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Terrestrial Ecological Assessment for the Expansion of the Pollution Control Dams associated with the Continuous Disposal of Ash at the Majuba Power Station, Mpumalanga Province

May 2019

for

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1 INTRODUCTION

1.1 PROJECT DETAILS AND BACKGROUND

Enviro-Insight CC was commissioned by Advisian Worley Parsons to perform a Scoping and Environmental Impact Assessment (EIA) specialist report for the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD) (hereafter the study area) at the Majuba Power Station's Ash Disposal Facility, Mpumalanga Province.

Majuba is an Eskom coal-fired power station, situated approximately 30 km NNW from Volksrust, Mpumalanga. It has six (6) coal-fired power generating with a capacity to generate 4 110MW of electricity. Ash is produced from the coal combustion process. The dry ash is then transported, via a conveyor system, to the Majuba ash disposal facility (ADF), situated 1.4 km west of the station, where it is disposed of.

In order to do dust suppression, pollution control and rehabilitation of the ADF, pollution control dams (PCD) are used on site. Water runoff is collected via concrete perimeter drains and diverted to one of the PCDs. The PCD are divided into the following:

- Ash Dams (AD) - Contaminated runoff from active ash disposal areas.
- Rehabilitation Dams (RD) - Clean water runoff from rehabilitated areas.

This report therefore seeks to detail any potential environmental impacts associated with the two extension AD facilities and the construction of the two RD.

1.2 STUDY AREA

The study area is located approximately 16 km southwest (SW) of Amersfoort and approximately 40 km north northwest (NNW) of Volksrust in the Mpumalanga Province. The site can be accessed via the R35 from an unnamed road towards Perdekop or via an unnamed road between the R23 and the N11 (Figure 1-1). The Majuba Power Station falls within the Dr Pixley Ka Isaka Seme Local Municipality located in the Gert Sibande District Municipality.

1.3 STUDY LIMITATIONS

- It is assumed that all third party information acquired is correct (e.g. GIS data and scope of work);
- The level of study did not warrant long-term trapping methods (i.e. small mammal trapping, herpetofauna trapping, camera trapping and night surveys) or a phytosociological delineation. The confidence in the assessment derived from the literature review and fieldwork data however is high due to the *status quo* of the study area, the location (disturbed area) and the size of the study area (relatively small);
- Due to the weather conditions on site during the survey, i.e. cold temperatures and high wind speeds, conditions were not optimal; and

- The site visit was conducted at the beginning of the wet season in November. No follow-up study was performed later on in the season.

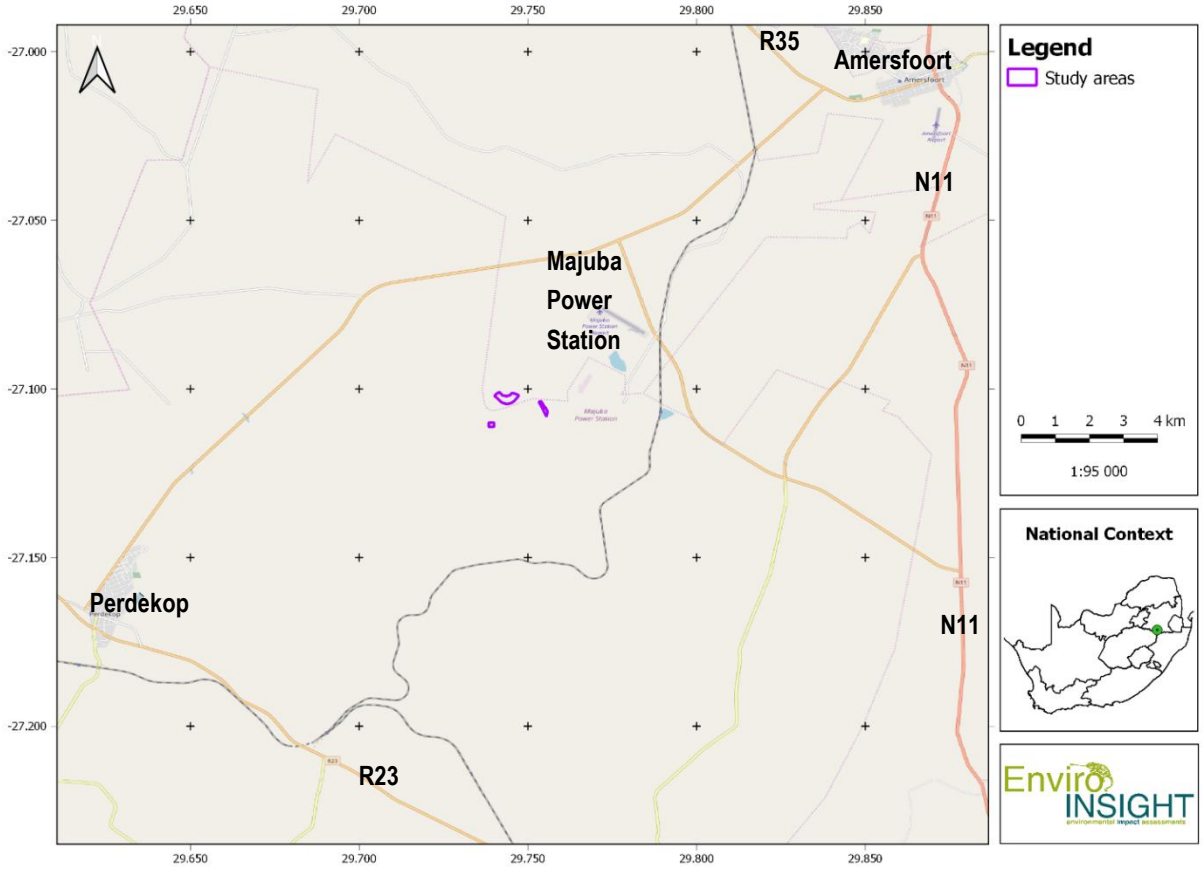


Figure 1-1: Locality of the study area for the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD).

2 METHODS

2.1 DESKTOP SURVEY

2.1.1 Flora Assessment

A literature review was conducted as part of the desktop study to identify the potential habitats and flora species of conservation concern (SCC) present within the study area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA) (SANBI, 2017)[1], to access

1 http://newposa.sanbi.org/

distribution records on southern African plants[2]. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree grid cell (QDGC) resolution; however, the BODATSA database provides distribution data as point coordinates. The literature study therefore, focussed on querying the database to generate species lists for the xMin, yMin 29.50°,-26.9° : xMax, yMax 30.20°,-27.34° extent (WGS84 datum) in order to increase the likelihood of obtaining a representative species list for the proposed study area.

The Red List of South African Plants website (SANBI, 2018)[3] was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Guide to grasses of Southern Africa (Van Oudtshoorn, 1999);
- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1998);
- Field guide to trees of southern Africa (Van Wyk & Van Wyk, 2013); and
- Problem plants and alien weeds of South Africa (Bromilow, 2010).

Additional information regarding ecosystems, vegetation types, and SCC included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006); and
- Red List of South African Plants (Raimondo *et al*., 2009; SANBI, 2018).

2.1.2 Fauna Assessment

The level of this study did not warrant intensive long term field sampling. Rather, conditions on site were evaluated during a rapid field assessment and placed into context within the regional vegetation type (Mucina & Rutherford, 2006), from which a series of conclusions and subsequent recommendations were derived to inform the development process.

Relevant databases, field guides and texts were consulted for the desktop and literature study included the following:

- The online Virtual Museum (VM) facility of the Animal Demography Unit (ADU) of the University of Cape Town (http://vmus.adu.org.za) was queried for the presence of mammal (MammalMAP, 2018), reptile (ReptileMAP, 2018) and amphibian (FrogMAP, 2018) SCC within the QDGC in which the proposed development resides (2729BA and 2729BB);
- Information relating to avifauna species of conservation concern (SCC) was obtained from the Southern Africa Bird Atlas Project (SABAP 2), Hockey *et al.,* (2005) and Taylor *et al.,* (2015);
- Mammal SCC information was obtained from Child *et al.,* (2017);
- Reptile information was predominantly obtained from Bates *et al.,* (2014); and
- Amphibian information was predominantly obtained from Du Preez & Carruthers (2017).

2 Data are obtained from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH)
3 http://redlist.sanbi.org/

Species nomenclature follows the aforementioned references throughout this document except for herpetofauna where nomenclature for reptiles follows ReptileMAP (2018) as new distribution data and taxonomic changes have already occurred since publication of Bates *et al.,* (2014). Similarly, the Frog Atlas of Southern Africa (FrogMAP, 2018) provides information on the geographic distributions of amphibians and keeps up-to-date with the latest taxonomic changes. The use of these online facilities is justified as it not only includes the latest verified publicly contributed data but also a complete record of the museum material in South Africa. The applicability of the information obtained from the literature sources was evaluated for the study area and the subsequent recommendations are to be used by the client in order to drive the development process in accordance with the relevant legislation.

2.1.3 GIS

Existing data layers were incorporated into a GIS to establish how the proposed the study area and associated activities interact with these important terrestrial entities. Emphasis was placed around the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2018);
- Mpumalanga Biodiversity Sector Plan (MBSP, 2014[a])
- MBSP Terrestrial Assessment (MBSP, 2014[b]);
- Important Bird Areas (BirdLife South Africa, 2015); and
- National List of Threatened Ecosystems (SANBI, 2011).

All mapping was performed using open source GIS software (QGIS[4]).

2.2 FIELD SURVEY

A site visit was performed on 7 November 2018 by an ecologist where the faunal and floral aspects of the survey area were evaluated. The timing of the study represented the start of wet season conditions which is sub-optimal for plant identification and good foraging quality for fauna species.

During the field surveys, the habitats were evaluated on foot and a series of georeferenced photographs were taken of the habitat attributes. The field surveys focused on a classification of the observed fauna and flora, habitats as well as the actual and potential presence of species of conservation concern (either classified as Threatened by the IUCN (2018), protected by NEMBA (2014) or indeed other legislations applicable provincially or nationally). An analysis of the diversity and ecological integrity of the habitats present on site was also performed.

4 http://qgis.osgeo.org/en/site/

2.3 SPECIES OF CONSERVATION CONCERN

The Red List of threatened species generated by the IUCN (http://www.iucnredlist.org/) provided the global conservation status. However, regional conservation status assessments performed following the IUCN criteria were considered to be the most relevant in cases where the conservation status was of greater importance and sourced for each group as follows:

- Plants: Red List of South African plants version 2018[5] and Raimondo *et al.* (2009);
- Reptiles: Bates *et al.* (2014);
- Amphibians: Du Preez & Carruthers (2017);
- Mammals: Child *et al.* (2016); and
- Avifauna: Taylor *et al.* (2015).

The conservation status categories defined by the IUCN, which are considered here to represent species of conservation concern, are the "threatened" categories defined as follows:

- **Critically Endangered (CR)** - Critically Endangered refers to species facing immediate threat of extinction in the wild.
- **Endangered (EN)** - Endangered species are those facing a very high risk of extinction in the wild within the foreseeable future.
- **Vulnerable (VU)** - Vulnerable species are those facing a high risk of extinction in the wild in the medium-term.

2.4 IMPACT ASSESSMENT

The following lists of impacts were evaluated against the data captured during the fieldwork to identify relevance to the study area. The relevant impacts were then subjected to a prescribed Impact Analysis methodology which is also described below. Mitigation measures were only developed for impacts deemed relevant on the basis of the Impact Analysis.

2.4.1 Potential Flora Impacts

1. Loss, and/or displacement of critically endangered/endangered plant species;
2. Impact on plant communities of particular scientific, conservation or education value;
3. Impact on sensitive plant ecological systems;
4. Decrease in diversity of natural plant communities;
5. Possibility to enhance the spread of invasive and/or alien plants and declared weeds;
6. Threat to the ecological functioning of natural plant communities due to:
    - Isolation of plant communities by destruction of habitat;
    - Reduction in the effective size of habitat/community; and

5 http://redlist.sanbi.org/index.php

- Physical destruction of the habitat.

7. Degradation of plant habitat through:
   - Compaction of the topsoil through trampling, vehicles, machinery etc.;
   - Introduction and/or spread of invasive alien species - creation of dispersal sites; and
   - Potential for bush encroachment through disturbance of topsoil.

2.4.2 Potential Fauna Impacts

1. Loss and/or displacement of critically endangered/endangered animal species;
2. Impact on natural communities of particular scientific, conservation or education value;
3. Impact on natural movement of species (flight pathways etc.);
4. Disturbance of non-resident or migrant species (birds over-wintering, breeding);
5. Decrease in diversity of natural animal communities;
6. Decrease in availability and reliability of food sources for animal communities;
7. Possibility to introduce and/or enhance the spread of alien animal species;
8. Threat to the ecological functioning of natural terrestrial communities due to:
   - Isolation of animal communities by destruction of habitat; and
   - Physical destruction of the habitat.
9. Construction of barriers to animal movement or migration.

2.4.3 Impact Analysis

Description of Aspects and Impacts

The accumulated knowledge and the findings of the environmental investigations in conjunction with the proposed Spatial Development Plan form the basis for the prediction of impacts. Once a potential impact has been determined it is necessary to identify which project activity will cause the impact, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal).

This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies. The aspects and impacts identified are therefore described according to the following:

Spatial Scope / Extent

The spatial scope for each aspect, receptor and impact is defined. The geographical coverage (spatial scope) description takes account of the following factors:

- The physical extent/distribution of the aspect, receptor and proposed impact; and
- The nature of the baseline environment within the area of impact.

For example, the impacts of noise are likely to be confined to a smaller geographical area than the impacts of atmospheric emissions, which may be experienced at some distance. The significance of impacts also varies spatially. Many are significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a local or regional level.

Table 2-1: Spatial Scale of the impact will be rated according to the following scale.

Spatial Scale	Rating
Activity specific	1
Area specific	2
Whole site/plant/mine	3
Regional/neighbouring areas	4
National	5

Duration

Duration refers to the length of time that the aspect may cause a change either positively or negatively on the environment. The environmental assessment will distinguish between different time periods by assigning a rating to duration based on the following scale:

Table 2-2: Duration of the impact will be rated according to the following scale.

Duration	Rating
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure	5

Severity

The severity of an environmental aspect is determined by the degree of change to the baseline environment, and includes consideration of the following factors:

- The reversibility of the impact;
- The sensitivity of the receptor to the stressor;
- The impact duration, its permanency and whether it increases or decreases with time;
- Whether the aspect is controversial or would set a precedent; and
- The threat to environmental and health standards and objectives.

Table 2-3: Severity of each of the impacts will be rated according to the following scale.

Severity	Rating
Insignificant/non-harmful	1
Small/potentially harmful	2
Significant/slightly harmful	3
Great/harmful	4
Disastrous/extremely harmful	5

Frequency of the Activity

The frequency of the activity refers to how regularly the activity takes place. The more frequent an activity, the more potential there is for a related impact to occur. The following frequency categories have been defined:

Table 2-4: Frequency of impacts will be rated according to the following scale:

Frequency	Rating
Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Probability of the Impact occurring

The probability of the impact refers to how often the aspect impacts or may impact either positively or negatively on the environment. After describing the frequency, the findings will be indicated on the following scale:

Table 2-5: Probability of impacts will be rated according to the following scale.

Probability	Rating
Almost never/almost impossible	1
Very seldom/highly unlikely	2
Infrequent/unlikely/seldom	3
Often/regularly/likely/possible	4
Daily/highly likely/definitely	5

Determination of Impact Significance

The information presented above in terms of identifying and describing the aspects and impacts is summarised in tabular form and significance is assigned with supporting rational. A definition of a 'significant impact' for the purposes of the study is:

"An impact which, either in isolation or in combination with others, could, in the opinion of the specialist, have a material influence on the decision-making process, including the specification of mitigating measures."

Significance will be classified according to the following:

- Very Low to Low - it will not have an influence on the decision;
- Medium to Medium-High - it should have an influence on the decision unless it is mitigated;
- High to Very High- it would influence the decision regardless of any possible mitigation.

Table 2-6: Consolidated Table of Aspects and Impacts Scoring

Spatial Scope	Rating	Duration	Rating	Severity	Rating
Activity specific	1	One day to one month	1	Insignificant/non-harmful	1
Area specific	2	One month to one year	2	Small/potentially harmful	2
Whole site/plant/mine	3	One year to ten years	3	Significant/slightly harmful	3
Regional/neighbouring areas	4	Life of operation	4	Great/harmful	4
National	5	Post closure	5	Disastrous/extremely harmful	5

Frequency of Activity	Rating	Probability of Impact	Rating
Annually or less	1	Almost never/almost impossible	1
6 monthly	2	Very seldom/highly unlikely	2
Monthly	3	Infrequent/unlikely/seldom	3
Weekly	4	Often/regularly/likely/possible	4
Daily	5	Daily/highly likely/definitely	5

Spatial Scope	Rating	Duration	Rating	Severity	Rating
Significance Rating of Impacts				Timing	
Very Low (1-25) Low (26-50) Low – Medium (51-75) Medium – High (76-100) High (101-125) Very High (126-150)				Pre-construction Construction Operation Decommissioning	
Adjusted Significance Rating					

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which has already been assessed by the relevant specialist. The description and assessment of the aspects and impacts is presented in a consolidated table with the significance of the impact assigned using the process and matrix detailed above.

The sum of the first three criteria (spatial scope, duration and severity) provides a collective score for the consequence of each impact. The sum of the last two criteria (frequency of activity and frequency of impact) determines the likelihood of the impact occurring. The product of consequence and likelihood leads to the assessment of the significance of the impact, shown in the significance matrix below in Table 2-7.

Table 2-7: Significance Assessment Matrix.

Likelihood (Frequency of Activity + Frequency of Impact)	Consequence (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	08	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 2-8: Positive and Negative Impact Mitigation Ratings.

Colour Code	Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
	Very High	126-150	Improve Current Management	Maintain Current Management
	High	101-125	Improve Current Management	Maintain Current Management
	Medium-High	76-100	Improve Current Management	Maintain Current Management
	Low-Medium	51-75	Maintain Current Management	Improve Current Management
	Low	26-50	Maintain Current Management	Improve Current Management
	Very Low	1-25	Maintain Current Management	Improve Current Management

The model outcome is then assessed in terms of impact certainty and consideration of available information. Where a particular variable rationally requires weighting or an additional variable requires consideration the model outcome is adjusted accordingly.

3 RESULTS

3.1 CLIMATE

The area around the Majuba Power Station normally receives approximately 584 mm of rain per year, with most of the rainfall occurring during the summer months (Sep - Feb). Weather conditions on the day of the site visit were not conducive for fauna observations in the surrounding area. Temperature measurements (obtained from Majuba power station weather stations every 10 minutes) were well below the average temperature recorded at midday (---) for the month of November (24 °C) (Figure 3-1).

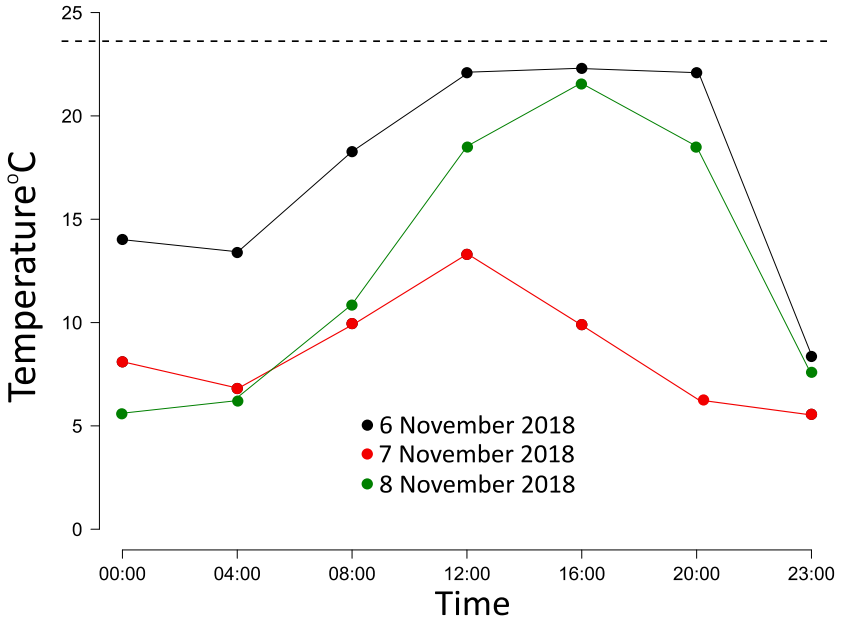


Figure 3-1: The mean temperature recorded at Majuba Power Station over the survey period.

The wind conditions were also not conducive for faunal surveys, especially so for avifauna, due to almost constant wind and occasional powerful gusts. Visibility was heavily affected due to ash being blown off the ash dump (Figure 3-2).

Figure 3-2: Strong winds at Majuba Power Station blowing ash off the ash dump into the surroundings.

3.2 REGIONAL VEGETATION

The study area falls entirely within the Amersfoort Highveld Clay Grassland vegetation unit (

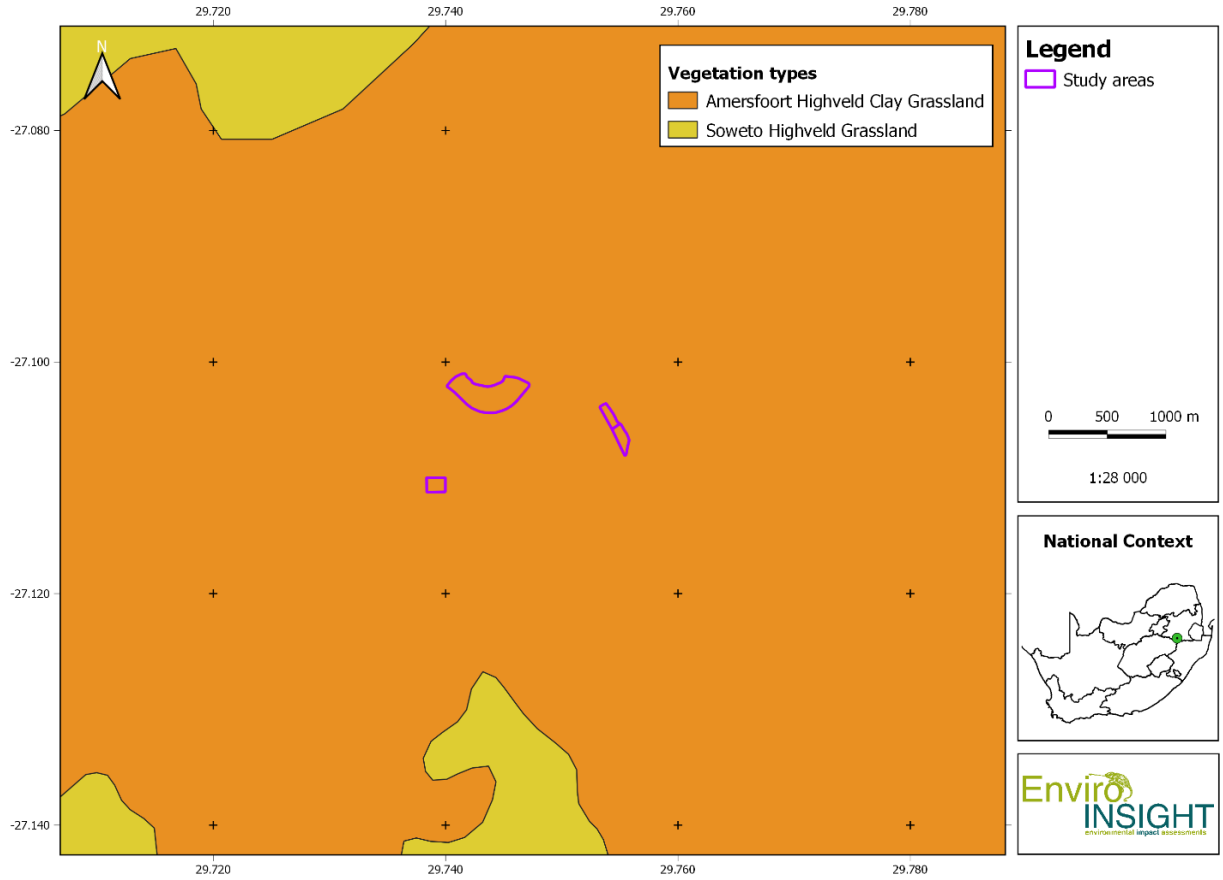


Figure 3-3) (Table 3-1). The vegetation is described as undulating grassland plains, with localised patches of dolerite outcrops in certain areas. The landscape is typically comprised of short closed grassland cover consisting mainly of *Themeda triandra*, which is often severely grazed to form a short lawn. This vegetation unit is considered Vulnerable with the conservation target set at 27 % of which none is currently protected. Approximately 25 % of the vegetation type is transformed of which 22 % is through cultivation, while exotic *Acacia* species (Silver and Black Wattle) and *Salix babylonica* invade drainage lines (Mucina & Rutherford, 2006). Overgrazing leads to the invasion of *Seriphium plumosum* (bankrupt bush).

Table 3-1: Attributes of the Amersfoort Highveld Clay Grassland regional vegetation unit

Name of vegetation type	Amersfoort Highveld Clay Grassland
Code as used in the Book - contains space	Gm 13
Conservation Target (percent of area) from NSBA	27 %
Protected (percent of area) from NSBA	0 %
Remaining (percent of area) from NSBA	75.5%
Description of conservation status from NSBA	Vulnerable
Description of the Protection Status from NSBA	Not protected
Area (km^2) of the full extent of the Vegetation Type	3896.55
Name of the Biome	Grassland Biome

Important taxa in this vegetation unit include the following:

Graminoids: *Aristida aequiglumis, A. congesta, A. junciformis, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa, E. sclerantha, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmannii, Alloteropsis semialata, Andropogon appendiculatus, E. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis, capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris* and *Urelytrum agropyroides*.

Herbs: *Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Pelargonium luridum, Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis, Helichrysum aureonitens, H. callicomum, H. oreophilum, H. rugulosum, Ipomoea crassipes, Pentanisia prunelloides, Selago densiflora, Senecio coronatus, Vernonia oligocephala* and *Wahlenbergia undulata*.

Geophytic herbs: *Gladiolus crassifolius, Haemanthus humilis, Hypoxis rigidula* and *Ledebouria ovatifolia*.

Succulent herb: *Aloe ecklonis*

Low shrubs: *Anthospermum rigidum* and *Stoebe plumosa.*

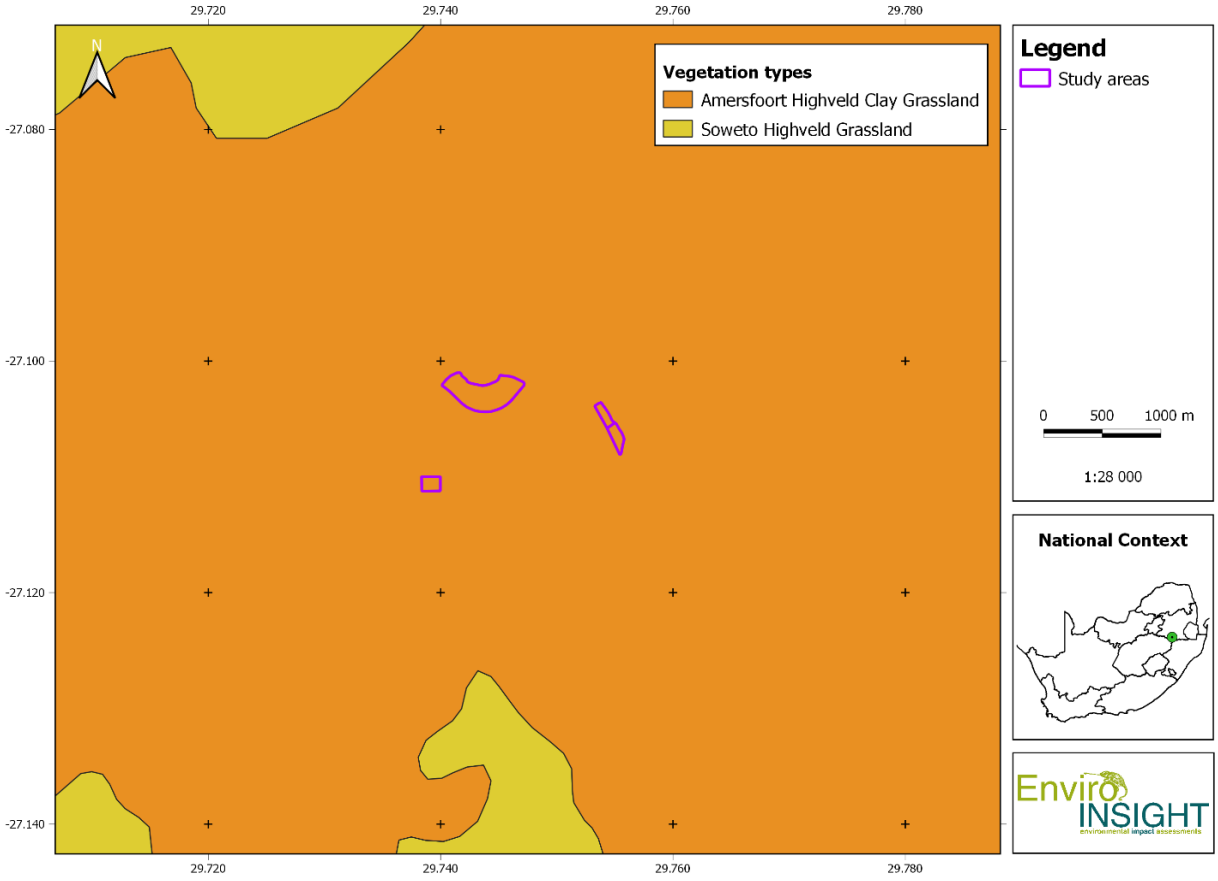


Figure 3-3: Regional vegetation types in relation to the study area.

3.3 MPUMALANGA BIODIVERSITY CONSERVATION PLAN

The Mpumalanga Biodiversity Conservation Plan (MBCP) maps the distribution of Mpumalanga's Provinces known biodiversity into six categories (Ferrar & Lötter, 2007). These are ranked according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature. Classification of the six categories is as follows:

1. Protected areas – already protected and managed for conservation;
2. Irreplaceable areas – no other options available to meet targets – protection crucial;
3. Highly Significant areas – protection needed, very limited choice for meeting targets;
4. Important and Necessary areas – protection needed, greater choice in meeting targets;
5. Areas of Least Concern – Natural areas with most choices, including for development; and

6. Areas with No Natural Habitat Remaining – transformed areas that make no contribution to meeting targets.

According to the MBCP, the study areas intersect with both "Least Concern" and "No Natural Habitat Remaining" (Figure 3-4).

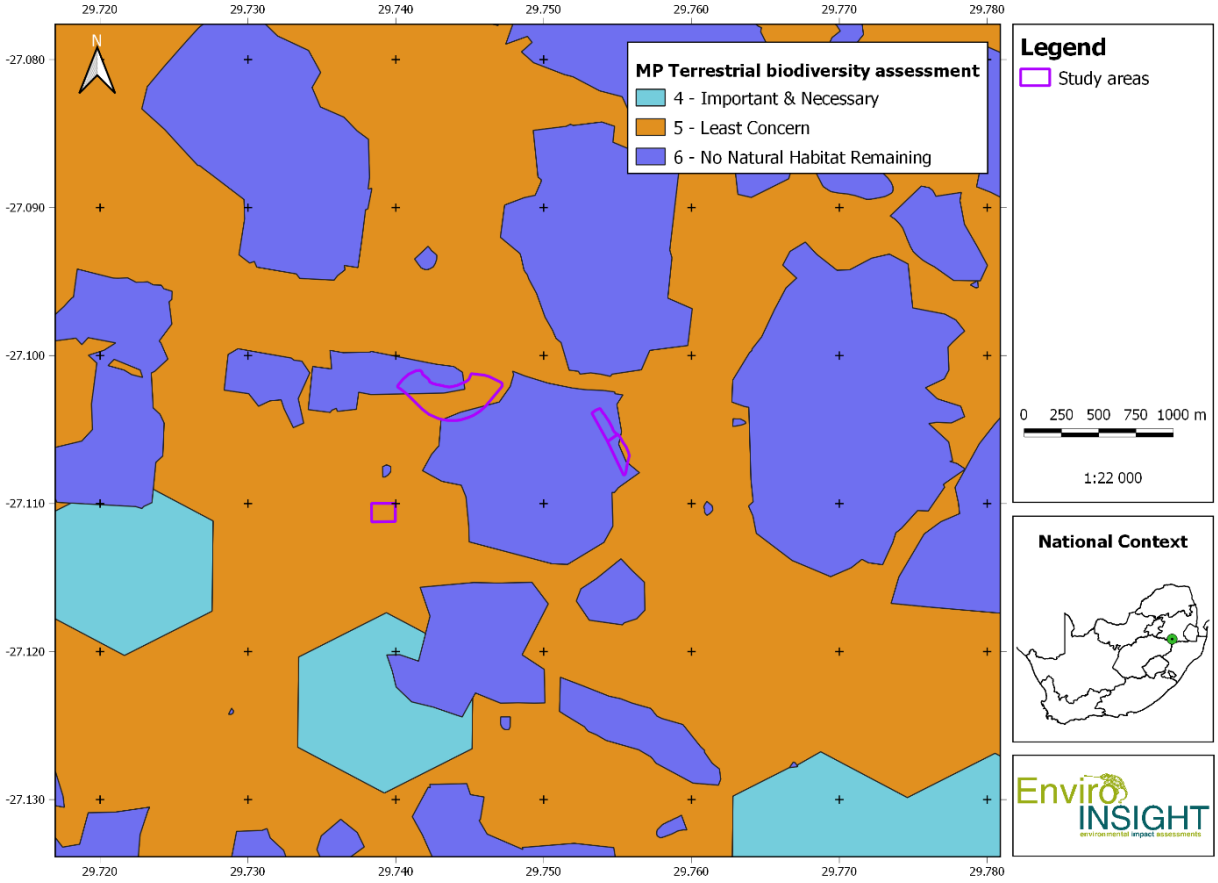


Figure 3-4: The study area in relation to the Mpumalanga Terrestrial Biodiversity Conservation Plan.

3.4 IMPORTANT BIRD AREAS

The study area falls within the Grassland Important Bird Area (SA125) covering an area of 1 084 550 ha in the Mpumalanga, Free State and KwaZulu-Natal Provinces (Figure 3-5). This large area is centred on the towns of Volksrust, Wakkerstroom and Memel. The IBA is partially protected in Mabola, KwaMandlangampisi and Pongola Bush, with the declaration of the Sneeuwberg Protected Environment currently in progress.

This area holds a significant proportion of the small population of the globally endangered White-winged Flufftail (*Sarothrura ayresi*) that has been recorded in South Africa. The species is known, or thought, to occur regularly at three wetlands in the IBA in seasons of suitable rainfall. Corn Crake (*Crex crex*) also occurs regularly at some of the wetlands. The various wetland

systems hold large numbers of Little Bittern (*Ixobrychus minutus*), Baillon's Crake (*Porzana pusilla*), Red-chested Flufftail (*Sarothrura rufa*) and African Rail (*Rallus caerulescens*), as well as several breeding populations of African Marsh Harrier (*Circus ranivorus*), Grey Crowned Crane (*Balearica regulorum*) and African Grass Owl (*Tyto capensis*). Of the terrestrial birds, the core populations of most of South Africa's threatened and endemic grassland species are centred on the IBA. An estimated 85% of the global population of Rudd's Lark (*Heteromirafra ruddi*) is thought to occur within the IBA. Although this lark ranges throughout the site, it is highly localised in open, moderately to heavily grazed level grassland, without forb invasion. It prefers hill tops or plateaus and favours trampled areas. Botha's Lark (*Spizocorys fringillaris*) also occurs in the IBA and is highly localised in grassland on black clay or dolerite soils, where it favours short, dense, natural grassland on plateaus and upper hill slopes, avoiding rocky areas, taller grass in bottomlands, vleis, croplands and planted pastures. (Marnewick *et al.,* 2015)[6].

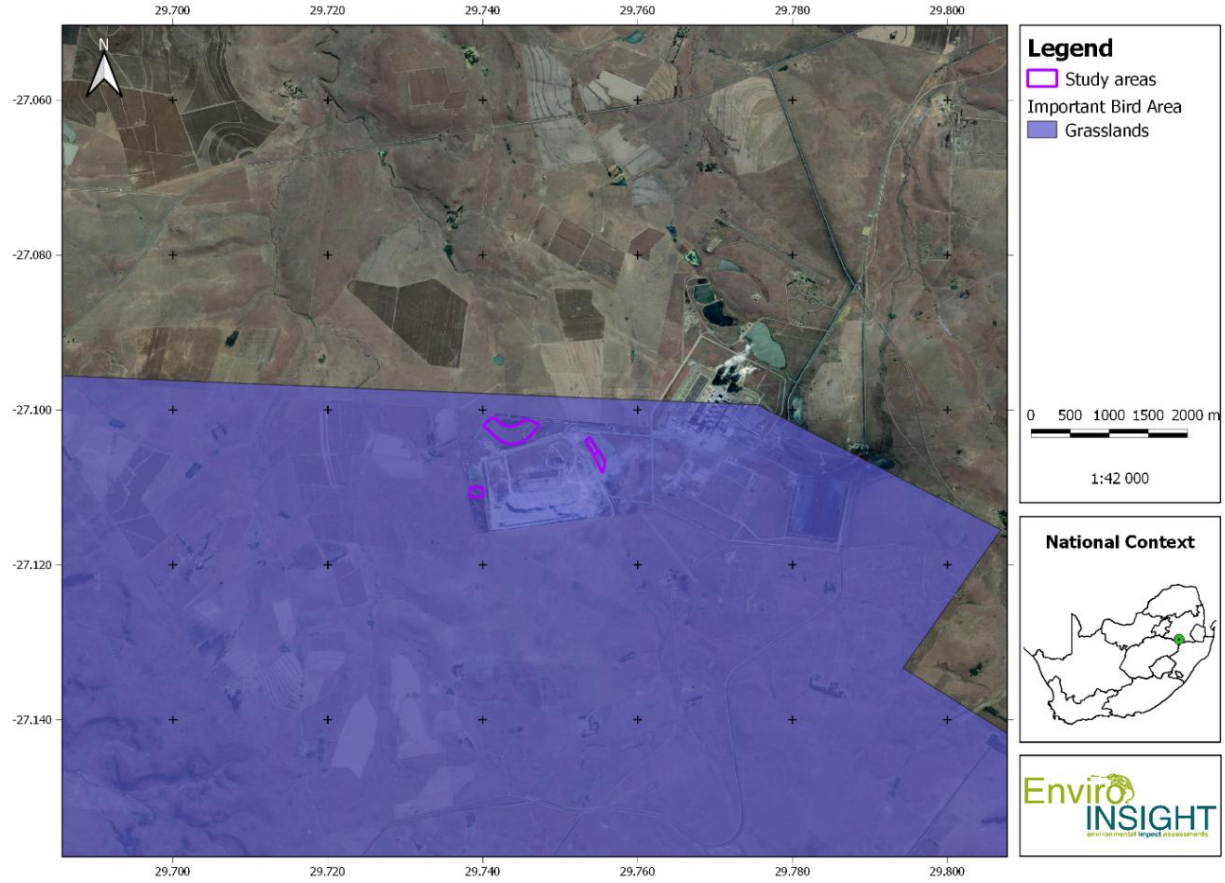


Figure 3-5: The study area in relation to Important Bird Areas.

[6] http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory/item/161-sa125-grasslands

3.5 OVERVIEW AND CURRENT IMPACTS

The current impacts of the study area include the existing ash disposal facilities and pollution control dams, and associated infrastructure such as internal roads and buildings. Limited natural vegetation remains as the study area has been negatively impacted on by the existing ash disposal facilities and pollution control dams. The surrounding areas are grazed and trampled by cattle but is still in a semi-natural condition.

The specialist tracks as well as the location of the sample sites during the field survey are shown in Figure 3-6. The specialist coverage was considered to be complete and all areas of the study area were clearly visible and accessible.

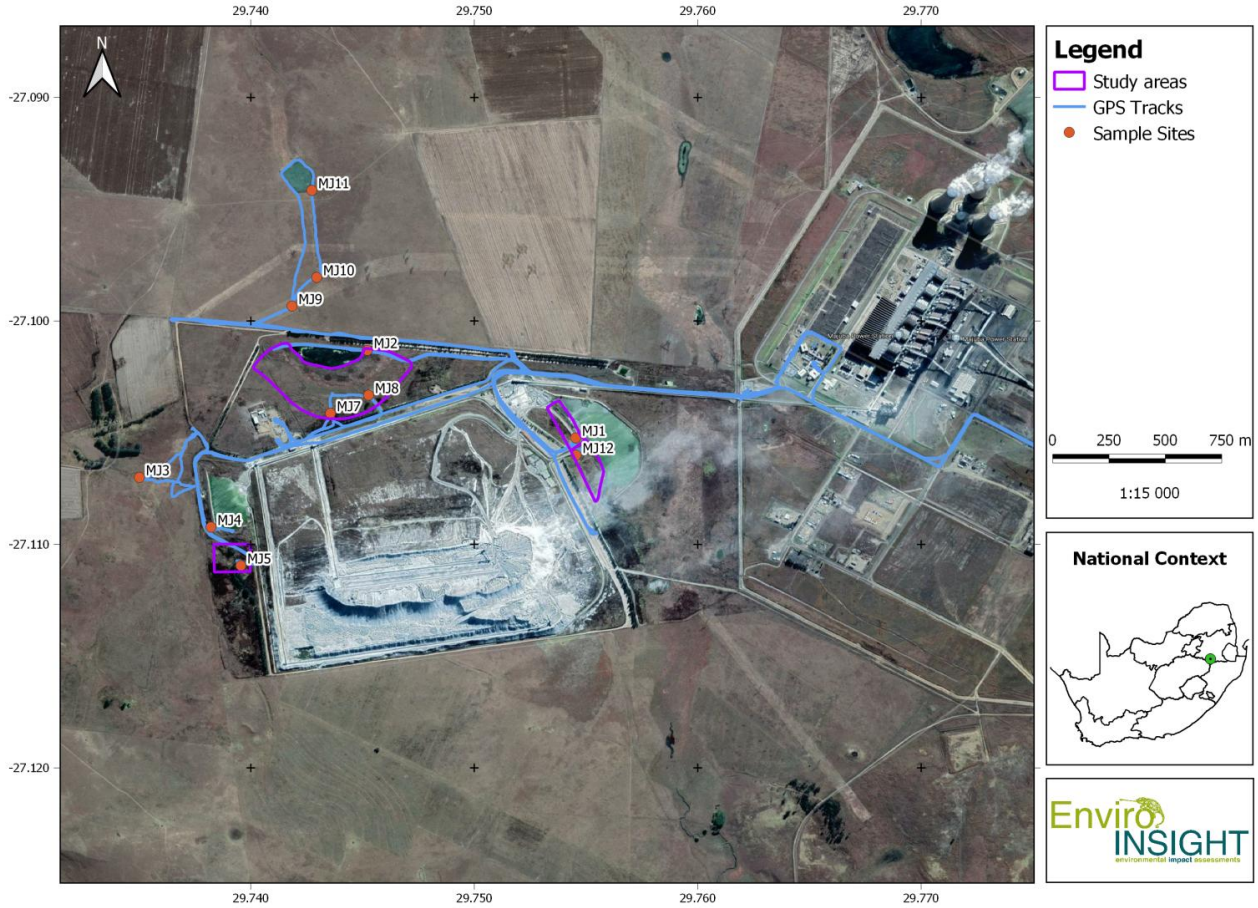


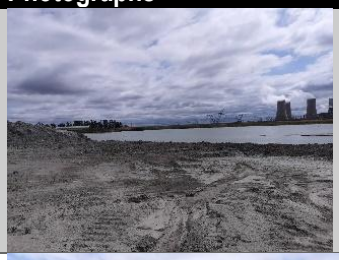
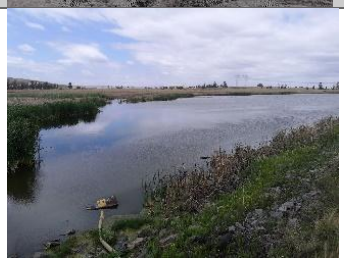
Figure 3-6: Specialist coverage (GPS tracks) and location of sample sites during the field survey.

3.6 HABITATS

3.6.1 Survey sites

Twelve survey sample sites surrounding the Majuba Power Station including the proposed extension areas were visited during the site visit. A short habitat description and visual representation of the 12 survey sites are presented in

Table 3-2: A short habitat description and visual representation of the 12 survey sites surrounding the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD).

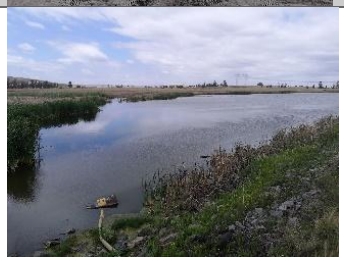
Survey sites	Habitat description	Photographs	
MJ1 -27.1052328° S 29.7545293° E	Existing AD with surrounding ash. Small patch of reeds present.		
MJ2 -27.1013105° S 29.7452117° E	Existing with good reed beds and one rocky shore.		
MJ3 -27.1069981° S 29.7350124° E	Stream below AD. No discernible flow, forming a series of small ponds. The area is heavily impacted by cattle (both trampling & faeces) and ash fallout (see 2nd photo).		
MJ4 -27.109223° S 29.7382175° E	Cement walled AD adjacent to ash dump. Marginal reed beds on one side. Heavily choked with ash (see 2nd photo).		

MJ5 -27.1109452° S 29.7395529° E	Old ash dumps (from trucks) vegetated by both pioneer and exotic vegetation. Very low ecological value.		
MJ6 -27.1041327° S 29.7435633° E	Heavily disturbed grassland on edge of AD.		
MJ7 -27.104132° S 29.74356° E	Seasonally inundated grassland on turf between AD and dense disturbed grassland of MJ6.		
MJ8 -27.1033214° S 29.7452647° E	Excavated trench leading from ash dump to AD. Densely reeded.		
MJ9 -27.099336 ° S 29.741842° E	Grassland drainage outside Eskom property. Grazed by cattle and trampled, but site is still in semi- natural condition.		
MJ10 -27.0980493° S 29.7429462° E	Dry drainage line leading down from AD to clean farm dam.		

MJ11 -27.0941572° S 29.7427244° E	Damned drainage line frequented by cattle. No reeds or other marginal vegetation.		
MJ12 -27.106004° S 29.7545543° E	Transformed habitat adjacent to MJ1 (between AD and ash dump).		

below.

Table 3-2: A short habitat description and visual representation of the 12 survey sites surrounding the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD).

Survey sites	Habitat description	Photographs	
MJ1 -27.1052328° S 29.7545293° E	Existing AD with surrounding ash. Small patch of reeds present.		
MJ2 -27.1013105° S 29.7452117° E	Existing with good reed beds and one rocky shore.		
MJ3 -27.1069981° S 29.7350124° E	Stream below AD. No discernible flow, forming a series of small ponds. The area is heavily impacted by cattle (both trampling & faeces) and ash fallout (see 2nd photo).		

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MJ12 -27.106004° S 29.7545543° E	Transformed habitat adjacent to MJ1 (between AD and ash dump).		

3.6.2 Main Habitats

Four main habitats were identified (Figure 3-7):

- Existing Ash Dump and associated infrastructure, including Pollution Control Dam;
- Natural Drainage;
- Natural Grassland; and
- Transformed Habitat.

The Ash Dump and associated infrastructure, including Pollution Control Dams, has very limited natural vegetation remaining and therefore also has limited optimal habitat for fauna species. Nevertheless, the PCD's and the reeds surrounding them provide habitat for many waterbirds.

The Natural Drainage habitat has no obvious aquatic vegetation such as reeds or other marginal vegetation. One section of the drainage line leading northwards from PCD to the clean farm dam is dry. Cattle graze and trample within the drainage area, but it is still in a semi-natural condition.

The Natural Grassland habitat includes both natural and exotic plant species. Cattle graze within this habitat, and some sections are heavily impacted by both trampling and faeces from cattle, as well as ash fallout.

The Transformed habitat has virtually no ecological value due to old ash dumps which are vegetated by both pioneer and exotic plants.

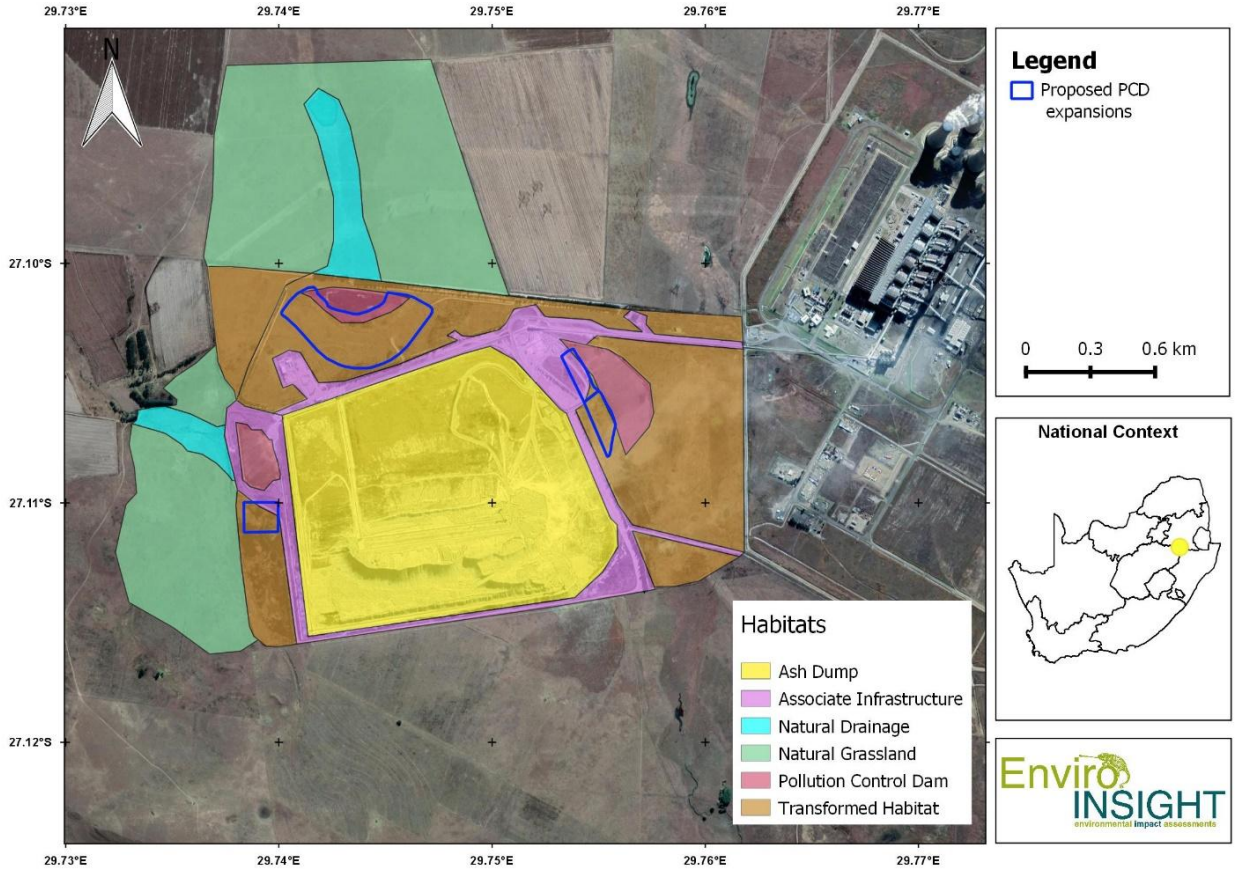

Figure 3-7: Habitat types identified within and surrounding the study area.

3.7 OBSERVED AND EXPECTED FAUNA

General

The study area resides on the 2729BA and the 2729BB quarter degree grid cells (QDGC). These QDGC's along with adjacent cells (2730AA, 2729BD, 2729BC, 2729AB, 2629DC, 2629DD) were considered to represent similar habitats and therefore the predicted species lists for mammals and herpetofauna were derived from observation records from these eight QDGC's.

All animal observations were recorded with photographic evidence where possible. For mammals and herpetofauna, this is provided in Table 3-3.

Mammals

The mammal species list derived from records collected for the QDGC's is presented in Appendix 2. Four species of conservation concern could be expected to occur within the study area and are discussed in section 0.

Herpetofauna

The herpetofauna species list derived from records collected for the eight QDGC's is presented in Appendix 4. Only one species of conservation concern could be expected to occur within the study area namely the Giant Girdled Lizard (*Smaug giganteus*; Vulnerable). This species is discussed in section 0.

Table 3-3: Observed fauna at the different survey sites.

Sites	Species	Photograph
RANDOM* -27.0994402° S 29.7419154° E	*Leptotyphlops scutifrons* (Peter's Thread Snake)	
MJ4 -27.1094642° S 29.7392172° E	*Canis mesomelas* (Black-backed Jackal) scat	

MJ4 -27.1094726° S 29.7392249° E	*Hystrix africaeaustralis* (Porcupine) scat		
RANDOM -27.1033491° S 29.752557° E	*Psammophylax rhombeatus* (Rhombic skaapsteker)		
MJ3 -27.1071325° S 29.7354653° E	*Cynictis penicillata* (Yellow mongoose burrow)		

MJ2 -27.1013108° S 29.7452123° E	*Aonyx capensis* (Cape Clawless Otter) scat		
MJ1 -27.1052876° S 29.7545062° E	*Canis mesomelas* (Black-backed Jackal) scat		

Avifauna

The study area is located in the 2705_2940 and 2705_2945 pentads. The avifauna species list derived from SABAP1 and SABAP2 records is presented in Appendix 3. Thirty-nine species were recorded during the survey, of which only a single species of conservation concern was observed namely the Blue Korhaan (*Eupodotis caerulescens*; Vulnerable). This species and other expected SCC are discussed in section 0. Photographic evidence of a selection of avifauna observed at the different survey sites are indicated in Figure 3-8 and Figure 3-9 below.

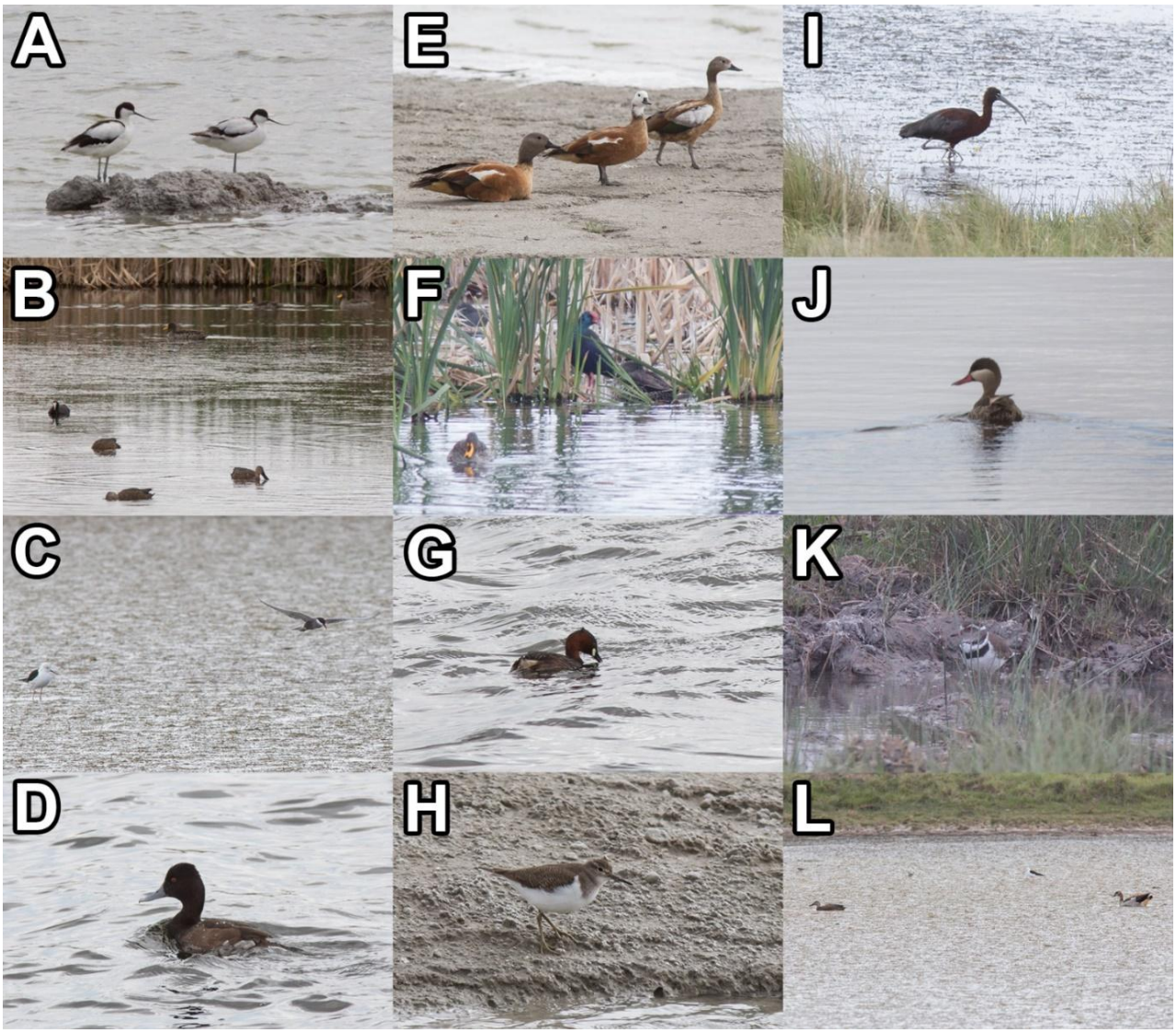

Figure 3-8: Photographic evidence of a selection of avifauna observed during the field survey[7].

7

A. *Recurvirostra avosetta* (Pied Avocet)
B. *Anas smithii* (Cape Shoveler)
C. *Chlidonias hybrida* (Whiskered Tern)
D. *Netta erythrophthalma* (Southern Pochard)
E. *Tadorna cana* (South African Shelduck)
F. *Porphyrio madagascariensis* (African Swamphen)
G. *Tachybaptus ruficollis* (Little Grebe)
H. *Actitis hypoleucos* (Common Sandpiper)
I. *Plegadis falcinellus* (Glossy Ibis)
J. *Anas erythrorhyncha* (Red-Billed Teal)
K. *Charadrius tricollaris* (Three-Banded Plover)
L. *Alopochen aegyptica* (Egyptian Goose)

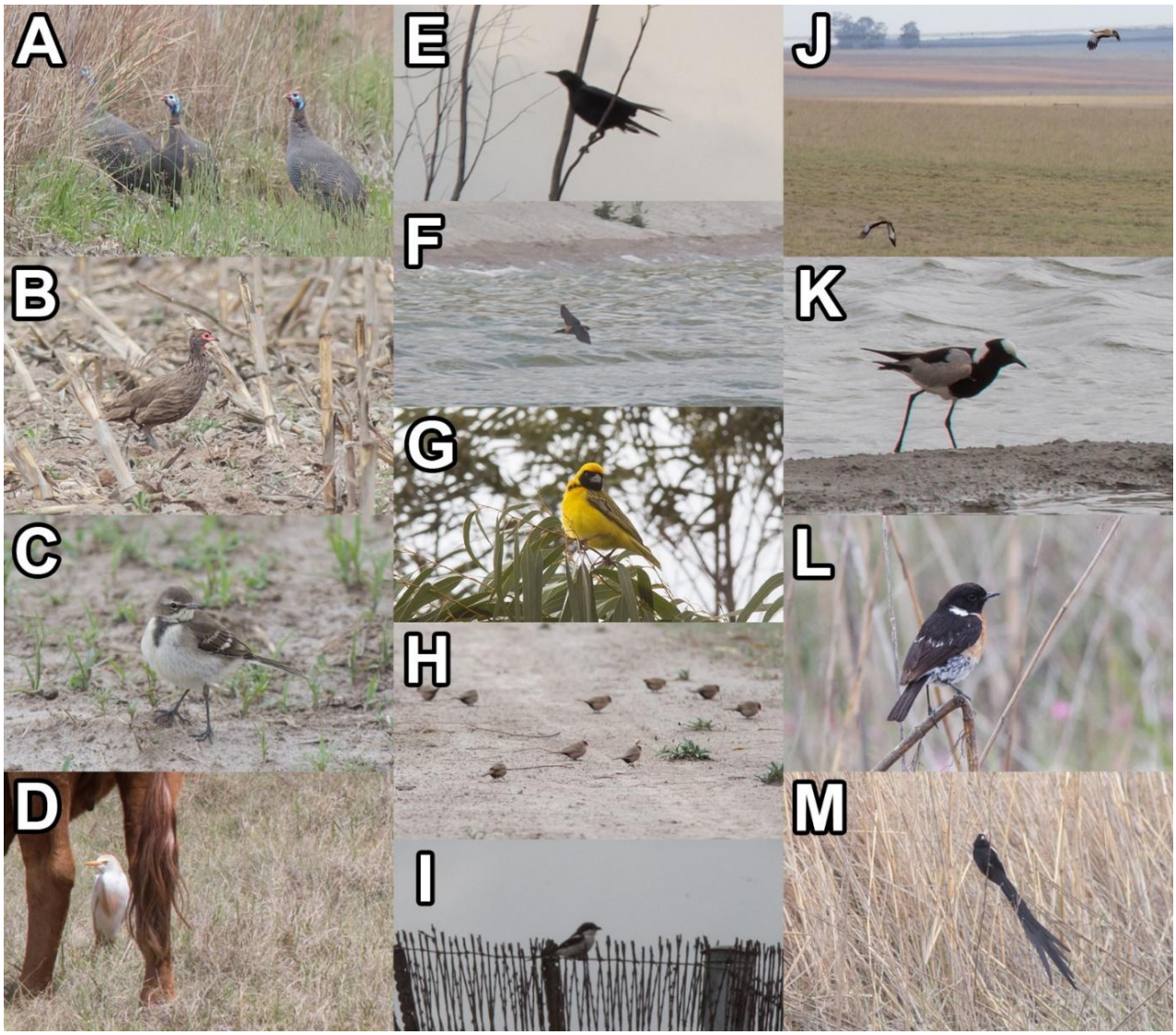

Figure 3-9: Photographic evidence of a selection of avifauna observed during the field survey [8]**.**

8

A. *Numida meleagris* (Helmeted Guineafowl)
B. *Pternistis swainsonii* (Swainson's Spurfowl)
C. *Motacilla capensis* (Cape Wagtail)
D. *Bubulcus ibis* (Western Cattle Egret)
E. *Lamprotornis bicolor* (Pied Starling)
F. *Cecropis semirufa* (Red-Breasted Swallow)
G. *Ploceus velatus* (Southern Masked Weaver)
H. *Estrilda astrild* (Common Waxbill)
I. *Lanius collaris* (Common Fiscal)
J. *Eupodotis caerulescens* (Blue Korhaan)
K. Vanellus armatus (Blacksmith Lapwing)
L. *Saxicola torquatus* (Africa Stonechat)
M. *Euplectes progne* (Long-Tailed Widowbird)

3.8 FLORAL SPECIES OF CONSERVATION CONCERN

All plant Species of Conservation Concern (SCC) potentially occurring within the study area and surroundings are indicated in Table 3-4. Limited suitable habitat for these plant species is present within the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD).

The high number of SCC that is known to persist within the region is a reflection of the important conservation status of the vegetation encountered in the study area as well as the pristine nature of much of the remaining natural vegetation.

Table 3-4: Potential plant Species of Conservation Concern.

Species	Conservation status	Habitat description	Present on site
Aloe kniphofioides	Vulnerable – species threatened by habitat loss through transformation and degradation, particularly from open cast coal mining in southern Mpumalanga. Populations declining from poor recruitment due to loss of pollinators and inappropriate fire management (species dependent on fire for flowering)	Occurs in high altitude montane grasslands	No – outside of range
Aspidoglossum demissum	Vulnerable – this species is known from only four localities all occurring within the Wakkerstroom district (Mpumalanga). Grasslands are susceptible to heavy grazing	Near edges of sheetrock on mountain summits, growing approximately 2000 m in Wakkerstroom Montane Grassland	Unlikely – outside of range
Aspidoglossum xanthosphaerum	Vulnerable – Habitat threatened by wetland drainage for crop cultivation and by trampling/grazing from livestock	Associated with marshy sites at around 1800 m	Unlikely
Argyrolobium campicola	Near Threatened – habitat transformed to agriculture and urban expansion	Highveld grassland from Pretoria to Dundee	Unlikely – highly disturbed and transformed habitat
Boophone disticha	Declining - loss of habitat and medicinal harvesting	Dry grassland and rocky areas.	Previously recorded on site
Brachystelma longifolium	Vulnerable – habitat degradation, invasive alien species (direct effects) and habitat loss	Granite domes, between rocks. Range includes Elandspruit, Morgenzon and Amersfoort.	Unlikely - no suitable habitat

Crinum bulbispermum	Declining - threatened by harvesting for the medicinal plant trade	Near rivers, streams, seasonal pans and in damp depressions	Previously recorded on site
Eucomis autumnalis	Declining - critically exploited over much of its range, harvesting for the medicinal plant trade	Damp, open grassland and sheltered places from the coast to 2450 m	Previously recorded on site
Gladiolus robertsoniae	Near threatened – predominately from agriculture, but recently through intensive coal mining. In addition, overgrazing and trampling by cattle particularly in the Amersfoort area. Populations in Gauteng have declined through urban expansion	Moist highveld grasslands, wedged in rock crevices, mostly dolerite outcrops.	No – unsuitable habitat
Kniphofia typhoides	Near threatened – reports suggest extensive declines in populations from habitat loss to coal mining, overgrazing by cattle and urban expansion. In Mpumalanga, habitat loss is primarily mediated through alien plant invasion	Associated with low lying wetlands and seasonally wet areas in *Themeda triandra* dominant grasslands on heavy black clay soils, tends to disappear from degraded grasslands.	Unlikely
Nerine platypetala	Vulnerable – habitat loss through extensive harvesting and land degradation	Found predominately in perennial marshes	Unlikely
Stenostelma umbelluliferum	Near threatened – the habitat is potentially threatened by urban expansion and industrial development has led to the establishment of highly fragmented populations. Loss of habitat through the removal of topsoil associated with open-cast mining. Agriculture is also a threat because of the highly fertile soils in which this species occurs	Occurs in deep black turf, mainly near drainage lines on vertic soils with high clay content in grassland. Plants grow either in full sun or light shade.	Unlikely

3.9 FAUNAL SPECIES OF CONSERVATION CONCERN

Seven faunal SCC were observed (refer to Table 3-3) or could potentially occur within the study area with a high probability and are briefly discussed:

1. African Clawless Otter (*Aonyx capensis*; IUCN Near-Threatened) – Confirmed at two of the PCD's (scat). Unlikely to be negatively affected by proposed expansion of PCD's in the long-term: only temporary disturbance during construction anticipated.

2. Serval (*Leptailurus serval*; IUCN Near-Threatened) – Almost certainly occurs in the area and will forage around the PCD's but does not exclusively rely on them. Unlikely to be negatively affected by proposed expansion of PCD's in long-term: only temporary disturbance during construction anticipated.
3. Southern African Vlei Rat (*Otomys auratus*; IUCN Near-Threatened) – Almost certainly occurs in the areas surrounding the PCD's as well as the wetlands and drainage areas. Unlikely to be negatively affected by proposed expansion of PCD's in long-term: only temporary disturbance during construction anticipated.
4. Giant Girdled Lizard (*Smaug giganteus*; IUCN Vulnerable) – Although found within the QDGC, no suitable habitat exists for this species in the areas earmarked for PCD expansion.
5. Blue Korhaan (*Eupodotis caerulescens*; IUCN Vulnerable) – Observed in the grasslands adjacent to the power station property. Will not be directly affected by expansion of PCD's but structural failure and/or flooding of PCD's could result in habitat loss for this species.
6. Red-footed Falcon (*Falco vespertinus*; IUCN Near-Threatened) – Migratory species foraging in the area, will not be affected by expansion of PCD's.

3.10 HABITAT SENSITIVITY

Based on the habitat conditions and fauna and flora observations during the fieldwork, as well as the current impacts described above, each habitat type was evaluated in terms of its ecological sensitivity. This sensitivity is rated as either low, medium or high, where low sensitivity is considered ideal for development and high sensitivity areas are to be avoided by the development. Figure 3-10 shows the preliminary habitat sensitivity for the study area which indicates that the majority of the study area is regarded as low sensitivity as the areas are either disturbed or transformed. The Natural Drainage Areas are of medium-high ecological sensitivity, while the surrounding Natural Grasslands are considered to be of medium ecological sensitivity. Care should be taken to ensure that impacts to these habitats do not arise during the proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD).

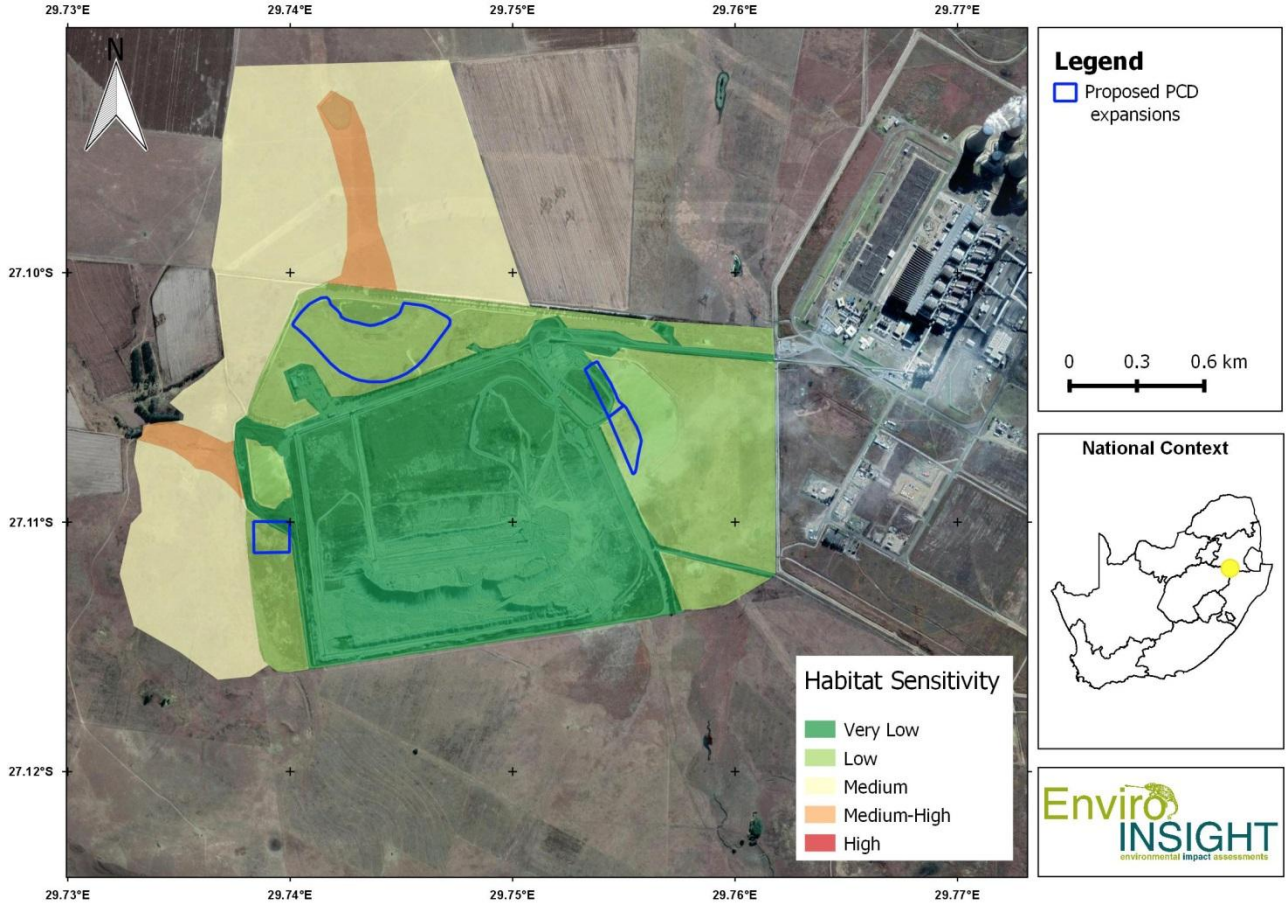

Figure 3-10: Preliminary habitat sensitivity of the study area.

4 IMPACT ASSESSMENT

1. Loss of existing habitat due to loss of vegetation

a. Physical removal of vegetation
   i. Construction camps & laydown areas [Construction] - *these areas need to be cleared of vegetation for safe operation and therefore available habitat for terrestrial fauna species will be reduced;*
   ii. Vegetation clearing and earthworks [Construction] – *Digging and laying foundations prior to construction will cause direct habitat loss as vegetation and soil is removed. Could lead to erosion caused by wind and rain. Such erosion undermines the stability of the habitat and reduces overall habitat quality for flora and fauna.*
   iii. Stochastic events such as fire (e.g. cooking fires or cigarettes of workers) [Construction & Operation] - *careless discarding of lit cigarette butts and/or glowing embers from cooking fires being blown into surrounding vegetation may cause runaway fires to remove habitat for terrestrial fauna species that would otherwise have been available.*

b. Secondary impacts associated with the loss of habitat and removal of vegetation

i. Displacement/loss of flora & fauna - *the removal of habitat (in this case unsuitable as the surrounding area is already disturbed), in particular vegetation, will directly result in the loss of flora species, and indirectly affect fauna reliant on this vegetation for foraging and/or refugia;*
ii. Establishment of alien and invasive vegetation – *as alien and invasive flora establish and spread across the site it reduces available natural habitat and habitat quality for flora and fauna.*

Impact Assessment (Pre-mitigation) – Refer to

c. Table 4-1Table 4-1.
d. Mitigation and Enhancement Measures
    i. Clearings associated with construction to occur in as small a footprint as possible. Surrounding natural vegetation outside the development footprint may not be disturbed;
    ii. Construction camps & lay down areas should be erected on already disturbed surfaces where no vegetation clearing or soil disturbance is required;
    iii. Minimise all disturbances, especially regarding the construction phase, where possible;
    iv. Vegetation clearing close to the watercourse should be prevented and appropriate storm water management should be put in place to limit erosion potential of exposed soil. Sedimentation trapping should be in place to prevent exposed soils from spilling into the watercourse;
    v. The watercourse and its buffer areas should be demarcated and fenced off prior to construction to exclude the watercourse from development activities;
    vi. Buffer zones are allocated to sensitive or important habitat features to alleviate the effect of habitat loss, habitat fragmentation, disturbances, increased isolation and edge effects. Suggested buffer zones for the watercourse/wetlands in the Aquatic Assessment report must be implemented where no construction or disturbances may take place. No vehicles or personnel are allowed to enter these areas;
    vii. Earthworks and vegetation clearing should be left open for as short a time as possible. Temporary erosion control measures during the construction phase should be implemented to limit erosion;
    viii. Re-vegetation, where required after clearance, should commence immediately after the construction phase;
    ix. Re-vegetation as part of the rehabilitation phase including the promotion of natural ecosystem processes is critical;
    x. Alien vegetation control should take place during all phases of the proposed operation;
    xi. An environmental induction for all staff members must be mandatory in which specific issues related to the potential of fire are addressed e.g. only smoking in designated areas, no open cooking fires etc. Rules of the Majuba Power Station regarding safety should be adhered to at all times.
e. Impact Assessment (Post-mitigation) – Refer to Table 4-2.
f. Residual impacts –
    i. A degree of erosion will take place during the construction phase but proper mitigation will reduce the residual impacts to acceptable levels.
    ii. The spread of alien species is likely to occur and should be continuously controlled.
g. Uncertainty – None.

2. Direct mortality of fauna

a. Project components that can cause direct mortality of fauna
    i. Staff or construction workers poaching [Construction & Operation] - *Several fauna species could be hunted by staff during the construction phase*;

ii. Direct mortality due to collisions with vehicles (roadkill) [Construction & Operational phase] - *Vehicles are defined as support vehicles (e.g. bakkies / pickups), staff vehicles (light passenger vehicles), large and slow moving construction vehicles (such as earth moving equipment/trucks) that will be either self-propelled or towed (construction phase). Traffic volumes are considered to be high in the area and consequently it is unavoidable that collision related fauna mortality will occur. There will be increased traffic volumes during each phase of the project, and this will occur over multiple years. Reptiles, amphibians, small mammals and avifauna are particularly prone to collisions with fast moving vehicles as they do not move out of the way upon approach by a vehicle. Furthermore, vehicle drivers rarely see small fauna on the road surface or avifauna flying across, and cannot avoid collisions with these animals while travelling at high speed;*

iii. Intentional killing of fauna [Construction & Operation] - *In general people are either superstitious or extremely fearful of snakes which usually results in the killing of the snake when it is encountered. Despite the beneficial ecological functions of snakes such as rodent control, snakes are usually considered to be dangerous (despite the many non-venomous species) and are therefore killed;*

iv. Direct mortality due to vegetation clearing and ground preparation for construction [Construction] - *The clearing of vegetation with machinery followed by the preparation of ground surfaces for construction is expected to result in the direct mortality of fauna by mechanical action (cutting, grinding and crushing), especially for burrowing fauna.*

b. Secondary impacts associated with direct mortality of fauna
   i. Changes in fauna population dynamics (e.g. rodent population explosion) – *for* example, *prolonged mortality of predacious species such as snakes could significantly reduce the population density of these predators and allow prey species to undergo localised population explosions. This in turn can have major negative impacts on the surrounding ecology.*

c. Impact Assessment (Pre-mitigation) – Refer to Table 4-1.

d. Mitigation and Enhancement Measures
   i. All vehicle speeds associated with the project should be monitored and should be limited to the lowest acceptable speed (maximum of 40 km/h) during the construction and operation phases, or as prescribed by the latest or previous Traffic Impact Assessment;
   ii. The ECO or the resident Environmental Officer at the Power Station/Eskom should monitor live animal observations in order to monitor trends in animal populations and thus implement proactive adaptable mitigation of vehicle movements, especially in close proximity to the watercourses and wetlands;
   iii. Road mortalities should be monitored by both vehicle operators (for personal incidents only) and the ECO (all road kill on a periodic monitoring basis as well as specific incidents) with trends being monitored and subject to review as part of the monthly reporting. Monitoring should occur via a logbook system where staff takes note of the date, time and location of the sighting/incident. This will allow determination of the locations where the greatest likelihood exists of causing road mortality and allow mitigation against it (e.g. fauna underpasses, and speed reductions mentioned above). Finally, mitigation should be adaptable to the onsite situation which may vary over time;
   iv. Reduce direct mortalities by allowing for fauna to cross roads. Existing road underpasses should be managed and maintained in order to allow fauna to utilise them;
   v. All staff operating motor vehicles must undergo an environmental induction training course that includes instruction on the need to comply with speed limits, to respect all forms of wildlife (especially reptiles and amphibians) and, wherever possible, prevent accidental road kills of fauna. Snakes should only be handled after inductions have taken place due to the risks of envenomation. Drivers not complying with speed limits should be subject to penalties;

e. Impact Assessment (Post-mitigation) – Refer to Table 4-2.
f. Residual impacts – It is not possible to avoid all faunal deaths but proper mitigation will reduce the residual impacts to acceptable levels.
g. Uncertainty – None.

3. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and lighting [Construction & Operation]

a. Project components that can result in increased noise, dust and lighting

i. Access roads and construction works [Construction & Operation] – *Noise, dust and lighting generated from moving vehicles operating on access roads and from machinery on site can disrupt fauna populations by interfering with their movements and/or breeding activities. In particular, lighting at night is expected to attract insects which will attract geckos and amphibians which in turn can attract snakes (which might be venomous). Lighting at night may also disrupt flight paths of migrating birds and bats foraging at night which could cause collisions.*

b. Secondary impacts associated with disruption/alteration of ecological lifecycles

i. Increased probability of interaction with reptiles – *As described above, snakes may be attracted to potential prey due to lights and represent a potential health and safety threat. In addition, reptiles attracted to site such as snakes could be killed by staff on site.*

c. Impact Assessment (Pre-mitigation) – Refer to Table 4-1.

d. Mitigation and Enhancement Measures

i. Equipment with low noise emissions must be used;
ii. A dust monitoring system should be implemented during the construction phase;
iii. Water or dust control agents should be used in working areas. Roads and areas with significant ash deposits or loose soil should be sprayed for dust suppression on a regular basis in designated susceptible areas during heavy usage;
iv. Reduce exterior lighting to that necessary for safe operation, and implement operational strategies to reduce spill light. Use down-lighting from non-UV lights where possible, as light emitted at one wavelength has a low level of attraction to insects. This will reduce the likelihood of attracting insects and their predators;
v. Keep noise levels suppressed as per the local municipality or national standards. Do not unnecessarily disturb faunal species, especially during the breeding season and those with juveniles;
vi. Existing barriers should be in place that keep fauna species away from the existing facilities. These fences should be maintained in order to ensure fauna species do not gain access to the construction site unnecessarily where they can be hurt or killed;
vii. All staff should be subjected to an induction training program where appropriate conservation principles, safety procedures, snake bite avoidance and first aid treatment are taught. Several staff members should complete a snake handling course in order to safely remove snakes from construction areas.

e. Impact Assessment (Post-mitigation) – Refer to Table 4-2.

f. Residual impacts – None.

g. Uncertainty – None.

4. Introduction of alien and/or invasive flora affecting native flora and faunal assemblages

a. Project components that can result in increased densities of alien flora
    i. Vehicles and machinery [Construction & Operation] – *Vehicles and machinery can spread alien plant seeds throughout the study area which could potentially spread into the adjacent (natural) areas. Alien plants can cause alterations to the environment which could affect local flora and fauna;*
    ii. Soil Disturbance [Construction & Operation] – *Seeds of pioneer invasive species could germinate and rapidly establish when the soil is disturbed.*
b. Secondary impacts associated with increased alien flora and fauna species
    i. Displacement of native species due to competition and/or unfavourable habitats due to alien establishment.
c. Impact Assessment (Pre-mitigation) – Refer to Table 4-1.
d. Mitigation and Enhancement Measures
    i. Alien flora on site should be eradicated prior to construction including all Category 1 and 2 alien invasive species. Any remaining alien flora post-construction should be monitored and removed as part of the management plan.
    ii. Disturbance of natural areas should be avoided and the spread of alien flora into natural areas should be controlled.
    iii. Continuous monitoring of the growth and spread of alien flora coupled with an adaptive management approach to identify suitable control mechanisms, preferably mechanical for such a small area. No chemical control should take place due to the close proximity of wetlands;
    iv. No planting of alien invasive species as part of landscaping or rehabilitation. Only trees indigenous to the vegetation unit and endemic to the area may be planted, even if for only visual purposes. The indigenous species used for landscaping purposes and where rehabilitation is required should be indicated prior to development and approved by the competent authority.
e. Impact Assessment (Post-mitigation) – Refer to Table 4-2.
f. Residual impacts
    - The management of alien flora remains a global issue with the success of control measures highly dependent on the management strategy as well as resources available (e.g. financial and intellectual).
g. Uncertainty – The types of alien and/or invasive species that might be spread onto the study area.

5. Watercourse contamination due to pollution

a. Project components that can cause increased pollution of watercourses.
    i. Ash disposal facility [Operation] – *Ash dispersal caused by prevailing winds, especially close to the watercourse, can negatively affect the flora and fauna of the associated watercourses. Siltation*

could dramatically affect mortality rates of avifauna and herpetofauna species utilising the watercourse as breeding and foraging habitat. A particular threat is the catastrophic failure of retention walls that cause mass spillage of ash into the watercourse (this has occurred at least once previously);

ii. Hydrocarbon spillage – *spillage from trucks and vehicles close to the watercourse can severely contaminate the associated watercourses. Serious spills can dramatically affect mortality rates of avifauna, mammals and herpetofauna species utilising the watercourse as breeding and foraging habitat.*

b. Secondary impacts associated with increased dust pollution.
   i. *Pollution of water downstream.*
   ii. *Health issues for livestock and people.*

c. Impact Assessment (Pre-mitigation) – Refer to Table 4-1.

d. Mitigation and Enhancement Measures
   i. Zero tolerance for hydrocarbon spillage next to the watercourse.
   ii. Ash dispersal impacts on the watercourse must be reduced to the minimum possible.
   iii. No vehicles or machinery are allowed within the buffer areas or the watercourse itself without NEMA and NWA authorisation. Predetermined areas should be indicated where vehicles and machinery are to be stored, repaired and refueled within a bunded area.
   iv. Use of drip trays positioned under stationary vehicles to collect hydrocarbons.
   v. Implementation of rapid response emergency spill procedures to deal with spills immediately, including training of staff to deal with such instances.
   vi. A comprehensive monitoring program on both avifauna and amphibians must be implemented on an annual basis.

e. Impact Assessment (Post-mitigation) – Refer to Table 4-2.

f. Residual impacts – Some degree of long-term pollution of the watercourses surrounding the ash disposal facility is inevitable due to rainwater runoff and wind-blown material entering this habitat and cannot be avoided entirely. If appropriate mitigation measures are applied and no major spillage events occur then these impacts can be considered to be acceptable in accordance with the original EIA performed for this ash disposal facility.

g. Uncertainty – fauna species affected (to be completed during pre-construction survey).

Table 4-1: The proposed development impacts on fauna and flora pre-mitigation.

Impact	Impacts Status	Consequence (C)			Likelihood (L)		Significance rating (C × L)	Significance rating
		Spatial scale	Duration	Severity	Frequency of Activity	Probability of Impact		
Loss of existing habitat due to loss of vegetation								
Construction camps & lay down areas	Negative	2	3	3	1	4	40	Low
Vegetation clearing and earthworks	Negative	2	2	4	1	5	48	Low
Stochastic events such as fire	Negative	3	1	3	1	4	35	Low
Direct mortality of fauna								
Staff or construction workers poaching and hunting	Negative	2	2	3	1	4	35	Low
Collisions with vehicles	Negative	3	4	3	3	4	70	Low-Medium
Intentional killing of fauna	Negative	2	4	4	4	3	70	Low-Medium
Vegetation and ground clearing preparation	Negative	2	2	4	1	4	40	Low
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and lighting								
Access roads and construction works	Negative	3	1	3	2	4	42	Low

Impact	Impacts Status	Consequence (C)			Likelihood (L)		Significance rating (C × L)	Significance rating
		Spatial scale	Duration	Severity	Frequency of Activity	Probability of Impact		
Construction camps & lay down areas	Negative	1	1	3	1	4	25	Very Low
Operational phase	Negative	2	5	3	5	4	90	Medium-High
Introduction of alien flora affecting native faunal assemblages								
Vehicles and machinery	Negative	2	4	3	4	4	72	Low-Medium
Soil disturbance	Negative	2	2	3	2	4	42	Low
Watercourse contamination due to pollution								
Ash disposal facility	Negative	2	5	4	4	4	88	Medium-High
Hydrocarbon spillage	Negative	2	4	5	5	4	99	Medium-High

Table 4-2: The proposed development impacts on fauna and flora post-mitigation.

Impact	Impacts Status	Consequence (C)			Likelihood (L)		Significance rating (C × L)	Significance rating
		Spatial scale	Duration	Severity	Frequency of Activity	Probability of Impact		
Loss of existing habitat due to loss of vegetation								
Construction camps & lay down areas	Negative	2	3	1	1	1	12	Very Low
Vegetation clearing and earthworks	Negative	2	2	3	1	4	35	Low
Stochastic events such as fire	Negative	3	1	2	1	2	18	Very Low
Direct mortality of fauna								
Staff or construction workers poaching and hunting	Negative	2	2	1	1	2	15	Very Low
Collisions with vehicles	Negative	3	4	2	3	2	45	Low
Intentional killing of fauna	Negative	2	4	1	1	2	21	Very Low
Vegetation and ground clearing preparation	Negative	2	2	2	1	2	18	Very Low
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and lighting								

Impact	Impacts Status	Consequence (C)			Likelihood (L)		Significance rating (C × L)	Significance rating
		Spatial scale	Duration	Severity	Frequency of Activity	Probability of Impact		
Access roads and construction works	Negative	3	1	1	1	2	15	Very Low
Construction camps & lay down areas	Negative	1	1	1	1	2	9	Very Low
Operational phase	Negative	2	5	2	3	2	54	Low-Medium
Introduction of alien flora affecting native faunal assemblages								
Vehicles and machinery	Negative	2	4	2	3	3	48	Low
Soil disturbance	Negative	2	2	2	1	2	18	Very Low
Watercourse contamination due to dust pollution								
Ash disposal facility	Negative	2	5	2	3	3	54	Low-Medium
Hydrocarbon spillage	Negative	2	4	3	3	2	45	Low

5 CONCLUSION AND PROFESSIONAL OPINION

The study area falls in the Vulnerable Amersfoort Highveld Clay Grassland vegetation unit, but from a provincial biodiversity management perspective the study area is located within "Least Concern" and "No Natural Habitat Remaining" areas. These areas are ideal for development as transformed areas make no contribution to meeting conservation targets within the province. The study area is however within the Grassland Important Bird Area, and accordingly suitable habitat including watercourses and wetlands need to be protected. No avifauna SCC may be disturbed or harmed during the construction or operational phase of the proposed expansion development.

The study area in question is already disturbed due to the existing ash disposal facilities including associated infrastructure such as internal roads and buildings. Accordingly, limited natural vegetation remains as the study area has been negatively impacted on by the existing facilities including choking by ash fallout that is being dispersed by wind.

The proposed impacts on fauna and flora are considered to be Very Low to Low, with the exception of operational activities that will have long-term Low to Medium impacts that can be mitigated to acceptable levels. Ash pollution from wind dispersal could negatively affect both flora and fauna within the surrounding area, which includes sensitive wetland habitats, and needs to be managed accordingly (it should be noted that this is currently not optimally enforced as personally observed on site, and Majuba Power Station management needs to implement preventative measures to limit the dispersal of ash as this can have detrimental effects in the long-term on both the environment and human health).

The natural drainage areas (wetlands) and grassland surrounding the AD's area considered to be sensitive habitats of importance and would need to be protected from impacts arising from proposed upgrade of two existing ash dams (AD) and the construction of two rehabilitation dams (RD). In particular, prevention of spillage events from AD's and the ash dump must be of the highest priority to avoid impacts to the surrounding drainage areas and associated natural grasslands. Mitigation measures to prevent these impacts are usually contained within standard operation procedures and best practice guidelines for construction and operation. Please refer to the relevant section above for all mitigation measures proposed for each activity. In order to ensure that the existing and proposed facilities cause only impacts of low significance on the environment, implementation of mitigation measures should take place and must be adhered to throughout the life of the project. This will require monitoring surveys to be conducted at regular intervals to ensure compliance and prescribe corrective measures in the case of non-compliance.

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7 APPENDIX

7.1 APPENDIX 1: FLORA SPECIES LIST

Plant species recorded on the BODATSA database in the xMin, yMin 29.50°,-26.9°: xMax, yMax 30.20°,-27.34° extent (WGS84 datum). Species of conservation concern have been marked in red.

Scientific name	IUCN Category[9]	Ecology
Alloteropsis semialata	LC	Indigenous
Tephrosia sp.		
Felicia muricata	LC	Indigenous
Stachys natalensis	LC	Indigenous
Crassula setulosa	NE	Indigenous; Endemic
Dactylis glomerata	NE	Not Indigenous; Naturalised
Dicoma anomala	LC	Indigenous
Selago sp.		
Chlorophytum fasciculatum		Indigenous
Cheilanthes quadripinnata	LC	Indigenous
Modiola caroliniana		Not Indigenous; Naturalised
Searsia dentata		Indigenous
Asplenium adiantum-nigrum	LC	Indigenous
Dyschoriste costata		Indigenous; Endemic
Cyperus congestus	LC	Indigenous
Dierama tyrium	LC	Indigenous; Endemic
Habenaria dregeana	LC	Indigenous
Indigofera hilaris	LC	Indigenous
Gazania krebsiana	LC	Indigenous
Helichrysum dregeanum	LC	Indigenous
Gladiolus crassifolius	LC	Indigenous
Eragrostis plana	LC	Indigenous
Eriosema cordatum	LC	Indigenous
Geranium robustum	LC	Indigenous; Endemic
Chaenostoma neglectum	LC	Indigenous
Indigofera torulosa	LC	Indigenous
Wahlenbergia virgata	LC	Indigenous
Asplenium varians	LC	Indigenous

[9] VU = Vulnerable; NT = Near Threatened; DD = Data Deficient; LC = Least Concern; NE = Not Evaluated;

Ipomoea crassipes	LC	Indigenous
Disperis tysonii	LC	Indigenous
Medicago laciniata	NE	Not Indigenous; Naturalised
Galium thunbergianum	LC	Indigenous
Hibiscus trionum		Not Indigenous; Naturalised
Imperata cylindrica	LC	Indigenous
Euryops transvaalensis	LC	Indigenous
Hyparrhenia anamesa	LC	Indigenous
Eragrostis cilianensis	LC	Indigenous
Lasiosiphon burchellii	LC	Indigenous; Endemic
Selago densiflora	LC	Indigenous
Xysmalobium pedifoetidum	LC	Indigenous
Fingerhuthia sesleriiformis	LC	Indigenous
Cirsium vulgare		Not Indigenous; Naturalised; Invasive
Fuirena pubescens	LC	Indigenous
Anredera cordifolia	NE	Not Indigenous; Naturalised; Invasive
Taraxacum hamatiforme		Not Indigenous; Naturalised
Alectra orobanchoides	LC	Indigenous
Centella asiatica	LC	Indigenous
Schistostephium crataegifolium	LC	Indigenous
Sporobolus centrifugus	LC	Indigenous
Hibiscus microcarpus	LC	Indigenous
Xysmalobium involucratum	LC	Indigenous
Cyperus usitatus	LC	Indigenous
Hypoxis iridifolia	LC	Indigenous
Monsonia attenuata	LC	Indigenous; Endemic
Verbascum thapsus		Not Indigenous; Cultivated; Naturalised; Invasive
Bulbostylis humilis	LC	Indigenous
Crassula lanceolata	LC	Indigenous
Cyperus fastigiatus	LC	Indigenous
Tritonia gladiolaris	LC	Indigenous; Endemic
Asplenium sp.		
Helichrysum splendidum	LC	Indigenous
Argyrolobium adscendens	LC	Indigenous
Kniphofia typhoides	NT	Indigenous; Endemic
Anthospermum rigidum	LC	Indigenous
Kniphofia albescens	LC	Indigenous; Endemic
Harpochloa falx	LC	Indigenous
Helichrysum melanacme	LC	Indigenous

Hermannia cristata	LC	Indigenous
Herniaria erckertii		Indigenous
Themeda triandra	LC	Indigenous
Brachiaria serrata	LC	Indigenous
Hesperantha coccinea	LC	Indigenous
Berula thunbergii	LC	Indigenous
Cheilanthes eckloniana	LC	Indigenous
Hermannia jacobeifolia	LC	Indigenous
Senecio hieracioides	LC	Indigenous
Arundinella nepalensis	LC	Indigenous
Limeum viscosum	NE	Indigenous
Aristida adscensionis	LC	Indigenous
Senecio erubescens	NE	Indigenous
Asparagus ramosissimus	LC	Indigenous
Sisymbrium turczaninowii	LC	Indigenous
Cyperus atriceps	LC	Indigenous
Cyperus rigidifolius	LC	Indigenous
Stenostelma umbelluliferum	NT	Indigenous; Endemic
Ipomoea purpurea		Not Indigenous; Naturalised; Invasive
Polygala amatymbica	LC	Indigenous
Riccia atropurpurea		Indigenous
Berkheya radula	LC	Indigenous
Physalis angulata		Not Indigenous; Naturalised; Invasive
Senecio laevigatus	LC	Indigenous; Endemic
Poa annua	NE	Not Indigenous; Naturalised
Nidorella resedifolia	LC	Indigenous
Tephrosia semiglabra	LC	Indigenous
Eragrostis micrantha	LC	Indigenous
Searsia discolor		Indigenous
Andropogon eucomus	LC	Indigenous
Kniphofia linearifolia	LC	Indigenous
Seriphium plumosum		Indigenous
Senecio isatideus	LC	Indigenous
Cynodon dactylon	LC	Indigenous
Lasiosiphon caffer	LC	Indigenous
Argyrolobium sp.		
Pachystigma thamnus	LC	Indigenous; Endemic
Jamesbrittenia silenoides	LC	Indigenous; Endemic
Lolium multiflorum	NE	Not Indigenous; Naturalised; Invasive

Manulea rhodantha	LC	Indigenous; Endemic
Tolpis capensis	LC	Indigenous
Euphorbia clavarioides	LC	Indigenous; Endemic
Cheilanthes involuta	LC	Indigenous
Trachyandra gerrardii	LC	Indigenous
Asclepias gibba	LC	Indigenous
Cephalaria pungens	LC	Indigenous
Cymbopogon dieterlenii	LC	Indigenous
Gymnosporia buxifolia	LC	Indigenous
Nerine platypetala	VU	Indigenous; Endemic
Albuca shawii		Indigenous
Cynodon hirsutus	LC	Indigenous; Endemic
Riccia okahandjana		Indigenous
Cynodon transvaalensis	LC	Indigenous
Xysmalobium undulatum		Indigenous
Helichrysum nudifolium	LC	Indigenous
Asclepias multicaulis	LC	Indigenous
Cyrtanthus breviflorus	LC	Indigenous
Brachystelma sp.		
Helichrysum mundtii	LC	Indigenous
Digitaria ternata	LC	Indigenous
Habenaria epipactidea	LC	Indigenous
Brachystelma foetidum	LC	Indigenous
Solanum campylacanthum		Indigenous
Eragrostis tef	NE	Not Indigenous; Naturalised
Rumex sagittatus	LC	Indigenous
Gladiolus sericeovillosus	LC	Indigenous; Endemic
Convolvulus sagittatus	LC	Indigenous
Solanum retroflexum	LC	Indigenous
Galium scabrelloides	LC	Indigenous
Colchicum striatum		Indigenous
Setaria sp.		
Haplocarpha nervosa	LC	Indigenous
Nidorella anomala	LC	Indigenous; Endemic
Watsonia pulchra	LC	Indigenous
Alternanthera pungens		Not Indigenous; Naturalised
Albuca setosa		Indigenous
Rhynchosia reptabunda	LC	Indigenous
Garuleum woodii	LC	Indigenous

Dianthus mooiensis		Indigenous; Endemic
Juncus oxycarpus	LC	Indigenous
Selago cucullata	LC	Indigenous
Cordylostigma virgata		Indigenous
Pennisetum sphacelatum	LC	Indigenous
Dyschoriste setigera		Indigenous; Endemic
Anthoxanthum ecklonii	LC	Indigenous
Berkheya pinnatifida	LC	Indigenous; Endemic
Mimulus gracilis	LC	Indigenous
Cyperus uitenhagensis	LC	Indigenous
Hermannia geniculata	LC	Indigenous
Tragus racemosus	LC	Indigenous
Zaluzianskya microsiphon	LC	Indigenous
Ranunculus multifidus	LC	Indigenous
Tagetes minuta		Not Indigenous; Naturalised; Invasive
Pycnostachys reticulata	LC	Indigenous
Hyparrhenia hirta	LC	Indigenous
Euphorbia prostrata	NE	Not Indigenous; Naturalised
Withania somnifera	LC	Indigenous
Lobelia erinus	LC	Indigenous
Amaranthus hybridus		Not Indigenous; Naturalised
Solanum torreanum	LC	Indigenous
Erythrina zeyheri	LC	Indigenous
Mentha longifolia	LC	Indigenous
Senecio macrocephalus	LC	Indigenous
Riccia nigrella		Indigenous
Ajuga ophrydis	LC	Indigenous
Osteospermum moniliferum	LC	Indigenous
Aspidoglossum demissum	VU	Indigenous; Endemic
Scabiosa columbaria	LC	Indigenous
Cyperus obtusiflorus	LC	Indigenous
Digitaria eylesii	LC	Indigenous
Mentha aquatica	LC	Indigenous
Haplocarpha scaposa	LC	Indigenous
Trichoneura grandiglumis	LC	Indigenous
Oxalis corniculata		Not Indigenous; Naturalised; Invasive
Agrimonia procera	LC	Not Indigenous; Naturalised; Invasive
Aristida bipartita	LC	Indigenous
Commelina africana	LC	Indigenous

Solanum pseudocapsicum		Not Indigenous; Naturalised; Invasive
Berkheya echinacea	LC	Indigenous
Helichrysum callicomum	LC	Indigenous
Cyperus semitrifidus	LC	Indigenous
Vigna vexillata	LC	Indigenous
Scleria woodii	LC	Indigenous
Helichrysum sp.		
Brachystelma praelongum	LC	Indigenous
Gladiolus papilio	LC	Indigenous
Lessertia stricta	LC	Indigenous
Eleocharis dregeana	LC	Indigenous
Eragrostis curvula	LC	Indigenous
Empodium elongatum	LC	Indigenous
Helichrysum oreophilum	LC	Indigenous
Chloris virgata	LC	Indigenous
Gladiolus robertsoniae	NT	Indigenous; Endemic
Sebaea leiostyla	LC	Indigenous
Asplenium platyneuron	LC	Indigenous
Trifolium africanum	NE	Indigenous
Striga elegans	LC	Indigenous
Gladiolus dalenii	LC	Indigenous
Kohautia amatymbica	LC	Indigenous
Verbena brasiliensis		Not Indigenous; Naturalised; Invasive
Helichrysum ammitophilum	LC	Indigenous
Asclepias cultriformis	LC	Indigenous
Cyrtanthus tuckii	LC	Indigenous
Hibiscus aethiopicus	LC	Indigenous
Gazania krebsiana	LC	Indigenous
Gladiolus permeabilis	LC	Indigenous
Cucumis hirsutus	LC	Indigenous
Cheilanthes hirta	LC	Indigenous
Cycnium tubulosum	LC	Indigenous
Helichrysum nudifolium	LC	Indigenous
Commelina africana	LC	Indigenous
Diclis reptans	LC	Indigenous
Senecio coronatus	LC	Indigenous
Lactuca inermis	LC	Indigenous
Pennisetum villosum	NE	Not Indigenous; Naturalised; Invasive
Aspidoglossum dissimile	LC	Indigenous; Endemic

Oenothera rosea		Not Indigenous; Naturalised; Invasive
Brachiaria advena	NE	Not Indigenous; Naturalised
Eragrostis chloromelas	LC	Indigenous
Eragrostis patentissima	LC	Indigenous
Pachycarpus grandiflorus	LC	Indigenous
Dichilus strictus	LC	Indigenous
Typha capensis		Indigenous
Cyperus keniensis	LC	Indigenous
Helichrysum miconiifolium	LC	Indigenous
Melolobium calycinum	LC	Indigenous
Aspidoglossum ovalifolium	LC	Indigenous
Leucosidea sericea	LC	Indigenous
Rabdosiella calycina	LC	Indigenous
Hilliardiella aristata	LC	Indigenous
Rumex acetosella		Not Indigenous; Naturalised
Bulbostylis hispidula	LC	Indigenous
Schkuhria pinnata		Not Indigenous; Naturalised
Nemesia umbonata	LC	Indigenous
Aloe ecklonis	LC	Indigenous
Polygala gracilenta	LC	Indigenous
Agapanthus inapertus	LC	Indigenous
Aristida congesta	LC	Indigenous
Satyrium neglectum	LC	Indigenous
Pennisetum thunbergii	LC	Indigenous
Achyranthes aspera		Not Indigenous; Naturalised
Euclea crispa		Indigenous
Funaria sp.		
Carex glomerabilis	LC	Indigenous
Erucastrum austroafricanum	LC	Indigenous
Nesaea sagittifolia		Indigenous
Wahlenbergia undulata	LC	Indigenous
Berkheya robusta	LC	Indigenous
Helichrysum rugulosum	LC	Indigenous
Chenopodium schraderianum		Not Indigenous; Naturalised
Rosa rubiginosa		Not Indigenous; Naturalised; Invasive
Nolletia ciliaris	LC	Indigenous
Gazania sp.		
Pellaea calomelanos	LC	Indigenous
Helichrysum mixtum	NE	Indigenous

Senecio rhomboideus	LC	Indigenous
Xysmalobium stockenstromense	LC	Indigenous
Setaria nigrirostris	LC	Indigenous
Cucumis myriocarpus	LC	Indigenous
Andropogon schirensis	LC	Indigenous
Psammotropha myriantha	LC	Indigenous
Cordylogyne globosa	LC	Indigenous
Helichrysum cephaloideum	LC	Indigenous
Cyphia elata	NE	Indigenous
Asplenium aethiopicum	LC	Indigenous
Sonchus asper		Not Indigenous; Naturalised; Invasive
Polygonum aviculare		Not Indigenous; Naturalised
Cyperus denudatus	LC	Indigenous
Clutia affinis	LC	Indigenous
Jamesbrittenia stricta	LC	Indigenous
Rorippa nudiuscula	LC	Indigenous
Pelargonium minimum	LC	Indigenous
Eragrostis capensis	LC	Indigenous
Carex spartea		Indigenous
Pseudognaphalium luteoalbum	LC	Not Indigenous; Naturalised
Galium capense	NE	Indigenous
Zantedeschia albomaculata	LC	Indigenous
Limeum pauciflorum	LC	Indigenous; Endemic
Plectranthus grallatus	LC	Indigenous
Holcus lanatus	NE	Not Indigenous; Naturalised
Dipcadi viride		Indigenous
Rumex steudelii	LC	Indigenous
Disa versicolor	LC	Indigenous
Abildgaardia ovata	LC	Indigenous
Leobordea divaricata	LC	Indigenous
Setaria incrassata	LC	Indigenous
Eragrostis sclerantha	LC	Indigenous
Salvia repens	LC	Indigenous
Cineraria aspera	LC	Indigenous
Aristea montana	LC	Indigenous
Myrsine africana	LC	Indigenous
Senecio sp.		
Ledebouria ovatifolia		Indigenous; Endemic
Stachys nigricans	LC	Indigenous

Ledebouria revoluta	LC	Indigenous
Eriospermum flagelliforme	LC	Indigenous
Alchemilla kiwuensis		Indigenous
Cyperus difformis	LC	Indigenous
Delosperma sp.		
Diospyros austro-africana		Indigenous
Lobelia flaccida	LC	Indigenous
Bromus hordeaceus	NE	Not Indigenous; Naturalised
Cerastium capense		Indigenous
Acalypha caperonioides	DD	Indigenous
Polygala virgata	LC	Indigenous
Senecio parentalis	LC	Indigenous; Endemic
Silene burchellii		Indigenous
Senecio achilleifolius	LC	Indigenous
Campylopus introflexus		Indigenous
Gerbera piloselloides	LC	Indigenous
Helichrysum monticola	LC	Indigenous
Peltocalathos baurii	LC	Indigenous; Endemic
Bulbostylis scleropus	LC	Indigenous
Rumex brownii		Not Indigenous; Naturalised
Echinochloa colona	LC	Indigenous
Eleusine coracana	LC	Indigenous
Ipomoea oblongata	LC	Indigenous
Catalepis gracilis	LC	Indigenous
Agrostis lachnantha	LC	Indigenous
Conyza podocephala		Indigenous
Hermannia sp.		
Chaenostoma floribundum	LC	Indigenous
Diospyros lycioides		Indigenous
Searsia pyroides		Indigenous
Euphorbia inaequilatera	NE	Indigenous
Asparagus laricinus	LC	Indigenous
Falkia oblonga		Indigenous
Plantago myosuros		Not Indigenous; Naturalised
Bryum dichotomum		Indigenous
Cyperus esculentus	LC	Indigenous
Plantago virginica		Not Indigenous; Naturalised
Greyia sutherlandii	LC	Indigenous
Tephrosia purpurea	NE	Indigenous

Geigeria burkei	NE	Indigenous; Endemic
Athrixia gerrardii	LC	Indigenous; Endemic
Urochloa panicoides	LC	Indigenous
Listia heterophylla	LC	Indigenous
Salvia runcinata	LC	Indigenous
Senecio harveianus	LC	Indigenous
Pleopeltis macrocarpa	LC	Indigenous
Pycreus macranthus	LC	Indigenous
Euphorbia striata	LC	Indigenous; Endemic
Asparagus asparagoides	LC	Indigenous
Crassula lanceolata		Indigenous; Endemic
Oxalis obliquifolia	LC	Indigenous
Pogonarthria squarrosa	LC	Indigenous
Asclepias vicaria	LC	Indigenous; Endemic
Convolvulus natalensis	LC	Indigenous
Microchloa caffra	LC	Indigenous
Digitaria tricholaenoides	LC	Indigenous
Phragmites australis	LC	Indigenous
Eragrostis planiculmis	LC	Indigenous
Oxalis depressa	LC	Indigenous
Xysmalobium undulatum	LC	Indigenous
Clutia natalensis	LC	Indigenous
Aristida junciformis	LC	Indigenous
Melinis nerviglumis	LC	Indigenous
Pycreus unioloides	LC	Indigenous
Gnidia gymnostachya	LC	Indigenous
Cannabis sativa	NE	Not Indigenous; Naturalised
Schoenoplectus muriculatus	LC	Indigenous
Khadia alticola	LC	Indigenous; Endemic
Aloe kniphofioides	VU	Indigenous
Indigofera sp.		
Orthochilus foliosus		Indigenous
Hypochaeris radicata		Not Indigenous; Naturalised
Striga bilabiata	LC	Indigenous
Fuirena coerulescens	LC	Indigenous
Pterygodium nigrescens	LC	Indigenous
Polygala gerrardii	LC	Indigenous; Endemic
Brachypodium flexum	LC	Indigenous
Dipcadi marlothii		Indigenous

Rumex crispus		Not Indigenous; Naturalised; Invasive
Aspidoglossum xanthosphaerum	VU	Indigenous; Endemic
Brachiaria eruciformis	LC	Indigenous
Senecio crenatus	LC	Indigenous; Endemic
Avena sativa	NE	Not Indigenous; Naturalised
Plantago lanceolata	LC	Indigenous
Cyperus capensis	LC	Indigenous; Endemic
Amaranthus capensis	LC	Indigenous; Endemic
Pollichia campestris		Indigenous
Senecio ruwenzoriensis	LC	Indigenous
Orthochilus aculeatus		Indigenous
Chenopodium foliosum		Not Indigenous; Naturalised
Senecio othonniflorus	LC	Indigenous
Scirpoides burkei	LC	Indigenous
Trifolium sp.		
Leobordea eriantha	LC	Indigenous
Sporobolus africanus	LC	Indigenous
Hermannia lancifolia	LC	Indigenous; Endemic
Helictotrichon turgidulum	LC	Indigenous
Sorghum sp.		
Athrixia phylicoides	LC	Indigenous
Dierama insigne	LC	Indigenous
Leersia hexandra	LC	Indigenous
Gnidia nodiflora	LC	Indigenous
Cyphia elata	NE	Indigenous; Endemic
Eragrostis racemosa	LC	Indigenous
Polygala sp.		
Echium plantagineum		Not Indigenous; Naturalised; Invasive
Triumfetta obtusicornis	LC	Indigenous; Endemic
Rubus ludwigii	LC	Indigenous
Cyphia bolusii	VU	Indigenous
Nesaea sagittifolia		Indigenous
Dianthus basuticus		Indigenous
Trifolium africanum	NE	Indigenous
Sporobolus discosporus	LC	Indigenous
Lessertia affinis	LC	Indigenous; Endemic
Polygala uncinata	LC	Indigenous
Hermannia coccocarpa	LC	Indigenous
Cotula anthemoides	LC	Indigenous

Koeleria capensis	LC	Indigenous
Crassula alba		Indigenous
Hebenstretia rehmannii	LC	Indigenous; Endemic
Ranunculus dregei	LC	Indigenous
Rhodohypoxis baurii	LC	Indigenous
Polygala hottentotta	LC	Indigenous
Juncus exsertus	LC	Indigenous
Xenostegia tridentata		Indigenous
Crinum bulbispermum	LC	Indigenous
Gomphocarpus fruticosus	LC	Indigenous
Rhynchosia totta	LC	Indigenous
Cynoglossum austroafricanum	LC	Indigenous
Cyanotis speciosa	LC	Indigenous
Pachycarpus dealbatus	LC	Indigenous
Cyrtanthus tuckii	LC	Indigenous; Endemic
Eragrostis sp.		
Phytolacca heptandra	LC	Indigenous
Monopsis decipiens	LC	Indigenous
Argyrolobium nigrescens	LC	Indigenous
Schoenoplectus decipiens	LC	Indigenous
Kohautia caespitosa	LC	Indigenous
Senecio inaequidens	LC	Indigenous
Gnidia sp.		
Thesium resedoides	LC	Indigenous
Artemisia afra	LC	Indigenous
Hypericum lalandii	LC	Indigenous
Selago procera	LC	Indigenous
Nemesia fruticans	LC	Indigenous
Nemesia caerulea	LC	Indigenous
Mohria nudiuscula	LC	Indigenous
Senecio gregatus	LC	Indigenous
Kyllinga erecta	LC	Indigenous
Ledebouria cooperi		Indigenous
Lotononis sp.		
Portulaca oleracea		Not Indigenous; Naturalised
Kyllinga pulchella	LC	Indigenous
Jamesbrittenia aurantiaca	LC	Indigenous
Hermannia parviflora	LC	Indigenous
Cymbopogon pospischilii	NE	Indigenous

Agapanthus sp.		
Panicum schinzii	LC	Indigenous
Pygmaeothamnus chamaedendrum	LC	Indigenous; Endemic
Hermannia grandistipula	LC	Indigenous
Romulea camerooniana	LC	Indigenous
Cyperus rotundus	LC	Indigenous
Limosella longiflora	LC	Indigenous
Cyperus rupestris	LC	Indigenous
Dianthus basuticus		Indigenous
Cineraria lobata	LC	Indigenous
Zantedeschia rehmannii	LC	Indigenous
Monocymbium ceresiiforme	LC	Indigenous
Melianthus comosus	LC	Indigenous
Anthospermum rigidum	LC	Indigenous
Lolium perenne	NE	Not Indigenous; Naturalised
Moraea pallida	LC	Indigenous
Asclepias stellifera	LC	Indigenous
Berkheya setifera	LC	Indigenous
Albuca virens		Indigenous
Helichrysum psilolepis	LC	Indigenous
Sporobolus sp.		
Verbena rigida		Not Indigenous; Naturalised; Invasive
Crassula dependens		Indigenous; Endemic
Miraglossum pulchellum	LC	Indigenous
Erodium cicutarium		Not Indigenous; Naturalised
Berkheya sp.		
Hyparrhenia dregeana	LC	Indigenous
Chlorophytum haygarthii		Indigenous
Habenaria dives	LC	Indigenous
Echium vulgare		Not Indigenous; Naturalised; Invasive
Rhynchosia adenodes	LC	Indigenous
Denekia capensis	LC	Indigenous
Cynoglossum hispidum	LC	Indigenous
Helichrysum cooperi	LC	Indigenous
Sebaea sedoides	LC	Indigenous
Zinnia peruviana		Not Indigenous; Naturalised
Cyperus marginatus	LC	Indigenous
Asclepias meyeriana	LC	Indigenous
Trifolium africanum	LC	Indigenous

Colchicum melanthoides		Indigenous
Pentanisia prunelloides	LC	Indigenous
Cosmos bipinnatus		Not Indigenous; Naturalised
Geranium multisectum	LC	Indigenous; Endemic
Pelargonium luridum	LC	Indigenous
Geranium wakkerstroomianum	LC	Indigenous; Endemic
Bryum argenteum		Indigenous
Veronica anagallis-aquatica	LC	Indigenous
Diclis rotundifolia	LC	Indigenous
Ruschia sp.		
Eleusine multiflora	NE	Not Indigenous; Naturalised
Leonotis ocymifolia	LC	Indigenous

7.2 APPENDIX 2: MAMMAL SPECIES LIST

Mammals predicted to potentially occur within the study area. Species of conservation concern have been marked in red.

Family	Scientific name	Common name	Conservation status Child *et al.*, (2016)
Canidae	***Canis mesomelas***	**Black-backed Jackal**	**Least Concern**
Canidae	*Vulpes chama*	Cape Fox	Least Concern
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern
Felidae	*Caracal caracal*	Caracal	Least Concern
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable
Felidae	*Leptailurus serval*	Serval	Near Threatened
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern
Herpestidae	***Cynictis penicillata***	**Yellow Mongoose**	**Least Concern**
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern
Herpestidae	*Ichneumia albicauda*	White-tailed Mongoose	Least Concern
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern
Hystricidae	***Hystrix africaeaustralis***	**Cape Porcupine**	**Least Concern**
Leporidae	*Lepus saxatilis.*	Scrub Hare	Least Concern
Leporidae	*Pronolagus rupestris*	Smith's Red Rock Hare	Least Concern
Muridae	***Gerbilliscus brantsii***	**Highveld Gerbil**	**Least Concern**
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern
Muridae	*Mus (Nannomys) minutoides*	Southern African Pygmy Mouse	Least Concern
Muridae	*Otomys auratus*	Southern African Vlei Rat	Near Threatened
Muridae	***Rhabdomys pumilio***	**Xeric Four-striped Grass Rat**	**Least Concern**
Mustelidae	***Aonyx capensis***	**African Clawless Otter**	**Near Threatened**
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern
Nesomyidae	*Dendromus mesomelas*	Brants's African Climbing Mouse	Least Concern
Pedetidae	*Pedetes capensis*	South African Spring Hare	Least Concern
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern
Vespertilionidae	*Neoromicia somalicus*	Somali Serotine	Least Concern

7.3 APPENDIX 3: AVIFAUNA SPECIES LIST

Avifauna predicted to potentially occur within the study area according to SABAP1 and SABAP2. Species observed during the fieldwork have been marked in bold. Species of conservation concern are indicated in red.

Scientific name	Common name	Conservation status Taylor *et al.* (2015)
Accipiter melanoleucus	Sparrowhawk, Black	Least concern
Acridotheres tristis	**Myna, Common**	**Least concern**
Acrocephalus arundinaceus	**Reed-warbler, Great**	**Least concern**
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Least concern
Actitis hypoleucos	**Sandpiper, Common**	**Least concern**
Afrotis afraoides	Korhaan, Northern Black	Least concern
Alcedo cristata	Kingfisher, Malachite	Least concern
Alopochen aegyptiacus	**Goose, Egyptian**	**Least concern**
Amadina erythrocephala	Finch, Red-headed	Least concern
Anas capensis	Teal, Cape	Least concern
Anas erythrorhyncha	**Teal, Red-billed**	**Least concern**
Anas smithii	**Shoveler, Cape**	**Least concern**
Anas sparsa	Duck, African Black	Least concern
Anas undulata	**Duck, Yellow-billed**	**Least concern**
Anastomus lamelligerus	Openbill, African	Least concern
Anhinga rufa	Darter, African	Least concern
Anthropoides paradiseus	Crane, Blue	Near threatened
Anthus cinnamomeus	Pipit, African	Least concern
Anthus leucophrys	Pipit, Plain-backed	Least concern
Anthus similis	Pipit, Long-billed	Least concern
Apus affinis	Swift, Little	Least concern
Apus barbatus	**Swift, African Black**	**Least concern**
Apus caffer	Swift, White-rumped	Least concern
Ardea cinerea	**Heron, Grey**	**Least concern**
Ardea goliath	Heron, Goliath	Least concern
Ardea melanocephala	Heron, Black-headed	Least concern
Asio capensis	Owl, Marsh	Least concern
Balearica regulorum	Crane, Grey Crowned	Endangered
Bostrychia hagedash	**Ibis, Hadeda**	**Least concern**
Bradypterus baboecala	Rush-warbler, Little	Least concern
Bubo africanus	Eagle-owl, Spotted	Least concern
Bubulcus ibis	Egret, Cattle	Least concern
Burhinus capensis	**Thick-knee, Spotted**	**Least concern**
Buteo rufofuscus	Buzzard, Jackal	Least concern
Buteo vulpinus	Buzzard, Steppe	Least concern
Calandrella cinerea	Lark, Red-capped	Least concern
Calidris minuta	**Stint, Little**	**Least concern**
Cercomela familiaris	Chat, Familiar	Least concern
Certhilauda semitorquata	Lark, Eastern Long-billed	Least concern
Cecropis semirufa	**Red-Breasted Swallow**	**Least concern**
Ceryle rudis	Kingfisher, Pied	Least concern
Charadrius pecuarius	Plover, Kittlitz's	Least concern
Charadrius tricollaris	Plover, Three-banded	Least concern
Chersomanes albofasciata	Lark, Spike-heeled	Least concern
Chlidonias hybrida	**Tern, Whiskered**	**Least concern**
Chrysococcyx caprius	Cuckoo, Diderick	Least concern
Ciconia ciconia	Stork, White	Least concern

Ciconia nigra	Stork, Black	Vulnerable
Circus macrourus	Harrier, Pallid	Near threatened
Cisticola ayresii	Cisticola, Wing-snapping	Least concern
Cisticola cinnamomeus	Cisticola, Pale-crowned	Least concern
Cisticola fulvicapilla	Neddicky, Neddicky	Least concern
Cisticola juncidis	Cisticola, Zitting	Least concern
Cisticola textrix	Cisticola, Cloud	Least concern
Cisticola tinniens	**Cisticola, Levaillant's**	**Least concern**
Colius striatus	Mousebird, Speckled	Least concern
Columba guinea	Pigeon, Speckled	Least concern
Columba livia	Dove, Rock	Least concern
Coracias garrulus	Roller, European	Near threatened
Corvus albus	**Crow, Pied**	**Least concern**
Corvus capensis	**Crow, Cape**	**Least concern**
Cossypha caffra	Robin-chat, Cape	Least concern
Coturnix coturnix	Quail, Common	Least concern
Crithagra atrogularis	Canary, Black-throated	Least concern
Crithagra flaviventris	Canary, Yellow	Least concern
Crithagra gularis	Seedeater, Streaky-headed	Least concern
Crithagra mozambicus	Canary, Yellow-fronted	Least concern
Delichon urbicum	House-martin, Common	Least concern
Dendrocygna viduata	Duck, White-faced	Least concern
Egretta alba	Egret, Great	Least concern
Egretta garzetta	Egret, Little	Least concern
Egretta intermedia	Egret, Yellow-billed	Least concern
Elanus caeruleus	**Kite, Black-shouldered**	**Least concern**
Emberiza capensis	Bunting, Cape	Least concern
Estrilda astrild	**Waxbill, Common**	**Least concern**
Euplectes afer	Bishop, Yellow-crowned	Least concern
Euplectes albonotatus	Widowbird, White-winged	Least concern
Euplectes ardens	Widowbird, Red-collared	Least concern
Euplectes axillaris	Widowbird, Fan-tailed	Least concern
Euplectes orix	Bishop, Southern Red	Least concern
Euplectes progne	**Widowbird, Long-tailed**	**Least concern**
Eupodotis caerulescens	Korhaan, Blue	Vulnerable
Falco amurensis	Falcon, Amur	Least concern
Falco biarmicus	Falcon, Lanner	Vulnerable
Falco naumanni	Kestrel, Lesser	Least concern
Falco rupicoloides	Kestrel, Greater	Least concern
Falco rupicolus	Kestrel, Rock	Least concern
Falco vespertinus	Falcon, Red-footed	Near threatened
Fulica cristata	**Coot, Red-knobbed**	**Least concern**
Gallinago nigripennis	Snipe, African	Least concern
Gallinula chloropus	**Moorhen, Common**	**Least concern**
Geocolaptes olivaceus	Woodpecker, Ground	
Geronticus calvus	Ibis, Southern Bald	Least concern
Glareola nordmanni	Pratincole, Black-winged	Least concern
Haliaeetus vocifer	Fish-eagle, African	Least concern
Himantopus himantopus	**Stilt, Black-winged**	**Least concern**
Hirundo albigularis	Swallow, White-throated	Least concern
Hirundo cucullata	Swallow, Greater Striped	Least concern
Hirundo fuligula	Martin, Rock	Least concern
Hirundo rustica	Swallow, Barn	Least concern
Hirundo spilodera	**Cliff-swallow, South African**	**Least concern**
Indicator indicator	Honeyguide, Greater	Least concern
Jynx ruficollis	Wryneck, Red-throated	Least concern

Lamprotornis nitens	Starling, Cape Glossy	Least concern
Lanius collaris	**Fiscal, Common (Southern)**	**Least concern**
Lybius torquatus	Barbet, Black-collared	Least concern
Macronyx capensis	Longclaw, Cape	Least concern
Megaceryle maximus	Kingfisher, Giant	Least concern
Mirafra africana	Lark, Rufous-naped	Least concern
Mirafra fasciolata	Lark, Eastern Clapper	Least concern
Motacilla capensis	**Wagtail, Cape**	**Least concern**
Muscicapa striata	Flycatcher, Spotted	Least concern
Mycteria ibis	Stork, Yellow-billed	Endangered
Myrmecocichla formicivora	Chat, Anteating	Least concern
Nectarinia famosa	Sunbird, Malachite	Least concern
Neotis denhami	Bustard, Denham's	Vulnerable
Netta erythrophthalma	**Pochard, Southern**	**Least concern**
Numida meleagris	**Guineafowl, Helmeted**	**Least concern**
Nycticorax nycticorax	Night-Heron, Black-crowned	Least concern
Oena capensis	Dove, Namaqua	Least concern
Oenanthe bifasciata	Chat, Buff-streaked	
Oenanthe monticola	Wheatear, Mountain	Least concern
Onychognathus morio	Starling, Red-winged	Least concern
Ortygospiza atricollis	Quailfinch, African	Least concern
Oxyura maccoa	Duck, Maccoa	Least concern
Passer diffusus	Sparrow, Southern Grey-headed	Least concern
Passer domesticus	**Sparrow, House**	**Least concern**
Passer melanurus	Sparrow, Cape	Least concern
Phalacrocorax africanus	Cormorant, Reed	Least concern
Phalacrocorax carbo	Cormorant, White-breasted	Least concern
Philomachus pugnax	Ruff, Ruff	Least concern
Phoenicopterus ruber	Flamingo, Greater	Near threatened
Phoeniculus purpureus	Wood-hoopoe, Green	Least concern
Phylloscopus trochilus	Warbler, Willow	Least concern
Platalea alba	Spoonbill, African	Least concern
Plectropterus gambensis	Goose, Spur-winged	Least concern
Plegadis falcinellus	**Ibis, Glossy**	**Least concern**
Plocepasser mahali	Sparrow-weaver, White-browed	Least concern
Ploceus capensis	Weaver, Cape	Least concern
Ploceus velatus	**Masked-weaver, Southern**	**Least concern**
Podiceps cristatus	Grebe, Great Crested	Least concern
Polemaetus bellicosus	Eagle, Martial	Endangered
Porphyrio madagascariensis	**Swamphen, African Purple**	**Least concern**
Prinia flavicans	Prinia, Black-chested	Least concern
Prinia hypoxantha	Prinia, Drakensberg	
Prinia subflava*	**Tawny-flanked Prinia**	
Pternistis swainsonii	Spurfowl, Swainson's	Least concern
Pycnonotus tricolor	Bulbul, Dark-capped	Least concern
Quelea quelea	**Quelea, Red-billed**	**Least concern**
Recurvirostra avosetta	Avocet, Pied	Least concern
Riparia cincta	Martin, Banded	Least concern
Riparia paludicola	Martin, Brown-throated	Least concern
Sagittarius serpentarius	Secretarybird, Secretarybird	Vulnerable
Saxicola torquatus	Stonechat, African	Least concern
Scleroptila africanus	Francolin, Grey-winged	
Scleroptila levaillantii	Francolin, Red-winged	Least concern
Scleroptila levaillantoides	Francolin, Orange River	Least concern
Scopus umbretta	Hamerkop, Hamerkop	Least concern

Serinus canicollis	Canary, Cape	Least concern
Spizocorys conirostris	Lark, Pink-billed	Least concern
Spizocorys fringillaris	Lark, Botha's	Endangered
Spreo bicolor	Starling, Pied	Least concern
Streptopelia capicola	Turtle-dove, Cape	Least concern
Streptopelia semitorquata	**Dove, Red-eyed**	**Least concern**
Streptopelia senegalensis	Dove, Laughing	Least concern
Struthio camelus	Ostrich, Common	Least concern
Tachybaptus ruficollis	**Grebe, Little**	**Least concern**
Tadorna cana	**Shelduck, South African**	**Least concern**
Telophorus zeylonus	Bokmakierie, Bokmakierie	Least concern
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Least concern
Threskiornis aethiopicus	Ibis, African Sacred	Least concern
Trachyphonus vaillantii	Barbet, Crested	Least concern
Tringa glareola	Sandpiper, Wood	Least concern
Tringa nebularia	Greenshank, Common	Least concern
Upupa africana	Hoopoe, African	Least concern
Vanellus armatus	**Lapwing, Blacksmith**	**Least concern**
Vanellus coronatus	Lapwing, Crowned	Least concern
Vanellus melanopterus	Lapwing, Black-winged	
Vanellus senegallus	Lapwing, African Wattled	Least concern
Vidua macroura	Whydah, Pin-tailed	Least concern
Zosterops virens	**White-eye, Cape**	**Least concern**

7.4 APPENDIX 4: HERPETOFAUNA SPECIES LIST

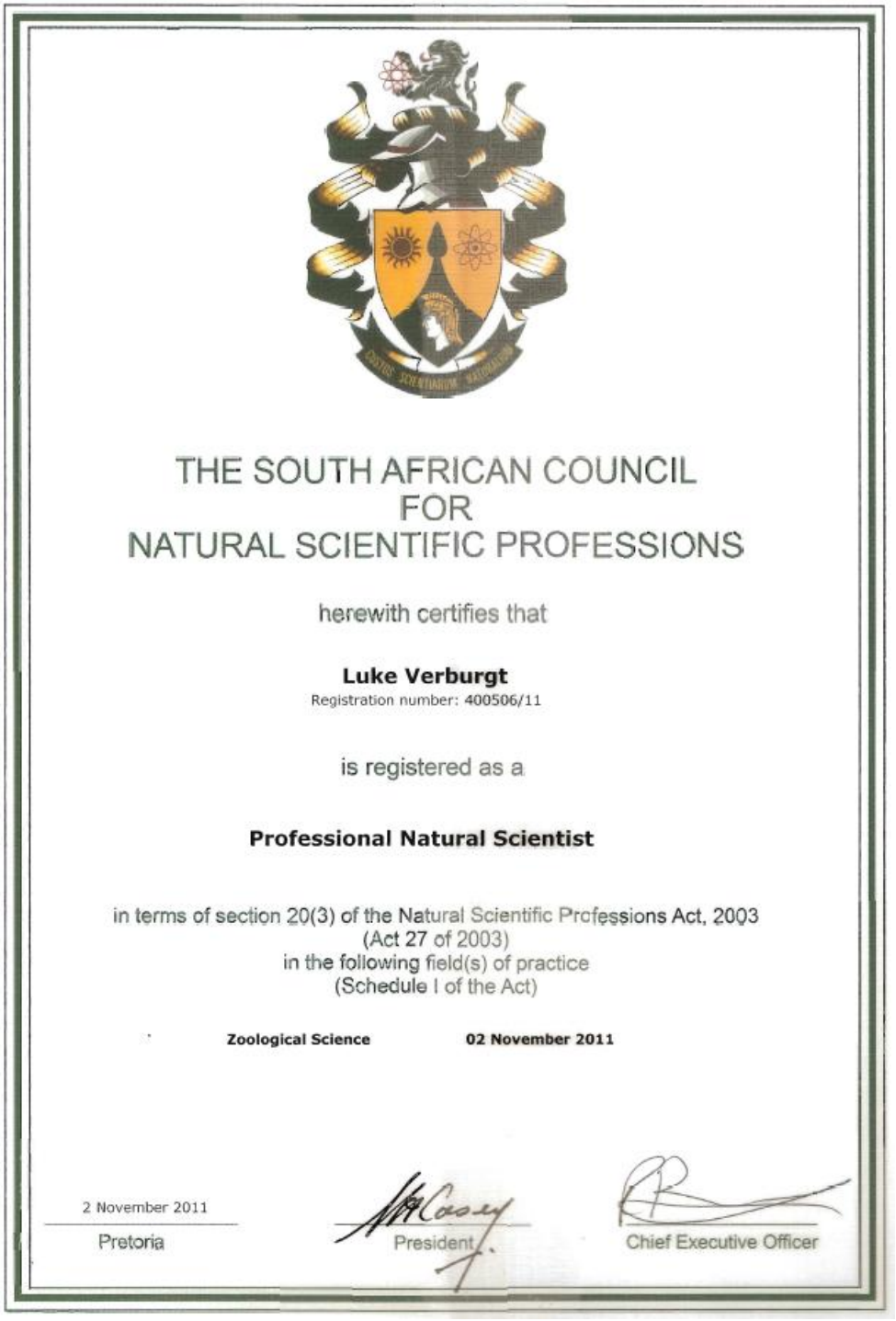
Herpetofauna predicted to potentially occur within the study area. Species observed during the fieldwork have been marked in bold. Species of conservation concern have been marked in red.

Group	Family	Scientific name	Common name	IUCN status
Reptiles	Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern
	Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern
	Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern
	Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern
	Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern
	Cordylidae	*Smaug giganteus*	Giant Girdled Lizard	Vulnerable
	Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern
	Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern
	Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern
	Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	Least Concern
	Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern
	Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern
	Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern
	Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern
	Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern
	Lamprophiidae	*Lamprophis guttatus*	Spotted House Snake	Least Concern
	Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern
	Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern
	Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern
	Lamprophiidae	***Psammophylax rhombeatus***	**Spotted Grass Snake**	**Least Concern**
	Leptotyphlopidae	***Leptotyphlops scutifrons***	**Eastern Thread Snake**	
	Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	Least Concern
	Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern
	Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern
	Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern
Amphibians	Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern
	Hyperoliidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern
	Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
	Phrynobatrachidae	*Semnodactylus wealii*	Rattling Frog	Least Concern
	Pipidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern
	Ptychadenidae	*Xenopus laevis*	Common Platanna	Least Concern
	Pyxicephalidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern
	Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern
	Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern
	Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern

Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern

7.5 APPENDIX 5: SPECIALISTS PROOF OF QUALIFICATION AND CV

Specialist: Luke Verburgt



THE SOUTH AFRICAN COUNCIL
FOR
NATURAL SCIENTIFIC PROFESSIONS

herewith certifies that

Luke Verburgt
Registration number: 400506/11

is registered as a

Professional Natural Scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice
(Schedule I of the Act)

Zoological Science **02 November 2011**

2 November 2011
Pretoria

President

Chief Executive Officer

Disclaimer

I, Luke Verburgt, *Pr. Sci. Nat. (Zoology)* declare that the work presented above is my own and has not been influenced in any way by the client. At no point has the client asked me as a specialist to manipulate my results and the above methods have been carried out to the appropriate standards required by the study.

Luke Verburgt
Pr. Sci. Nat.