PROPOSED ARNOT-GUMENI 400 kV TRANSMISSION LINE

Avifaunal & Fauna Component

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Draft Report V1

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1. INTRODUCTION

The increase in human demand for space and life-supporting resources resulted in a rapid loss of natural open space in South Africa. When natural systems are rezoned for development, indigenous fauna and flora are replaced by exotic species and converted to sterile landscapes with no dynamic propensity or ecological value (Wood *et al.,* 1994). Additionally, development rarely focussed on decisive planning to conserve natural environments, while little thought was given to the consequences on the ecological processes of development in highly sensitive areas.

Transformation and fragmentation are not the only results of unplanned and intended developments, the loss of ecosystem functioning and ultimately the local extinction of species can also result. Therefore, careful planning will not only preserve rare and endemic fauna and flora, but also the ecological integrity of ecosystems of the landscape level which is imperative for the continuation of natural resources, such as fossil fuels, water and soils with agricultural potential.

In 1992 the Convention of Biological Diversity, a landmark convention, was signed by more than 90 % of all members of the United Nations. The enactment of the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004), together with the abovementioned treaty, focuses on the preservation of all biological diversity in its totality, including genetic variability, natural populations, communities, ecosystems up to the scale of landscapes. Hence, the local and global focus changed to the sustainable utilisation of biological diversity.

1.1 Background

Pachnoda Consulting cc was contracted by Baagi Environmental Consultancy cc to provide an avifaunal and fauna impact report for the proposed Arnot-Gumeni 400 kV transmission line in central Mpumalanga.

The proposed alignment is approximately 60-70 km in length, and runs from the existing Arnot substation in the south-west, north-eastwards to the Gumeni substation (in construction) near Machadodorp (Figure 1).

Based on the length of the proposed route, three alternative corridors (each 2 km wide) have been proposed of which one had to be chosen during the Environmental Impact Assessment. One of the alternatives (*c*. Alternative 5) was based on a "least-cost" analysis and was an amalgamated effort whereby a “best-fit” alignment from each specialist discipline (e.g. fauna, flora, avifauna and visual) were analysed according to a suite of environmental parameters (e.g. vegetation type, presence of surface water, drainage, topography, geology, infrastructure, etc.). The three alternatives are as follow (Figure 1):

- Alternative 1 (56.7 km) runs along the southern extent of the study area for approximately 30 km whereby it deviates in a northerly direction towards the

Gumeni substation. Alternative 1 is located parallel to an existing 400 kV transmission (southern extent) and distribution (northern extent) line;
- Alternative 3 (59.6 km) is located on the northern part of the study area and runs along the N4 highway;
- Alternative 5 (52.5 km) is located centrally and follows an existing 275 kV distribution line.

1.2 Terms of Reference

The terms of reference for this assessment are to:

- provide a general description of the affected environment concerning the avifaunal and faunal habitat types;
- provide an indication on the occurrence of threatened, “near-threatened” and conservation important bird and animal species likely to be affected by the proposed corridor(s);
- provide an indication of sensitive bird and fauna areas or habitat types (to be incorporated into a sensitivity map) along the proposed corridor(s); and
- identify negative avifaunal and faunal impacts.

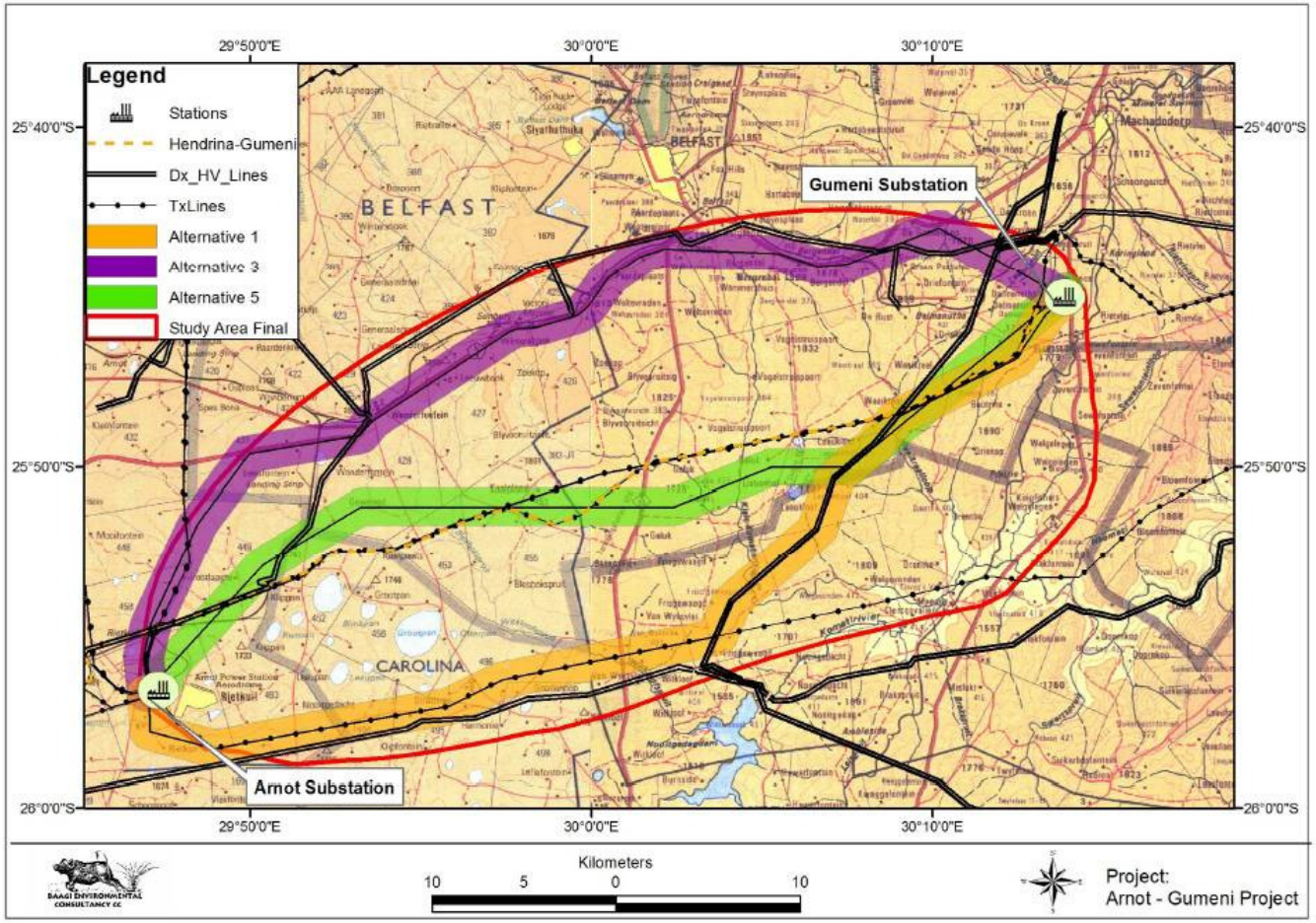

Figure 1: A locality map illustrating the geographic position of the proposed Arnot-Gumeni 400 kV transmission line and five alternative corridors.

2. METHODS

A site visit was conducted during 22-25 November 2011 and 20-23 February 2012 whereby the physical environment of the study area was inspected following an evaluation of GIS based information on the biotic and biophysical attributes of the area.

Visual observations of the proposed corridors were made during the site visit and additional data was obtained by means of sites located on high-altitude grassland and selected wetland features (pertaining to the eastern section of the study area). The objectives of the study were to:

- obtain a basic overview of the variation and general status of habitat types likely to be affected by the proposed development;
- obtain an indication of the relative structure and ecological condition of habitat types on the study site based on 19 sites of high-altitude grassland and selected wetland features investigated during the site visit (Figure 2); and
- inspect existing transmission lines within the proximity of the proposed alternative routes to obtain an overview of the range of potential impacts and likely effects of long-term management activities on the bird and faunal community.

2.1 Avifauna

- Hockey *et al*. (2005) was consulted for general information on the life history attributes of bird species;
- The Southern African Bird Atlas Project (Harrison *et al*, 1997) was consulted to obtain information regarding the distribution patterns of bird species. The information was based on each quarter degree square within the study area;
- Additional distributional data was also sourced from the SABAP2 database (www.sabap2.adu.org.za). Since bird distributions are dynamic (based on landscape changes affected by fragmentation and climate change), SABAP2 was born (and launched in 2007) from SABAP1 with the main difference being that all sampling is done at a finer scale known as pentad grids (5 min lat x 5 min long, equating to 9 pentads within a QDGC). This implies that the data is recent, site-specific, and more comparable with observations made during the site visit;
- The conservation status of bird species and their respective biogeographic affinities were sourced from the IUCN Red List of Threatened Species (2012), Barnes (2000) and Barnes (1998). The latter provides an overview of the Important Bird Areas (IBAs) in southern Africa;
- The route selection process was facilitated by Wattled Crane, Blue Crane and Grey Crowned Crane occurrences and breeding localities (1991 – 2010/11).

The dataset was obtained from the Endangered Wildlife Trust (the ownership belongs to EWT and the KZN Crane Foundation).

- Data on power line derived bird mortalities were sourced from the electrical infrastructure mortality incident register (the dataset was provided by EWT);
- Additional information regarding bird-power line interactions was provided by Mr. C. van Rooyen of the Endangered Wildlife Trust;
- Conversations with the public sector, my own personal observations and the Highlands and Wetlands Birding Route (www.birdingroutes.co.za) provided additional distributional data on threatened and conservation-dependant bird species;
- Data on wetland types was obtained from the National Wetlands Inventory (Version.3, 2006), the EWT and Mr. Retief Grobler; and
- The regional vegetation classification was based on Mucina & Rutherford (2006).

2.2 Fauna

Mammals

- The occurrence and conservation status of mammal taxa were based on the IUCN Red List (2012) and Friedmann & Daly (2004), while mammalian nomenclature was based on Skinner & Chimimba (2005) unless otherwise specified.
- As part of the assessment, it was decided to model the predicted distribution of the Oribi (*Ourebia ourebi*) on the study area. The predicted model will provide a visual indication of the sensitivity of the study area and a means to facilitate comparisons between the proposed corridors and will be modelled according to set of environmental characteristics based on Oribi habitat selection and preference:
    - Aspect of slope;
    - Degree of slope;
    - Topography; and
- Ecological condition of the floristic composition
- Actual observations of mammal taxa obtained during plot-based sampling.

Herpetofauna

- Red Data categories were chosen according to the dated assessment conducted by Branch (1988) and the South African Reptile Conservation Assessment (SARCA; www.saherps.net/sarca/index.php); and
- Red Data categories and listings of amphibian taxa follow Minter *et al*. (2004) and Measey (2010).

Arthropods

- Threatened and near-threatened categories for diurnal butterflies were chosen according to the Henning *et al*. (2009); and
- Schedule B1 of the list of protected species issued in terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 were used for invertebrates species.

2.3 Limitations

In order to obtain a comprehensive understanding of the dynamics of avifaunal communities on the study area, as well as the status of endemic, rare or threatened species in any area, impact assessments should consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies are not feasible and are mostly based on instantaneous sampling bouts.

It should be realised that bird distribution patterns fluctuate widely in response to environmental conditions. In addition, some sections of the study area (e.g. ravines and mountainous areas) were inaccessible by road and could not be evaluated.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

Furthermore, additional information may come to light during a later stage of the process or development. This company, the consultants and/or specialist investigators do not accept any responsibility for conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from the surveys or requests made to them at the time of this report.

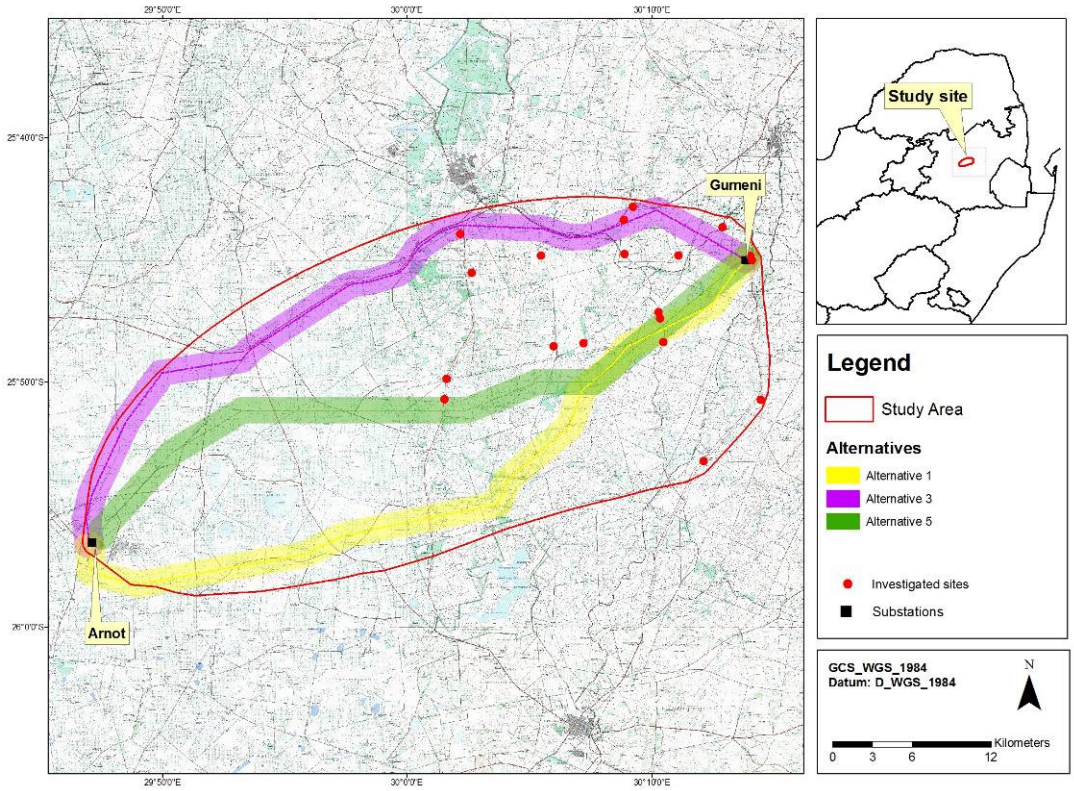

Figure 2: A map illustrating the investigated sites corresponding to high-altitude grassland and selected wetland features on the eastern part of the study area.

3. RESULTS & DISCUSSION

3.1 Regional Vegetation Description

Bird diversity is positively correlated with vegetation structure. Therefore, floristic richness is not regarded to be the single most important contributor of observed patterns in bird abundance and spatial distributions. However, this relationship is less clear for faunal diversity, although spatial heterogeneity could provide more niche space for faunal species to occupy. For example, rocky grassland will hold more faunal species than open grassland on plains.

Grasslands are generally poor in woody plant species although it is an important habitat for many terrestrial and cryptic bird species such as larks, pipits, korhaans and cisticolas. Many grassland bird and animal species are also threatened by habitat destruction and fragmentation (Barnes, 2000). On the other hand, woodlands are rich in woody plant species and are an important constituent of the Savanna Biome that provide habitat for a range of other faunal species that are not partial to the open grasslands (e.g. certain raptor species).

The study area corresponds to a total of two ecological types (Figure 3) and one Biome. Four vegetation types are traversed by the proposed corridor alternatives (Table 1).

Table 1: An indication of the vegetation types traversed by the proposed corridor alternatives.

Vegetation Type	Alternative 1	Alternative 3	Alternative 5
Eastern Highveld Grassland	X	X	X
Lydenburg Montane Grassland	X	X	X
KaNgwane Montane Grassland	X	-	X
Eastern Temperate Freshwater Wetlands	-	X	-
Total:	**3**	**3**	**3**

a. Eastern Highveld Grassland

Nearly 70 % of the proposed study area is occupied by Eastern Highveld Grassland (Table 2). This grassland is located on slightly to moderately undulating plains and includes a number of low hills and pan depressions (see Eastern Temperate Freshwater Wetlands). The latter is an important consideration since they provide critical important foraging habitat for two “near-endemic” flamingo species as well as a number of other waterbird species. The vegetation is typically short and dominated by graminoid species of the genera *Themeda, Aristida, Agrostis* and *Eragrostis*. Nearly 44 % of this grassland type is already transformed by cultivation, coal mines and the creation of artificial impoundments. Although the latter has contributed to the regional waterfowl diversity, the transformation and flooding of wetland habitat has led to the demise of many terrestrial threatened bird species that historically occupied the area.

The open structure of this vegetation type is an important consideration since it conforms to the typical habitat requirements of many large terrestrial bird species such as the Blue Korhaan (*Eupodotis caerulescens*) and Secretarybird (*Sagittarius serpentarius*), while many of the moist grassland patches, especially those dominated by *Imperata cylindrica* and *Arundinella nepalensis* provides optimal breeding habitat for the "Vulnerable" African Grass-owl (*Tyto capensis*). Since large parts of this type correspond to cattle farms, it is frequently overgrazed or converted to extensive areas of agricultural land.

b. KaNgwane Montane Grassland

Approximately 13 % of the study site is occupied by this vegetation type. However, only Alternative 1 and 5 traverse KaNgwane Montane Grassland, which is located on the south-eastern part of the study site. This vegetation type is located on the undulating hills of the eastern edge of the Escarpment of Mpumalanga, and is typical of a transitional area between the Highveld (to the west) and the Escarpment (to the east). It is likely to support a number of endemic faunal species of which many are

currently threatened or near-threatened. In addition, it is rich in plant species with many biogeographically important taxa. The section traversed by the proposed route was relatively untransformed and capable of supporting a rich avifaunal composition represented by many regional endemics and species with Afromontane affinities such as the Buff-streaked Chat (*Oenanthe bifasciata*).

c. Lydenburg Montane Grassland

Approximately 21 % of the study area corresponds to Lydenburg Montane Grassland (Mucina & Rutherford, 2006) and is confined to the north-eastern part of the study area. It is structurally very similar to that of the KaNgwane Montane Grassland and well represented by numerous biogeographically important plant taxa. It is restricted to the higher-lying plateau and consists of short grassland and a forb layer rich in species.

It is also capable of supporting a diverse avifaunal and faunal composition that is represented by many regional grassland endemics with localised or restricted distribution ranges (e.g. Oribi *Ourebia ourebi*). The short graminoid structure and hilly topography of this grassland type is an important consideration since it conforms to the typical habitat requirements of the White-bellied Korhaan (*Eupodotis senegalensis*), Denham's Bustard (*Neotis denhami*), cranes and provides important foraging habitat for the Southern Bald Ibis (*Geronticus calvus*), especially when burned.

d. Eastern Temperate Freshwater Wetlands

Only one percent of the study area is occupied by the Eastern Temperate Freshwater Wetlands. These wetlands systems are represented by large closed-basin, endorheic pans, or shallow depressions filled with rainwater that support zoned systems of aquatic and hygrophilous vegetation.

These pan systems, although localised, are critical important foraging habitat for large flocks of "near-threatened" Greater (*Phoenicopterus ruber*) and Lesser Flamingos (*P. minor*) and large congregations of Palaearctic migrant waders (e.g. members of the Scolopacidae) during the wet season.

Table 2: The surface area (ha) of each regional vegetation type in relation to the approximate total surface area of the study area.

Vegetation Type	Area (ha)	%
Eastern Highveld Grassland	64060.48	65.15%
Lydenburg Montane Grassland	20168.16	20.51%
KaNgwane Montane Grassland	13065.12	13.29%
Eastern Temperate Freshwater Wetlands	1027.20	1.04%
Total	**98320.96**	**100.00%**

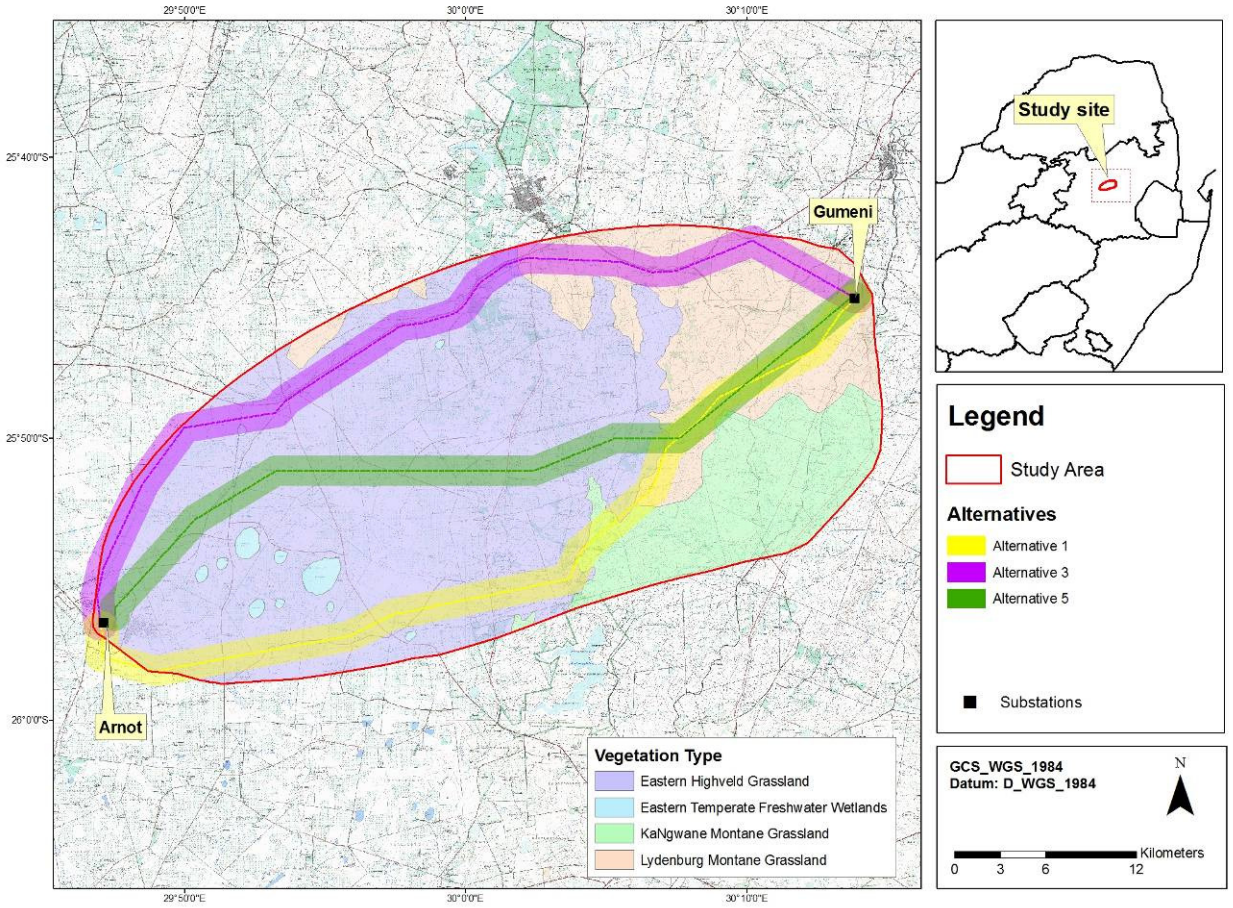

Figure 3: The regional vegetation types traversed by the proposed corridors. Map categories according to Mucina and Rutherford (2006).

3.2 Habitat Types identified from the Study Area

3.2.1 Short upland & rocky undulating grassland

These habitat types were dominant on the upper plateaus of the escarpment and relatively well-preserved on the eastern part of the study site (Figure 4). When pristine, these grasslands support a rich assemblage of fauna species including many globally threatened species (e.g. Denham's Bustard *Neotis denhamii,* Blue and Wattled Crane *Anthropoides paradiseus* & *Bugeranus carunculatus,* Southern Bald Ibis *Geronticus calvus,* Yellow-breasted Pipit *Anthus chloris,* Rudd's Lark *Heteromirafra ruddi &* Oribi *Ourebia ourebi*) as well as the national "near-threatened" Black-winged Lapwing (*Vanellus melanopterus*). It is also likely to support two species of Korhaan (*Eupodotis caerulescens & E. senegalensis*) with decreasing population trends.

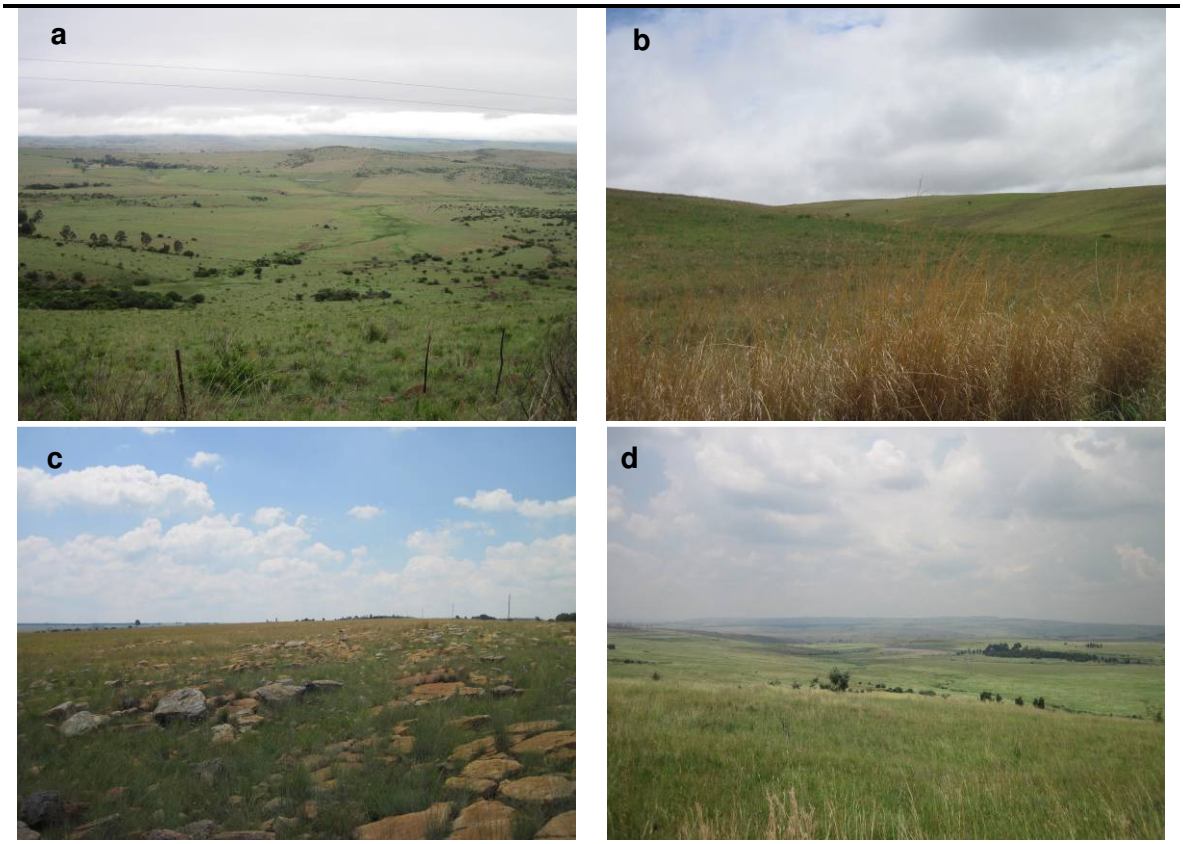

Figure 4: An example of short, species-rich high-altitude grassland. Note the undulating topography and the presence of outcrops.

3.2.2 Secondary and grazed grassland

These areas were centred on the western parts of the study area and were mainly confined to the Eastern Highveld grassland (Figure 5). It conforms to open species-poor grassland dominated by secondary grass species, in particular *Eragrostis curvula* and *E. plana*. However, despite being grazed, it provides ephemeral foraging habitat for many large terrestrial bird species (e.g. Blue Korhaan *Eupodotis caerulescens* and Secretarybird *S. serpentarius*) when extensive tract persists.

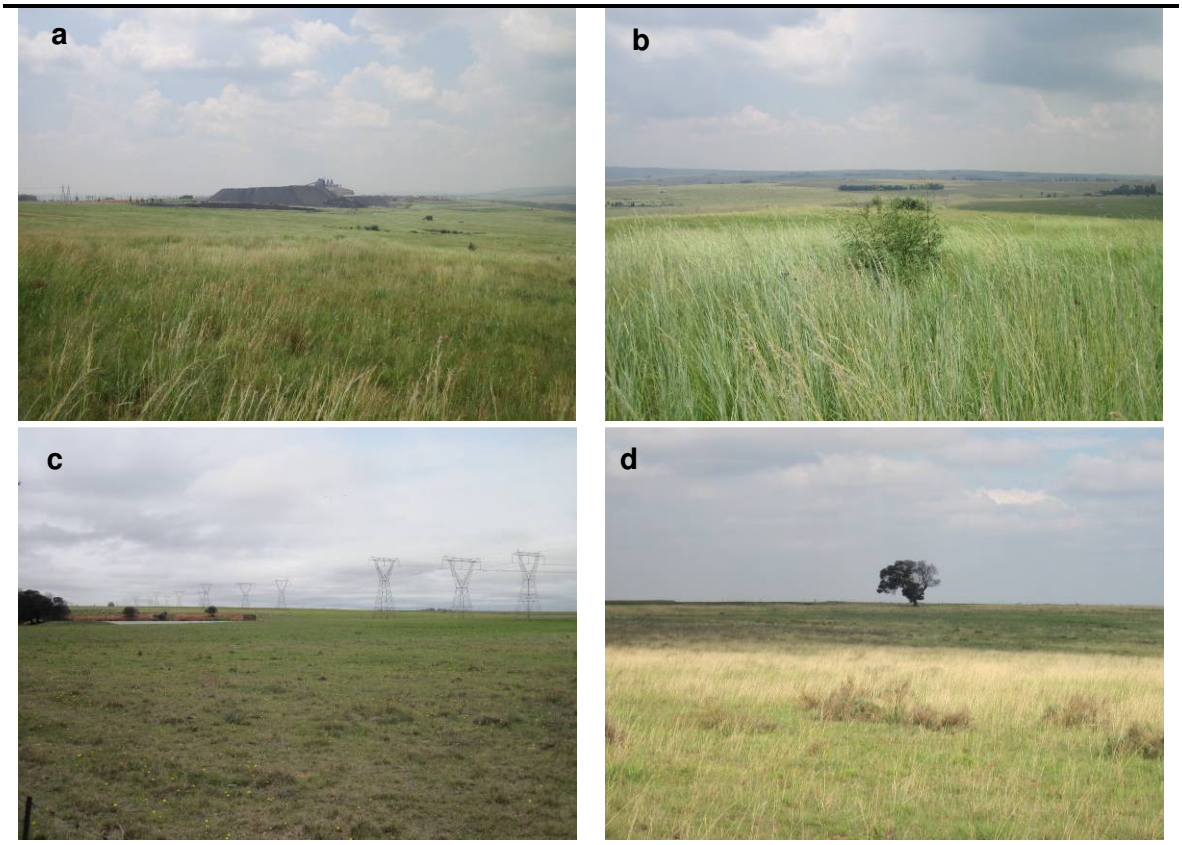

Figure 5: Secondary grazed grassland as seen from the study area.

3.2.3 Arable land, pastures and cultivated fields

These are represented by agricultural land and artificially maintained pastures, which were well represented on the study area (Figure 6). These habitat types provide ephemeral foraging habitat, especially when left fallow, for the Secretarybird (*Sagittarius serpentarius*), Grey Crowned Crane (*Balaearica regulorum*) and Blue Korhaan (*E. caerulescens*). Other bird species that utilise this habitat type that are prone to power line collisions are the White Stork (*Ciconia ciconia*) which is occasionally present in large numbers (hundreds), Spur-winged Goose (*Plectropterus gambensis*) and Egyptian Goose (*Alopochen aegyptiaca*).

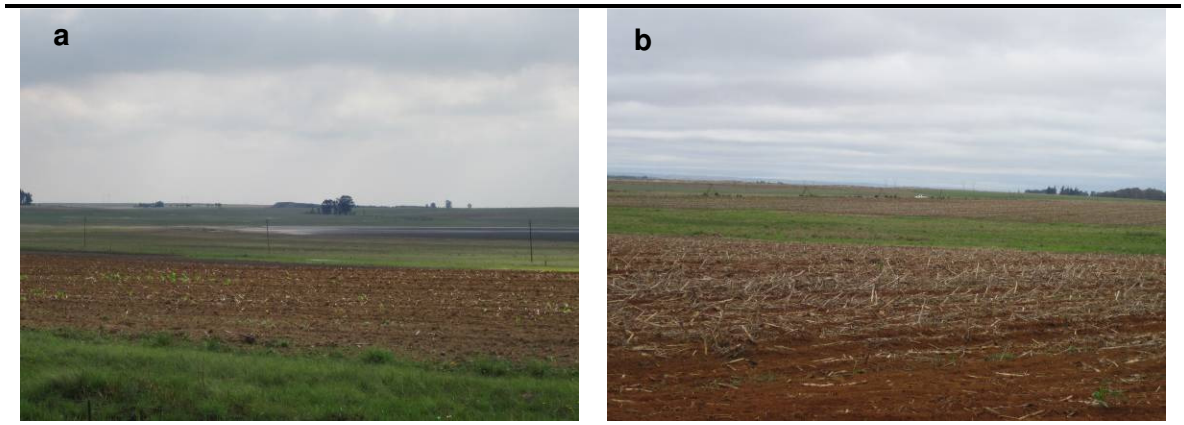

Figure 6: Arable land and cultivated fields.

3.2.4 Riparian Areas/ Drainage Lines

These habitat types are represented by tributaries within the upper catchment of the Klein-Olifants, Komati and Klein-Komati and the Elands River systems (Figure 7). Most of the rivers are of the bed-rock bottom type with a well-established fringe of overhanging vegetation. These linear systems are important since they sustain a variety of waterbird taxa (e.g. prominent species such as Egyptian Goose *Alopochen aegyptiaca,* African Black Duck *Anas sparsa,* the genera *Phalacrocorax* (cormorants) and *Anhinga* (darters), the Giant Kingfisher *Megaceryle maxima,* the African Fish Eagle *Haliaeetus vocifer*) including the "near-threatened" Spotted-necked Otter (*Lutra maculicollis*).

These systems share one important ecological function: maintaining genetic stability between bird populations along their entire length. The riparian and emergent vegetation are important dispersal corridors, for it increases the probability of colonisation of areas outside of the study area, thereby reducing the isolation of residing populations. Such movement of bird species will enhance gene flow and reduce inbreeding depression and loss of genetic variability.