood of red data species occurring on-site has been determined using the i) distribution maps in reference books and ii) a comparison of the habitat described from the field survey.

##### Field survey:

The habitats on-site were assessed to compare with habitat requirements of red data species determined during the literature survey. During the site visit the presence and identification of bird and mammal species was determined using the following methods / techniques:

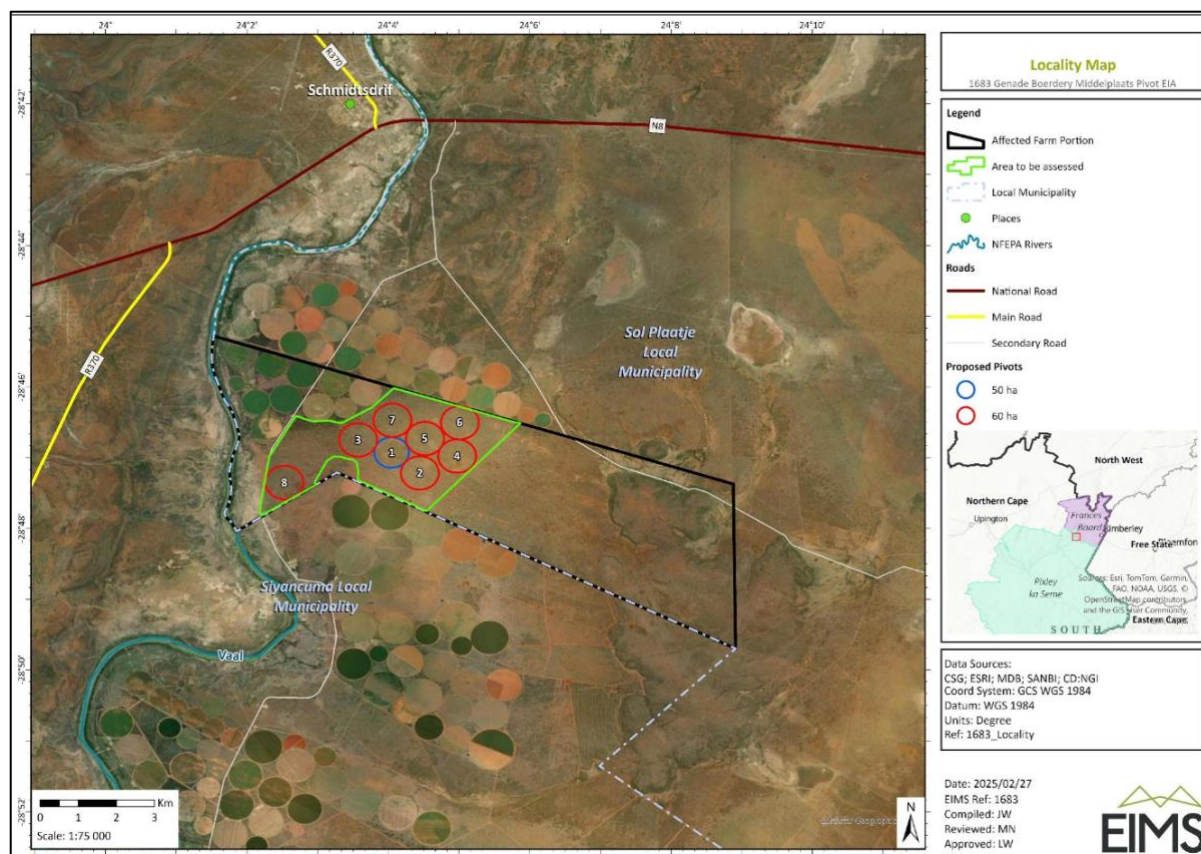
- Identification by visual observation.
- Identification of bird and mammal calls.
- Identification of spoor.
- Identification of faeces.
- Presence of burrows and / or nests.

**Criteria used in the assessment of impacts**

The methodology used in the assessment of the identified impacts is provided in appendix 4

## 4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The property under application is described as Middel Plaats South No. 104. It is located approximately 40km North east of Douglas and 10km south of Schmidtsdriif within the Sol Plaatje Local Municipality and the Francis Baard District.



**Figure 1** The location of the Farm Middle Plaats

### 4.1. BROAD-SCALE VEGETATION PATTERNS

The vegetation within the study area is classified as Kimberley Thornveld Vegetation (Mucina & Rutherford 2006, VegMap 2018)

Kimberley Thornveld is described as having a well developed tree layer with *Vachellia erioloba*, *Vachellia tortilis* and *V. karroo* and *Boscia albitrunca*. The shrub layer is also described as well developed with occasional dense stands of *T. camphoratus* and *S. mellifera*. The grass layer is open with a lot of uncovered soil.

## 4.2. PLANT COMMUNITY DESCRIPTION

Vegetation within this proposed development area is relatively homogenous in terms of species composition. There is a slight variation in density of the trees across the area which results in patches of open grassland with this savannah. The vegetation associated with the rocky outcrops “koppies” is the only area where the vegetation changes with any significance. Prior to the purchase of the property by Genade Boerdery the property was utilized for extensive cattle grazing, and was quite heavily grazed, with the vegetation exhibiting a moderately poor condition.

### **Mixed *Vachellia* Savannah**

This vegetation community contains a tree layer which is mainly comprised of *Vachellia erioloba* and *Vachellia tortilis*. Three vegetation strata are evident within this vegetation unit. There is a prominent tree layer between 2.5m – 5m, a shrub layer, between 1.5m – 2.5m and a grass layer with an average height of 50cm. *Vachellia erioloba*, and *Vachellia tortilis* are prominent within this vegetation type however *Ziziphus muconata*, *Vachellia haematoxylon*, *Vachellia karroo*, *Boscia albitrunca* and *Grewia flava* also occur. The density of the trees varies across the landscape, with some areas forming a more open savannah, while other areas have dense pockets of trees and shrubs. Other species recorded included, *Asparagus glaucus*, *Zygophyllum lichtensteinianum*, *Lycium hirsutum*, *Helichrysum arenicola*, *Selago multispicata*, and *Melhania rehmannii*. Grass species within this vegetation community included, *Eragrostis lehmanniana*, *Schmidtia pappophoroides*, *Aristida congesta*, *Centropodia glauca*, *Enneapogon scoparius*, *Stipagrostis hirtigluma* *Stipagrostis uniplumis*, and *Tricholaena monachne*

### ***Vachellia erioloba* woodland**

This vegetation type occurs in the northwestern section of the property. It is distinguished from the Mixed *Vachellia* Savanna by the high density of *Vachellia erioloba*, it dominates the woody species composition with only scattered individuals of other woody species recorded within the area and the grass sword is dominated by *Schmidtia pappophoroides*. The existing pivots occur within this vegetation type and only a small intact area vegetation remains along the edge of these pivots.

### **Grasslands**

Open grasslands occur within the study area. The height of the grass sword varies depending on the level of utilisation but averages between 50-70cm tall, the percentage coverage in most of the grassland is good between 75% and 85%. Prominent grass species include, *Eragrostis lehmanniana*, *Stipagrostis uniplumis*, *Aristida congesta*, *Eragrostis curvula*, *Eragrostis obtuse*, *Fingerhuthia Africana*, *Eragrostis superba*, *Stipagrostis obtuse* and *Schmidtia pappophoroides*.

### ***Senegalia mellifera* scrub.**

This vegetation type is associated with the rocky outcrops which occur in the area. The vegetation is dominated by *Senegalia mellifera* although shrubs such as *Ehretia rigida*, *Gymnosporia buxifolia* *Tarchonanthus camphoratus*, and *Grewia flava* were recorded.



**Figure 2** Examples of the vegetation that occur within the proposed development area

In terms of the Environmental Screening Tool, the site is considered to be of low sensitivity. There are no identified FEPA wetlands within the development site or situated within 500m of the development site. The Vaal river is situated to the west of the study site which is bordered by a gravel road. The closest point of the river is about 1km from the road. No wetlands or drainage lines were encountered within the proposed development footprint or in the immediate surrounds of the study site. The site does not fall within an identified River FEPA, or an important fish support area or an Upstream management area, and thus can be considered to be of low sensitivity in terms of aquatic biodiversity.

### 4.3. POPULATIONS OF SENSITIVE AND/OR THREATENED SPECIES

#### **FLORA**

Historical records of Red List plant species were consulted in order to determine the likelihood of any such species occurring in the study area and these were searched for in the field. Plant species observed as well as a list of threatened plant species previously recorded in the quarter degree grids in which the study area is situated which was obtained from the South African National Biodiversity Institute, are listed in the table below

**Table 1 :** Potential and recorded Protected Plant species on site

Species	Legislation	Conservation status	Potential of occurrence on site
<i>Vachellia erioloba</i>	National Forests Act 1998	Protected	Recorded on property and within development footprint
<i>Vachellia haematoxylon</i>	National Forests Act 1998	Protected	Recorded on property and within development footprint
<i>Bosica albitrunca</i>	National Forests Act 1998 NCNCA	Protected Schedule 2	Recorded in the area but NOT within development footprint

<i>Titanopsis calcarea</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence within development footprint
<i>Plinthus karooicus</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence within development footprint
<i>Ruschia ruralis</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence within development footprint
<i>Bulbine abyssinica</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Moderate</b> potential of occurrence within development footprint
<i>Aloe claviflora</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Moderate</b> potential of occurrence within development footprint
<i>Ornithogalum nanodes</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence within development footprint
<i>Nemesia pubescens</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence within development footprint
<i>Aloe grandidentata</i>	NCNCA	Schedule 2	Not recorded during survey but very <b>high</b> possibility of occurrence in the area

Owing to the narrow temporal window of sampling some species may not have been recorded, this however does not preclude them from occurring within the development site. It is therefore recommended that prior to clearing an additional walk through is conducted. In order to remove species listed in Schedule 1 & 2 of the NCNCA, during site clearing activities an integrated permit application will have to be made to the DAERL to obtain the required permission to remove and/or translocate these species from site. In order to remove the protected trees a license application will have to be made to the Department of Forestry.

## **FAUNA**

The property has already been disturbed by agricultural activity (existing pivots and extensive cattle grazing). The grazing pressure reduces the standing biomass and grass cover which affects the habitat suitability of certain faunal species. Disturbances that alter the natural environment have two effects namely, it may cause the loss of certain species due to the destruction of habitat. It may also cause the influx of other species previously unable to colonise an area owing to lack of suitable habitat or because they have been excluded through competition.

It was not possible to compile a complete list of species present on the property during the field survey owing to the limited time frame of the assessment. It is therefore important to note that many species that potentially occur on-site may not have been identified thus emphasis was placed on the habitat in order to determine potential occurrence of species. The potential of occurrence is also assessed for the immediate surrounding area as to establish the possibility of ecological linking corridors for certain species.



Based on the bird species identified while on-site, the proposed development site hosts both grassland and bushveld bird species. The loose sandy soils which occurs over a large portion of the study site, makes these areas suitable for burrowing mammals.

### Reptiles Species of Conservation Concern

No red data terrapin, tortoises, snakes or lizards were identified as occurring in the quarter degree square, based on the distribution maps available in the South African Red Data Book for reptiles (Bates *et al.* 2014) and The Southern African Reptile Conservation Assessment (SARCA). The conservation status was cross checked on the IUCN website to determine most recent status listing for these species. There are however some species of reptiles that may occur in the area that are protected in terms of the NCNCA these are listed in the table below

**Table 2:** Protected Reptile species

Species	Legislation	Conservation status
<i>Chamaeleo dilepis</i>	NCNCA	Schedule 1
<i>Psammobates tentorius</i>	NCNCA	Schedule 2
<i>Geochelone pardalis</i>	NCNCA	Schedule 2
<i>Lamprophis fuliginosus</i>	NCNCA	Schedule 2
<i>Pseudaspis cana</i>	NCNCA	Schedule 2
<i>Prosymna sundevalli</i>	NCNCA	Schedule 2

### Amphibians of Conservation Concern

No red data amphibians were identified as occurring in the quarter degree squares, based on the distribution maps available in the South African Red Data Book for amphibians (Minter *et al.*, 2004) Du Preez and Carruthers (2009) and the South African Frog Atlas project. There are however some species that are protected in terms of the NCNCA that may occur in the area, these are listed in the Table 4.

**Table 3:** Protected Amphibians

Species	Legislation	Conservation status
<i>Xenopus laevis</i>	NCNCA	Schedule 2
<i>Bufo gariepensis</i>	NCNCA	Schedule 2
<i>Bufo gutturalis</i>	NCNCA	Schedule 2
<i>Bufo garmani</i>	NCNCA	Schedule 2
<i>Tomopterna cryptotis</i>	NCNCA	Schedule 2
<i>Rana angolensis</i>	NCNCA	Schedule 2
<i>Rana fuscigula</i>	NCNCA	Schedule 2

### Birds of Conservation Concern

A list of all red data bird species occurring in the quarter degree square, was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7<sup>th</sup> edition (Hockey *et al.*, 2005). The IUCN 3.1. status is also presented in the table. Based on an evaluation of the habitat requirements for these red data species, the potential of these species occurring either on-site or within 500m of the property boundary is provided in Table below.

Eight red data bird species have been recorded for the quarter degree square, five have a high potential to occur on site. Most of these species will utilise the site for foraging purposes but they may not be totally dependent on the site.

**Table 4:** Bird species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements <sup>1</sup>	Potential for Occurrence On-site and surrounding area
Blue Crane	<i>Anthropoides paradiseus</i>	Near Threatened Vulnerable	Grasslands, cultivated lands Karoo scrub and edges of vleis	<b>Very Low</b> – Edge of distribution range, vegetation too dense
Kori Bustard	<i>Ardeotis kori</i>	Near Threatened Near Threatened	Dry thornveld grassland, arid scrub requires the cover of some trees	<b>High</b> – Recorded in the area Suitable habitat occurs on site
Greater Flamingo	<i>Phoenicopterus ruber</i>	Near Threatened Least Concerned	Greater Flamingos forage on open shallow eutrophic wetlands, both inland and coastal, with a preference for saline and brackish waters	<b>Very Low</b> - No large bodies of open water occur on the proposed development site.
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable Least Concerned	Lanner Falcons are generally a cliff nesting bird, but have adapted to using the disused nests of Black and Pied crows, situated either in trees or on power lines For foraging purposes, Lanner Falcons utilise a wide range of habitats, from semi desert to woodland, agricultural land and also occurs in cities, but appear to prefer open habitats	<b>High</b> – Suitable foraging habitat occurs on site
Lesser Flamingo	<i>Phoenicopterus minor</i>	Near Threatened Near Threatened	The Lesser Flamingo forages on large brackish or saline, inland and coastal waters, shallow eutrophic wetlands, salt pans and sheltered coastal lagoons This species may use water bodies more saline than those used by the Greater	<b>Very Low</b> - no large bodies of open water occur on the proposed development site
Secretary bird	<i>Asagittarius serpentarius</i>	Vulnerable Vulnerable	This species shows a preference for open country, mainly savannah, open woodland, grassland, dwarf shrubland, mountain slopes and	<b>High</b> – Suitable habitat occurs on site

<sup>1</sup> Habitat requirements determined using the following reference material: Harrison et al., 1997a; Harrison et al., 1997b; Hockey et al., 2005

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements <sup>1</sup>	Potential for Occurrence On-site and surrounding area
			man-made habitats such as grazing paddocks and fallow fields	
African White backed Vulture	<i>Gyps africanus</i>	Critically endangered Critically endangered	Savannah and bushveld. Nest in tall trees ( <i>Vachellia erioloba</i> ).	<b>High</b> - No nests were recorded within the planned development area. The fact that the site is located near operating pivots reduces its suitability but does not exclude it as potential habitat
Cape Vulture	<i>Gyps coprotheres</i>	Endangered Endangered	Widespread in southern Africa where it can be found in open grasslands and woodlands, from sea level to very high mountains provided there are high cliffs to breed on. They can, however, roost on trees and pylons far away from their breeding sites.	<b>High</b> - Suitable habitat on the property. The fact that the site is located near operating pivots reduces its suitability but does not exclude it as potential habitat

### Mammals of Conservation Concern

A list of all red data mammal species occurring in the quarter degree squares, was extrapolated from the Red Data Book for Mammals (EWT, 2004) and the MammalMAP, the Mammal Atlas of Africa database. Based on an evaluation of the habitat requirements for these red data species (EWT, 2004; Skinner and Chimimba, 2005), the potential of these species occurring either on-site or within 500m of the property boundary is provided in the table below

**Table 5:** Mammal species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS <sup>2</sup>	SUITABLE HABITAT ON-SITE <sup>3</sup>	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
South African hedgehog	<i>Atelerix frontalis</i>	Near Threatened	The South African Hedgehog is a nocturnal species that has been recorded to occur in grassland, resting curled up under matted grass, in debris under the shade of bushes or in	<b>High</b> – Area has sufficient grassland and bushes thus suitable habitat is present.

<sup>2</sup> Status based on listing in the National Red List of Mammals 2016

<sup>3</sup> Habitat requirements determined using the following reference material: Skinner and Smithers, 1990; EWT, 2004; Skinner and Chimimba, 2005

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS <sup>2</sup>	SUITABLE HABITAT ON-SITE <sup>3</sup>	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
			holes under the ground	
Brown hyaena	<i>Hyaena brunnea</i>	Near Threatened	They occur in semi-desert scrub, open scrub and open woodland savannah. As they are nocturnal, cover in which to lie in during the day is essential, such as dense shade or holes in the ground. This species has been reported in the general vicinity of the site, and it is possible that this species may currently visit the site as a vagrant when feeding.	<b>Low</b> – For the most part, the vegetation cover of the proposed development site is suitable however the substantial amount of agricultural activity and its proximity to human habitation make it unlikely that this animal will occur in the area
Spotted-necked otter	<i>Lutra maculicollis</i>	Vulnerable	Spotted-necked Otters are found in fresh water of large rivers with prominent pools, lakes, dams and well watered swamps. They occur in deeper water than the Cape Clawless Otter, but do not move far from the water margins. They are also dependent on adequate cover of dense vegetation or holes in which to hide.	<b>Low</b> – Although it is likely that it occurs around the river the proposed development site of the pivots is situated too far from the water margin
Black-footed Cat	<i>Felis nigripes</i>	Vulnerable	Arid and mesic savanna and scrubland, prefer rocky areas	<b>Moderate</b> – limited suitable habitat

#### 4.4. BROADSCALE TERRESTRIAL & AQUATIC PROCESSES

Kimberley Thornveld is classified as Least Threatened only 4.4% of this vegetation is formerly conserved and 26.4% is considered transformed, mostly by agricultural cultivation. Threats include bush encroachment mostly by *Senegalia mellifera* owing to overgrazing, cultivation and mining.

The study area does not fall within a CBA, it is not considered a threatened ecosystem in terms of NEM:BA. The proposed development site does not fall within a River or wetland FEPA, it does not fall within or near any Important birds' areas, nor does it fall within a strategic water resource area. It is not located within

a focus area for land-based protected area expansion. It is located approximately 24 km east of the Ghaap Plateau Focus area and approximately 26 km North of the Mokala National Park primary focus area. Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large, protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems.

The site does not contain any NFEPA wetlands or pans. It does not fall within a River FEPA or upstream management area. The site does not fall within a strategic water source area. The site is considered to have a low aquatic biodiversity sensitivity rating, as there are no aquatic biodiversity features on site, this was confirmed during site survey. The site survey was undertaken during the wet season which eases the identification of wetland systems, should they be present.

#### 4.4. ALIEN/INVASIVE SPECIES

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harboring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture.

The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed IAPs are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016 as listed below:

- **Category 1a (PROHIBITED): Listed Invasive Species**

A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

- **Category 1b (PROHIBITED / Exempted if in Possession or Under control): Listed Invasive Species**

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

- **Category 2 (PERMIT REQUIRED): Listed Invasive Species**

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

- **Category 3 (PROHIBITED): Listed Invasive Species**

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

**Table 6:** Alien invasive species that occur in and around the property

Species		Category
<i>Argemone mexicana</i>	Yellow flowered Mexican Poppy	1b
<i>Prosopis cf. glandulosa</i>	Mesquite	3
<i>Argemone ochroleuca</i>	White flowered Mexican poppy	1b
<i>Datura ferox</i>	Large thorn apple	1

## 5. SITE SENSITIVITY

The classification of areas into different sensitivity classes is based on information collected at various levels. This includes the national conservation status of the vegetation, the presence of species of special concern and the condition of the vegetation.

Vegetation types can be categorised according to their conservation status, which is in turn, assessed according to the degree of the transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. Sensitivity of habitats and sites within the area can be assessed using a combination of criteria as follows:

	Criterion	Definition
1	Conservation status of untransformed habitats occurring in the study area	The extent of each vegetation type occurring within the study area that is conserved and/or transformed relative to a targeted amount required for conservation
2	Presence and number of Red Data species and other species of special concern	Presence or potential presence of Red Data species within habitats
3	Within-habitat species richness of flora and the between-habitat (beta) diversity of the site	Presence or potential presence of Red Data Species within habitats.
4	The type or nature of topography of the site, ie presence of ridges koppies etc	Steepness and/or nature of topography in the study area.
5	The type and nature of important ecological processes on site, especially hydrological processes, ie wetlands drainage lines etc.	Habitats and/or terrain features that represent ecological processes such as water-flow migration routes etc.

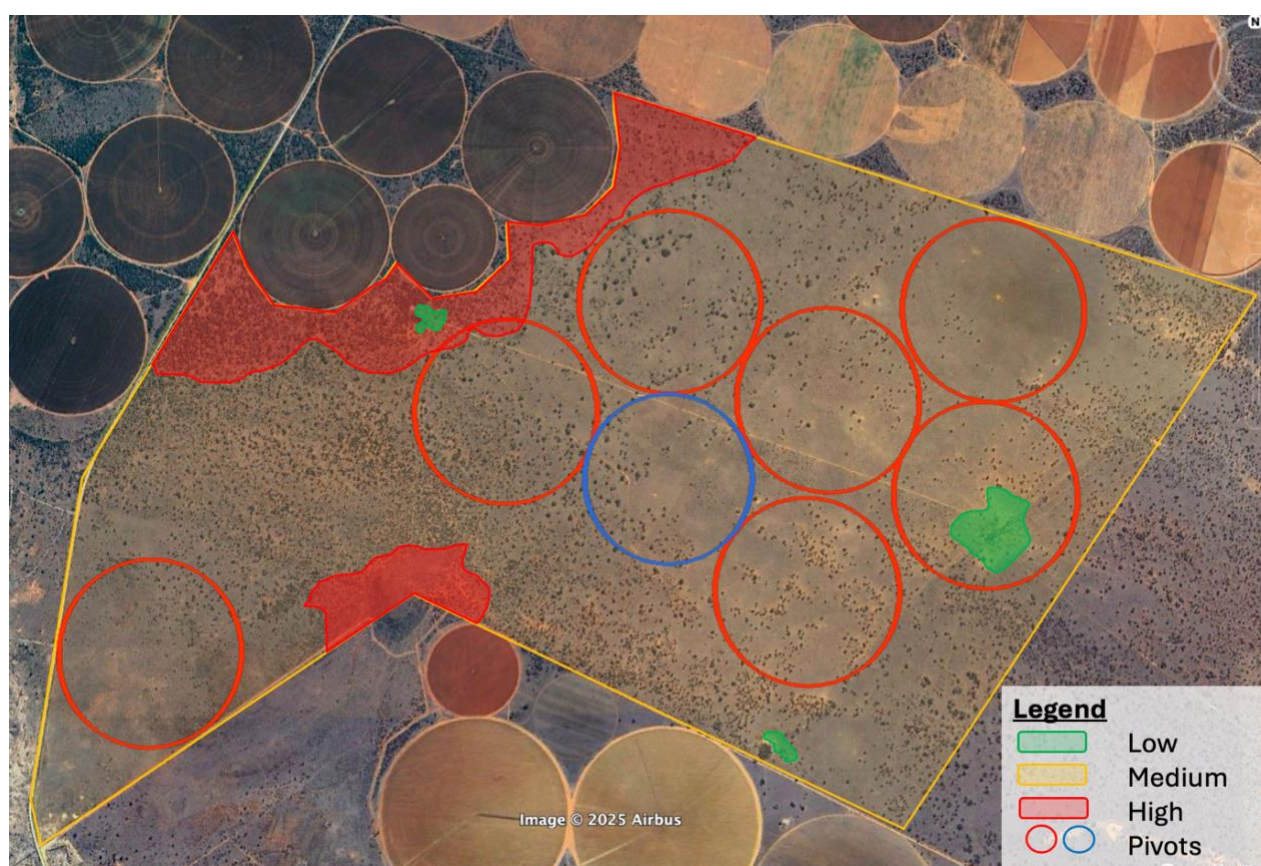
In order to advise the impact assessment and the proposed mitigation, a sensitivity map has been generated for the property using a number of criteria. In order to quantify and detail the sensitive areas in terms of the criteria used to assess sensitivity, the site was demarcated into a number of manageable blocks. A table was created to list each of the sensitivity criteria and a value assigned to each criteria. Each block was then assessed in terms of its relative sensitivity value. This produced a quantifiable sensitivity map. The criteria used to assess the sensitivity included;

Current state of degradation	1 = (80-100% degraded), Very degraded, highly transformed 2 = (60 -79% degraded), moderately transformed 3 = (40 – 59%) degraded, some transformation 4 = (20 -39% degraded, slightly transformed 5 = (0-19%) degraded Good condition
Slope & drainage	1 = Flat 2 = Gently undulating 3 = Slight slope 4 = Slope less than 5° 5 = Slope 5° or greater
Potential for erosion	1= Low 2 = Medium 3 = High
Presence of Red Data Species	0 = No 1 = Yes
Suitable habitat for RD species	0 = No 1 = Yes
Potential habitat fragmentation	1 = Low 2 = Low – moderate 3 = Moderate 4 = Moderate - high 5 = High
Importance to biodiversity& Ecosystem Functioning	

- 1 = Low
- 2 = Low – moderate
- 3 = Moderate
- 4 = Moderate - high
- 5 = High

Areas have been classified as follows:

- **Low (0-9)** sensitivity areas are already highly transformed and/or already contain development. Any development in these areas will not have a significant environmental impact.
- **Medium (10-20)** sensitivity areas: The vegetation and habitats in these areas have had some disturbance and may include some potential habitat for red data species or the presence of limited red data/protected species. Development in these areas, would be subject to guidelines and the mitigation measures.
- **High (21-25)** sensitivity areas included confirmed high number of red data /protected species, and ideal red data species habitat. Any development in these areas would have a significant environmental impact. No development should take place in these areas, but it is recognised that in certain exceptional cases, development may need to take place. Under these conditions very strict development guidelines would be required, and only under guarantee that similar areas within the site would be conserved thus reducing the risk of development.



**Figure 3** Site sensitivity map with proposed pivot layout



The pivots mostly fall within the moderate sensitivity areas. The high and moderate sensitivity areas contain protected trees, the areas of greater tree density have been classified as high sensitive areas. These trees will be lost when the vegetation is cleared for the construction of the pivots. The *Vachellia erioloba* is also a protected species under the National Forests Act of 1998 (Act 84 of 1998). Larger trees are important as nesting and as perching sites but the groups of smaller trees provide a unique habitat acting as a nursery for other plant species and creating important habitats for faunal species.

## 6. POTENTIAL IMPACTS

Typically, a development is divided into the construction phase and the operational phase. It is during this construction phase that most of the destruction of habitat and microhabitat takes place. For this development the construction phase will be considered as the initial clearing and preparation of the land. Planting and harvesting and subsequent successional phases will be considered the operational phase. The pivots will be run on a cyclic basis so only a few of the pivots will be operational at any one time, thus the construction and operational phases will run concurrently with pivots being at different phases of the successional process and development until all the pivots have been developed.

### 1. **Habitat fragmentation, Loss of Natural vegetation and Alien invasion**

Vegetation clearing will occur as a result of the development of irrigation pivots. This loss of natural vegetation will cause fragmentation and habitat disturbance in the landscape. The disturbance destroys primary vegetation. As primary vegetation is more functional in an ecosystem, this could irreversibly transform the vegetation characteristics and faunal populations in the area. Clearing of surface areas has the effect of creating unnatural open spaces through the vegetation and the matrix of the landscape. For the smaller species, it limits movement and restricts access to foraging sites. This results in reduced population density of prey species (invertebrates and / or smaller birds and / or smaller mammals and / or herpetofauna) which then reduces the food availability for predators invertebrates and / or larger birds and / or larger mammals and / or herpetofauna). The changes in the vegetation structure also alter the availability of suitable cover for many faunal species.

There are already substantial numbers of pivots located all along the Vaal River from Douglas to Schmitsdrif, as well as a secondary gravel road that runs along the river connecting the R375 to the N8, so much of this ecosystem has already been fragmented. The layout of the pivots is such that there will be some continuous natural vegetation on the property which may assist in lessening the onsite impact of fragmentation from the pivots.

As with all disturbance, there is an increased risk of alien infestation. Many alien species proliferate in disturbance areas such as the periphery of the irrigation lands. Invasive species affect our natural biodiversity in a number of ways. They may compete directly with natural species for food or space, may compete indirectly by changing the food web or physical environment, or hybridize with indigenous species. Rare species with limited ranges and restricted habitat requirements are often particularly vulnerable to the influence of these alien invaders. Invasive plants have claimed about 8 percent or 10 million hectares of land suitable for agricultural use in South Africa. These invasive alien plants steal about seven percent of South Africa's water bulk every year.

#### Mitigation:

*Vegetation clearing should be restricted to areas of the pivot only. Alien vegetation that has grown as a result of land clearing must be removed by approved methods.*

<b>Impact Name</b>	<b>Habitat fragmentation, Loss of Natural vegetation and Alien invasion</b>
<b>Alternative</b>	1

Phase	Construction & Operation				
Environmental Risk					
Attribute	Pre - mitigation	Post mitigation -	Attribute	Pre - mitigation	Post mitigation -
Nature of Impact	-1	-1	Magnitude	3	2
Extent of Impact	2	1	Reversibility	4	3
Duration	4	4	Probability	3	3
Environmental Risk (pre- mitigation)					-9.75
Environmental Risk (post-mitigation)					-7.5
Degree of confidence in impact prediction					HIGH
Cumulative Impacts					2
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.13
Final Significance (Medium to low)					-8.44

## 2. Loss of Species of Conservation Concern

The clearing of vegetation will result in the loss of some protected flora. The cumulative impact of vegetation clearing and the subsequent loss of these trees for irrigation development in this area increases the significance of this impact as more of the vegetation type is transformed, however the development will not result in a loss of the resource from the area. The areas where the protected trees occur in high densities has been excluded from development. The loss of suitable habitat for RDB faunal species which would result in these animals moving off the property into the surrounding areas. The reduction of suitable habitat from an area is always a cause for concern, and although suitable habitat may still be available it does impact on the number of these species that an area can carry.

### Mitigation:

A search and rescue operation should be performed prior to clearing, it is however not a feasible or practical option with regard to the protected trees, so it's important to ensure that trees between the pivots remain undisturbed.

Impact Name	Loss of Species of Conservation Concern				
Alternative	1				
Phase	Construction				
Environmental Risk					
Attribute	Pre - mitigation	Post mitigation -	Attribute	Pre - mitigation	Post mitigation -
Nature of Impact	-1	-1	Magnitude	3	2
Extent of Impact	2	1	Reversibility	3	3
Duration	4	4	Probability	3	3

Environmental Risk (pre- mitigation)	-9
Environmental Risk (post-mitigation)	-7.5
Degree of confidence in impact prediction	HIGH
Cumulative Impacts	2
Degree of Potential irreplaceable loss of resources	1
Prioritisation Factor	1.13
<b>Final Significance (Medium to Low)</b>	<b>-8.44</b>

### 3. Anthropogenic Disturbances, Intentional and/or accidental killing of fauna

Anthropogenic disturbances include aspects such as, vibrations caused by machinery & vehicles. These aspects will impact on invertebrate species more than any other faunal species. These anthropogenic disturbances impact on the way invertebrates forage. For example; some invertebrates use vibrations caused by their prey to locate and catch them. Vibrations caused by construction equipment will make this impossible. Smaller fauna will inevitably be killed during land clearing activities as these activities will destroy their habitat. In addition to unintentional killing of fauna, some faunal species, particularly herpetofaunal species, are often intentionally killed as they are thought to be dangerous.

#### Mitigation

*There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. A search and rescue can be conducted prior to clearing activities, for example animals such as tortoises should be moved out of harm's way. As the killing of herpetofauna is considered a result of ignorance, this can be ameliorated through education. The labour force involved should be educated regarding the conservation importance of herpetofauna.*

Impact Name	Anthropogenic Disturbances, Intentional and/or accidental killing of fauna						
Alternative	1						
Phase	Construction & Operation						
Environmental Risk							
Attribute	Pre - mitigation	Post mitigation	-	Attribute	Pre - mitigation	Post mitigation	-
Nature of Impact	-1	-1		Magnitude	1	1	
Extent of Impact	1	1		Reversibility	2	2	
Duration	3	3		Probability	3	2	
Environmental Risk (pre- mitigation)						-6	
Environmental Risk (post-mitigation)						-3.5	
Degree of confidence in impact prediction						MEDIUM	
Cumulative Impacts						3	
Degree of Potential irreplaceable loss of resources						1	
Prioritisation Factor						1.25	
Final Significance(Low)						-3.94	

## 7. RECOMMENDATIONS AND CONCLUSION

The area of the proposed development consists of mostly natural vegetation. The proposed development will have an impact on the biodiversity of the area, as it will result in further fragmentation of the habitat and the loss of protected tree species from site. However, this loss will not result in the loss of these species from the area, as they are well represented in the surrounding areas.

The continued development of land adjacent to the Vaal River does mean that there is less natural vegetation in the area, nevertheless this section has not been included in the CBA of the Vaal river system in this region, probably owing to the already fragmented nature of the surrounding area from the existing pivots and gravel road.

The impact of the proposed development on the terrestrial and aquatic biodiversity is considered to be moderate to low and as such the development should be able to proceed as long as the mitigations measures are adhered to and that best practice measures for the operation are implemented. The planned development will not alter the biodiversity and habitat significantly from the status quo of the surrounding area.

## 8. REFERENCES

- Alexander, G. & Marais, J. 2007.** A Guide to the Reptiles of Southern Africa. Struik Nature, Cape Town.
- BirdLife International 2012.** IUCN Red List of Threatened Species. Version 2013.1. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on **2 September 2017**.
- Branch W.R. (Ed) 1988:** South African Red Data Book – Reptiles and Amphibians. NMB Printers, Port Elisabeth.
- Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K And Strauss, T. 2005.** National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia 17. South African National Biodiversity Institute, Pretoria.
- Du Preez, L. & Carruthers, V. 2009.** *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.
- Fairbanks, D.H.K., Thompson, M.W., Vink, D.E., Newby, T.S., Van Den Berg, H.M. & Everard, D.A. 2000.** The South African land-cover characteristics database: a synopsis of the landscape. S. Afr. J. Sci. 96: 69–82.
- EWT, 2004.** Red Data Book of the Mammals of South Africa: A conservation Assessment. Endangered Wildlife Trust, Johannesburg.
- Hockey P.A.R., Dean W.R.J., and Ryan P.G. 2005.** Robert's Birds of Southern Africa, seventh edition. Trustees of the John Voelcker Bird Book Fund, Cape Town.
- Institute For Water Research, 2012.** Implementing Uncertainty Analysis in Water Resources Assessment and Planning, Water Research Commission Project No: K5/2056, Institute for Water Research, Rhodes University.
- Minter L.R., Burger M., Harrison J.A., Braak H.H., Bishop P.J., and Kloepfer D. (Eds), 2004.** Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MBA Series #9. Smithsonian Institute, Washington DC.
- Mucina, L. and Rutherford, M.C. (eds) 2006.** The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011).** Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801

**Skinner J.D., and Chimimba C.T. 2005:** Mammals of the Southern African Subregion. Cambridge University Press, Cape Town.

**Taylor, M., Peacock, F., Wanless, R.(eds) 2015.** The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg.

**Van Wyk, A.E. & Smith, G.F. 2001.** Regions of floristic endemism in southern Africa. Umdaus press, Hatfield

# APPENDIX 1

## SPECIES LISTS

### PLANT SPECIES CHECK LIST

Family		Ecology	IUCN	NCNCA	Forest Act
Aizoaceae	<i>Titanopsis calcarea</i> (Marloth) Schwantes	Indigenous; Endemic	LC	Schedule 2	
Aizoaceae	<i>Ruschia</i> sp.			Schedule 2	
Aizoaceae	<i>Plinthus karoicus</i> I. Verd.	Indigenous	LC	Schedule 2	
Aizoaceae	<i>Ruschia ruralis</i> (N.E.Br.) Schwantes	Indigenous; Endemic	LC	Schedule 2	
Amaranthaceae	<i>Salsola microtricha</i> Botsch.	Indigenous; Endemic	LC		
Anacardiaceae	<i>Searsia pyroides</i> (Burch.) Moffett var. <i>gracilis</i> (Engl.) Moffett		LC		
Asparagaceae	<i>Asparagus glaucus</i> Kies	Indigenous	LC		
Asparagaceae	<i>Asparagus setaceus</i> (Kunth) Jessop		LC		
Asparagaceae	<i>Asparagus suaveolens</i> Burch.		LC		
Asphodelaceae	<i>Bulbine abyssinica</i> A.Rich.	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Aloe claviflora</i> Burch.	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Aloe granditata</i>	Indigenous	LC	Schedule 2	
Asteraceae	<i>Chrysocoma ciliata</i> L.	Indigenous	LC		
Asteraceae	<i>Helichrysum arenicola</i> M.D.Hend.	Indigenous	LC		
Asteraceae	<i>Euryops asparagoides</i> (Licht. ex Less.) DC.	Indigenous	LC		
Asteraceae	<i>Nolletia chrysocomoides</i> (Desf.) Cass. ex Less.	Indigenous	LC		
Asteraceae	<i>Tarchonanthus camphoratus</i> L.		LC		
Brassicaceae	<i>Lepidium africanum</i> (Burm.f.) DC.	Indigenous	LC		
Brassicaceae	<i>Heliophila minima</i> (Stephens) Marais	Indigenous	LC		
Boraginaceae	<i>Ehretia rigida</i> (Thunb.) Druce subsp. <i>nervifolia</i> Retief & A.E. van Wyk		LC		
Capparaceae	<i>Boscia albitrunca</i> (Burch.) Gilg & Gilg-Ben.	Indigenous	LC	Schedule 2	Protected
Cactaceae	<i>Opuntia humifusa</i> (Raf.) Raf				
Celastraceae	<i>Gymnosporia buxifolia</i> (L.) Szyszyl.				
Cleomaceae	<i>Cleome rubella</i> Burch.	Indigenous	LC		
Convolvulaceae	<i>Cuscuta appendiculata</i> Engelm.	Indigenous; Endemic	LC		

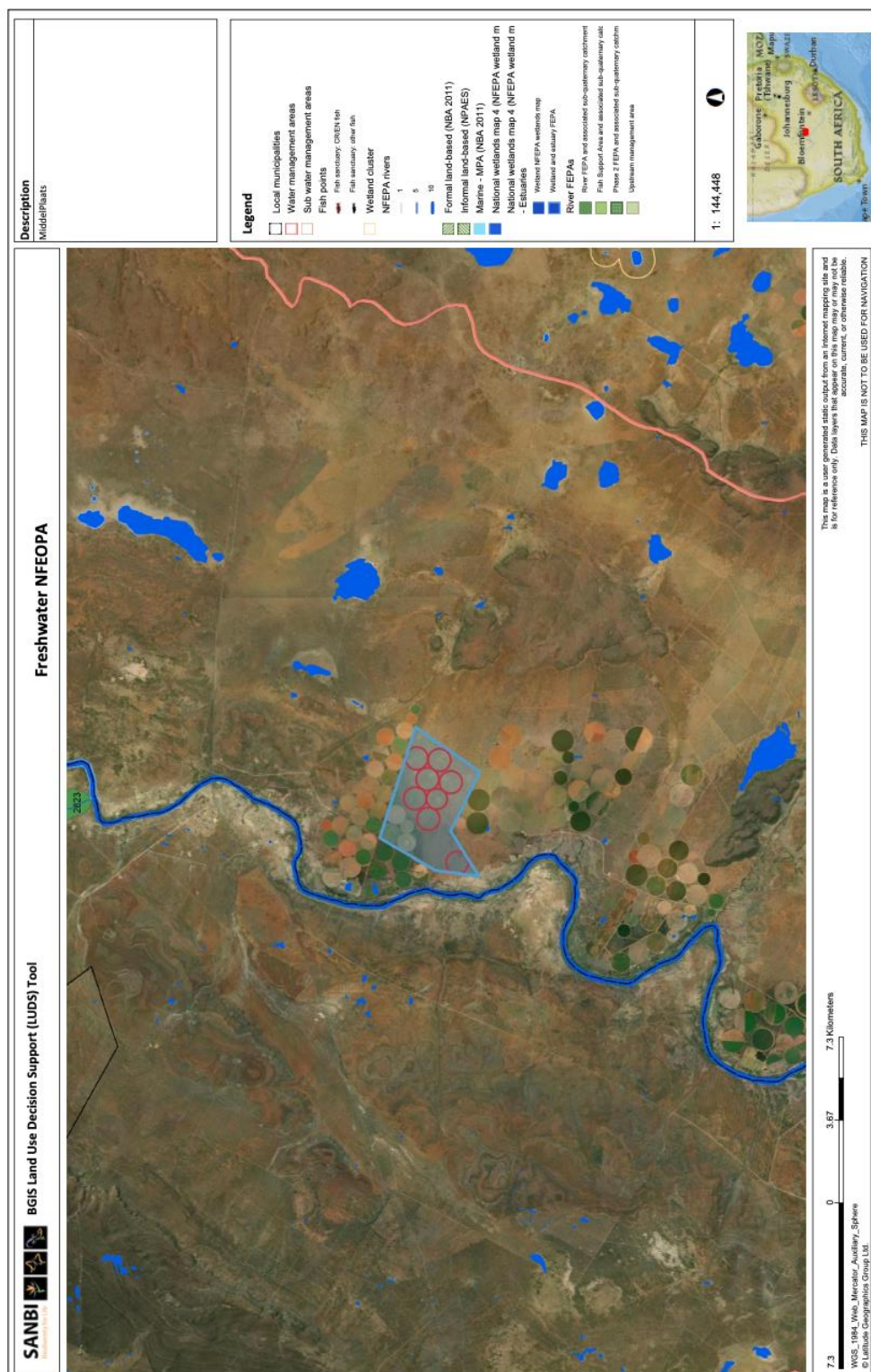


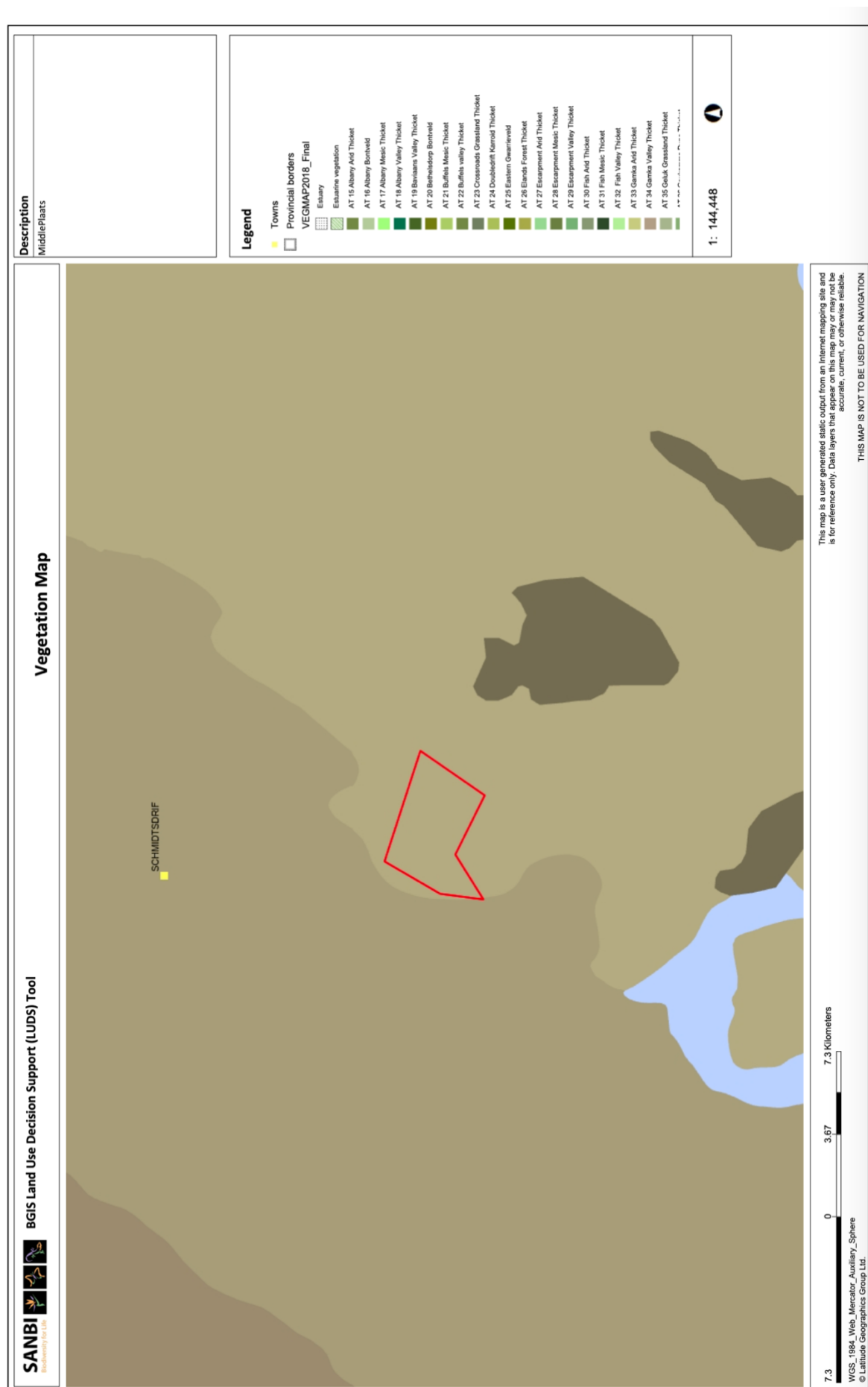
Cucurbitaceae	<i>Kedrostis crassirostrata</i> Bremek.	Indigenous	LC	
Cucurbitaceae	<i>Acanthosicyos naudinianus</i> (Sond.) C.Jeffrey	Indigenous	LC	
Cyperaceae	<i>Pseudoschoenus inanis</i> (Thunb.) Oteng-Yeb.	Indigenous	LC	
Ebenaceae	<i>Diospyros lycioides</i> Desf.	Indigenous	LC	
Fabaceae	<i>Vachellia erioloba</i> (E.Mey.) P.J.H.Hurter	Indigenous	LC	Protected
Fabaceae	<i>Vachellia haematoxylon</i> (Willd.) Seigler & Ebinger	Indigenous	LC	Protected
Fabaceae	<i>Vachellia karroo</i> (Hayne) Banfi & Gallaso		LC	
Fabaceae	<i>Vachellia tortilis</i> (Forssk.) Gallaso & Banfi			
Fabaceae	<i>Pomaria burchellii</i> (DC.) B.B.Simpson & G.P.Lewis	Indigenous	LC	
Fabaceae	<i>Senegalia mellifera</i> (Vahl) Seigler & Ebinger subsp. <i>detinens</i> (Burch.) Kyal. & Boatwr.	Indigenous	LC	
Fabaceae	<i>Prosopis glandulosa</i> Torr. var. <i>glandulosa</i>			
Gisekiaceae	<i>Gisekia pharnaceoides</i> L.	Indigenous	LC	
Hyacinthaceae	<i>Albuca</i> sp.			
Hyacinthaceae	<i>Albuca prasina</i> (Ker Gawl.) J.C.Manning & Goldblatt	Indigenous		
Hyacinthaceae	<i>Ornithogalum nanodes</i> F.M.Leight.	Indigenous	LC	Schedule 2
Malvaceae	<i>Hermannia bryoniifolia</i> Burch.	Indigenous; Endemic	LC	
Malvaceae	<i>Melhania rehmannii</i> Szyszyl.	Indigenous	LC	
Malvaceae	<i>Hermannia pulchella</i> L.f.	Indigenous	LC	
Malvaceae	<i>Grewia flava</i> DC.		LC	
Menispermaceae	<i>Antizoma angustifolia</i> (Burch.) Miers ex Harv.	Indigenous	LC	
Ophioglossaceae	<i>Ophioglossum reticulatum</i> L.	Indigenous	LC	
Ophioglossaceae	<i>Ophioglossum polyphyllum</i> A.Braun	Indigenous	LC	
Papaveraceae	<i>Argemone mexicana</i> L. forma <i>mexicana</i>	Naturalised		

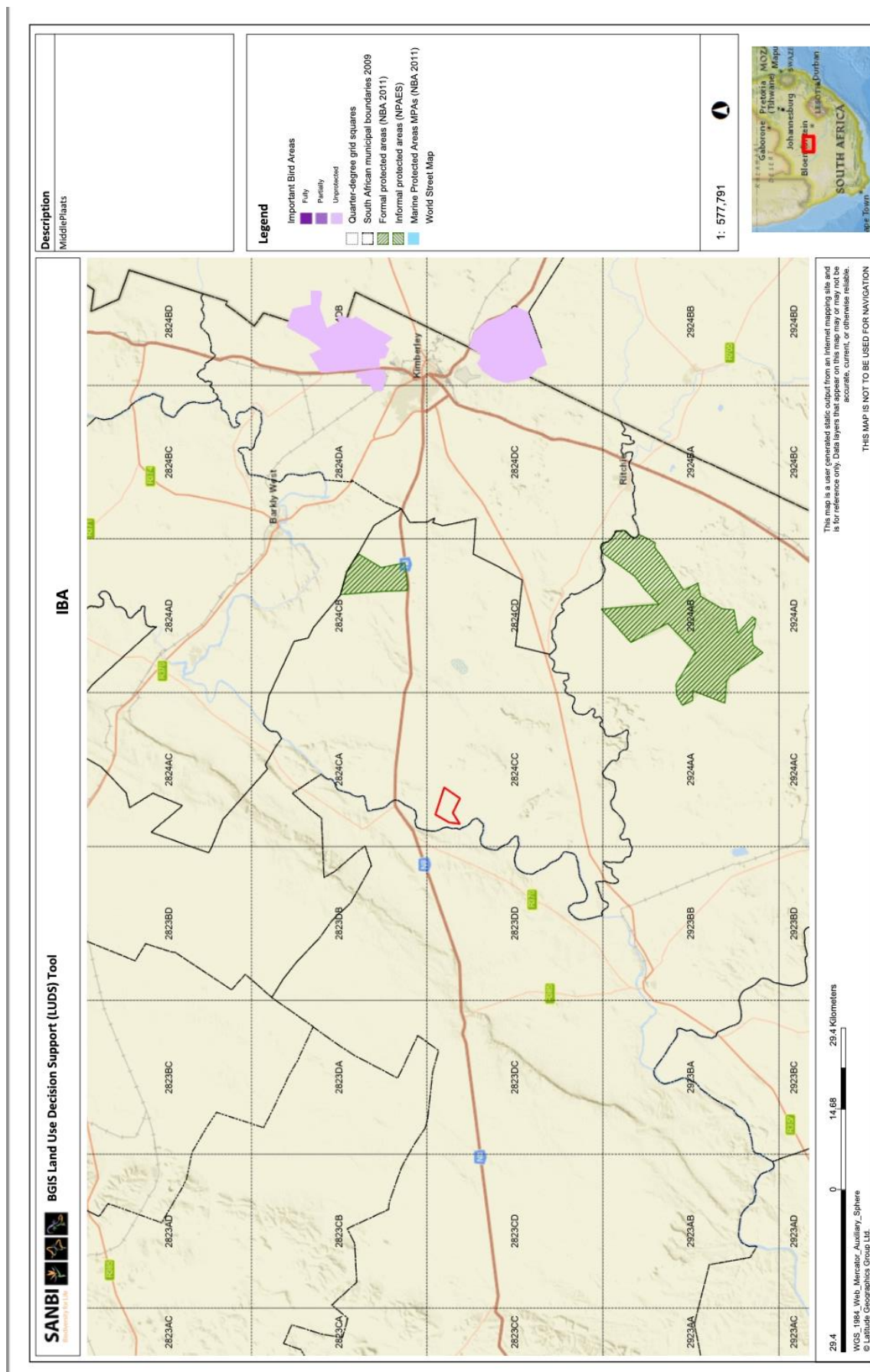
Papaveraceae	<i>Argemone ochroleuca</i> Sweet subsp. <i>ochroleuca</i>	Naturalised	
Poaceae	<i>Eragrostis curvula</i> (Schrad.) Nees	Indigenous	LC
Poaceae	<i>Centropodia glauca</i> (Nees) Cope	Indigenous	LC
Poaceae	<i>Aristida congesta</i> Roem. & Schult.	Indigenous	LC
Poaceae	<i>Stipagrostis uniplumis</i> (Licht.) De Winter	Indigenous	LC
Poaceae	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	Indigenous	LC
Poaceae	<i>Tricholaena monachne</i> (Trin.) Stapf & C.E.Hubb.	Indigenous	LC
Poaceae	<i>Enneapogon scoparius</i> Stapf	Indigenous	LC
Poaceae	<i>Aristida stipitata</i> Hack.	Indigenous	LC
Poaceae	<i>Eragrostis pseudobtusa</i> De Winter	Indigenous; Endemic	NE
Poaceae	<i>Eragrostis lehmanniana</i> Nees var. <i>lehmanniana</i>		LC
Poaceae	<i>Phragmites australis</i> (Cav.) Steu		LC
Poaceae	<i>Cynodon dactylon</i> (L.) Pers.		LC
Poaceae	<i>Schmidtia pappophoroides</i> Steud.		LC
Polygalaceae	<i>Polygala seminuda</i> Harv.	Indigenous	LC
Ruscaceae	<i>Sansevieria aethiopica</i> Thunb.	Indigenous	LC
Saliaceae	<i>Salix mucronata</i> Thunb. subsp. <i>mucronata</i>		LC
Scrophulariaceae	<i>Nemesia pubescens</i> Benth.	Indigenous	Schedule 2
Scrophulariaceae	<i>Selago mixta</i> Hilliard	Indigenous; Endemic	LC
Scrophulariaceae	<i>Selago multispicata</i> Hilliard		LC
Solanaceae	<i>Lycium pilifolium</i> C.H.Wright	Indigenous	LC
Solanaceae	<i>Lycium hirsutum</i> Dunal	Indigenous	LC
Solanaceae	<i>Lycium arenicola</i> Miers	Indigenous	LC
Thymelaeaceae	<i>Lasiosiphon polycephalus</i> (E.Mey. ex Meisn.) H.Pearson		LC
Zygophyllaceae	<i>Roepera lichtensteiniana</i> (Cham.) Beier & Thulin	Indigenous	
Zygophyllaceae	<i>Zygophyllum lichtensteinianum</i> Cham. & Schldl.		LC

## APPENDIX 2

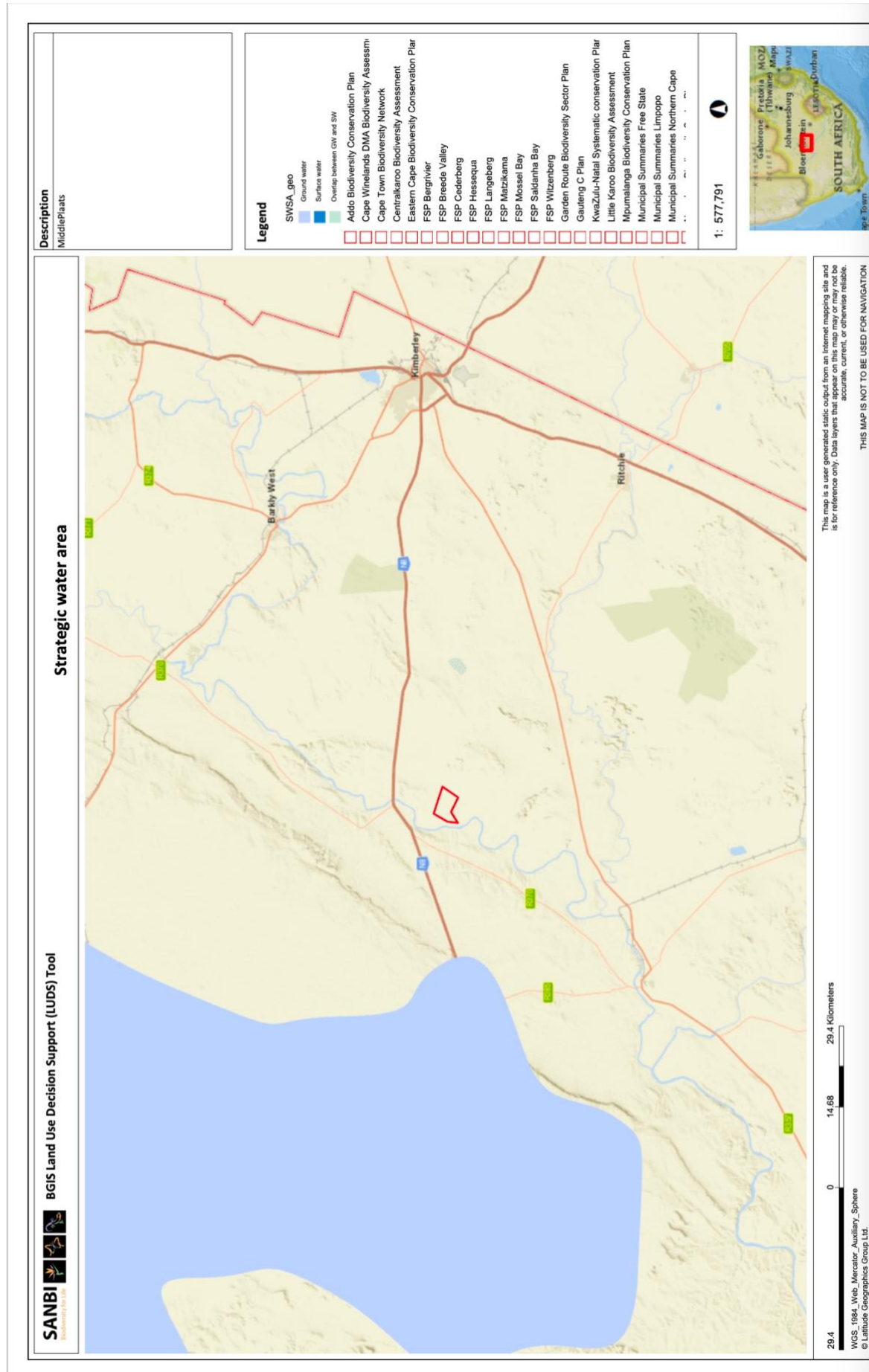
## REGIONAL CONSERVATION PLANNING

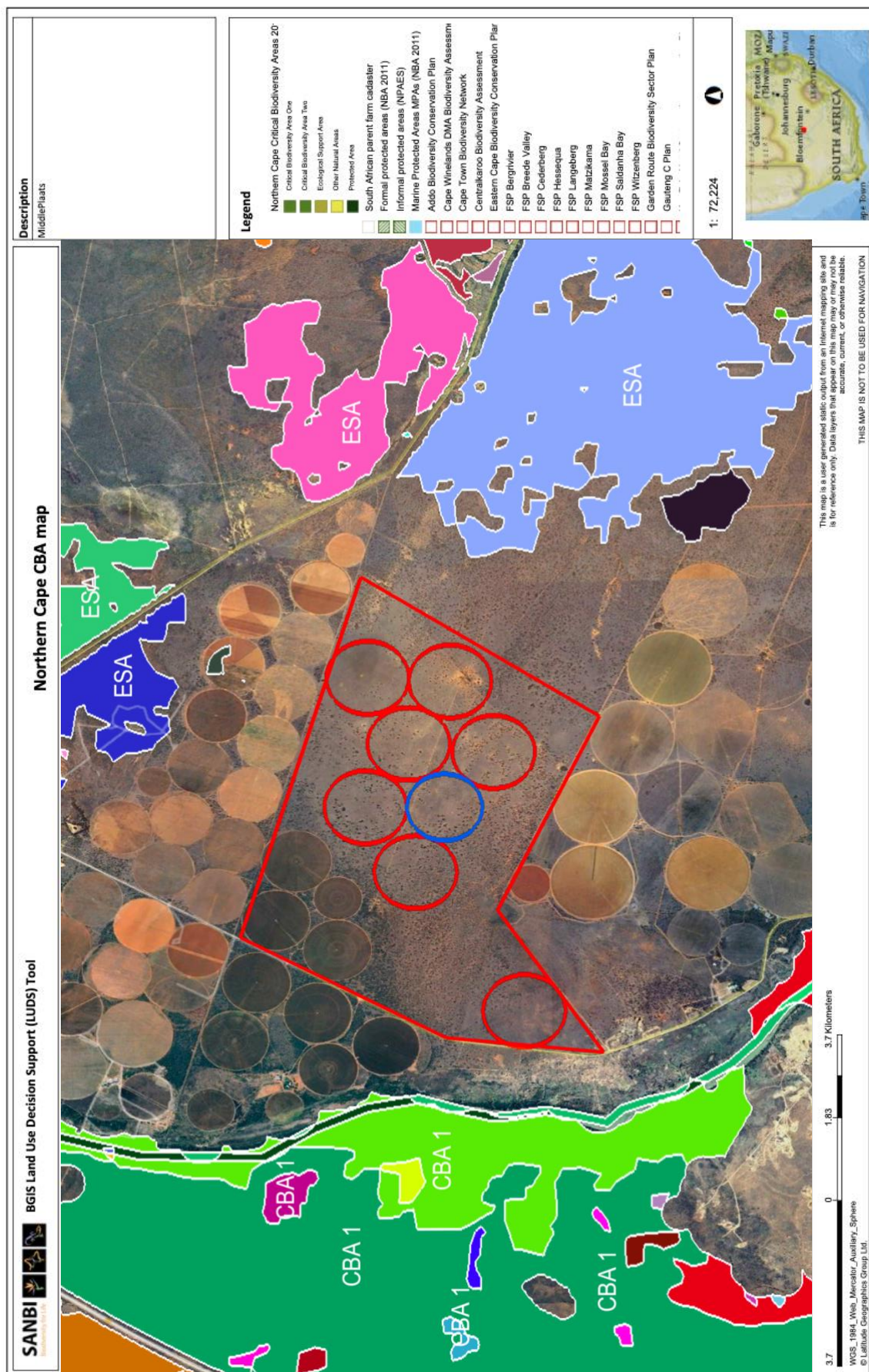












# APPENDIX 3

## DETAILS OF SPECIALIST

### ABRIDGED CURRICULUM VITA

#### NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

#### QUALIFICATIONS

BSc (Rhodes University) – Botany and Zoology  
 BSc (Hons) Wildlife Management, Pretoria University  
 PhD (Rhodes University)

#### PHD DISSERTATION

Vegetation potential of natural rangelands in the mid Fish River Valley. Towards a sustainable and acceptable management system.

#### RESEARCH INTERESTS

My academic interests cover various areas dealing with ecological functioning, and wildlife management, with a special interest in the functioning and management of arid and semi arid rangelands.

#### ACADEMIC AWARD

Awarded a medal in 2001 by the Grassland Society of Southern Africa for: Outstanding Student in Range and Forage Science

#### PROFESSIONAL EXPERIENCE

1999 – 2000	<u>Eastern Cape Parks Board</u>	Ecologist
2000 -2002	<u>Coastal &amp; Environmental Services</u>	Consultant
2003 – present	<u>Ecological Management Services</u>	Owner/Consultant

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. Although we are based in Kimberley we cover most of South Africa and have projects in the Eastern Cape, Free State, North West Province, Northern Cape and Gauteng. We have undertaken impact assessments for various types of developments including urban and rural developments, agricultural developments, as well as developments within the mining sector. We also provide specialist input to various types of projects and have formulated biodiversity offset studies required to off set impacts from large developments.

A selection of recent work is as follows:

- Department of Agriculture Northern Cape—Hopetown Piggery
- Department of Agriculture Northern Cape—Phillipstown Piggery



- Department of Agriculture Northern Cape—Chikiana Piggery
- Department of Agriculture Northern Cape—De Aar Hydroponics
- Sidi Parani—Fertilizer granulation plant in Christiana
- Tiva Enviro Services - Biodiversity study for De Aar Hospital
- Ghaap Ostrich Abattoir—Biodiversity Study
- Amakhala Nature Reserve—Development of lodge facilities
- IG van der Merwe Trust—Residential development, Douglas
- Valrena Trust—Residential development along Vaal River
- Idstone Pty Ltd—Development of irrigation ground for seed potatoes production
- Tiaan Trust—Development of irrigation ground
- C F Scholtz & Seuns - Development of irrigation ground for growing of crops
- Kosie Smith Trust - Development of irrigation ground for growing seed potatoes
- Bakgat Trust—Development of irrigation ground for growing of crops
- Mount Carmel (pty) Ltd—Development of irrigation ground for growing of crops
- Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production
- Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops
- Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production
- Valrena Trust—Development of irrigation ground for growing of crops
- Middeldrift Dairy Trust—Establishment of Dairy
- Eliweni Wildlife (Pty) Ltd - Lodge Development on Amakhala Nature Reserve
- Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes
- Trisa Trust—Development of irrigation ground for the growing of seed potatoes
- GWK Pty Ltd—Development of irrigation pivots and vineyards
- Blair Athol Golf course development
- Rolfontein Nature Reserve lodge development
- SLR—Ecological Specialist survey for Kudumane Mine
- Biodiversity offset plan—UMK mine
- Biodiversity Action Plan for UMK mine
- Biodiversity offset Kudumane Mine
- IDC—Ecological Management & Business Plan: Siyancuma Women in Game Initiative
- Swanvest 123 Pty Ltd—Wolverfontein Breeding Facility
- De Beers—Ecological Evaluation and Management Plan for Kleinsee Game Farm
- Kalahari Oryx Game Reserve—Risk Assessment introduction of Lion
- Department of Land Affairs—Ecological Management and Business plan for Thwane Commonage
- Mauricedale Game Ranch—Paardefontein Specialist Vegetation Survey
- Santrosa Investments Pty Ltd—Olie Rivier Game Farm HA
- Manzi Safaris Habitat Assessment
- Thuru Lodge—Risk Assessment & Habitat Analysis
- Dugmore brothers—Habitat assessment Hartebeesthoek
- Schutte Boerdery Trust—Habitat Assessment Glenfrere
- F G. Taljaard—Habitat Assessment Namakwari Game Reserve
- Rivierfront Wild - Doornfontein Habitat Assessment
- Sjobbolet Trust—Hartsvally Habitat Assessment
- Raltefontein Habitat Assessment
- Kalahari Oryx Game Reserve—Specialist Vegetation survey

#### PROFESSIONAL ASSOCIATIONS

Grassland Society of Southern Africa

South African Council for Natural scientific Professions Registration number 400117/05

#### RESEARCH PUBLICATIONS

- Evans, N.V., Avis, A.M. and Palmer, A.R. 1997. Changes to the vegetation of the mid-Fish River valley, Eastern Cape South Africa, in response to land-use, as revealed by a direct gradient analysis. *African Journal of Range & Forage science*, **14**(2): 68-74.
- Birch N.V., Avis, A.M. and Palmer, A.R. (1999) The Effect Of Land-Use On The Vegetation Communities Along A Topo-Moisture Gradient In The Mid-Fish River Valley, South Africa. *African Journal of Range & Forage science*, **16**(1): 1-8
- Birch, N.V., Avis, A.M. and Palmer, A.R. 1999. Changes to the vegetation communities of natural rangelands in response to land-use in the mid-Fish River valley, South Africa. *People and Rangelands Building the Future* (Eds D. Eldridge & D. Freudenberger) pp.319-320 vol 1. Proceeding of the VI International Rangeland Congress, Townsville, Queensland, Australia

---

## APPENDIX 4

### IMPACT ASSESSMENT METHODOLOGY

---