



# **AVIFAUNAL ASSESSMENT REPORT FOR THE PROPOSED MOKOLO AND CROCODILE WATER AUGMENTATION PROJECT (MCWAP-2)**

**Thabazimbi, Limpopo**

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**CLIENT**



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## List Acronyms

| Acronym | Definition  |
|---------|---|
| AOI     | Area of Interest  |
| CBA     | Critical Biodiversity Area  |
| CEMPr   | Construction Environmental Management Programme                   |
| CR      | Critically Endangered   |
| DEFF    | Department of Environment, Forestry and Fisheries                 |
| ECO     | Environmental Control Officer                                     |
| EN      | Endangered  |
| ESA     | Ecological Support Area   |
| EWT     | Endangered Wildlife Trust   |
| FID     | Flight Initiation Distance  |
| GIS     | Geographic Information Systems                                    |
| GPS     | Global Positioning System   |
| IBA     | Important Bird and Biodiversity Areas                             |
| IUCN    | International Union for Conservation of Nature                    |
| LEDET   | Limpopo Department of Economic Development, Environment & Tourism |
| LT      | Least Threatened  |
| MCWAP-2 | Mokolo and Crocodile Water Augmentation Project                   |
| MDS     | Multidimensional Scaling  |
| NMDS    | Non-metric Multidimensional Scaling                               |
| NNR     | No Natural Remaining  |
| NT      | Near Threatened   |
| ONA     | Other Natural Area  |
| PA      | Protected Area  |
| SABAP   | Southern African Bird Atlas Project                               |
| SACAD   | South Africa Conservation Areas Database                          |
| SADAP   | South Africa Protected Areas Database                             |
| SANS    | South African National Standards                                  |
| SCC     | Species of Conservation Concern                                   |
| TBC     | The Biodiversity Company  |
| VU      | Vulnerable  |



## 1 Introduction

The Biodiversity Company (TBC) was appointed by GIBB (Pty) Ltd on behalf of GBN Joint Venture to conduct an avifaunal assessment for the Mokolo Crocodile Water Augmentation Project Phase 2 (MCWAP-2) in the Thabazimbi and Lephalale Local Municipalities, Limpopo Province. This avifaunal assessment forms part of the conditions of Environmental Authorisation for the MCWAP-2 project.





This report represents the culmination of both dry and wet season surveys along the proposed pipeline route. The study provides a baseline description of the avifaunal community and goes on to highlight conservation important species, areas modelled to support higher concentrations of disturbance prone species, important habitats, raptor nest localities and important habitats known to support the highest and most unique avian diversities. This information was used to delineate and map areas of avifaunal sensitivity.

The report closes with a concise list of management actions and recommendations on the monitoring that should follow. More detailed management recommendations per project phase are provided in the Construction Environmental Management Programme (CEMP<sub>r</sub>).



Figure 1-1 White-crested Helmet-shrikes (*Prionops plumatus*)

## 2 Specialist Details

|                |  |  |
|----------------|--|--|
| Report Name    | AVIFAUNAL ASSESSMENT REPORT FOR THE PROPOSED MOKOLO AND CROCODILE WATER AUGMENTATION PROJECT (MCWAP-2)   |  |
| Submitted to   |    |  |
| Report Writer  | <p><b>Tyron Clark</b></p>  <p>Tyron Clark (Pr. Sci. Nat. 121338) has 10 years of experience conducting biodiversity assessments, specialising in avifauna and herpetofauna in a number of African countries, affording him good experience in variety of development types. He attained his MSC in Zoological science from the University of the Witwatersrand. His research interests centre on biogeography and ecological niche modelling.</p>   |  |
| Desktop Review | <p><b>Lindi Steyn</b></p>  <p>Lindi Steyn has a PhD in Biodiversity and Conservation from the University of Johannesburg. She specialises in avifauna and has worked in this specialisation since 2013.</p>   |  |
| Reviewer       | <p><b>Andrew Husted</b></p>  <p>Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.</p>  |  |
| Declaration    | <p>The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.</p> |  |



### 3 Terms of Reference

The scope of work as stipulated in the Request for Quotation included:

- Review all the relevant reports to identify any key issues or potential gaps in the existing studies that should be carried forward;
- Review and confirm appropriate spatial sensitivities;
- Conduct fieldwork that spans at least two sampling seasons (wet and dry seasons);
- Provide input and mitigation measures into the CEMPr;
- Technical design input;
- Project meetings; and
- Compilation of final Avifaunal Report.

### 4 Project Description

The Mokolo Crocodile River Water Augmentation Project, Phase 2 (MCWAP2), project entails the transfer of water from the Crocodile River to the Lephalale (Ellisras) and Steenbokpan areas. The project also includes the implementation of a river management system in the Crocodile River as well as in certain tributaries. The project fall within the Waterberg District Municipality of the Limpopo Province where it crosses the Thabazimbi and Lephalale Local Municipalities.

The dominant land uses surrounding the project area includes urban developments, mining areas as well as large stretches of nature reserves and protected areas. A locality map of the project area is shown in Figure 4-1.

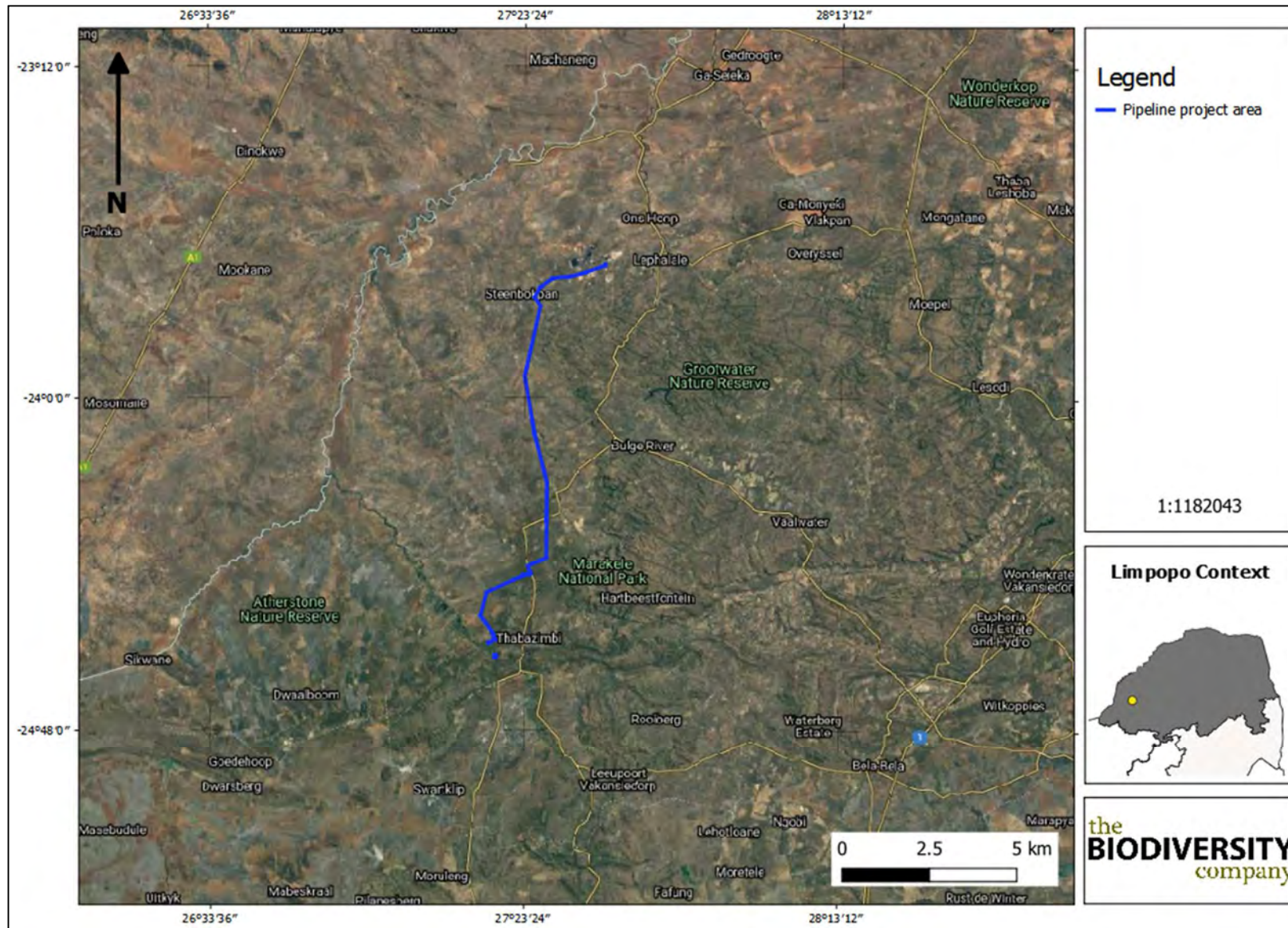


Figure 4-1 Locality of the project area



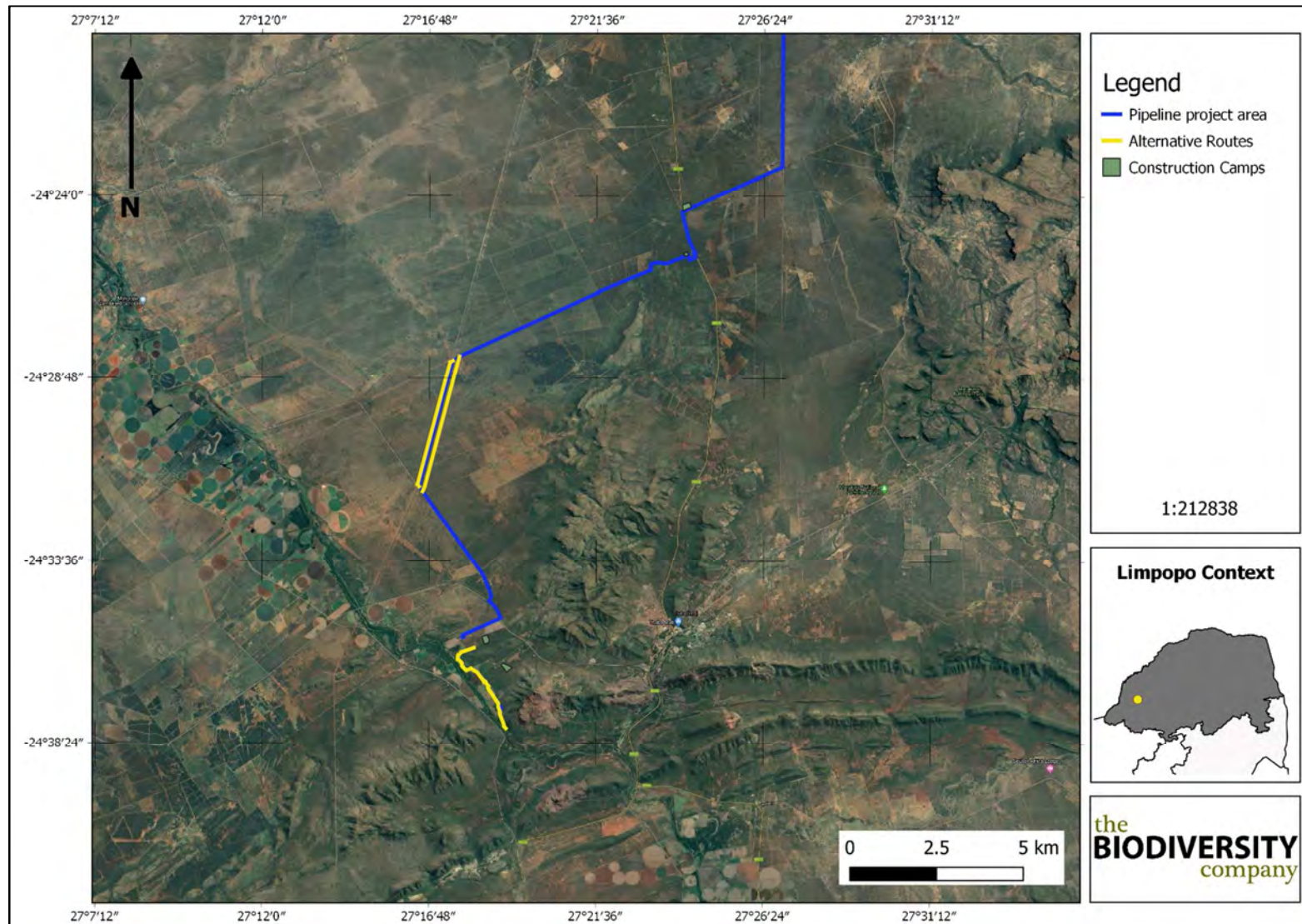


Figure 4-2 Alternative routes of the pipeline

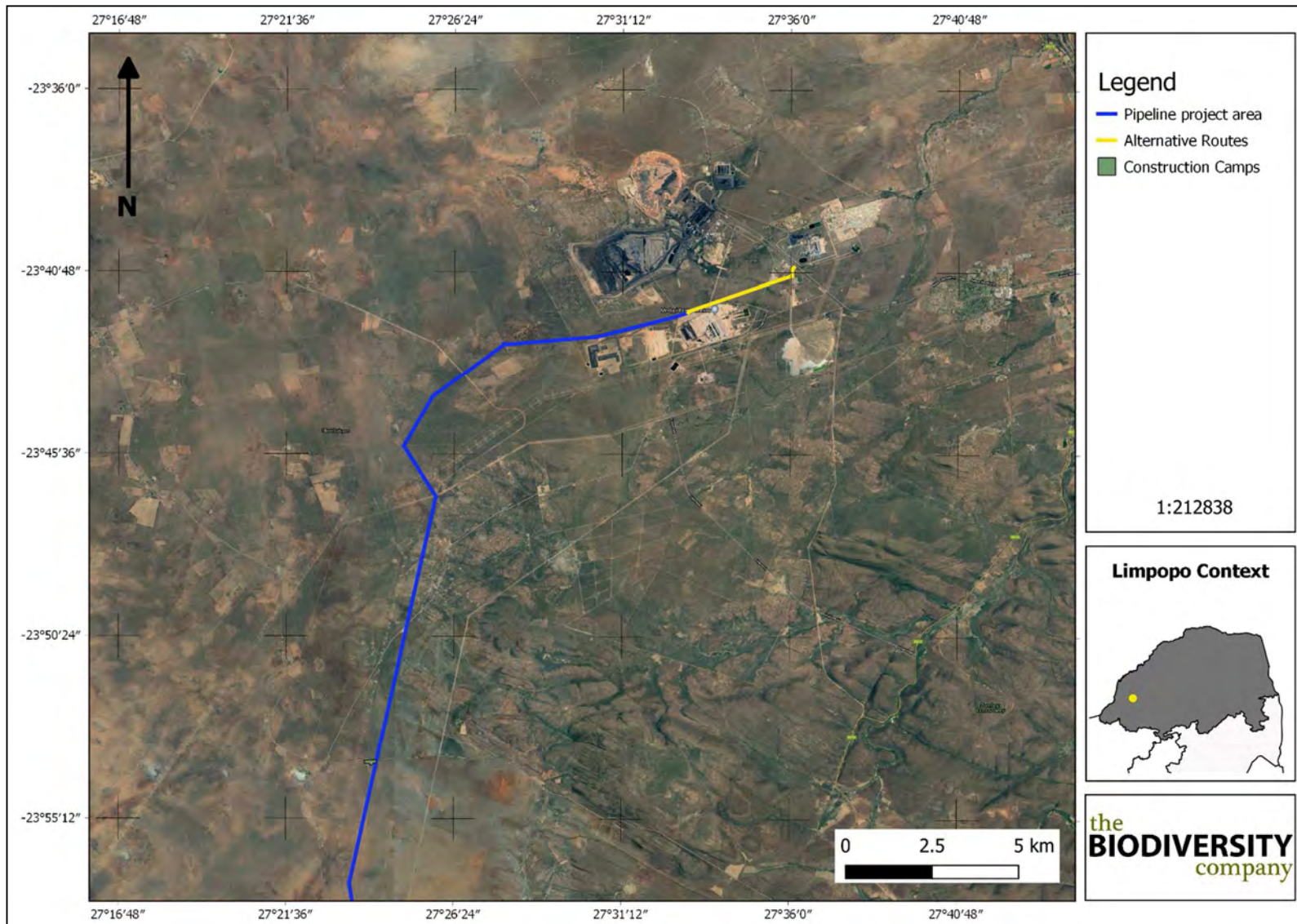


Figure 4-3 Alternative routes of the pipeline



## 5 Limitations

The following limitations should be noted for the study:

- In spite of the best efforts of the social coordination team, access to some farm portions was restricted. However, these were few and far between and the sampling effort is considered robust enough that any lack of samples from these areas is not anticipated to affect the results of this survey to any appreciable level. These areas were scanned on the ground with binoculars from the boundary and analysed from a desktop level using Google Earth for potentially sensitive habitat; and
- The nature of these kinds of surveys only offers a brief snapshot of the true diversity to be found in the project area. Nevertheless, the species accumulation curves for the point count data suggest adequate sampling and that the inventory is probably largely representative of the local avifaunal assemblage. Furthermore, interviews with numerous landowners helped to fill all remaining gaps on the presence of cryptic, illusive and rare species that went undetected.

## 6 Methodologies

### 6.1 Desktop assessment

#### 6.1.1 Geographic Information Systems (GIS) Mapping

Brief descriptions of the standardised methodologies applied are provided below. More detailed descriptions of survey methodologies are available upon request. Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Limpopo Conservation Plan (2018);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Important Bird and Biodiversity Areas (IBA, 2015); and
- SADAP (South Africa Protected Areas Database) and SACAD (South Africa Conservation Areas Database) (2019).

### 6.2 Fieldwork

Sampling consisted of standardized point counts as well as random incidental surveys. Standardized point counts (following Buckland *et al.* 1993) were conducted to gather data on the species composition and relative abundance of species within the three broad habitat types identified within the concession. Each point count ran over a 10 min period. The horizontal detection limit was set at 50 m. At each point the observer documented the date, start time and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and flight direction and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not have been detected during the rigid point count protocol, incidental searches were conducted. This involved the opportunistic sampling of species between point count periods.

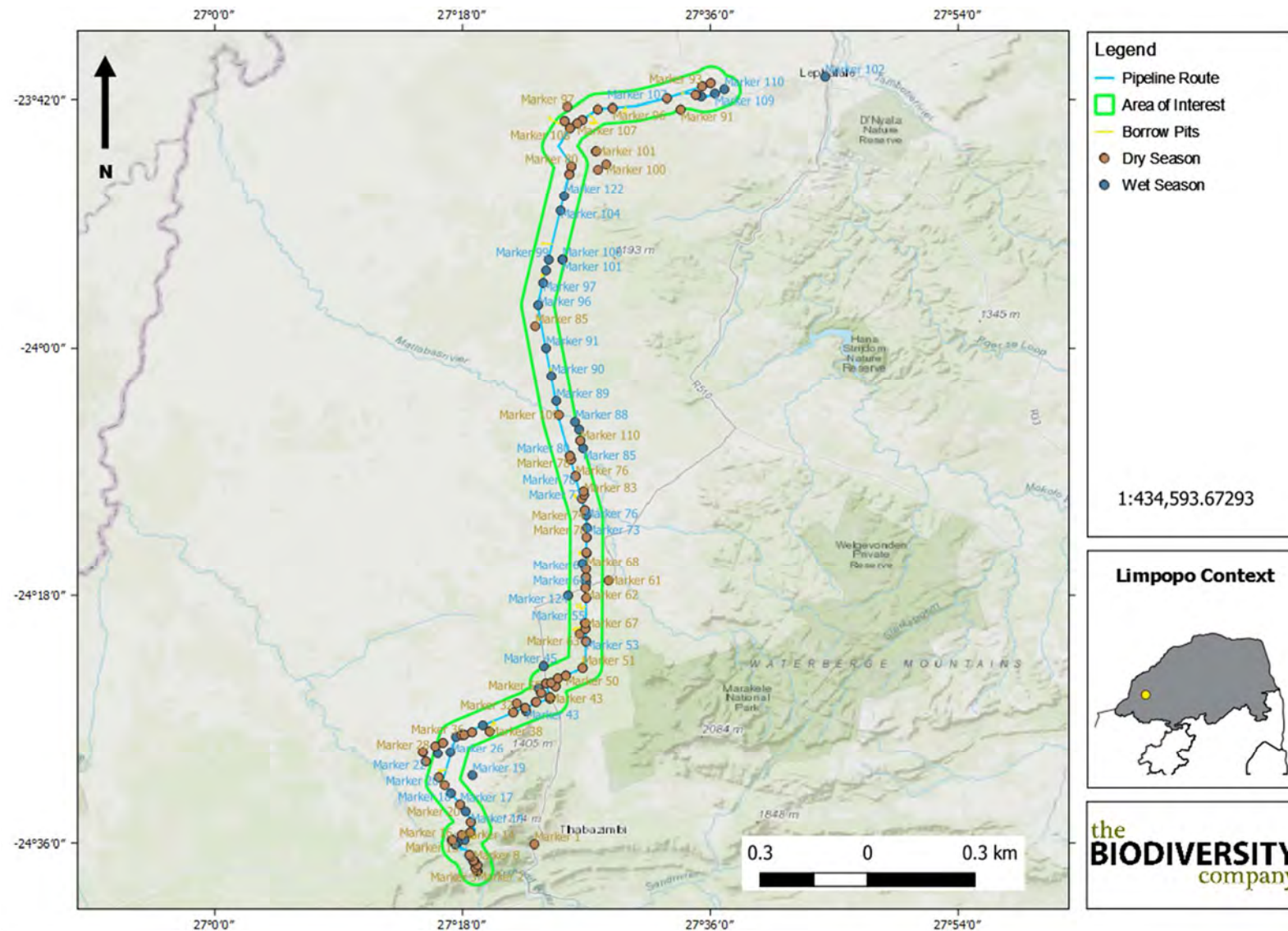


Figure 6-1 Avifaunal point count sampling points over both the wet and dry season surveys



### 6.3 Data Analysis

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to generate a species accumulation curve to assess sampling adequacy. Random accumulation was assumed over 100 permutations. Next, to distinguish similarities / differences in the species composition between the four identified avifaunal habitats the matrix was converted into a Bray-Curtis dissimilarity matrix and used to generate a two-axis non-metric multidimensional scaling (NMDS) ordination. Thirdly count data were used to establish dominant species and calculate the diversity of each habitat. Shannon's Diversity Index H was the metric used to estimate diversity. All statistical analyses were performed in the R statistical environment.

## 7 Receiving Environment

### 7.1 Desktop Spatial Assessment

The following features describes the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI. The desktop analysis and their relevance to this project are listed in Table 7-1.

Table 7-1 Desktop spatial features examined.

| Desktop Information Considered        | Relevant/Not relevant   | Section |
|---------------------------------------|---|---------|
| Conservation Plan                     | The project area overlaps with a CBA1, CBA2, ESA1, ESA2 and ONA classified area.  | 7.2     |
| Protected Areas (SAPAD & SACAD)       | The project crosses a number of nature reserves, it also comes within 650 m of the Marakele National park and falls within its 10 km protected area buffer (Desmet <i>et al.</i> , 2013). It is 5 km away from the Waterberg Biosphere Reserve. | 7.3     |
| Important Bird and Biodiversity Areas | The project area comes within 4.5 km of the Waterberg IBA and the 1.9 km from the Northern Turf Thornveld.  | 7.4     |
| Vegetation Type                       | The project area occurs in the Limpopo Sweet Bushveld, the Western Sandy Bushveld, the Western Mountain Bushveld, the Subtropical Alluvial vegetation and Dwaalboom Thornveld.  | 7.6     |

### 7.2 Limpopo Conservation Plan

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.*, 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.*, 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);

- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.*, 2018).

Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Desmet *et al.*, 2018).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Desmet *et al.*, 2018).

Figure 7-1 shows the project area overlaps with a:

- CBA1;
- CBA2;
- ESA1;
- ESA2; and
- ONA classified area.

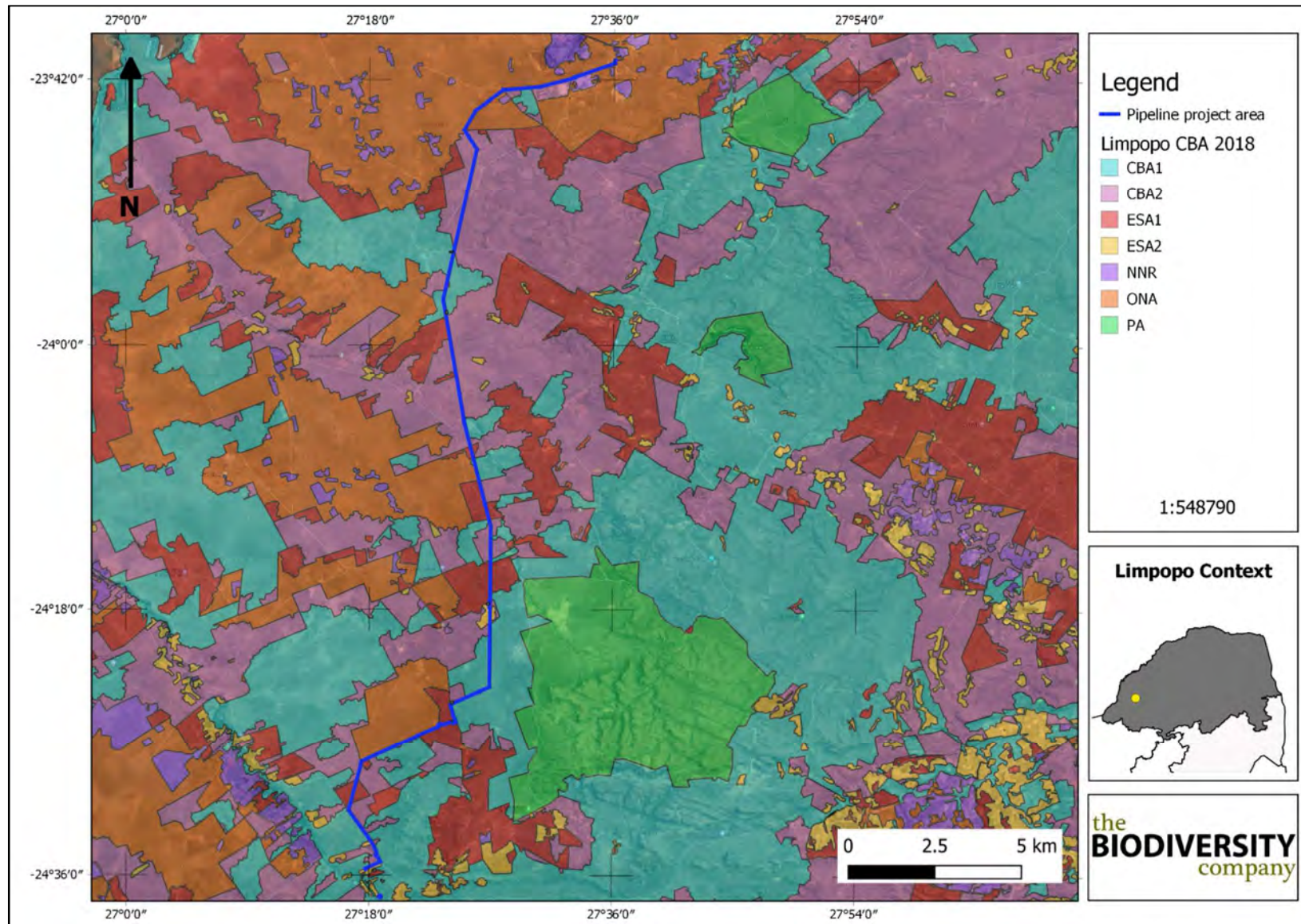


Figure 7-1 The project area superimposed on the Limpopo Critical Biodiversity Areas (Desmet *et al.*, 2018)





Figure 7-2 The project area superimposed on the Limpopo Critical Biodiversity Areas (Desmet *et al.*, 2018).

### 7.3 Protected Areas

The Department of Environment, Forestry and Fisheries (DEFF) maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas:

- Special nature reserves;
- National parks;
- Nature reserves;
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;
- Marine protected areas declared in terms of the Marine Living Resources Act;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

The types of conservation areas that are currently included in the database are the following:

- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Transfrontier conservation areas;
- Transfrontier parks;
- Military conservation areas and
- Conservancies

Figure 7-3 shows that the project crosses a number of nature reserves, it also comes within 650 m of the Marakele National Park and falls within its 10 km protected area buffer (Desmet *et al.*, 2013). It is 5 km away from the Waterberg Biosphere Reserve.



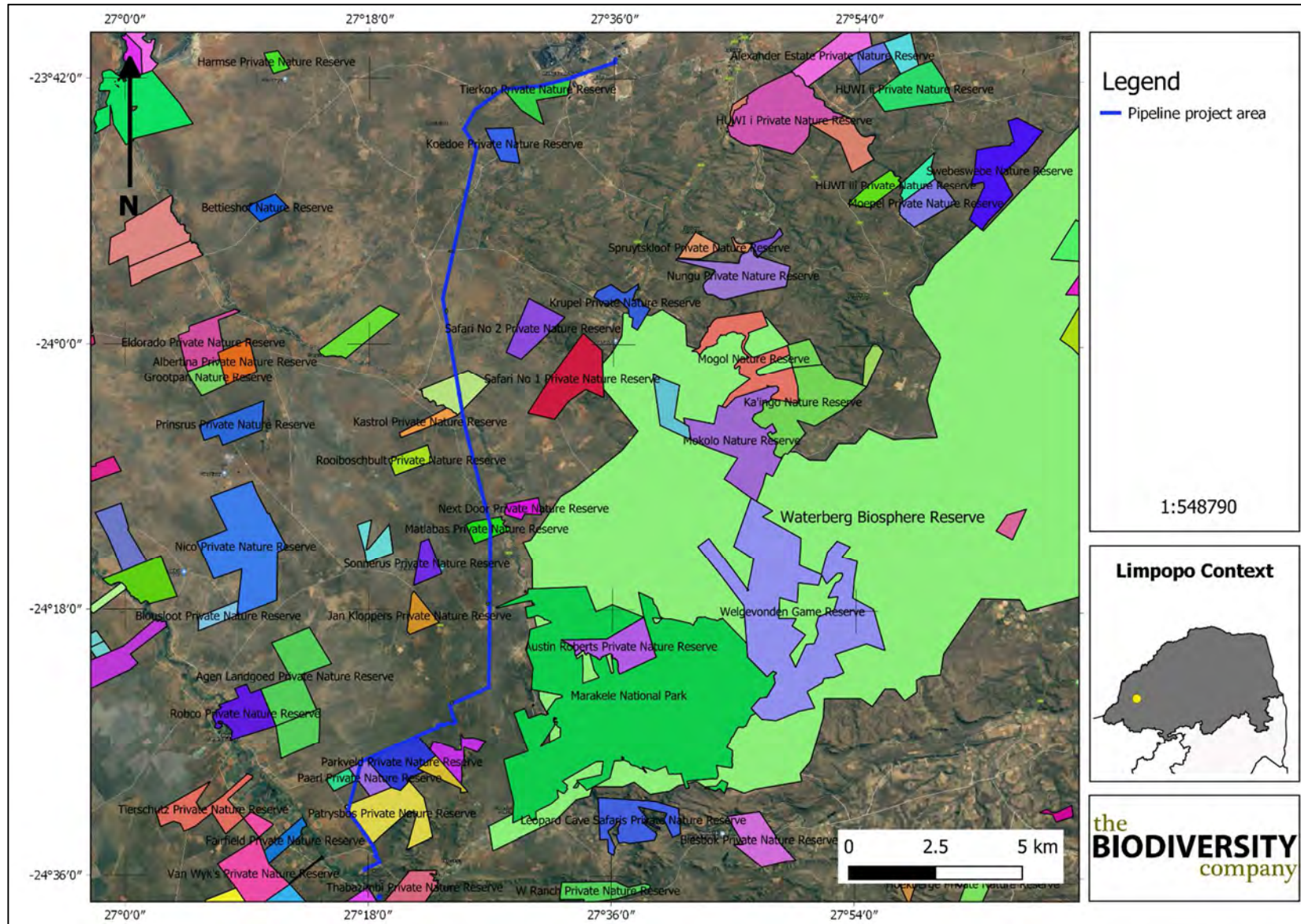


Figure 7-3 The protected areas associated with the project area (SAPAD, 2018; SACAD, 2018 )



## 7.4 Important Bird and Biodiversity Area

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The project area comes within 4.5 km of the Waterberg IBA and the 1.9 km from the Northern Turf Thornveld IBA (Figure 7-5).

The Waterberg IBA consists of the whole Waterberg Plateau. The Kransberg is the western sector of the Waterberg range and falls within the Marakele National Park. The Kransberg holds a large colony of Cape vulture (*Gyps coprotheres*), approximately 800-850 pairs. The IBA also supports many other raptor species such as: Martial Eagle *Polemaetus bellicosus*, Verreaux's Eagle *Aquila verreauxii*, Jackal Buzzard *Buteo rufofuscus* and African Harrier-Hawk *Polyboroides typus*. Breeding populations of Peregrine Falcon *Falco peregrinus*, Lanner Falcon *F. biarmicus*, Black Stork *Ciconia nigra* and Cape Eagle-Owl *Bubo capensis* occurs in this IBA.

Woodland bird species found in this IBA include Red-crested Korhaan *Lophotis ruficrista*, Monotonous Lark *Mirafrapa passerina*, Barred Wren-Warbler *Calamonastes fasciolatus*, Southern White-crowned Shrike *Eurocephalus anguimans*, Scaly-feathered Finch *Sporopipes squamifrons*, Violet-eared Waxbill *Uraeginthus granatinus* and Black-faced Waxbill *Estrilda erythronotos*. Half-collared Kingfisher *Alcedo semitorquata* and Mountain Wagtail *Motacilla clara* occur along the mountain streams. Along some of the rivers White-backed Night Heron *Gorsachius leuconotus* and African Finfoot *Podica senegalensis* can be found. Buff-streaked Chat *Campicoloides bifasciata* and Cape Rock Thrush *Monticola rupestris*, which are endemic to South Africa, Lesotho and Swaziland, also occur in the IBA.

Biome-restricted species include Kurrichane Thrush *Turdus libonyanus*, White-bellied Sunbird *Cinnyris talatala*, Barred Wren-Warbler and Burchell's Starling *Lamprotornis australis*, which are common. White-throated Robin-Chat *Cossypha humeralis* is considered fairly common and Buff-streaked Chat, Kalahari Scrub Robin *Erythropygia paena* and Gurney's Sugarbird are regarded as uncommon (Birdlife South Africa, 2015A).

The Northern Thornveld IBA consists of a group of privately owned farms that forms a triangle delineated roughly by the Crocodile River in the east and the Bierspruit River in the west; the confluence of these two rivers is approximately 3 km south-west of Thabazimbi. This IBA is important as it is home to the Yellow-throated Sandgrouse *Pterocles gutturalis*, and is regarded as the core of the resident South African population (Birdlife South Africa, 2015B).

Other important birds in the IBA include Secretarybird *Sagittarius serpentarius*, Kori Bustard *Ardeotis kori*, Lanner Falcon *Falco biarmicus* and Black-winged Pratincole *Glareola nordmanni*.

Common biome-restricted species found within this IBA include Kurrichane Thrush *Turdus libonyanus*, White-throated Robin-Chat *Cossypha humeralis*, Burchell's Starling *Lamprotornis australis*, White-bellied Sunbird *Cinnyris talatala* and the fairly common Kalahari Scrub Robin *Erythropygia paena* (Birdlife South Africa, 2015B).

The species listed in these IBAs will likely be found within the project area based on the proximity to the IBA.



Figure 7-4 Yellow-billed Hornbill (*Tockus leucomelas*)

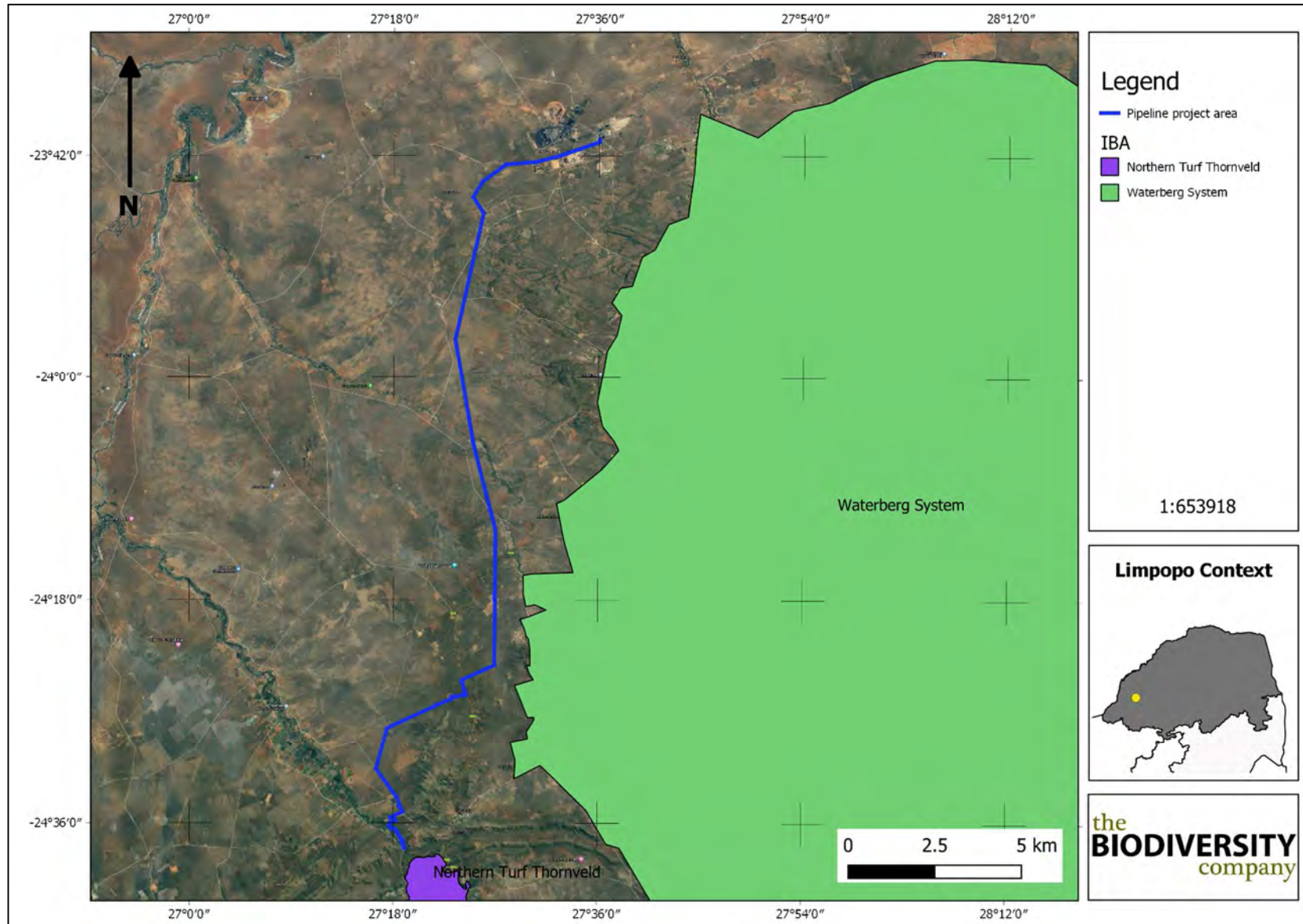


Figure 7-5 The important bird and biodiversity areas in relation to the project area (IBA, 2015)



## 7.5 Biome

The project area is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

- a) Seasonal precipitation; and
- b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia*, *Senegalia* and *Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

## 7.6 Vegetation Types

The grassland biome comprises many different vegetation types. The project area is situated in five vegetation types according to Mucina & Rutherford (2006) (Figure 7-7). They are the Limpopo Sweet Bushveld, the Western Sandy Bushveld, the Western Mountain Bushveld, the Subtropical Alluvial vegetation and Dwaalboom Thornveld. The main two vegetation types the Limpopo Sweet Bushveld and the Western Sandy Bushveld both have a high abundance of large trees such as *Vachellia erioloba*, *Senegalia nigrescens*, *Sclerocarya birrea* subsp. *caffra*, *Vachellia robusta* and *Senegalia burkei*. Large tree species are essential for nests of larger avifauna species such as Martial Eagles (*Polemaetus bellicosus*), and the White-backed Vultures (*Gyps africanus*).



Figure 7-6 Pied Kingfisher (*Ceryle rudis*)

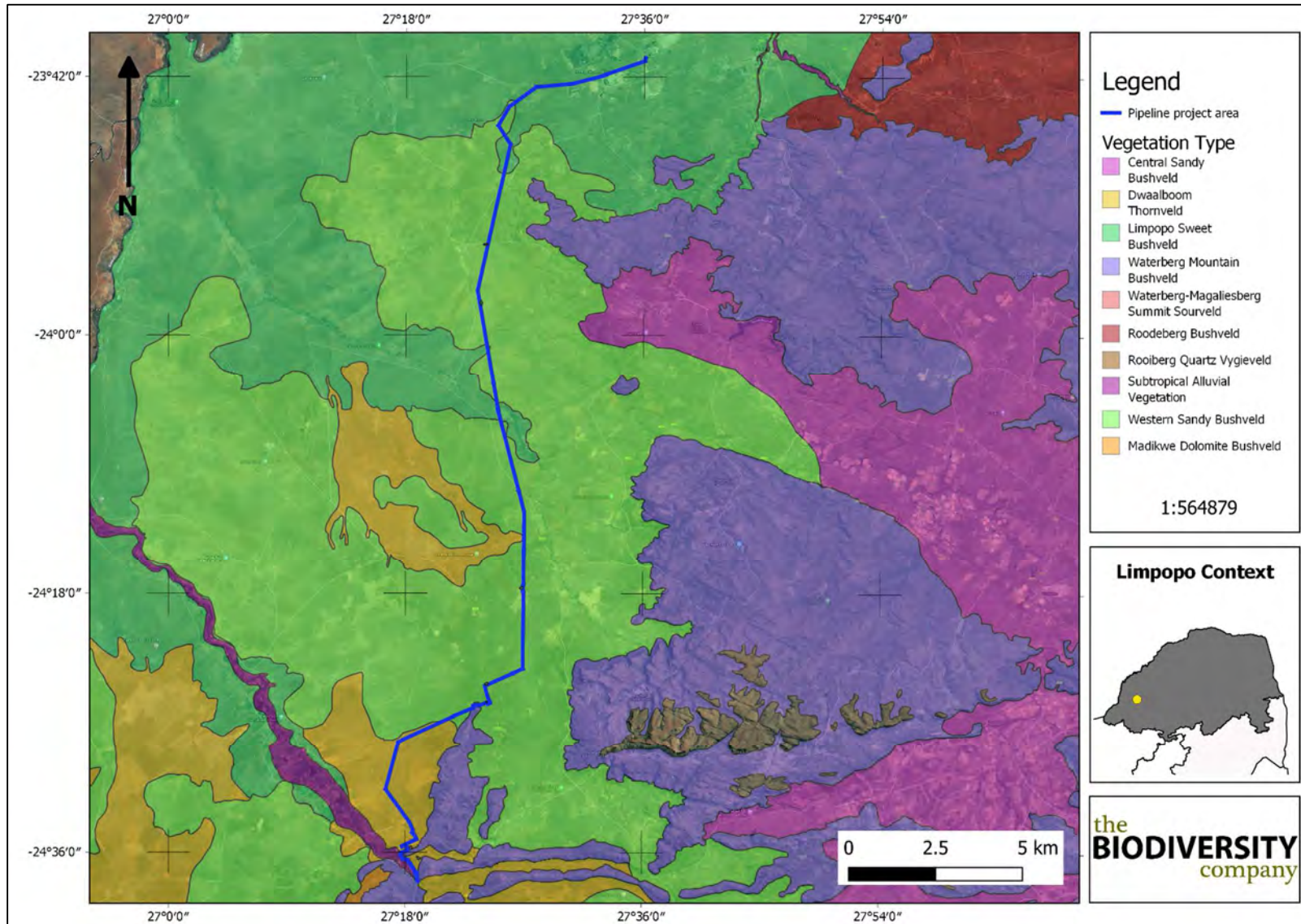


Figure 7-7 The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018)

## 7.7 Review of Relevant Projects

The purpose of the following section is to provide a summary of species that were recorded in the original avifauna study conducted by Nemaï Consulting in 2018 as part of the Environmental Impact Assessment (EIA) study, as well as other relevant studies that has been conducted in and around the project area. The Nemaï Consulting (2018) study identified fifty eight species in the project area of which seven species were provided by local land/farm owners (Table 7-2). The Steppe Eagle (*Aquila nipalensis*) is one of the species provided by the local landowners, this species is listed as EN internationally. In this study the author identified five major habitats where these avifaunal species were observed. They were; rivers and associated riparian zones, woodland (savanna), pans, agricultural areas and rocky outcrops.

Table 7-2 Avifauna species recorded by Nemaï Consulting 2018 in the project area

| Scientific Name                   | Common Name                 |
|-----------------------------------|-----------------------------|
| <i>Acridotheres tristis</i>       | Myna, Common                |
| <i>Alopochen aegyptiaca</i>       | Goose, Egyptian             |
| <i>Apus affinis</i>               | Swift, Little               |
| <i>Apus caffer</i>                | Swift, White-rumped         |
| <i>Aquila nipalensis</i>          | Eagle, Steppe               |
| <i>Ardea melanocephala</i>        | Heron, Black-headed         |
| <i>Bostrychia hagedash</i>        | Ibis, Hadedash              |
| <i>Bubo africanus</i>             | Eagle-owl, Spotted          |
| <i>Bubulcus ibis</i>              | Egret, Cattle               |
| <i>Buphagus erythrorhynchus</i>   | Oxpecker, Red-billed        |
| <i>Burhinus capensis</i>          | Thick-knee, Spotted         |
| <i>Buteo vulpinus</i>             | Buzzard, Common             |
| <i>Cinnyricinclus leucogaster</i> | Starling, Violet-backed     |
| <i>Circaetus cinereus</i>         | Snake-eagle, Brown          |
| <i>Circaetus pectoralis</i>       | Snake-eagle, Black-chested  |
| <i>Cisticola chiniana</i>         | Cisticola, Rattling         |
| <i>Cisticola juncidis</i>         | Cisticola, Zitting          |
| <i>Clamator jacobinus</i>         | Cuckoo, Jacobin             |
| <i>Clamator levaillantii</i>      | Cuckoo, Levaillant's        |
| <i>Colius striatus</i>            | Mousebird, Speckled         |
| <i>Coracias caudatus</i>          | Roller, Lilac-breasted      |
| <i>Corythaixoides concolor</i>    | Go-away-bird, Grey          |
| <i>Dendrocygna viduata</i>        | Duck, White-faced Whistling |
| <i>Dicrurus adsimilis</i>         | Drongo, Fork-tailed         |



## MCWAP-2

| Scientific Name                  | Common Name                      |
|----------------------------------|----------------------------------|
| <i>Elanus caeruleus</i>          | Kite, Black-shouldered           |
| <i>Estrilda astrild</i>          | Waxbill, Common                  |
| <i>Euplectes afer</i>            | Bishop, Yellow-crowned           |
| <i>Euplectes orix</i>            | Bishop, Southern Red             |
| <i>Euplectes progne</i>          | Widowbird, Long-tailed           |
| <i>Glaucidium perlatum</i>       | Owlet, Pearl-spotted             |
| <i>Halcyon albiventris</i>       | Kingfisher, Brown-hooded         |
| <i>Haliaeetus vocifer</i>        | Fish-eagle, African              |
| <i>Hirundo cucullata</i>         | Swallow, Greater Striped         |
| <i>Hirundo rustica</i>           | Swallow, Barn                    |
| <i>Lamprolornis nitens</i>       | Starling, Cape Glossy            |
| <i>Lanius collaris</i>           | Fiscal, Common (Southern)        |
| <i>Melierax canorus</i>          | Goshawk, Southern Pale Chanting  |
| <i>Merops apiaster</i>           | Bee-eater, European              |
| <i>Merops pusillus</i>           | Bee-eater, Little                |
| <i>Numida meleagris</i>          | Guineafowl, Helmeted             |
| <i>Passer domesticus</i>         | Sparrow, House                   |
| <i>Plectropterus gambensis</i>   | Goose, Spur-winged               |
| <i>Ploceus velatus</i>           | Masked-weaver, Southern          |
| <i>Pternistis natalensis</i>     | Spurfowl, Natal                  |
| <i>Pternistis swainsonii</i>     | Spurfowl, Swainson's             |
| <i>Pycnonotus tricolor</i>       | Bulbul, Dark-capped              |
| <i>Saxicola torquatus</i>        | Stonechat, African               |
| <i>Scopus umbretta</i>           | Hamerkop                         |
| <i>Streptopelia semitorquata</i> | Dove, Red-eyed                   |
| <i>Streptopelia senegalensis</i> | Dove, Laughing                   |
| <i>Struthio camelus</i>          | Ostrich, Common                  |
| <i>Tockus erythrorhynchus</i>    | Hornbill, Red-billed             |
| <i>Tockus leucomelas</i>         | Hornbill, Southern Yellow-billed |
| <i>Trachyphonus vaillantii</i>   | Barbet, Crested                  |
| <i>Tyto alba</i>                 | Owl, Barn                        |
| <i>Upupa africana</i>            | Hoopoe, African                  |
| <i>Vanellus armatus</i>          | Lapwing, Blacksmith              |
| <i>Vanellus senegallus</i>       | Lapwing, African Wattled         |

In an avifaunal study by Feathers Environmental Services in 2017 for the Expansion of Thabazimbi, Ferrogate & Northam railway loops, 32 birds were observed of which only one was an SCC (Marabou Stork, *Leptoptilos crumeniferus*). The northern portion of this study adjoins the southern portion of the MCWAP2 project area. The author of this study found that based on the project being in low significance areas (more disturbed areas) that the project would not have a long term effect on the birds in the area.

In a study at Matimba Power Station performed by Pachnoda Consulting in 2009, 100 avifauna species were recorded during two site visits. None of the species observed were SCCs. In this study none of the SCCs species expected were likely to be permanent residence based on them being vagrants with a lack of suitable habitat.

Bathusi Environmental Consulting completed a Biodiversity Assessment at Matimba Power Station in 2014. In this study they found 53 bird species of which one, the Tawny Eagle (*Aquila rapax*) is an SCC. Ten of the expected SCCs had a high likelihood of occurrence while a further 13 had a moderate likelihood of occurrence based on the savanna habitat of the project area with a large amount of larger trees.

## 8 Results and Discussion

### 8.1 Site Diversity

A consolidation of SABAP 2 aliasing data from the 15 pentads covering the length of the pipeline route suggest a regional species richness of 279 species (255 spp. recorded from full protocol and 54 spp. from ad hoc surveys). Although, these pentads are large (9.2 km x 8.3 km) and likely cover some habitats that may not be present within the project area this list is largely representative of the bird community likely to occupy the pipeline route (although probably a slight underestimate).



Figure 8-1 Arrow-marked Babbler (*Turdoides jardineii*)

During the current assessment, a combined total of 177 bird species were recorded during both dry and wet season surveys, along the proposed pipeline route. This includes species detected during both point count (150 spp.) and incidental observations (additional 27 spp.). Interviews with landowners and tenants along the route yielded anecdotal evidence of an additional 7 species not detected during fieldwork, bringing the total recorded species richness along the pipeline route to 184 species.

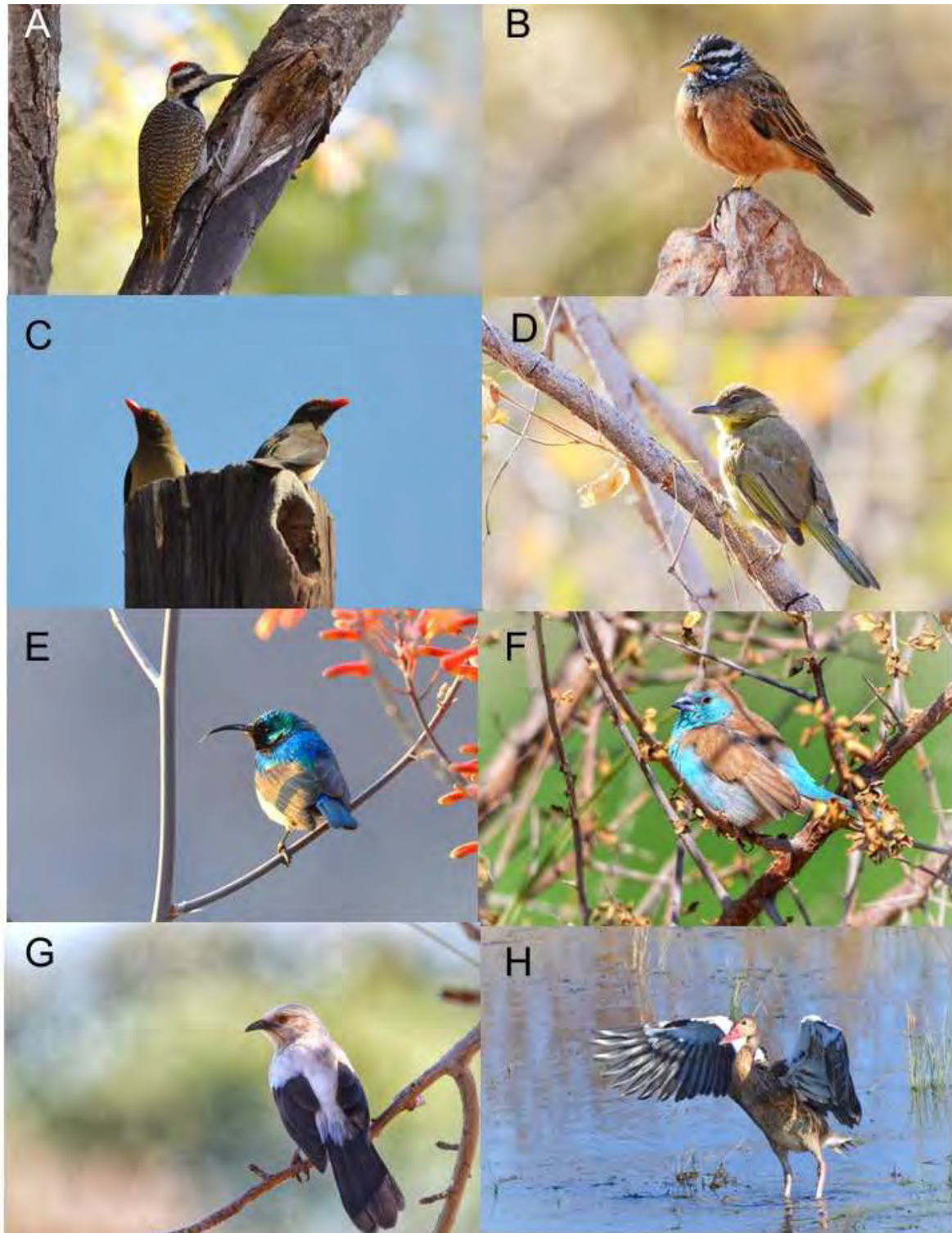


Figure 8-2 Examples of some of the birdlife observed on site; A) Bearded Woodpecker, B) Cinnamon-breasted Bunting, C) Red-billed Oxpecker, D) Yellow-bellied Greenbul, E) White-bellied Sunbird, F) Blue Waxbill, G) Pied Babbler, H) Spur-winged Goose



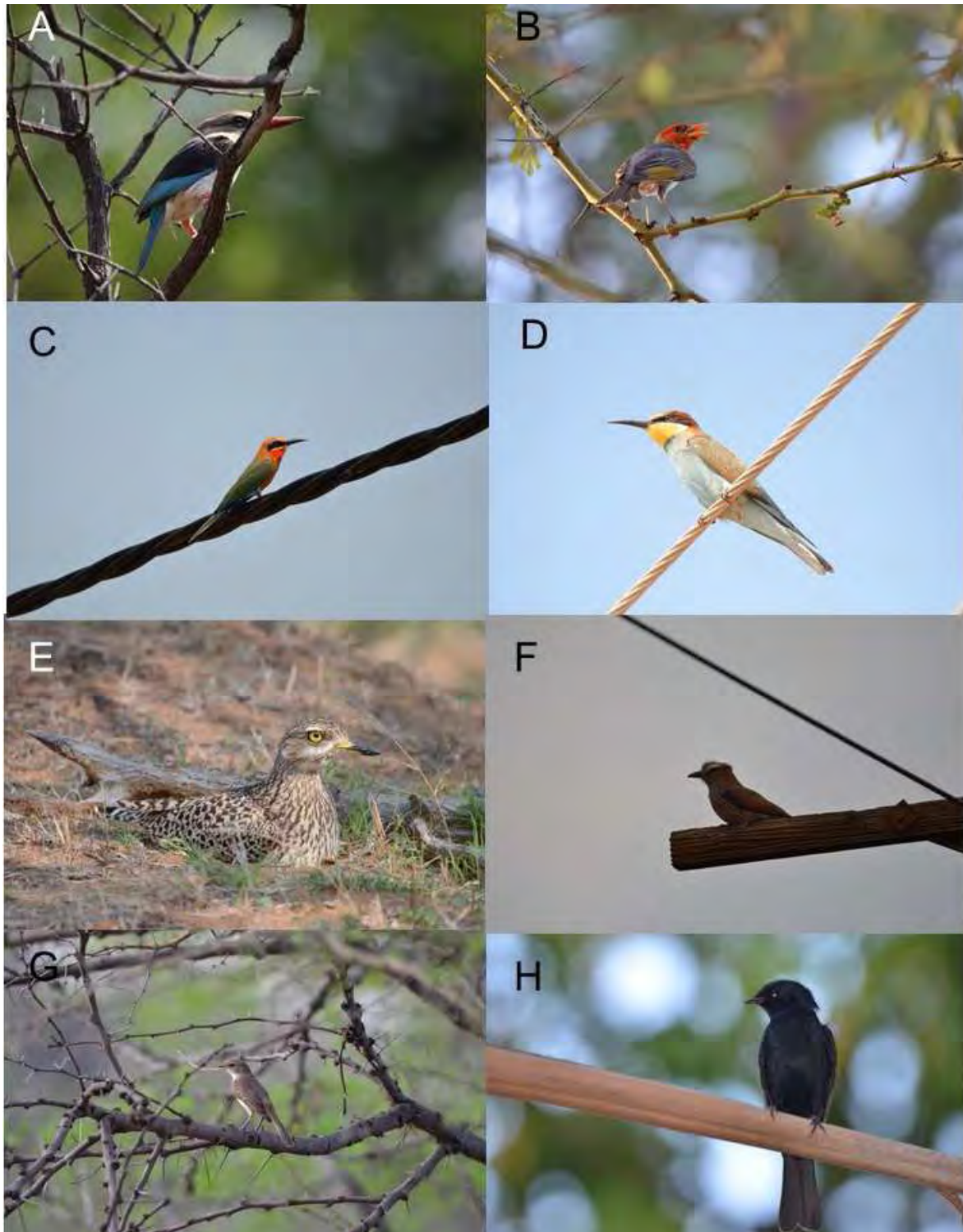


Figure 8-3 Examples of some of the birdlife continued; A) Striped Kingfisher, B) Red-headed Weaver, C) White-fronted Bee-eater, D) European Bee-eater, E) Spotted Thick-knee, F) Purple Roller, G) Marico Flycatcher, H) Southern Black Flycatcher

This represents a considerable proportion of the regional diversity (64%) as defined by the AOI <sup>1</sup>. Indeed, four species represent novel records not previously detected during SABAP 2 aliasing surveys bringing the total regional diversity to 283 species. These included Black Stork, Yellow-billed Stork, White-backed Mousebird and Booted Eagle. Pictures of some of the birdlife observed during the field survey are shown in Figure 8-2.

Comparisons in species richness between dry (107 spp.) and wet (120 spp.) season surveys within the project area revealed seasonal shifts in species composition and richness. Results showed that 30 species were only detected during winter surveys while 43 species were only detected during summer surveys. This highlights the strong influence of phenology on species detection and the importance of conducting multiple season surveys for attaining a more representative inventory. The heightened species richness recorded during the wet season is attributable to three main factors. Firstly, the arrival of migratory species (e.g. European Bee-eater, Willow Warbler, Barn Swallow, Red-chested Cuckoo, Greater Striped Swallow, Wahlberg's Eagle, Woodland Kingfisher, Striped Kingfisher, Booted Eagle and Orange-breasted Bush-shrike). Secondly the increased detection rate of displaying cryptic species (Desert Cisticola, Rufous-naped Lark, Burchell's Coucal). Lastly the remainder area accounted for by the detection of conspicuous species that were simply missed during the first survey.



Figure 8-4 Fixed point photographs of the proposed weir site along the Crocodile river providing a comparison of the change in primary productivity of the habitat between wet and dry season surveys

Table 8-1 provides a list of the 30 most abundant species along the pipeline route. Together these species account for 70% of the total number of observed individuals along the route. This data reveals that the most abundant species are generally common, adaptable and commensal. Wattled Starling were exceptionally abundant in the southern region near Thabazimbi where the species gathers in large flocks (of several hundred birds) in the croplands in the dry season. Other particularly abundant species included Helmeted Guineafowl, Laughing Dove, Cape Turtle Dove, Crested Francolin, Blue Waxbill, Rattling Cisticola, Southern Masked Weaver, Southern Yellow-billed Hornbill, Red-billed Quelea, White-browed Scrub Robin and Kalahari Scrub Robin.

<sup>1</sup> Area of Interest (AOI) is defined as the 15 pentads covering the entire pipeline route.



Table 8-1 Top 30 most abundant species ranked in order of decreasing abundance.

| Common Name                     | Scientific Name                 | Relative Abundance |
|---------------------------------|---------------------------------|--------------------|
| Wattled Starling                | <i>Creatophora cinerea</i>      | 14.90              |
| Helmeted Guineafowl             | <i>Numida meleagris</i>         | 5.71               |
| Laughing Dove                   | <i>Spilopelia senegalensis</i>  | 4.02               |
| Cape Turtle Dove                | <i>Streptopelia capicola</i>    | 3.53               |
| Crested Francolin               | <i>Dendroperdix sephaena</i>    | 3.53               |
| Blue Waxbill                    | <i>Uraeginthus angolensis</i>   | 3.38               |
| Rattling Cisticola              | <i>Cisticola chiniana</i>       | 3.18               |
| Southern Masked Weaver          | <i>Ploceus velatus</i>          | 2.98               |
| Southern Yellow-billed Hornbill | <i>Tockus leucomelas</i>        | 2.33               |
| Red-billed Quelea               | <i>Quelea quelea</i>            | 2.18               |
| White-browed Scrub Robin        | <i>Cercotrichas leucophrys</i>  | 2.14               |
| Kalahari Scrub Robin            | <i>Cercotrichas paena</i>       | 1.89               |
| European Bee-eater              | <i>Merops apiaster</i>          | 1.69               |
| Lesser Striped Swallow          | <i>Cecropis abyssinica</i>      | 1.59               |
| Chinspot Batis                  | <i>Batis molitor</i>            | 1.49               |
| Golden-breasted Bunting         | <i>Emberiza flaviventris</i>    | 1.44               |
| Black-backed Puffback           | <i>Dryoscopus cubla</i>         | 1.44               |
| Emerald-spotted Wood Dove       | <i>Turtur chalcospilos</i>      | 1.29               |
| Grey Go-away-bird               | <i>Corythaixoides concolor</i>  | 1.24               |
| Common Waxbill                  | <i>Estrilda astrild</i>         | 1.19               |
| Grey-backed Camaroptera         | <i>Camaroptera brevicaudata</i> | 1.14               |
| Cape Glossy (Cape) Starling     | <i>Lamprolornis nitens</i>      | 1.04               |
| Tawny-flanked Prinia            | <i>Prinia subflava</i>          | 1.04               |
| Little Swift                    | <i>Apus affinis</i>             | 0.99               |
| Red-billed Oxpecker             | <i>Buphagus erythrorhynchus</i> | 0.94               |
| Crowned Lapwing                 | <i>Vanellus coronatus</i>       | 0.94               |
| Arrow-marked Babbler            | <i>Turdoides jardineii</i>      | 0.94               |
| Blacksmith Lapwing              | <i>Vanellus armatus</i>         | 0.94               |
| African Palm Swift              | <i>Cypsiurus parvus</i>         | 0.89               |
| Fork-tailed Drongo              | <i>Dicrurus adsimilis</i>       | 0.89               |

The frequency with which a given species was recorded provides a rough measure of the commonness, spread or ubiquity of that species throughout the project area. The ten most frequently encountered species along the route included Rattling Cisticola, Crested Francolin,

Cape Turtle Dove, Southern Yellow-billed Hornbill, Blue Waxbill, Laughing Dove, White-browed Scrub Robin, Chinspot Batis, Black-backed Puffback and Emerald-spotted Wood Dove which together accounted for 33 % of the total number of observations made. Some of the least abundant and least frequently observed species included Yellow-billed Stork, Black Stork Striped Kingfisher, Burchell's Coucal, Booted Eagle, White-backed Vulture, Cape Vulture, Wahlberg's Eagle, Marico Sunbird, Green-winged Pytilia, African Hoopoe and Grey Tit-flycatcher.

Table 8-2 Top 30 most frequently observed species.

| Common Name                     | Scientific Name                     | Frequency (%) |
|---------------------------------|-------------------------------------|---------------|
| Rattling Cisticola              | <i>Cisticola chiniana</i>           | 4.80          |
| Crested Francolin               | <i>Dendroperdix sephaena</i>        | 4.41          |
| Cape Turtle Dove                | <i>Streptopelia capicola</i>        | 3.76          |
| Southern Yellow-billed Hornbill | <i>Tockus leucomelas</i>            | 3.37          |
| Blue Waxbill                    | <i>Uraeginthus angolensis</i>       | 3.24          |
| Laughing Dove                   | <i>Spilopelia senegalensis</i>      | 3.11          |
| White-browed Scrub Robin        | <i>Cercotrichas leucophrys</i>      | 2.85          |
| Chinspot Batis                  | <i>Batis molitor</i>                | 2.72          |
| Black-backed Puffback           | <i>Dryoscopus cubla</i>             | 2.46          |
| Emerald-spotted Wood Dove       | <i>Turtur chalcospilos</i>          | 2.33          |
| Kalahari Scrub Robin            | <i>Cercotrichas paena</i>           | 2.33          |
| Grey-backed Camaroptera         | <i>Camaroptera brevicaudata</i>     | 2.08          |
| Grey Go-away-bird               | <i>Corythaixoides concolor</i>      | 1.95          |
| Tawny-flanked Prinia            | <i>Prinia subflava</i>              | 1.82          |
| Fork-tailed Drongo              | <i>Dicrurus adsimilis</i>           | 1.69          |
| Cape Glossy (Cape) Starling     | <i>Lamprolornis nitens</i>          | 1.69          |
| Crimson-breasted Shrike         | <i>Laniarius atrococcineus</i>      | 1.56          |
| Long-billed Crombec             | <i>Sylvietta rufescens</i>          | 1.43          |
| Lesser Striped Swallow          | <i>Cecropis abyssinica</i>          | 1.43          |
| Helmeted Guineafowl             | <i>Numida meleagris</i>             | 1.43          |
| Red-crested Korhaan             | <i>Lophotis ruficrista</i>          | 1.30          |
| Southern Masked Weaver          | <i>Ploceus velatus</i>              | 1.30          |
| Natal Spurfowl                  | <i>Pternistis natalensis</i>        | 1.17          |
| Southern Boubou                 | <i>Laniarius ferrugineus</i>        | 1.04          |
| Blacksmith Lapwing              | <i>Vanellus armatus</i>             | 1.04          |
| Orange-breasted Bush-shrike     | <i>Chlorophoneus sulfureopectus</i> | 0.91          |
| White-bellied Sunbird           | <i>Cinnyris talatala</i>            | 0.91          |
| Southern Red-billed Hornbill    | <i>Tockus rufirostris</i>           | 0.91          |

| Common Name           | Scientific Name           | Frequency (%) |
|-----------------------|---------------------------|---------------|
| African Grey Hornbill | <i>Lophoceros nasutus</i> | 0.91          |
| Southern Black Tit    | <i>Melaniparus niger</i>  | 0.91          |

## 8.2 Sampling Adequacy

During the survey a total of 2014 birds representing 150 species were counted during the 167 point count samples spanning two seasons (Table 8-3). Sampling effort along the pipeline route is deemed adequate and the inventory considered largely representative of the bird community that inhabits these areas. This is based on the species accumulation curves for all point counts (Figure 8-5) which reached an asymptote at 30 point count samples (i.e. roughly halfway through the point counts). The asymptote was defined by the tangent of the accumulation curve with a straight line (with a gradient one). In other words, the point where less than one species was added for each new point count.

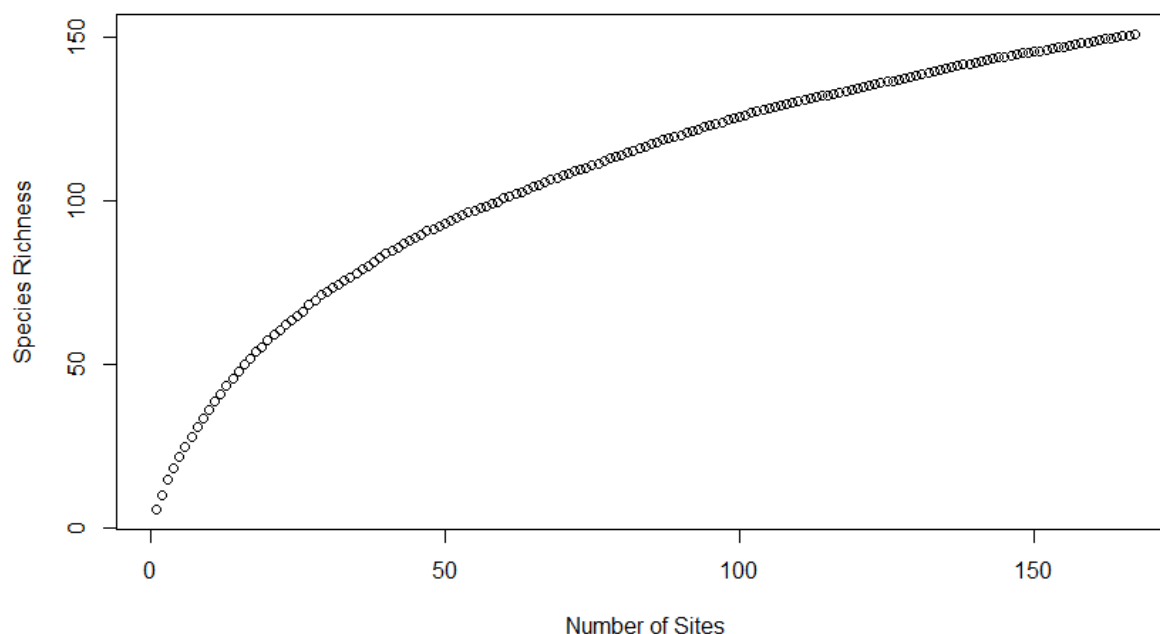


Figure 8-5 Species accumulation curves for point count sampling conducted along the proposed pipeline route

## 8.3 Habitat Diversity

Six broad avifaunal habitat types were identified within the project area namely Open Thornveld, Pans and Dams, Riparian, Rocky, Tall Thornveld and Transformed. A summary the point count data for each of these habitats is given in Table 8-3 together with their respective diversity as indicated by Shannon's H (a diversity index that takes into account species richness, abundance and evenness).



Table 8-3 Summary of count data and diversity estimates for the various habitats.

| Habitat        | Samples (n) | Species | Individuals | Relative abundance | Shannon Diversity Index (H) |
|----------------|-------------|---------|-------------|--------------------|-----------------------------|
| Pans and Dams  | 25          | 83      | 290         | 11.60              | 4.03                        |
| Open Thornveld | 81          | 78      | 539         | 6.65               | 3.87                        |
| Tall Thornveld | 30          | 74      | 445         | 14.83              | 3.61                        |
| Riparian       | 12          | 57      | 205         | 17.08              | 3.48                        |
| Rocky          | 6           | 25      | 86          | 14.33              | 2.84                        |
| Transformed    | 13          | 32      | 449         | 34.54              | 1.61                        |

Species diversity was found to be highest in the Pans and Dams habitat followed by Open Thornveld, Tall Thornveld, Riparian and Rocky habitats while it was lowest in Transformed areas. Overall, these results suggest that areas of heightened diversity appear to be associated with increased water availability (such as pans, dams and rivers), an observation which makes sense given the aridity of the thornveld covering the majority of the project area. A brief description of each broad habitat and the species assemblage associated with them is provided below.

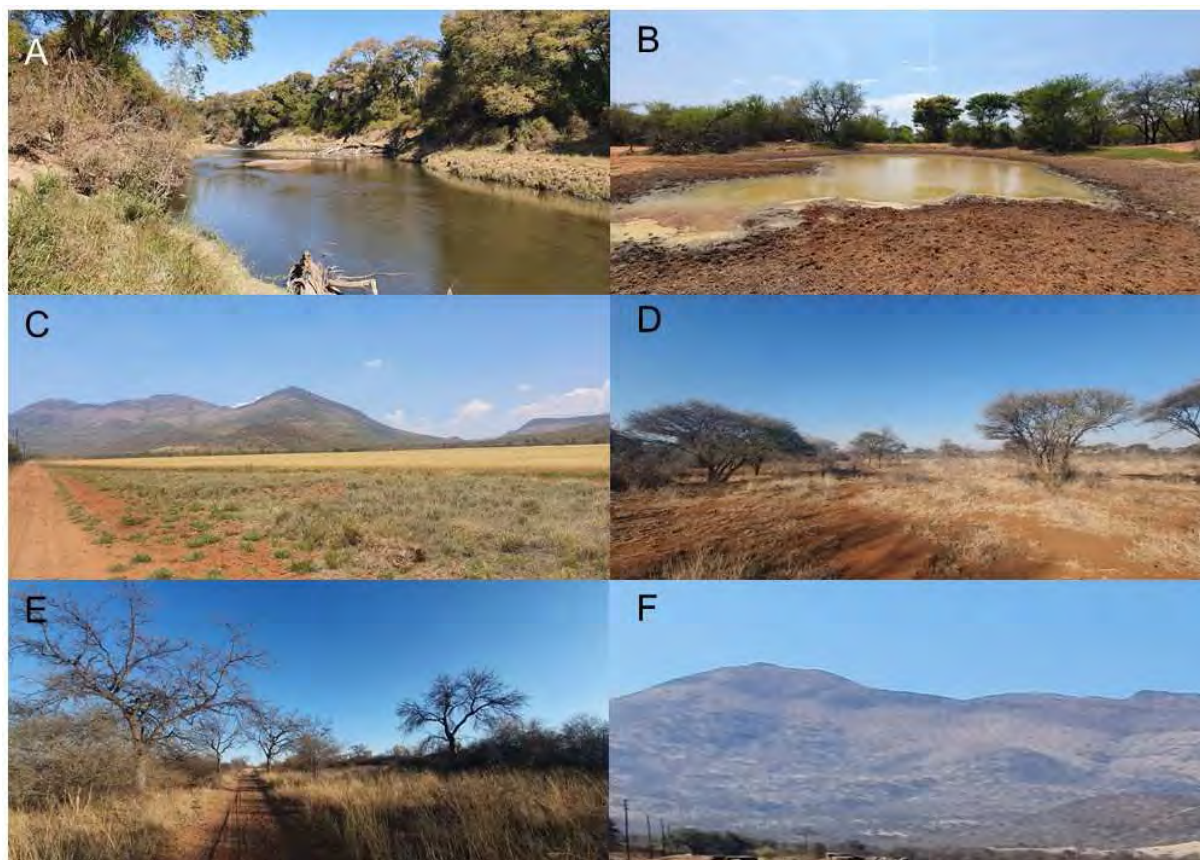


Figure 8-6 Examples of the six broad avifaunal habitat types identified within the project area; A) Riparian, B) Pans and Dams, C) Transformed, D) Open Thornveld, E) Tall Thornveld and F) Rock Outcrops.

### 8.3.1 Pans and Dams

Numerous small pans and dams are scattered along the length of the pipeline corridor. These waterbodies (many of which are ephemeral) provide an important source of water, food and refuge for the region's birdlife in an otherwise arid landscape. Unsurprisingly, these areas also hosted by far the highest avifaunal diversity of all the habitats along the route. Trees also tend to be taller around these waterbodies and thus provide more suitable nesting habitat for raptors. Species that characterise this habitat (those which were either not seen or seen in very low abundances in other habitats) include Swallow-tailed Bee-eater, Western Cattle Egret, White-fronted Robin Chat, Spur-winged Goose, Cape Vulture, Grey Heron, Black-headed Heron, Purple Heron, Hadedda Ibis, Green-winged Pytilia, Acacia Pied Barbet, Three-banded Plover and Red-billed Teal.

### 8.3.2 Riparian

This habitat encompasses linear watercourses (rivers and wetlands) and the riparian habitat associated with them. It is likely that the lower than expected diversity results for Riparian areas

is simply an artifact of low sample numbers in this habitat type. This is because the project area only crosses two perennial river systems the Crocodile and the Matlabas Rivers. It is likely that more sampling within these habitats will continue to yield a steady flow of additional species through time. The Riparian habitat is typified by its taller woody component which provides ideal nesting habitat for a wide variety of raptors. The riparian habitat was characterised by the following species Black Stork, Woodland Kingfisher, Meyer's Parrot, Spotted Eagle Owl Golden-tailed Woodpecker, African Fish Eagle, Reed Cormorant, Spotted Thick-knee, African Darter, Brown-throated Martin, African Hoopoe, Lesser Honeyguide, Red-chested Cuckoo, African Palm Swift and Black Crake.

### **8.3.3 Tall Thornveld**

This habitat was distinguished from the dominant open thornveld by the higher concentration of taller woody species, particularly *Sclerocarya birrea* and *Senegalia nigrescens*. This habitat is very important as not only was it the third most diverse habitat, but it also provides ideal habitat for the region's large-bodied and conservation important raptor species. Species characteristic of this habitat include African Hawk Eagle, Wahlberg's Eagle, Little Bee-eater, Double-banded Sandgrouse, African Wattled Lapwing, Southern White-crowned Shrike, Groundscraper Thrush and Red-billed Oxpecker.

### **8.3.4 Open Thornveld**

This is the most dominant and ubiquitous habitat along the pipeline route. This habitat consists of *Vachellia* dominated dry thornveld. Although this habitat was found to support the second highest bird diversity it is comprised mainly of a mix of generalist species that for the most part overlap with other habitat types. The few species that were found exclusively within this habitat included Striped Kingfisher, White-backed Mousebird, Little Swift, Booted Eagle, White-backed Vulture, Greater Striped Swallow, Black-chested Prinia, Rufous-naped Lark, Grey Tit-flycatcher and Black-throated Canary.

### **8.3.5 Rocky Outcrops**

This was the least common habitat along the pipeline route. Although diversity was low on these hot and dry outcrops the bird community was the most unique. Species characteristic of this habitat included Cinnamon-breasted Bunting, Red-faced Mousebird, Marico Sunbird, Marico Flycatcher and Green Wood-hoopoe.

### **8.3.6 Transformed**

This included all areas that have been transformed from a natural state by human actions such as gardens, past and current crop cultivation, built-up areas, infrastructure, roads and railway lines.

## **8.4 Habitat Uniqueness**

The non-metric multidimensional scaling (NMDS) ordination shown in Figure 5–4 provides a visual representation of the difference / similarity in the species composition among the three



habitats types found along the pipeline routes. Immediately apparent from when looking at the ordination plot is that there is a great deal of species overlap amongst the six identified habitats. This is particularly true of the Open Thornveld community. However, closer examination reveals that the Tall Thornveld and Rocky Outcrop habitats support avifaunal assemblages that are largely unique of the other habitats indicated by them being offset to the right and left of the plot respectively. The grouping is also tighter suggesting a higher proportion of habitat specialists occupy these habitats. There is little distinction between Open and Tall Thornveld habitats in terms of overall species assemblages other than that large-bodied raptors and their nests were more frequently encountered in Tall Thornveld.

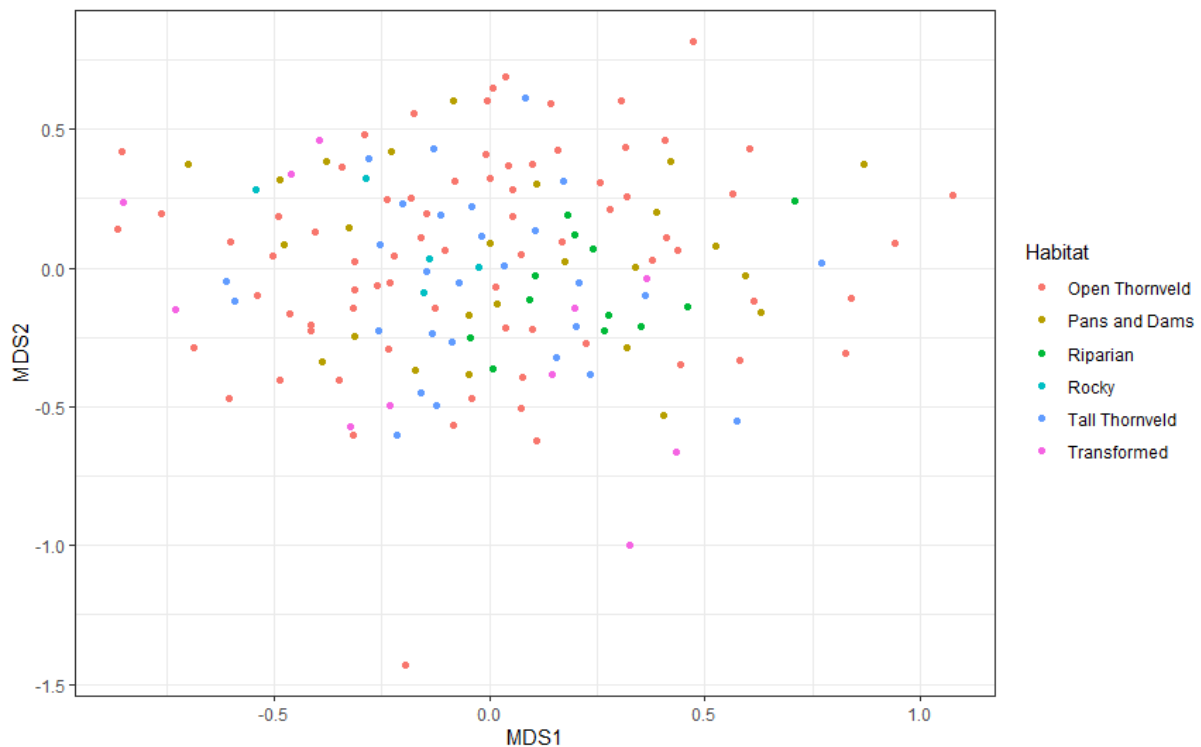


Figure 8-7 Non-metric multidimensional scaling ordinations of the relative abundances of bird species based on Bray-Curtis similarities obtained from the point counts taken along the proposed pipeline route

## 8.5 Species of Conservation Concern

Regionally, a total of 25 IUCN Red-listed species have the potential to occur within the AOI as defined by the 15 SABAP 2 pentads covering the greater project area. This is a significant number of SCC in a national context. Particularly notable is that an exceptionally large proportion (60%) of these species are Threatened with extinction (i.e. have a conservation status of Vulnerable or higher). Based on distribution and the availability of suitable habitat as many as 18 of these species are considered Highly likely to occur and a further four are considered moderately likely to occur. In fact, only African Marsh Harrier, White-bellied Korhaan and Black-winged Pratincole are considered unlikely to occur based on a combination of marginal distribution and lack of suitably moist grassland. Many of these species are also provincially protected (Desmet *et al.*, 2013).

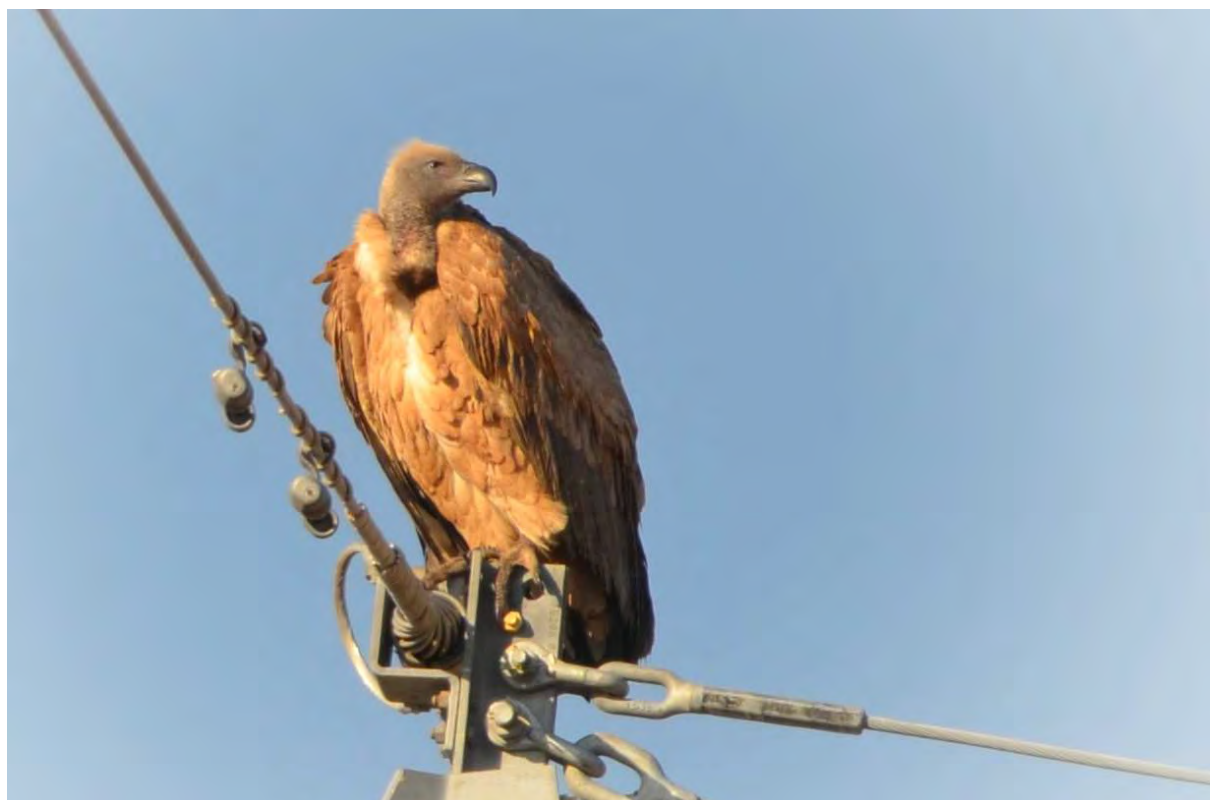


Figure 8-8 The Critically Endangered White-backed Vulture (photo taken where the Eskom servitude crosses the pipeline route north of the Matlabas River)

During the surveys, a total of five SCC were detected along the pipeline route. These included White-backed Vulture, Cape Vulture, Martial Eagle, Yellow-billed Stork, and Black Stork. The presence of a further five SCC is assumed based on anecdotal evidence provided by local landowners which included Lappet-faced Vulture (photographs), Bateleur (account), Secretarybird (account), Southern Ground-hornbill (photograph) and Kori Bustard (photograph).

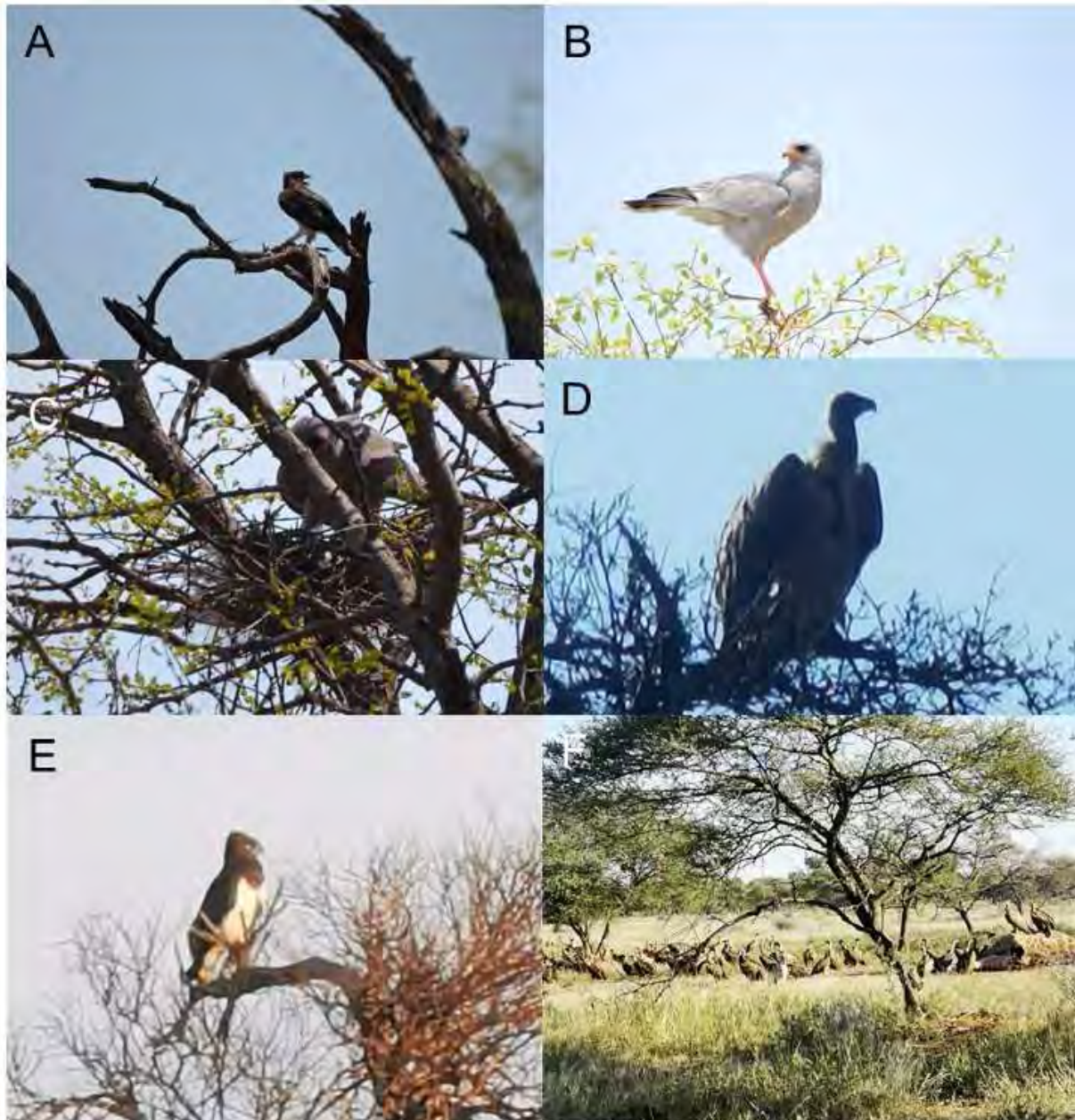


Figure 8-9 Photographs of some of the raptors observed within the project area A) African Hawk Eagle, B) Pale Chanting Goshawk, C) Gabar Goshawk on nest, D) White-backed Vulture, E) Black-chested Snake Eagle, F) congregation of vultures at a kill. Pictures D, E and F are provided courtesy of Mr. Robert Ankiewicz.



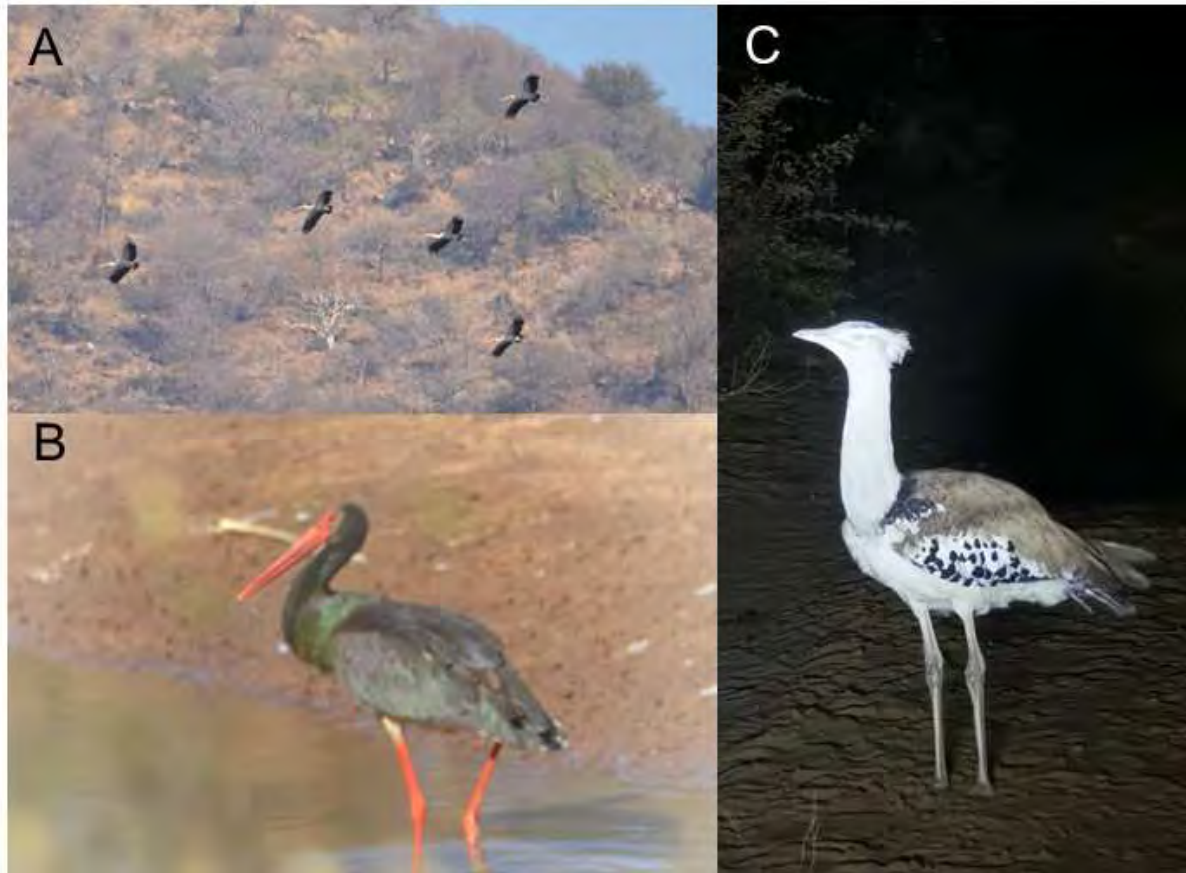


Figure 8-10 Examples of some of the other conservation important bird species detected along the proposed pipeline route; A) Yellow-billed Stork, B) Black Stork, C) Kori Bustard.

Picture C is provided courtesy of Mr. Robert Ankiewicz.

#### **White-backed Vulture (Critically Endangered)**

Sightings of these large raptors were concerningly scarce. During both dry and wet season surveys only two individuals were observed and in both occasions the birds were seen roosting on or near the Eskom powerline servitude to Medupi Power Station. Such low detection rates are uncharacteristic for the region and may be a manifestation of the drastically increased pressure on this species in recent years. At the same time as the wet season survey, some 55 specimens were found dead, presumably poisoned at Mmadikola, near the Boteti River (22 October 2020). This exacerbates the impact of the last major poisoning event near Chobe in June 2019, when more than 540 vultures were poisoned. This species has a large distribution occurring in savannah habitats throughout sub-Saharan Africa. Primarily a species of open wooded savanna, particularly areas of *Acacia* (*Vachellia*). It requires tall trees for nesting. Aside from poisoning, this species is Threatened by habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning.

### **Cape Vulture (Endangered)**

The species listed as EN on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). The Waterberg mountains and particularly the Kranskop colony in Marakele, is one of the areas with the highest number of breeding pairs of this species in Southern Africa. Consequently, this species is considered highly likely to occur on site. Indeed, photographic evidence from local landowners confirms the presence of the species within the project area.

### **Lappet-faced Vulture (Endangered)**

Only a small, very rapidly declining population of this large charismatic vulture species remains, owing primarily to poisoning and persecution, as well as ecosystem alterations (IUCN, 2017). The species inhabits dry savanna, arid plains, deserts and open mountain. It ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. This rare species is unlikely to be resident, but may scavenge on any dead carcasses in the area, and therefore the likelihood of occurrence is rated as moderate.

### **Martial Eagle (Endangered)**

The presence of this species was confirmed by the existence of a large nest on Karoobult 126 KQ. Although the nest was not utilised for breeding during the survey there are signs that the nest is being maintained. Indeed according to Mr Mathes Van Zyl the nest was rebuilt in 2017 after a large fire swept through and destroyed the nest. Martial Eagles are known to maintain several nests within their home range which they may alternate between for breeding. This is the largest regionally occurring eagle. The species is listed as EN on a regional scale and VU on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017).

### **Tawny Eagle (Endangered)**

In 2015, I photographed an individual near the contractor's entrance to the Medupi Power Station ash disposal facility (the pipeline traverses through this area). This species is listed as EN on a regional scale and VU on an international scale and occupies dry open habitats from sea level to 3000 m. It will occupy both woodland and wooded savannah (IUCN, 2017). The species is generally scarce outside of major reserves. The species has undergone major range contractions in recent years having lost as much as 20% of its regional population such that only some 800 pairs remain in South Africa. Other threats including persecution and drowning in farm dams, collision and electrocution with transmission lines, roadkill and habitat loss (Barnes, 2000). Based on personal observations of the species in the area together with the species' known distribution, habitat suitability and a large prey base availability this species is considered highly likely to occur along the pipeline route, particularly along the northern half.

**Bateleur (Endangered)**

Although not common in the area, evidence from Mr Hennie Van Deventer suggests that the species does occasionally visit the project area. However, no nests of this species or signs of breeding are noted. This species prefers open grassland and savanna, it is not found in thick forested areas. The species shares threats common to all of the regionally occurring large-bodied raptors.

**Steppe Eagle (Endangered)**

A large raptor that is listed as LT regionally but as EN on a global scale. It is a migrant bird species that over-winters in South Africa and has undergone extremely rapid population declines within its range. This species does not breed in South Africa and would only use the project area as a temporary foraging site the likelihood of occurrence is rated as moderate as it's a species has been recorded in the Marakele National park and based on the SABAP data the species was only seen in one pentad.

**Southern Ground Hornbill (Endangered)**

These charismatic large ground birds are listed as EN regionally and as VU globally. Secondary poisoning, trade and persecution are estimated to have caused very rapid population declines in this species in South Africa (IUCN, 2017). The species inhabits woodland and savanna, also frequenting grassland adjoining patches of forest. These large birds are very scarce outside of protected areas. The species was re-introduced to Thaba Tholo Private Game Reserve as part of the Mabula Ground hornbill Project and communications with management staff during the survey reveal they have a breeding site in the middle of one of the farm portions, presumably Amsterdam 123 KQ. Mrs Rykie May from Tarantaalpan 132 KQ Portion 1 states that the birds are frequently observed on her property although no nests have been documented. Additionally, Mr Dennis Stander from Thaba Tholo states that the birds have been known to occur on Paarl 124 KQ. Lastly, Mr Mathes Van Zyl from Karoobuilt 126 KQ provided photographic evidence of this species on the game farm. These anecdotes illustrate the wide-ranging nature of the species. Consequently, several of the farms within the vicinity of Thaba Tholo provide important foraging, ranging and perhaps, in future breeding habitat for these Threatened birds. No ground hornbills were seen during the surveys.

**Yellow-billed Stork (Endangered)**

A flock of nine birds was seen circling over the Crocodile River and the adjacent lucerne croplands close to the proposed weir site near Thabazimbi. The species was not seen again. The ephemeral pans along the pipeline route provide ideal foraging habitat for this species. However, given their nomadic nature (tends to track rainfall) its presence is likely to be sporadic and fleeting. This species is considered unlikely to occur along the route. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017).

**Lanner Falcon (Vulnerable)**



This wide-ranging species is likely to capitalize on the substantial prey base (high passerine abundance) present within the study area. This species occupies a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. This species is considered highly likely to occur along the pipeline route. Although the pipeline does not traverse any cliff habitat the abundance of cliffs and rocky hillcrests in proximity to the pipeline mean that this species is likely to frequently utilise the habitat along the pipeline route for foraging.

### **Secretarybird (Vulnerable)**

Although not detected this species is known to occur along the powerline route based on strong anecdotal evidence. The family occupying the farm Ruigtevlei 97 KQ Ptn 5 observed breeding by this species on the farm several years ago and mention that the birds make occasional visits to the farm from Marakele national Park. The likelihood of occurrence is rated as high due to the extensive open grasslands and present in the project area, as well as the agricultural areas present in which this species may forage. This species occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017).

### **Kori Bustard (Vulnerable)**

These large terrestrial birds are listed as NT both on a regional and global scale. They occur on flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna and very occasionally wheat fields and firebreaks. Collisions with high voltage power lines is a major threat to this species in the Karoo of South Africa (IUCN, 2007). The habitat along the entire length of the pipeline route is highly suitable for this species, especially in the northern half of the project area. Interviews with farmers revealed no accounts in the south suggesting that the species may have been locally extirpated along the southern regions of the route particularly closer to Thabazimbi. Most accounts come from around the Matlabas River crossing area extending northwards towards Lephalale.

### **Black Stork (Vulnerable)**

A single individual was observed during the dry-season survey foraging at a pool along the Matlabas River in the Matlabas Private Reserve premises. These birds are widespread but nowhere common and sightings are very infrequent. The species nests on cliffs. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). Along the pipeline route this species is most likely to be found along the Crocodile and Matlabas Rivers.

### **Half-collared Kingfisher (Near Threatened)**

This species is listed as NT on a regional scale and occurs across a large range. This is a habitat specialist which frequents narrow rivers, streams, and estuaries with dense riparian vegetation. It is predominantly piscivorous and therefore requires good water clarity to hunt (IUCN, 2017). This species is considered highly likely to occur along the reaches of the Crocodile and Matlabas Rivers that cross the pipeline route. The species is known to be particularly sensitive to increased turbidity and changes in the integrity of the riparian zone.

#### **Abdim's Stork (Near Threatened)**

This species is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes especially along rivers. It often forages in open grassland especially in burnt areas. They tend to roost in cliffs (in the Waterberg region) but do occasionally use trees. Ideal habitat in the form of pans and rivers in bushveld occurs along the pipeline route, particularly along the Crocodile and Matlabas Rivers.

#### **European Roller (Near Threatened)**

This is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a high chance of this species occurring in the project area.

#### **African Finfoot (Vulnerable)**

This shy and illusive waterbird occurs in well-wooded perennial streams, rivers, pools, lakes and dams. It is most often encountered in clear swift flowing waters. It is rarely found away from shoreline. This species was not detected but very likely occurs along the Crocodile River and to a lesser extent the Matlabas River.

#### **Yellow Throated Sandgrouse (Near Threatened)**

The species has a very sparse and patchy distribution across southern Africa. Importantly, however, one of the species' most significant strongholds occurs in a relatively small area of croplands and open savannah just south of Thabazimbi. Indeed in 2016 during a survey for a mine about 14 Km south of Thabazimbi I observed flocks flying and calling overhead and have not detected them north of Thabazimbi (even though they could potentially occur). This species is therefore considered moderately likely to occur along the southern half of the route but is unlikely to occur in the portions nearer Lephalale. More specifically the agricultural lands along the pipeline, on the outskirts of Thabazimbi are most to be visited by this species. Here breeding may occur but their presence would most likely be due to foraging. This species is categorised as NT on a regional scale. The species inhabits croplands, short open grassland and recently burnt veld, especially on black clay soils near water. The species is one of the flagship species of the Waterberg IBA that is found close to the project area.

#### **Greater Painted-snipe (Near Threatened)**

This rare and seemingly nomadic species shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in. These habitats exist within the project area and thus the likelihood of occurrence is high.

Table 8-4 List of present and potentially occurring red-listed avifauna.

| Common Name                | Scientific Name                 | Status (Regional, Global) | LO | Anecdotal | SABAP 2 |
|----------------------------|---------------------------------|---------------------------|----|-----------|---------|
| White-backed Vulture       | <i>Gyps africanus</i>           | CR, CR                    | 1  | x         | x       |
| Lappet-faced Vulture       | <i>Torgos tracheliotos</i>      | EN, EN                    | 2  | x         |         |
| Cape Vulture               | <i>Gyps coprotheres</i>         | EN, EN                    | 1  | x         | x       |
| Martial Eagle              | <i>Polemaetus bellicosus</i>    | EN, VU                    | 1  | x         |         |
| Tawny Eagle                | <i>Aquila rapax</i>             | EN, VU                    | 2  |           | x       |
| Bateleur                   | <i>Terathopius ecaudatus</i>    | EN, NT                    | 2  | a         |         |
| Southern Ground-hornbill   | <i>Bucorvus leadbeateri</i>     | EN, VU                    | 2  | a         |         |
| Steppe Eagle               | <i>Aquila nipalensis</i>        | LC, EN                    | 3  |           | x       |
| African Marsh Harrier      | <i>Circus ranivorus</i>         | EN, LC                    | 4  |           |         |
| Yellow-billed Stork        | <i>Mycteria ibis</i>            | EN, LC                    | 1  |           |         |
| Secretarybird              | <i>Sagittarius serpentarius</i> | VU, VU                    | 2  | x         | x       |
| Lanner Falcon              | <i>Falco biarmicus</i>          | VU, LC                    | 2  |           |         |
| Black Stork                | <i>Ciconia nigra</i>            | VU, LC                    | 1  | a         |         |
| White-bellied Korihaan     | <i>Eupodotis senegalensis</i>   | VU, LC                    | 4  |           |         |
| African Finfoot            | <i>Podica senegalensis</i>      | VU, LC                    | 2  |           |         |
| Kori Bustard               | <i>Ardeotis kori</i>            | NT, NT                    | 2  | x         | x       |
| Black-winged Pratincole    | <i>Glareola nordmanni</i>       | NT, NT                    | 4  |           |         |
| European Roller            | <i>Coracias garrulus</i>        | NT, LC                    | 2  |           | x       |
| Greater Painted-snipe      | <i>Rostratula benghalensis</i>  | NT, LC                    | 2  |           | x       |
| Abdim's Stork              | <i>Ciconia abdimii</i>          | NT, LC                    | 2  |           | x       |
| Marabou Stork              | <i>Leptoptilos crumenifer</i>   | NT, LC                    | 3  |           | x       |
| Half-collared Kingfisher   | <i>Alcedo semitorquata</i>      | NT, LC                    | 2  |           |         |
| Yellow-throated Sandgrouse | <i>Pterocles gutturalis</i>     | NT, LC                    | 3  |           |         |
| Greater Painted-snipe      | <i>Rostratula benghalensis</i>  | NT, LC                    | 2  |           |         |

## 9 Sensitivity Assessment

This sensitivity assessment is based on the systematic layering of aspects likely to influence avifaunal sensitivity to the proposed development. These included hotspots of disturbance prone species, localities of observed SCC and raptor nests as well as habitats identified as being particularly important and sensitive from an avifaunal perspective.



## 9.1 Disturbance Prone Avifauna and Hotspots

The main impact (aside from habitat loss / degradation) associated with the installation of the proposed pipeline on avifauna relates to sensory disturbances arising from noise, dust, vibrations and increased human activity. Consequently, the identification of disturbance prone species and probable hotspots for their occurrence was considered to be a critically key consideration in the overall delineation of important and sensitive areas for avifauna in this report. These species are listed in Table 9-1. Data on abundances gathered during the wet season survey (when migrants are also present) was used to model hotspots of disturbance sensitive species along the pipeline route (Figure 9-1). The rationale behind the prioritisation of disturbance prone species is given below.

The available scientific literature on bird responses to disturbance provides evidence to suggest that bird species do not react uniformly to human disturbance with some showing aversion, others complacency and others outright affinity for it. Using this wealth of research we devised a ranking system to highlight a subset of species most sensitive to human disturbance based on four main characteristics that appear to be most frequently associated with decreased flight initiation distance (FID). These include body size, trophic guild, breeding residency and commensal affinity.

Body size is perhaps the frequently cited correlate of decreased FID. There have been explanations as to why larger birds are more prone to disturbance but the two most prevailing reasons are related to the greater time required to take-off (Adams *et al.* 2006) and the tendency of larger birds to vacate a noisy areas more readily than smaller birds due to the acoustic masking of their lower frequency calls which are drowned out by mechanical noises (Francis *et al.* 2011). Based on this, we assigned all birds the size of francolins and larger as having a body size score, all those between this and starling size a moderate score and all those smaller than this a Low score.

Trophic guild is also likely influence tolerance to disturbance. Research suggests that sensory acute birds such as raptors and other predatory birds are more likely to be adversely affected by increased disturbances. To incorporate trophic guild we assigned all raptors a high trophic guild score, all non-raptor predatory birds and insectivores a moderate score and all other fruit and seed eating species a low score.

To account for sensitive life history stages such as breeding (when species are generally known to be more prone to disturbance) we took into consideration the breeding residency of each species. Those which are known to be resident breeders were assigned a score of high, those with nomadic tendencies moderate and those that are migratory non-breeders were scored low.

Lastly none of these statistics are very helpful if one does not take into account the species' tolerance towards human presence or put differently how commensal they are. Species known to be highly commensal (e.g. House Sparrow) were assigned a score of low, those which occasionally tolerate human presence (e.g. garden birds) were assigned a moderate score while those that are more commonly found in natural habitats further from humans were assigned a high score.

Table 9-1 List of disturbance prone species.

| Common Name               | Scientific Name                 | Body Size | Trophic Guild | Breeding Residency | Commensal Affinity | Total | Disturbance Rating | Status (Regional, Global) | LO |
|---------------------------|---------------------------------|-----------|---------------|--------------------|--------------------|-------|--------------------|---------------------------|----|
| African Fish Eagle        | <i>Haliaeetus vocifer</i>       | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| White-backed Vulture      | <i>Gyps africanus</i>           | 3         | 3             | 3                  | 3                  | 12    | H                  | CR, CR                    | 1  |
| Cape Vulture              | <i>Gyps coprotheres</i>         | 3         | 3             | 3                  | 3                  | 12    | H                  | EN, EN                    | 1  |
| Brown Snake Eagle         | <i>Circaetus cinereus</i>       | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Pale Chanting Goshawk     | <i>Melierax canorus</i>         | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Gabar Goshawk             | <i>Micronisus gabar</i>         | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Shikra                    | <i>Accipiter badius</i>         | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| African Hawk Eagle        | <i>Aquila spilogaster</i>       | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Booted Eagle              | <i>Hieraaetus pennatus</i>      | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Wahlberg's Eagle          | <i>Hieraaetus wahlbergi</i>     | 3         | 3             | 3                  | 3                  | 12    | H                  |                           | 1  |
| Martial Eagle             | <i>Polemaetus bellicosus</i>    | 3         | 3             | 3                  | 3                  | 12    | H                  | EN, VU                    | 1  |
| Black Stork               | <i>Ciconia nigra</i>            | 3         | 3             | 2                  | 3                  | 11    | H                  |                           | 1  |
| Red-crested Korhaan       | <i>Lophotis ruficrista</i>      | 3         | 2             | 3                  | 3                  | 11    | H                  |                           | 1  |
| Spotted Eagle-owl         | <i>Bubo africanus</i>           | 3         | 3             | 3                  | 2                  | 11    | H                  |                           | 1  |
| Coqui Francolin           | <i>Peliperdix coqui</i>         | 3         | 1             | 3                  | 3                  | 10    | M                  |                           | 1  |
| Pearl-spotted Owlet       | <i>Glaucidium perlatum</i>      | 2         | 3             | 3                  | 2                  | 10    | M                  |                           | 1  |
| Fiery-necked Nightjar     | <i>Caprimulgus pectoralis</i>   | 2         | 3             | 3                  | 2                  | 10    | M                  |                           | 1  |
| African Harrier-Hawk      | <i>Polyboroides typus</i>       | 3         | 3             | 3                  | 1                  | 10    | M                  |                           | 1  |
| Yellow-billed Stork       | <i>Mycteria ibis</i>            | 3         | 2             | 2                  | 3                  | 10    | M                  |                           | 1  |
| Red-billed Oxpecker       | <i>Buphagus erythrorhynchus</i> | 2         | 3             | 3                  | 2                  | 10    | M                  |                           | 1  |
| Common Ostrich            | <i>Struthio camelus</i>         | 3         | 1             | 3                  | 2                  | 9     | M                  |                           | 1  |
| Lesser Honeyguide         | <i>Indicator minor</i>          | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Golden-tailed Woodpecker  | <i>Campethera abingoni</i>      | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Bearded Woodpecker        | <i>Chloropicus namaquus</i>     | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Yellow-fronted Tinkerbird | <i>Pogoniulus chrysoconus</i>   | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Acacia Pied Barbet        | <i>Tricholaema leucomelas</i>   | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Black-collared Barbet     | <i>Lybius torquatus</i>         | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| African Grey Hornbill     | <i>Lophoceros nasutus</i>       | 2         | 1             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Meyer's Parrot            | <i>Poicephalus meyeri</i>       | 2         | 1             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Double-banded Sandgrouse  | <i>Pterocles bicinctus</i>      | 2         | 1             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Grey Heron                | <i>Ardea cinerea</i>            | 3         | 2             | 3                  | 1                  | 9     | M                  |                           | 1  |

| Common Name                           | Scientific Name                  | Body Size | Trophic Guild | Breeding Residency | Commensal Affinity | Total | Disturbance Rating | Status (Regional, Global) | LO |
|---------------------------------------|----------------------------------|-----------|---------------|--------------------|--------------------|-------|--------------------|---------------------------|----|
| Black-headed Heron                    | <i>Ardea melanocephala</i>       | 3         | 2             | 3                  | 1                  | 9     | M                  |                           | 1  |
| Western Cattle Egret                  | <i>Bubulcus ibis</i>             | 3         | 2             | 3                  | 1                  | 9     | M                  |                           | 1  |
| Green-backed Heron                    | <i>Butorides striata</i>         | 3         | 2             | 3                  | 1                  | 9     | M                  |                           | 1  |
| Hamerkop                              | <i>Scopus umbretta</i>           | 3         | 2             | 3                  | 1                  | 9     | M                  |                           | 1  |
| Brown-crowned Tchagra                 | <i>Tchagra australis</i>         | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Yellow-bellied Greenbul               | <i>Chlorocichla flaviventris</i> | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Long-billed Crombec                   | <i>Sylvietta rufescens</i>       | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Yellow-bellied Eremomela              | <i>Eremomela icteropygialis</i>  | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Burnt-necked Eremomela                | <i>Eremomela usticollis</i>      | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Southern Pied Babbler                 | <i>Turdoides bicolor</i>         | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Chestnut-vented Tit-Babbler (Warbler) | <i>Sylvia subcoerulea</i>        | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Barred Wren-warbler                   | <i>Calamonastes fasciolatus</i>  | 1         | 2             | 3                  | 3                  | 9     | M                  |                           | 1  |
| Crested Francolin                     | <i>Dendroperdix sephaena</i>     | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Natal Spurfowl                        | <i>Pternistis natalensis</i>     | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Swainson's Spurfowl                   | <i>Pternistis swainsonii</i>     | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Helmeted Guineafowl                   | <i>Numida meleagris</i>          | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Egyptian Goose                        | <i>Alopochen aegyptiaca</i>      | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Spur-winged Goose                     | <i>Plectropterus gambensis</i>   | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Green Wood-hoopoe                     | <i>Phoeniculus purpureus</i>     | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Lilac-breasted Roller                 | <i>Coracias caudatus</i>         | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Purple Roller                         | <i>Coracias naevius</i>          | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Brown-hooded Kingfisher               | <i>Halcyon albiventris</i>       | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Pied Kingfisher                       | <i>Ceryle rudis</i>              | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| White-fronted Bee-eater               | <i>Merops bullockoides</i>       | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Little Bee-eater                      | <i>Merops pusillus</i>           | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Swallow-tailed Bee-eater              | <i>Merops hirundineus</i>        | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Speckled Mousebird                    | <i>Colius striatus</i>           | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Burchell's Coucal                     | <i>Centropus burchellii</i>      | 2         | 2             | 2                  | 2                  | 8     | M                  |                           | 1  |
| Black Crake                           | <i>Amaurornis flavirostra</i>    | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Common Moorhen                        | <i>Gallinula chloropus</i>       | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Wood Sandpiper                        | <i>Tringa glareola</i>           | 1         | 1             | 3                  | 3                  | 8     | M                  |                           | 1  |

| Common Name                 | Scientific Name                    | Body Size | Trophic Guild | Breeding Residency | Commensal Affinity | Total | Disturbance Rating | Status (Regional, Global) | LO |
|-----------------------------|------------------------------------|-----------|---------------|--------------------|--------------------|-------|--------------------|---------------------------|----|
| African Jacana              | <i>Actophilornis africanus</i>     | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Little Grebe                | <i>Tachybaptus ruficollis</i>      | 1         | 1             | 3                  | 3                  | 8     | M                  |                           | 1  |
| African Darter              | <i>Anhinga rufa</i>                | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Reed Cormorant              | <i>Microcarbo africanus</i>        | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Purple Heron                | <i>Ardea purpurea</i>              | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Hadedda Ibis                | <i>Bostrychia hagedash</i>         | 3         | 1             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Brubru                      | <i>Nilais afer</i>                 | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Black-backed Puffback       | <i>Dryoscopus cubla</i>            | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Black-crowned Tchagra       | <i>Tchagra senegalus</i>           | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| White-crested Helmet-shrike | <i>Prionops plumatus</i>           | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Chinspot Batis              | <i>Batis molitor</i>               | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Pied Crow                   | <i>Corvus albus</i>                | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Lesser Swamp Warbler        | <i>Acrocephalus gracilirostris</i> | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Levaillant's Cisticola      | <i>Cisticola tinniens</i>          | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Neddicky                    | <i>Cisticola fulvicapilla</i>      | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Desert Cisticola            | <i>Cisticola aridulus</i>          | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Bar-throated Apalis         | <i>Apalis thoracica</i>            | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Grey-backed Camaroptera     | <i>Camaroptera brevicaudata</i>    | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Rufous-naped Lark           | <i>Mirafr africana</i>             | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Southern Black Flycatcher   | <i>Melaenornis pammelaina</i>      | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| White-browed Scrub Robin    | <i>Cercotrichas leucophrys</i>     | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Kalahari Scrub Robin        | <i>Cercotrichas paena</i>          | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Burchell's Starling         | <i>Lamprotomis australis</i>       | 1         | 2             | 3                  | 2                  | 8     | M                  |                           | 1  |
| Marico Sunbird              | <i>Cinnyris mariquensis</i>        | 1         | 1             | 3                  | 3                  | 8     | M                  |                           | 1  |
| Red-billed Buffalo Weaver   | <i>Bubalornis niger</i>            | 2         | 2             | 3                  | 1                  | 8     | M                  |                           | 1  |
| Violet-eared Waxbill        | <i>Uraeginthus granatinus</i>      | 1         | 1             | 3                  | 3                  | 8     | M                  |                           | 1  |
| Green-winged Pytilia        | <i>Pytilia melba</i>               | 1         | 1             | 3                  | 3                  | 8     | M                  |                           | 1  |



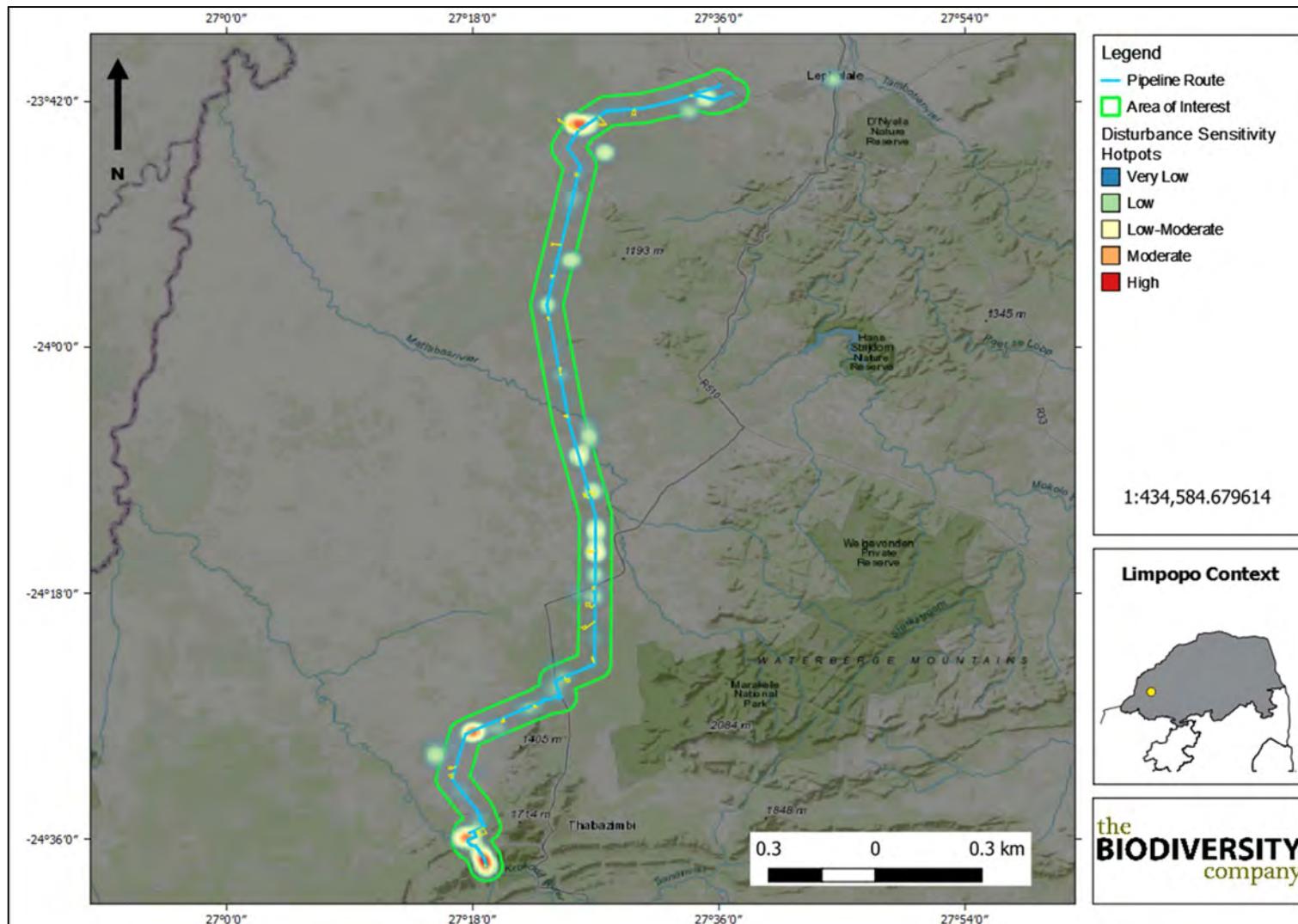


Figure 9-1 Concentrations of disturbance prone species along the proposed pipeline route. The green line represents the specialist defined 4 km area of interest corridor.

## 9.2 Spatial distribution of SCC and raptor nests

Analysis of the spatial data collected during the surveys reveal a number of pertinent findings with regards to avifaunal sensitivity, as represented / summarized spatially in Figure 9-2 and Figure 9-3 below. The point locality data in these maps has been separated into four main categories which include:

1. Raptor Nests – Threatened Species;
2. Raptor Nests – Non-threatened Species;
3. Kranskop Cape Vulture Colony;
4. Species of Conservation Concern (SCC) - Point localities of observed SCC individuals;
5. Suitable Raptor Nesting Habitat; and
6. Buffers on raptor nests:
  - Threatened raptors preferential: 1 km
  - Threatened raptors preferential minimum: 500 m
  - Non-threatened raptors preferential: 200 m
  - Non-threatened raptors minimum: 100 m

Overall, the majority of SCC avifauna including Threatened raptor species and their nests were recorded in the southern half of the pipeline route. In terms of Threatened raptors this area was found to support Cape Vulture, Verreaux's Eagle, Martial Eagle and Secretarybird. During the survey Cape Vulture were restricted to the cliffs around Kranskop in Marakele National Park, which represents a significant breeding colony for the species. Verreaux's Eagle was represented by anecdotal accounts and is thought to breed on the small cliffs near the first weir in Thabazimbi as well as on the cliffs within the farm Karoobult 126 LQ. Perhaps of greatest significance with regards to the project was the detection of a Martial Eagle Nest on the same farm. This species occupies a very wide home range and consequently inter-nest distances are notoriously large. These large apex raptors are Endangered and although they often tend to more than one nest within their range. This particular nest appears to be favoured as it is well kept and was recently reconstructed after a fire passed through. Other SCC species in this area included Ground Hornbill (on Tarentaalpan), Yellow-billed Stork (Near first Weir in Thabazimbi).

The northern half of the pipeline, in contrast, was more sparsely occupied by SCC but those that do occur are highly Threatened (e.g. Critically Endangered White-backed Vulture). Nevertheless, there were a number of notable observations, the most significant of which included the fleeting sighting of the rare and Vulnerable Black Stork along the Matlabas River. Communications with staff from the Matlabas Reserve suggest that this species together with a wide diversity of other storks including Saddle-billed Stork occur on the reach of river just west of the crossing point at Farm Welgevonden 16 KQ. White-backed Vulture was detected once, perched on a pylon. No

nests of this species were detected along the pipeline route during the current survey, but the species is known to breed in the region, with nesting prevalence increasing northwards. A number of significant raptor nests belonging to Non-threatened species were also marked along the route. These nests belonged mainly to Wahlberg's Eagle (a breeding migrant present in summer months) but also African Hawk-eagle.

Overall, it is important to note that no nests of SCC or other raptor species were detected directly within the pipeline route construction footprint, borrow pits or other related infrastructures (as provided) during the dry and wet season survey. However, the pipeline route does pass through buffers assigned to both Threatened and Non-threatened raptor nests that were detected during the current survey. Of greatest significance in this regard is the Martial Eagle Nest on Karoobult 126 LQ. This nest is situated 630 m south of the proposed pipeline route which is placed to run within the Karoobult property before entering a servitude between the farms. The property to the north called Buffelsvly 127 KQ and is logged as one of the appellants. The only other Threatened raptor species nest that intercepts the pipeline is that of Secretarybird on Ruigtevley 97 KQ (Ptn. 5) however, this nest has been abandoned in recent years (last seen nesting on a low Acacia here in 2018). Most of the Wahlberg's Eagle nests are far enough from the route that disturbance capable of causing nest abandonment is deemed unlikely, under the assumption that construction passes these nests during winter when the birds are in the northern hemisphere wherever possible and practical (granted that this may be difficult given that construction will occur over many months).



Figure 9-2 Martial Eagle Nest on Karoobult 126





Figure 9-3 Wahlberg's Eagle Nest

With the exception of the Cape Vulture Colony at Kranskop which is afforded a buffer of 5 km, nests of all other threatened raptor species are afforded a minimum core buffer area of 1 km. Nests of non-threatened SCC are afforded a minimum core buffer area of 200 m and a preferred larger buffer area of 1 km.

Avifaunal buffer guidelines for developments such as this within Limpopo Province have not been gazetted. As per provincial stipulation (Limpopo Conservation Plan v2, 2013) the onus is on the avifaunal specialist to assign appropriate buffers. The buffers given here have been based on a combination of those stipulated for SCC nests in the face of high intensity impacts in the draft Species Environmental Assessment Guideline (2020) as well as on literature on the home range and breeding biology of these species (Hockey *et al.* 2005). Relevant high intensity impacts as defined in this document include drilling, loud noise, vibration, seismic blasting, commercial and industrial development and removal of vegetation or soil. The former specifies a minimum buffer of 1 km for raptors and large-bodied SCC species for high intensity impacts and specifies that this may be reduced for smaller raptors in low intensity impact scenarios to a buffer of 200 m.

At this point it is important to acknowledge the justification for the variation in buffer size between the Red-listed SCC raptors versus the non-red listed SCC raptor species. The former are all Larger-bodied raptors that are, as their conservation status suggests, inherently more sensitive to threats than the smaller and considerably more common, widespread and adaptable African Hawkeagle and Whalberg's Eagle. This defined the core minimum buffer areas. The rationale behind the larger (preferred) buffer areas is based on the philosophy adopted by Martínéz *et al.* (2010) that posits that buffers for large-bodied raptors should be a function of its spatial biology. At present the most widely adopted default approach is to buffer nest sites by half the mean inter-nest distance of the local population (e.g. U.S. Fish & Wildlife Service 2013). With regards to this



project all of the Red-listed SCC raptors are wide ranging species with very large inter-nest distances. Martial Eagle in particular occupies a notoriously large home range of 100-1000 km<sup>2</sup> with average inter-nest distances in the Karoo of >15 km (Boshoff 1993, Machange *et al.* 2005). Following the principles above this would suggest a 7.5 km buffer for Martial Eagle and around 2.5 km for Verreaux's Eagle. Given that the project is unlikely to pose as adverse a risk as would otherwise be associated with wind energy developments upon which these guidelines are mainly based, we have decided to opt with the lower value of 1 km preferred and 500 m minimum buffer for Threatened raptor species which, in light of the above, represents a considerable reduction. The Kranskop Cape Vulture colony is a unique situation and warrants its own buffer. This is not a nest of a single individual but rather the largest communal roost site for the species in the Province and consequently a 5 km buffer is deemed easily defensible<sup>22</sup>.

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<sup>22</sup> Given that the conservation buffer for wind energy developments for this species is 50 km (Pfeiffer *et al.* 2015).

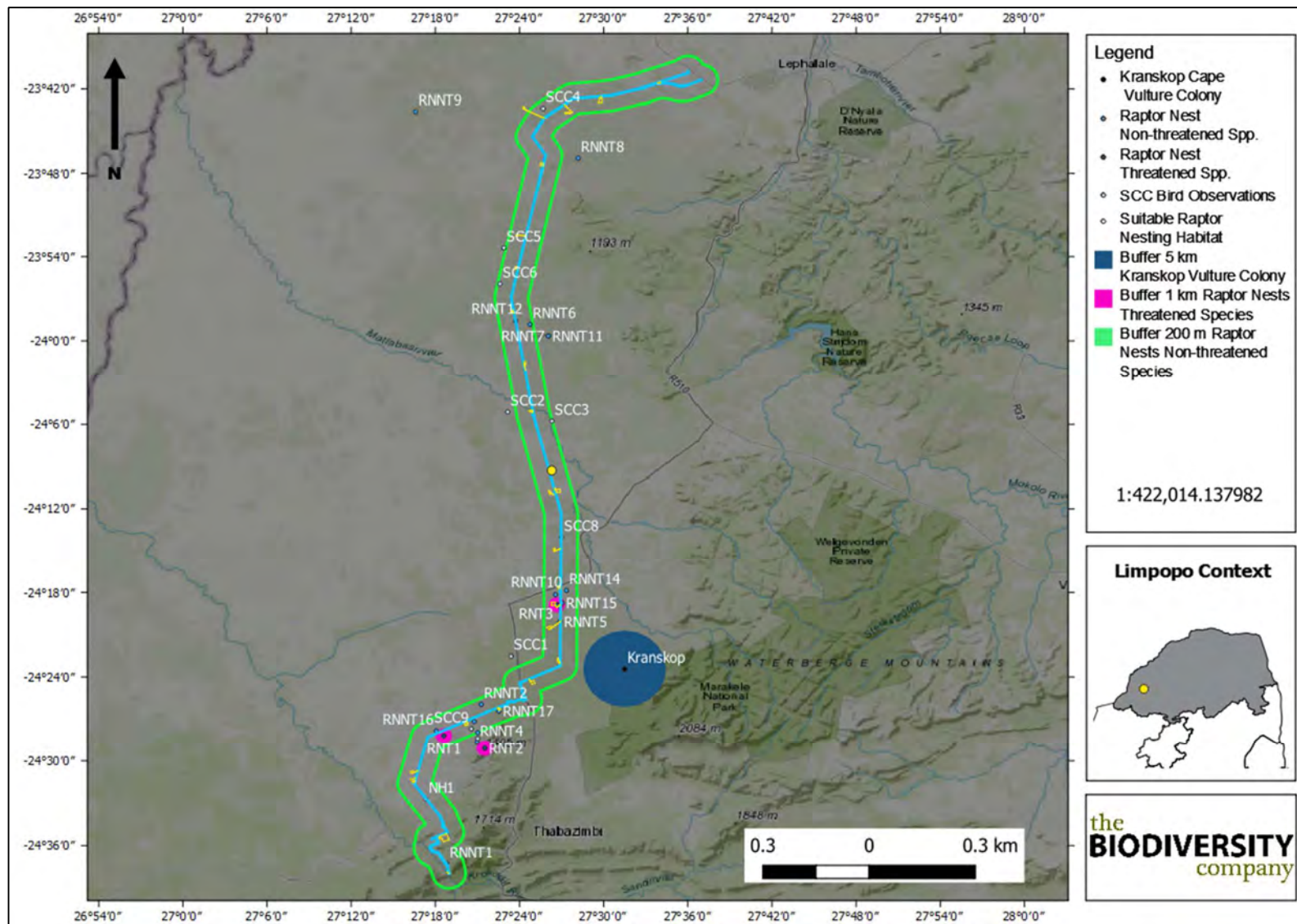


Figure 9-4 Raptor nest localities, overview. The green line represents the specialist defined 4 km area of interest corridor.

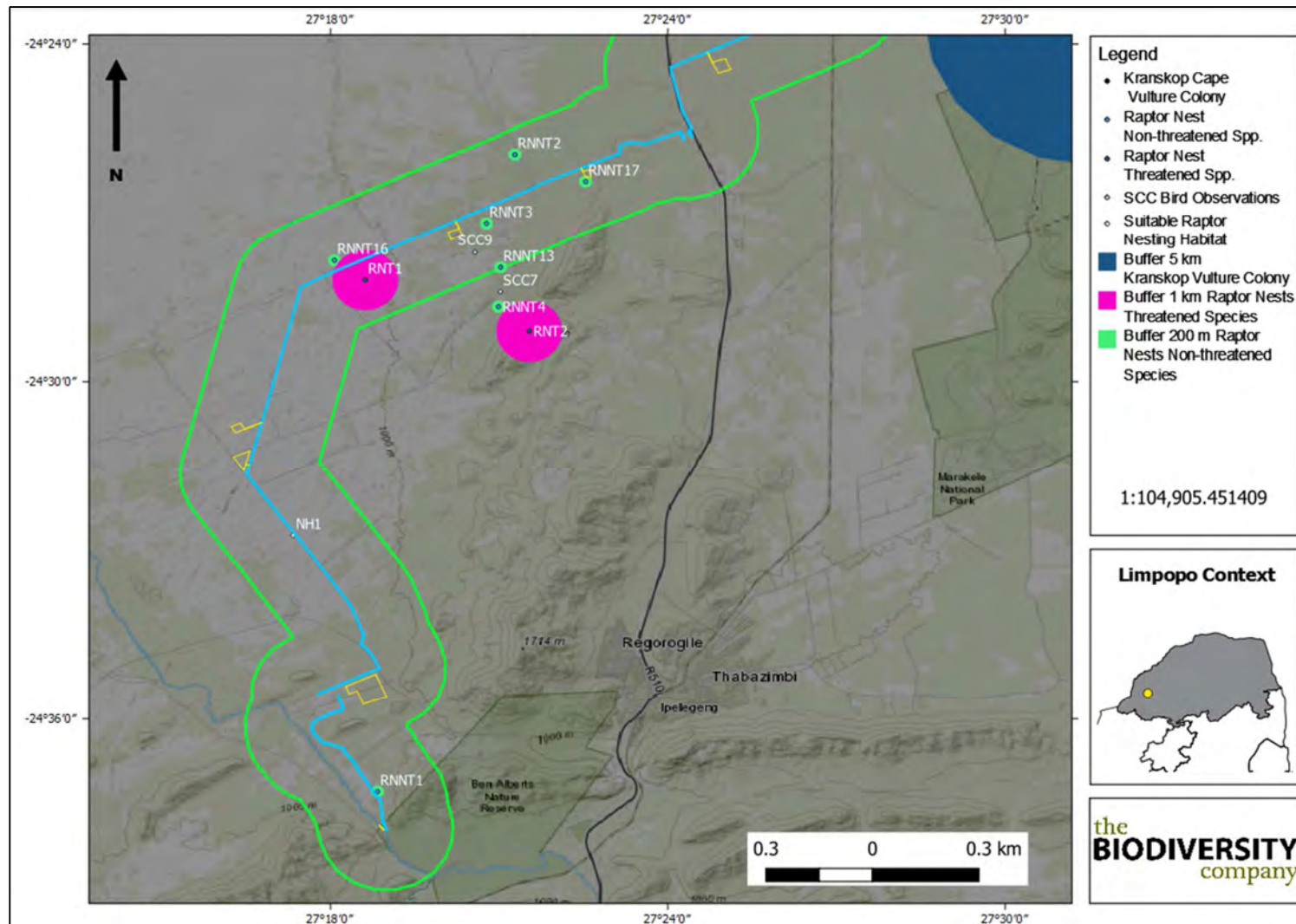


Figure 9-5 Raptor nest localities, southern pipeline corridor.





Figure 9-6 Raptor nest localities, central



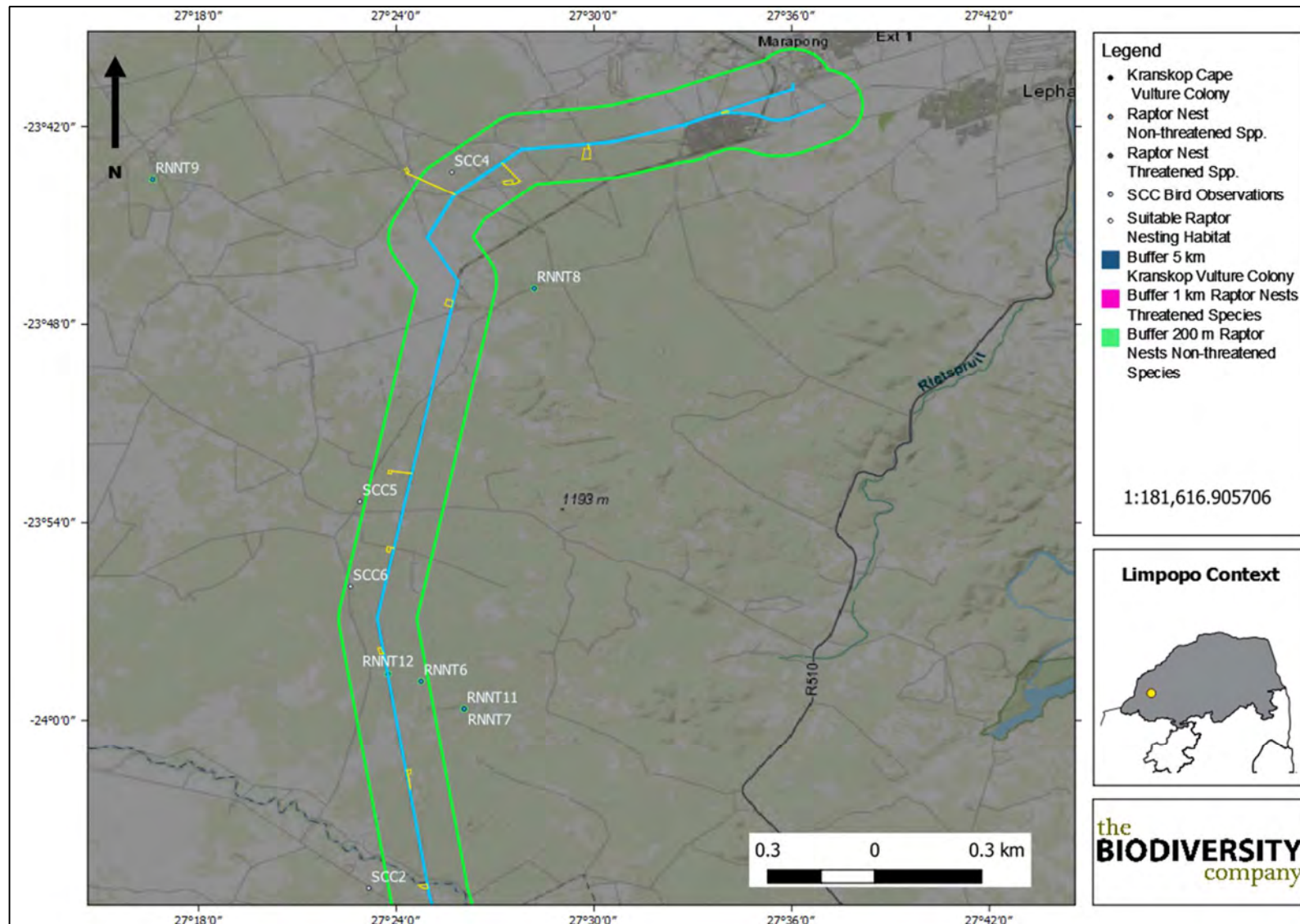


Figure 9-7 Raptor nest localities, north

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### **9.3 Significant Avifaunal Habitats**

The last layer to the sensitivity assessment involved the delineation of significant habitats for avifauna (Figure 9-8). These included suitable breeding habitat for large-bodied tree-nesting raptors, suitable rocky outcrops for cliff nesting raptors and wetland and riparian habitats for a wide range. More specifically these include:

#### **9.3.1 Wetlands and Riparian**

The Pans and Dams habitats were found to support the highest diversity of birds (both in terms of species richness and abundance). These wetland habitats together with rivers and their associated riparian habitat provide an important source of water, food and cover in an otherwise arid landscape and attract a wide diversity of birds, many of which are of conservation importance (e.g. Yellow-billed and Black Storks, Half-collared Kingfisher, African Finfoot). All pans and dams were assigned a high sensitivity as were the three main rivers and their riparian vegetation which bisect the pipeline route namely the Crocodile, Matlabas and Sandloop. The riparian habitat along these rivers provides ideal large-bodied raptor nesting habitat.

#### **9.3.2 Highly Suitable Large Raptor Tree Nesting Habitat**

Three patches of Tall Thornveld were highlighted as harbouring sufficiently high concentrations of the type of suitably tall trees frequented by large-bodied raptors for breeding. These occur on the following farms:

- Stratford 462 KQ;
- Karoobult 126 KQ;
- Ruigtevley 97 KQ; and
- Pontes Estates 744 LQ.

#### **9.3.3 Highly Suitable Large Raptor Cliff Nesting Habitat**

Significant large rocky outcrops that support suitable cliff nesting habitat are to be found on:

- Karoobult 126 KQ;
- Mabulskop 406 KQ; and
- Geelhoutskloof 359 LQ.

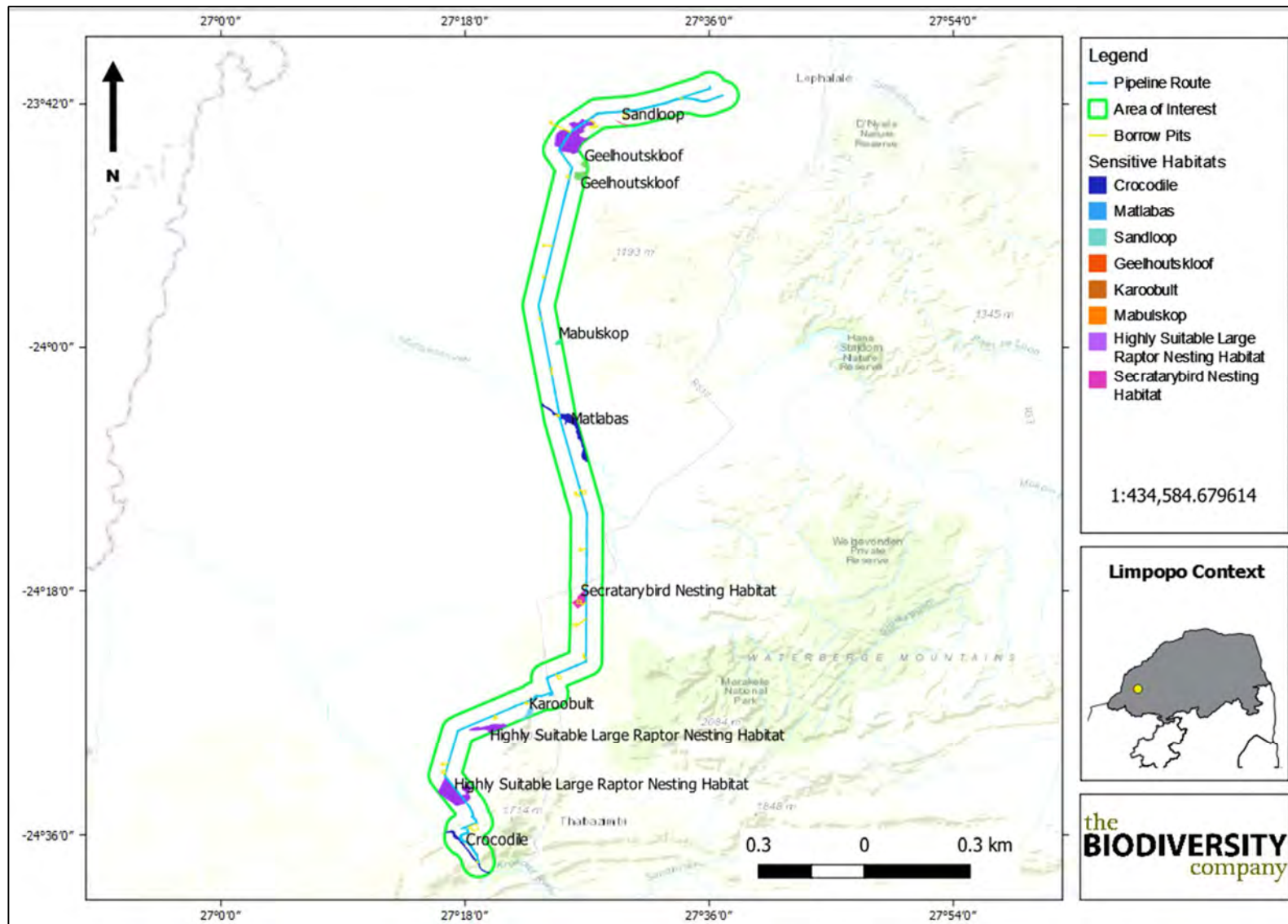


Figure 9-8 Significant avifaunal habitats

## 9.4 Overall Areas of Avifaunal Importance and Sensitivity

Results of this assessment highlight the following areas of avifaunal importance and sensitivity:

- All areas modelled to support high concentrations of disturbance prone species. These areas were classified into high and moderate sensitive areas depending on the degree of disturbance risk;
- All raptor nests. Nests of threatened species were assigned a 1 km radial buffer while those of non-Threatened species were assigned a radial buffer of 200 m on their nests;
- Highly suitable large raptor nesting habitat namely the tall *Senegalia nigrescens* woodlands (Stratford 462 KQ). Here rather bear east of the road (within the 100 m corridor) as the western side supports the majority of the large trees. Another suitable nesting habitat area was identified on Ruigtevlei 97 KQ, however here it may prove more detrimental to move the pipeline to the west of the railway servitude due to the intact vegetation on the east and lack of road servitude, simply try to retain all large trees above 20 m);
- Certain reaches of the Matlabas River and its associated riparian zone which was found to support significant congregations of Black Stork (reach to the east of the crossing point on farms Welgevonden 16 KQ Ptn 6 and Schoonwater 950 KQ). The pipeline should cross to the west of the low-level bridge (ideally between the low-level bridge and the railway line) an area of disturbance which is of lower sensitivity;
- All perennial river and riparian habitat (particularly Crocodile and Matlabas Rivers) for their potential to support, inter alia, African Finfoot and Half-collared Kingfisher;
- All cliffs for their potential to support cliff-nesting species; and
- Tarantaalpan 132 KQ (Ptn 1 and 5) and Thaba Tholo Private Reserve are considered sensitive due to their resident Ground Hornbills. No spoil sites, borrow pits, pipelines or associated infrastructure are planned for these farms based on the spatial data provided. These areas should be excluded from any development related to this water transfer scheme project.



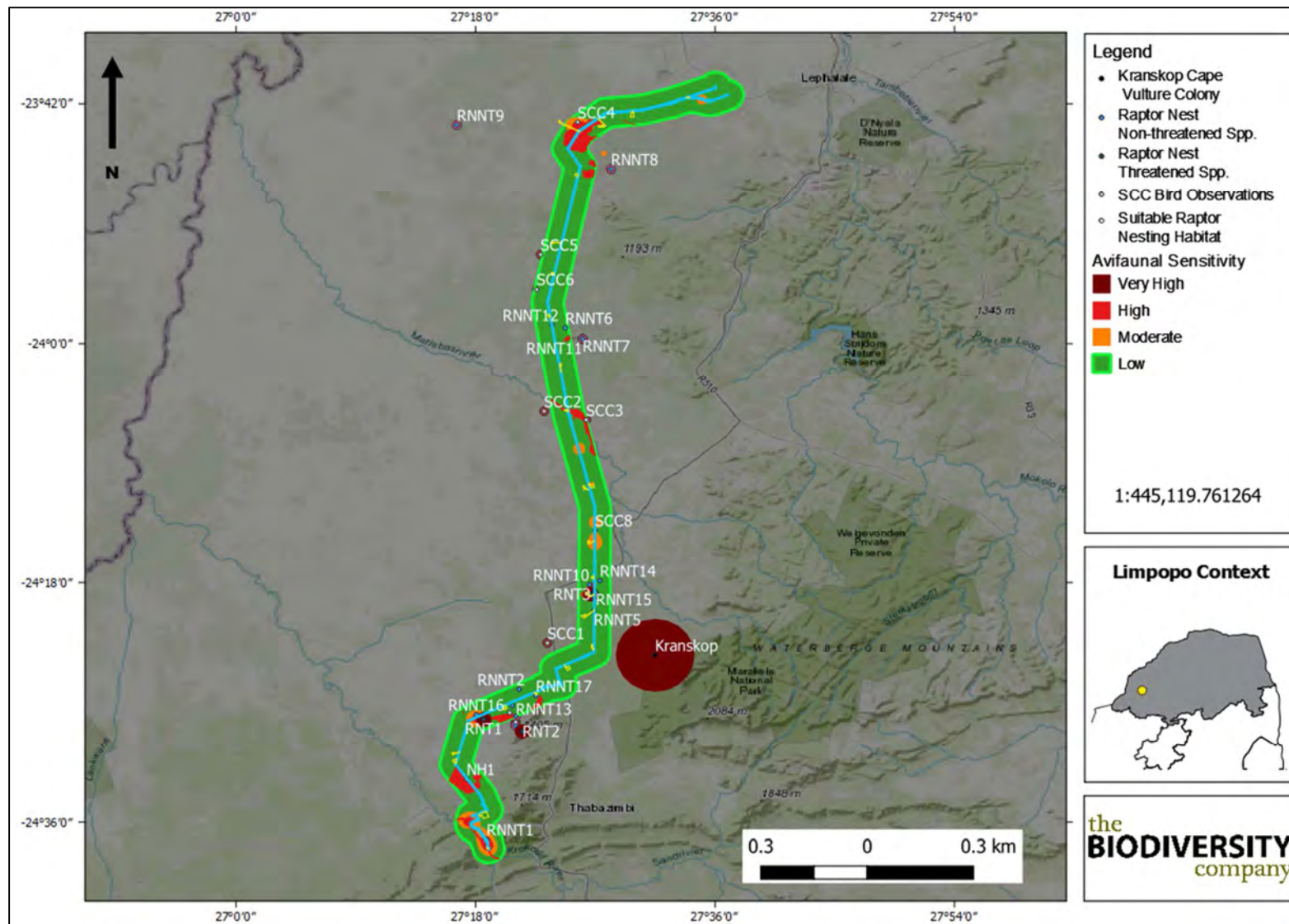


Figure 9-9 Avifaunal sensitivity map, overview

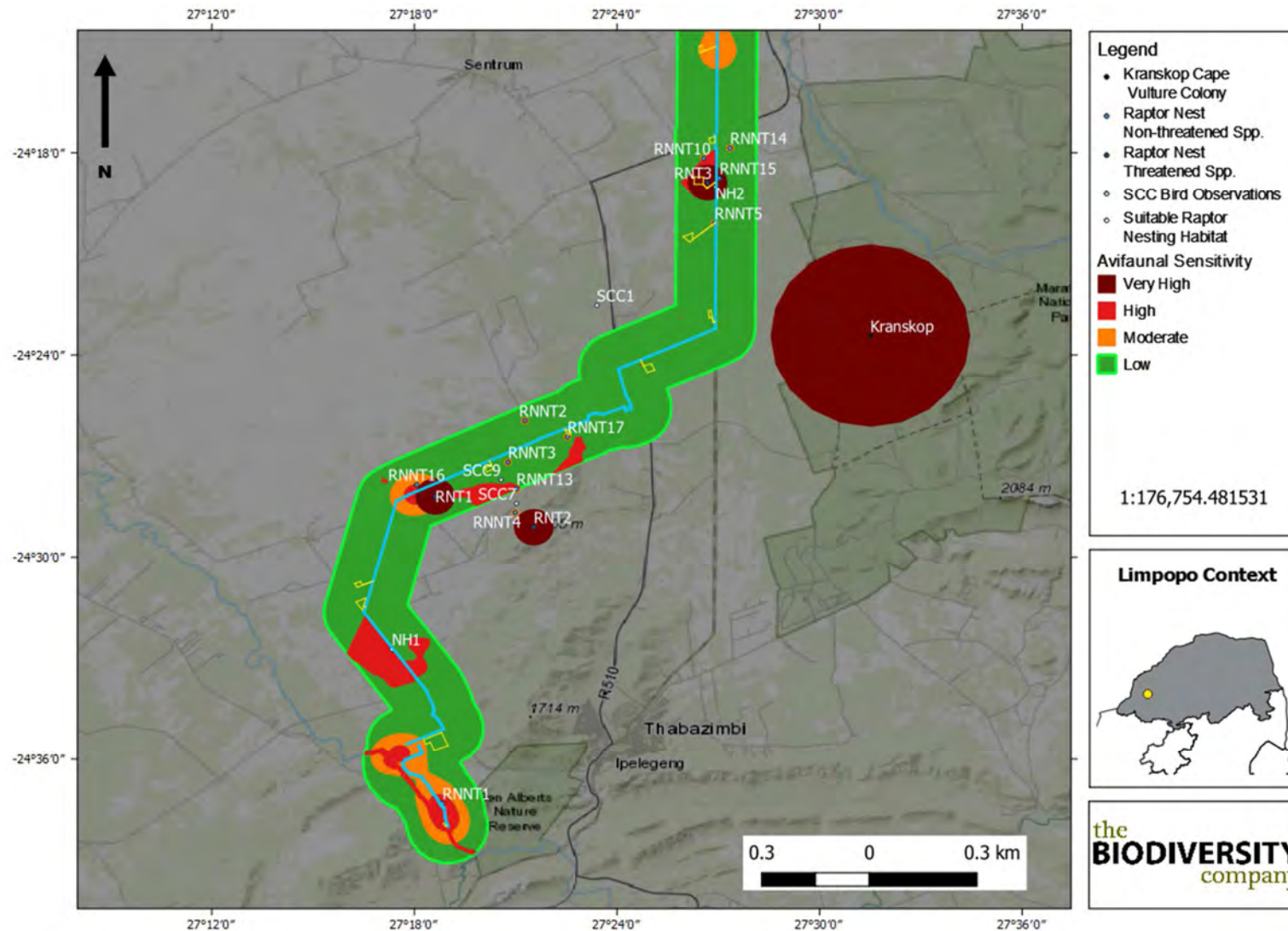


Figure 9-10 Avifaunal sensitivity map, south

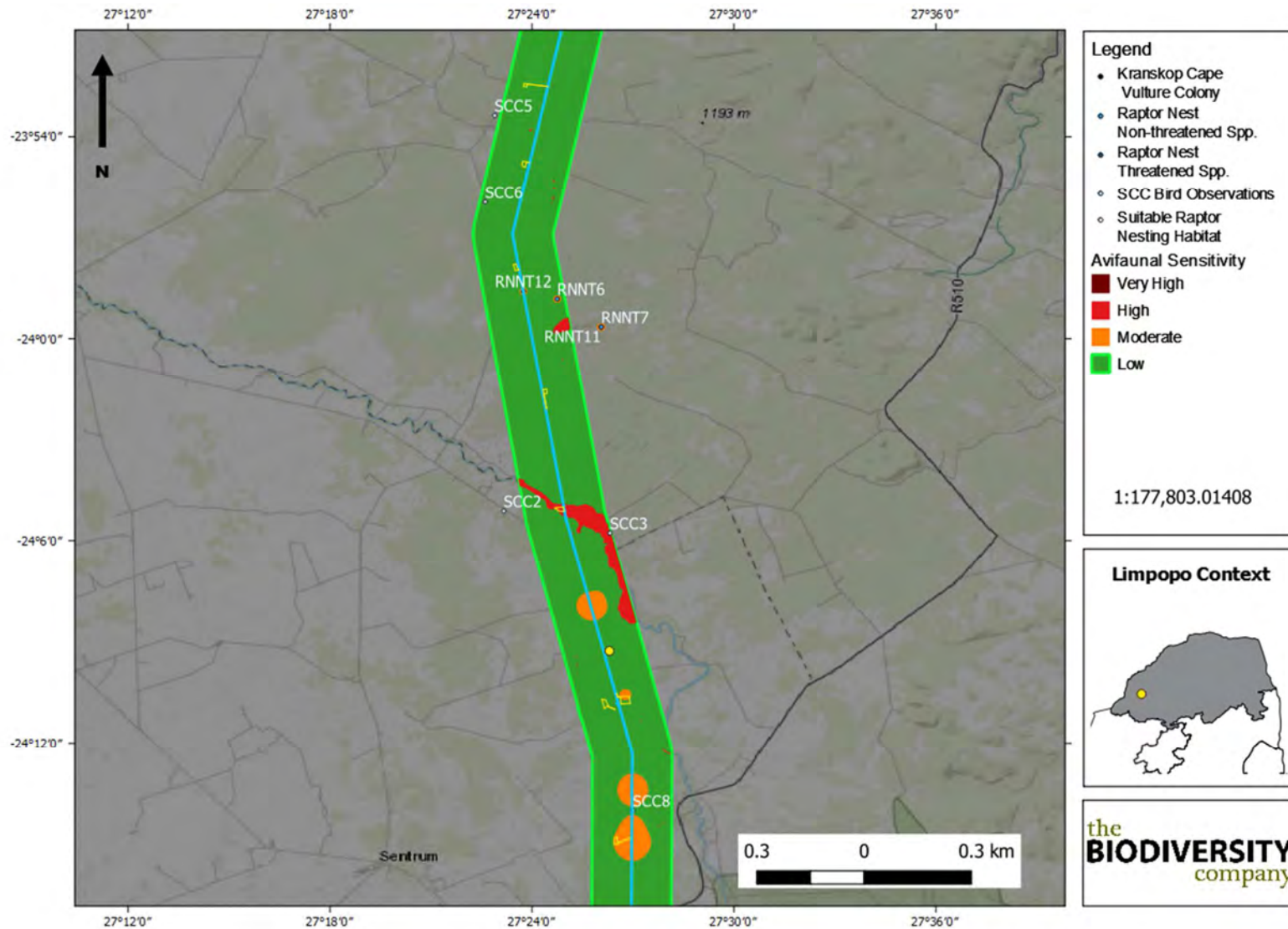


Figure 9-11 Avifaunal sensitivity map, central



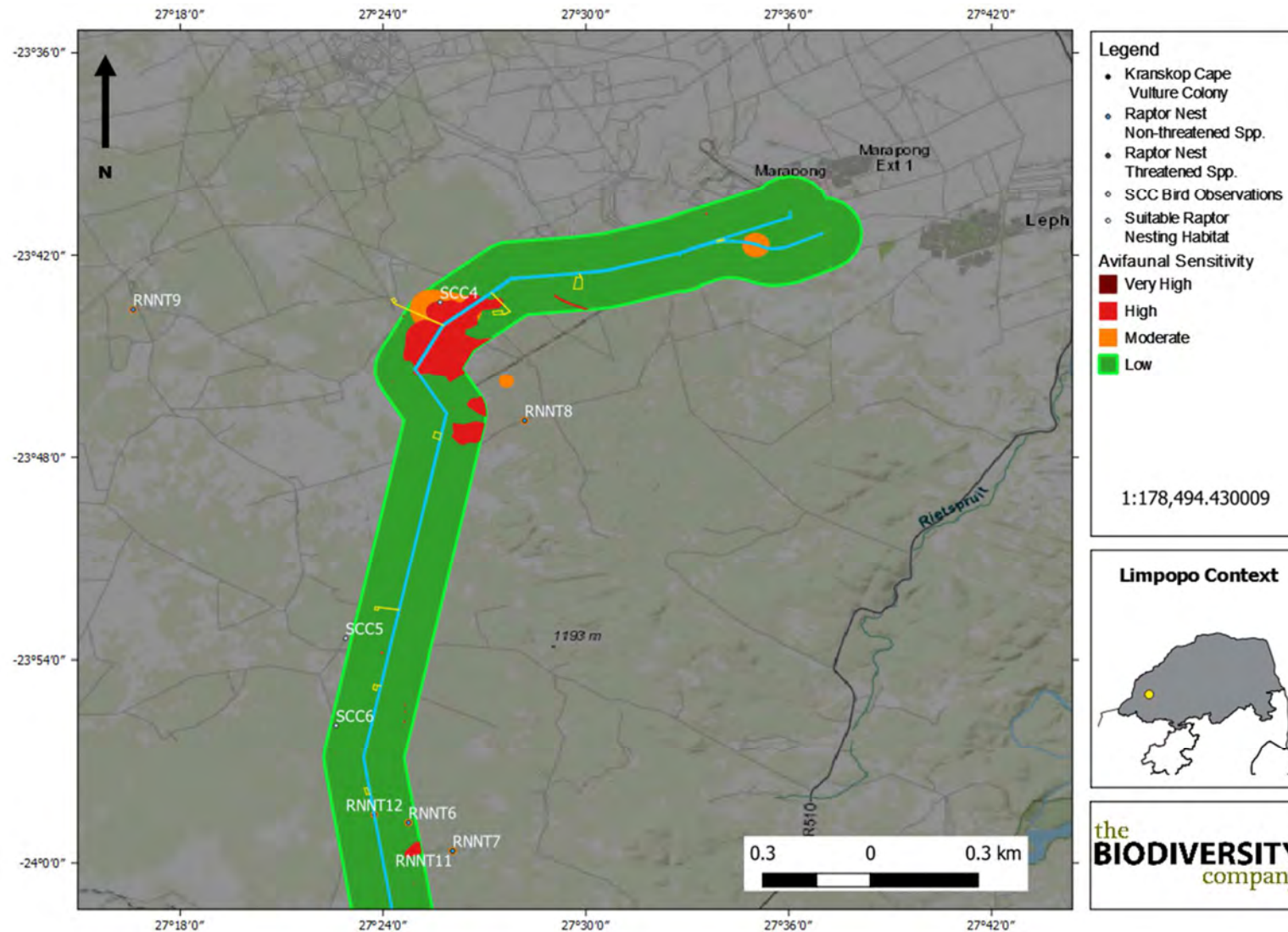


Figure 9-12 Avifaunal sensitivity map, north



## 10 Borrow Pit Impact Assessment

During this avifaunal baseline survey, the various proposed borrow pit sites were visited and assessed in terms of the potential impacts they may have on the local avifaunal assemblage. Most of the proposed borrow pit sites do not coincide with any of the identified sensitive areas for avifauna. There are, however, a few exceptions. These borrow pits together with the sensitivity receptor triggered and the suggested recommendation to address this challenge are listed in Table 10-1.

Table 10-1 List of present and potentially occurring red-listed avifauna.

| Borrow Pit | Challenge   | Recommendation   |
|------------|---|--|
| BP39       | In Matlabas River floodplain, high avifaunal sensitivity area                       | Consider alternative site outside of the Matlabas River floodplain |
| BPH        | In area of moderate disturbance risk  | No recommendation leave as is                                      |
| BP41       | In area of moderate disturbance risk  | No recommendation leave as is                                      |
| BPG        | In suitable Secretarybird nesting habitat   | Consider shifting to southern boundary of Ruigtevlei 97 KQ, Ptn. 5 |
| BP35       | Marginally encroaches on edge of 200 m buffer on non-threatened raptor species nest | Shift 50 m north   |

The following list (Table 10-2) provides a framework for the anticipated major impacts associated with the borrow pits.

Table 10-2 Summary of impacts to avifauna associated with the proposed borrow pits.

| Main Impact   | Related Activities  | Secondary Impacts Anticipated   |
|---|---|---|
| <b>1. Loss / degradation of habitat</b>                                     | Physical removal of vegetation  | Displacement/loss of avifauna (including possible SCC)  |
|   | Access roads and servitudes   | Increased potential for disturbance   |
|   | Soil dust precipitation   | Habitat degradation and edge effects  |
|   | Dumping of waste products   | Habitat degradation and foraging hazards  |
| <b>2. Loss / abandonment of large-bodied raptor nests</b>                   | Direct removal of nests and / or felling of suitable nesting trees  | Loss of nesting habitat   |
|   | Noise, dust and other sensory disturbances during construction  | Nest abandonment, fledging failures   |
| <b>3. Spread and/or establishment of alien and/or invasive species</b>      | Vegetation removal  | Loss of suitable natural foraging and breeding habitat  |
|   | Vehicles potentially spreading seed   | Spreading of potentially dangerous diseases due to invasive and pest species                                  |
|   | Vehicles potentially spreading seed   | Alteration of avifaunal assemblages due to predation  |
|   | Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents<br>Creation of infrastructure suitable for breeding activities of alien and/or invasive birds | Altered species assemblages   |
| <b>4. Direct mortality of avifauna</b>                                      | Clearing of vegetation  | Loss of nests and important breeding / foraging habitat   |
|   | Roadkill due to vehicle collision   | Increase in rodent populations and associated disease risk  |
|   | Intentional killing for food (hunting) or otherwise   | Increased mortality   |
| <b>5. Habitat fragmentation</b>   | Removal of vegetation associated with borrow pits   | Secondary impacts associated with reduced dispersal/migration of fauna  |
|   | Compacted roads   | Reduced plant seed dispersal  |
| <b>6. Disruption/alteration of sensitive life history stages (breeding,</b> | Sensory disturbance.  | Secondary impacts associated with disruption/alteration of ecological life cycles due to sensory disturbance. |

|  |  |  |
|--|--|--|
| migration, feeding) due to noise and other sensory disturbances. |  |  |
|--|--|--|

### 10.1 Construction / Operation Phase

Table 10-3 lists the impacts likely to be associated with the construction/operation of the borrow pits. Most of the potentially negative impacts on avifauna associated with the borrow pits are likely to be temporary in nature and limited mainly to the construction phase, which is likely to overlap to a large degree with their operational phase. The main impacts associated with the establishment and use of these borrow pits is likely to be loss / degradation of habitat and loss / abandonment of large-bodied raptor nests. With regards to the former habitat loss is inevitable and has the potential to be of Moderately High significance. However, this impact is only likely to last the duration of the pipeline construction phase and thereafter, provided suitable rehabilitation measures are implemented, should see the re-colonisation of bushveld habitat and the return of most species that once occupied these areas. However, special attention does however, need to be given to the borrow pit sites as listed in Table 10-1 which are situated in sensitive avifaunal areas and the recommended actions considered. The loss / abandonment of raptor nests has the potential to have a Moderate High significance, however no raptor nests were detected within any of the borrow pit sites. Only one site namely BP36 marginally encroaches on the 200 m buffer assigned to a non-Threatened raptor species nest, however, this impact can be avoided by shifting the pit 50 m north. Under these assumptions and considering that the borrow pits will be allowed to be re-vegetated with indigenous bushveld, the significance of these two impacts can be reduced to a Moderate significance.

The other construction/operation related activities are considered to have a Moderate pre-mitigation impact that can be reduced to Low given the generally low avifaunal sensitivity of their locations and the various mitigation measures which can be applied.

Table 10-3 Impact significance during the construction/operation phase pre- and post-mitigation

| Impact  | Prior to mitigation                                |   |   |             |  |                       |            |                 | Post mitigation                                    |  |   |             |   |                       |            |              |
|---|--|---|---|-------------|--|-----------------------|------------|-----------------|--|--|---|-------------|---|-----------------------|------------|--------------|
|   | Duration of Impact                                 | Spatial Scope   | Severity of Impact  | Consequence | Sensitivity of Receiving Environment     | Probability of Impact | Likelihood | Significance    | Duration of Impact                                 | Spatial Scope  | Severity of Impact  | Consequence | Sensitivity of Receiving Environment        | Probability of Impact | Likelihood | Significance |
| 1. Loss / degradation of habitat                                | 4  | 1   | 4   | 9           | 4  | 5                     | 9          |                 | 4  | 2  | 3   | 9           | 2   | 4                     | 6          |              |
|   | Life of operation or less than 20 years: Long Term | Activity specific/ < 5 ha impacted / Linear features affected < 100m                                | Great / harmful/ ecosystem structure and function largely altered |             | Ecology highly sensitive /important      | Definite              |            | Moderately High | Life of operation or less than 20 years: Long Term | Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m | Significant / ecosystem structure and function moderately altered |             | Ecology with limited sensitivity/importance | Highly likely         |            | Moderate     |
| 2. Loss / abandonment of large-bodied raptor nests              | 5  | 3   | 4   | 12          | 4  | 3                     | 7          |                 | 3  | 2  | 2   | 7           | 2   | 3                     | 5          |              |
|   | Permanent  | Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m | Great / harmful/ ecosystem structure and function largely altered |             | Ecology highly sensitive /important      | Likely                |            | Moderately High | One year to five years: Medium Term                | Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m | Small / ecosystem structure and function largely unchanged        |             | Ecology with limited sensitivity/importance | Likely                |            | Low          |
| 3. Spread and/or establishment of alien and/or invasive species | 3  | 3   | 3   | 9           | 3  | 3                     | 6          |                 | 2  | 2  | 2   | 6           | 2   | 3                     | 5          |              |
|   | One year to five years: Medium Term                | Local area/ within 1 km of the site boundary / < 5000ha   | Significant / ecosystem structure and function                    |             | Ecology moderately sensitive/ /important | Likely                |            | Moderate        | One month to one year: Short Term                  | Development specific/ within the site boundary / < 100 ha impacted / Linear                          | Small / ecosystem structure and function largely                  |             | Ecology with limited sensitivity/importance | Likely                |            | Low          |

| Impact                          | Prior to mitigation                 |   |   |             |   |                       |            |              | Post mitigation                   |  |  |             |   |                       |            |              |
|---------------------------------|-------------------------------------|---|---|-------------|---|-----------------------|------------|--------------|-----------------------------------|--|--|-------------|---|-----------------------|------------|--------------|
|                                 | Duration of Impact                  | Spatial Scope   | Severity of Impact  | Consequence | Sensitivity of Receiving Environment    | Probability of Impact | Likelihood | Significance | Duration of Impact                | Spatial Scope  | Severity of Impact   | Consequence | Sensitivity of Receiving Environment        | Probability of Impact | Likelihood | Significance |
|                                 |                                     | impacted / Linear features affected < 1000m   | moderately altered  |             |   |                       |            |              |                                   | features affected < 100m   | unchanged  |             |   |                       |            |              |
| 4. Direct mortality of avifauna | 3                                   | 3   | 3   | 9           | 3                                       | 3                     | 6          |              | 2                                 | 2  | 2  | 6           | 2   | 3                     | 5          |              |
|                                 | One year to five years: Medium Term | Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m | Significant / ecosystem structure and function moderately altered |             | Ecology moderately sensitive/ important | Likely                |            | Moderate     | One month to one year: Short Term | Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m | Small / ecosystem structure and function largely unchanged |             | Ecology with limited sensitivity/importance | Likely                |            | Low          |
| 5. Habitat fragmentation        | 3                                   | 3   | 3   | 9           | 4                                       | 4                     | 8          |              | 2                                 | 2  | 2  | 6           | 2   | 3                     | 5          |              |
|                                 | One year to five years: Medium Term | Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m | Significant / ecosystem structure and function moderately altered |             | Ecology highly sensitive / important    | Highly likely         |            | Moderate     | One month to one year: Short Term | Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m | Small / ecosystem structure and function largely unchanged |             | Ecology with limited sensitivity/importance | Likely                |            | Low          |
|                                 | 3                                   | 3   | 3   | 9           | 3                                       | 4                     | 7          |              | 2                                 | 2  | 2  | 6           | 2   | 3                     | 5          |              |



| Impact  | Prior to mitigation                 |   |   |             |  |                       |            |              | Post mitigation                   |  |  |             |   |                       |            |              |
|---|-------------------------------------|---|---|-------------|--|-----------------------|------------|--------------|-----------------------------------|--|--|-------------|---|-----------------------|------------|--------------|
|   | Duration of Impact                  | Spatial Scope   | Severity of Impact  | Consequence | Sensitivity of Receiving Environment     | Probability of Impact | Likelihood | Significance | Duration of Impact                | Spatial Scope  | Severity of Impact   | Consequence | Sensitivity of Receiving Environment        | Probability of Impact | Likelihood | Significance |
| 6. Disruption/alteration of sensitive life history stages (breeding, migration, feeding) due to noise and other sensory disturbances. | One year to five years: Medium Term | Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m | Significant / ecosystem structure and function moderately altered |             | Ecology moderately sensitive / important | Highly likely         |            | Moderate     | One month to one year: Short Term | Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m | Small / ecosystem structure and function largely unchanged |             | Ecology with limited sensitivity/importance | Likely                |            | Low          |

## 10.2 Mitigation Measures

Recommended mitigation and rehabilitation measures include the following:

- Areas of indigenous vegetation outside of the direct borrow pit and access road footprint, should under no circumstances be fragmented or disturbed further;
  - Clearing of vegetation should be minimized and avoided where possible;
  - The area of the borrow pits must be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon;
  - The borrow pits must not be used as an area for dumping of waste; and
- All laydown, chemical toilets etc. should be restricted to low sensitivity areas;
- Existing access routes and walking paths must be made use of, and new routes limited;
- Any materials should not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded;
- No permanent structures should be permitted at borrow pit sites;
- No storage of vehicles or equipment should be allowed outside of the designated project areas;
- A qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate any birds that may be found during construction;
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated;
- Areas that are denuded need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;
- Compilation of and implementation of an alien vegetation management plan;
- All structure footprints should be landscaped and rehabilitated after the operational phase is complete. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;
- All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the

presence of SCC or raptor nests, their identification, conservation status and importance, biology, habitat requirements and management requirements as per the EMPr;

- If any straggling birds or large raptor nests are found during construction directly in the line of construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action;
- No trapping, killing or poisoning of avifauna is to be allowed on site;
- Noise must be kept to an absolute minimum during the early mornings, late evenings and at night to minimize all possible disturbances;
- Speed limits must still be enforced to ensure that road killings and erosion is limited;

## 11 Recommended Management Actions

Outright avoidance is not the only mitigation. This input has been divided into scenarios designed to minimise disturbance to breeding SCC avifauna under scenarios where avoidance is feasible and where it is not. Under the first scenario one can minimize disturbance either by avoiding the nest by adhering to a spatial buffer or by timing the construction to pass the nest while the birds are not breeding at the nest. It is preferable to employ both spatial and temporal measures but a compromise of one or both may need to happen depending on project constraints. If the nest cannot be avoided at all that is when the avoidance not feasible scenario would apply. Due to the presence of species Threatened with extinction it is recommended that LEDET be involved in the decision and authorisation / permitting regarding the way forward and feasibility regarding the relocation of these species' nests. A summary table detailing the locations of the various SCC avifauna, their distance from the pipeline route, their prescribed buffers, the farm they were observed and the recommended course of immediate action are detailed in Table 11-1.



Figure 11-1 Roadkill Crested Francolin

### 11.1 Nests: Avoidance Feasible - Spatial Measures:

- Locate and identify any nests of SCC avifauna within survey corridor;
- Conduct SCC nest surveys during both winter and summer seasons to gain information with regards to nest attendance, and breeding status. Winter surveys are important for resident species, particularly Cape Vulture, White-backed Vulture, Martial Eagle, Tawny Eagle, Verreaux's Eagle and Black Stork which tend to lay in mid to late winter in South Africa. Early summer surveys are important to detect chicks and fledglings but also



particularly important to assess activity status on nests of breeding migrants such as Wahlberg's Eagle which are absent during winter;

- SCC avifauna are defined in this context as not only all red-listed species but also select non-red-listed species which include all raptors, storks and colony / cooperative nesting passerines (e.g. Red-billed Buffalo Weaver and Red-billed Oxpecker);
- Prescribe buffers based on best practice and / or specialist expertise:
  - Red-listed spp.: Minimum Core – 1 km; Preferred Outer 2.5 km; and
  - Non-red-listed spp.: Minimum Core – 200 m; Preferred Outer 1 km.
- During the winter survey several SCC raptor nests were detected, identified, and mapped within the above buffers. These included five species:
  - Cape Vulture (Kranskop Colony, Marakele National Park);
  - Martial Eagle (Karoobult 126 LQ);
  - Verreaux's Eagle (Karoobult 126 LQ);
  - Secretarybird (Ruigtevley 97 KQ, Ptn. 5);
  - Wahlberg's Eagle (various locations along route); and
  - African Hawk-Eagle (various locations along route).
- Incorporate nest locality data and buffers into master plan and demonstrate efforts to re-align pipeline and associated infrastructure accordingly.

## 11.2 Nests: Avoidance Feasible - Temporal Measures

- Proper pre-construction planning will allow for the implementation of proactive temporal measures to minimize disturbance to nesting avifauna when construction ultimately commences;
- Once all the data on the locations of all SCC nests and the species they belong to has been gathered the specialist will be able to provide information on sensitive avifaunal breeding times in certain areas along the pipeline. Based on the preliminary findings from the winter survey the following is provisionally advised:
  - In general attempt to conduct the bulk of the earth-moving and high intensity impacts (e.g. excavation and blasting) during autumn through early winter (February-May);
  - Construction near Nests of resident SCC raptor species (e.g. Black Eagle, Verreaux's Eagle and Secretarybird) should avoid taking place from June to December (eggs laid in June-July, nestling period 2.5-4 months); and

- Construction near nests of SCC breeding migrants (e.g. Wahlberg's Eagle) should avoid taking place from August to January (egg laying peaks September- October, nestling period 2-3 months).

### 11.3 Nests: Avoidance not Feasible

- Demonstrate commitment to either spatially or temporally minimize disturbances to breeding SCC raptors. This can be done by incorporating this data into the master plan and writing it into the method statement. If not possible it is advisable to motivate this in writing in anticipation of any potential enquiry by LEDET and / or DEFF. Important to remember is that these are large charismatic and Threatened Raptor species which have the potential to generate large public and media attention;
- If not possible, then written motivation should be supplied by the client in conjunction with the specialist. Thereafter an agreement will need to be made as to the way forward and whether relocation will be required. These decisions will need to be made in consultation with LEDET and potentially the Endangered Wildlife Trust (EWT). Endangered Species are involved and EWT are the authority in this regard in South Africa; and
- Relocation of any avifaunal nests will require a permit. Costs associated with permitting should be budgeted for.



Figure 11-2 Crimson-breasted Shrike (*Laniarius atrococcineus*)

Table 11-1 Locations of the various SCC avifauna, their distance from the pipeline route, their prescribed buffers, the farm they were observed and the recommended course of immediate action. Red text: Potential buffer infringement on threatened raptor species nest that is active. Blue text: Potential buffer infringement on threatened raptor species nest that has already been abandoned. Orange text: Potential buffer infringement on non-threatened SCC avifauna nest.

| Species  | Code   | Nest Status                | Location                 | Latitude       | Longitude    | Distance from Route | Spatial Avoidance Preferred Minimum / | Temporal Avoidance   | Notes  |
|--|--------|----------------------------|--------------------------|----------------|--------------|---------------------|---------------------------------------|--|--|
| Kranskop Cape Vulture Colony                       |        |                            |                          |                |              |                     |                                       |  |  |
| Cape Vulture ( <i>Gyps coprotheres</i> )           | RNT1   | Active                     | Kranskop, Marakele NP    | -24.390603°    | 27.525131°   | 7.54 km             | 5 km                                  | June to December (not mandatory)   | Far enough away, disturbance unlikely  |
| Raptor Nests – Threatened Species                  |        |                            |                          |                |              |                     |                                       |  |  |
| Martial eagle ( <i>Polemaetus bellicosus</i> )     | RNT2   | Active, unattended         | Karoobult 126 LQ         | -24.470090°    | 27.310364°   | 630 m               | 1 km / 500 m                          | June to December (eggs laid in June-July, nestling period 2.5-4 months).           | Martial Eagle Nest most important and options should be investigated to re-align to stay outside of 500 km minimum buffer and preferably out of the 1 km buffer. Time intensive construction activities to avoid this area during breeding season.                                   |
| Verreaux's Eagle ( <i>Aquila verreauxii</i> )      | RNT3   | Active, unattended         | Karoobult 126 LQ         | -24.485228°    | 27.359009°   | 4.25 km             | 1 km / 500 m                          |  |  |
| Secretary Bird ( <i>Sagittarius serpentarius</i> ) | RNT4   | Inactive, deconstructed    | Ruigtevley 97 KQ, Ptn. 5 | -24.314810°    | 27.444732°   | 450 m               | 1 km / 500 m                          |  |  |
| Raptor Nests – Non-threatened Species              |        |                            |                          |                |              |                     |                                       |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT1  | Active, unattended         | Mooivalei 342 KQ Rem 10  | -24.621873°    | 27.313946°   | 115 m               | 200 m / 100 m                         | August to January (egg laying peaks September-October, nestling period 2-3 months) | These are breeding migrants which are absent during winter months. If pipeline re-routing proves unfeasible from these species then ensure that the two nests which are situated less than 200 m from the pipeline are subject to temporal avoidance (especially October to January) |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT13 | Active, Attended, Breeding | Karoobult 126 LQ         | -24°27'58.77"S | 27°21'1.63"E | 1955                | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT2  | Active, unattended         | Buffelsvlei 127 KQ       | -24.432704°    | 27.354702°   | 1.25 km             | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT3  | Active, unattended         | Karoobult 126 LQ         | -24.453148°    | 27.346297°   | 450 m               | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT4  | Active, unattended         | Karoobult 126 LQ         | -24.478002°    | 27.349815°   | 3 km                | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT5  | Inactive, deconstructed    | Ruigtevley 97 KQ, Ptn. 5 | -24.334991°    | 27.448205°   | 79 m                | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT6  | Inactive, deconstructed    | Mabulskop 406 LQ Rem     | -23.980356°    | 27.412566°   | 1.63 km             | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT7  | Active, attended, breeding | Mabulskop 406 LQ Rem     | -23.994203°    | 27.434347°   | 3.55 km             | 200 m / 100 m                         |  |  |
| Wahlberg's eagle ( <i>Hieraaetus wahlbergi</i> )   | RNNT8  | Active, unattended         | Geelhoutskloof 359 LQ    | -23.781946°    | 27.469829°   | 3.98 km             |                                       |  |  |

## MCWAP-2

| Species  | Code  | Nest Status                              | Location                  | Latitude    | Longitude  | Distance from Route | Spatial Avoidance Preferred Minimum / | Temporal Avoidance | Notes   |
|--|-------|--|---------------------------|-------------|------------|---------------------|---------------------------------------|--------------------|---|
| Wahlberg's eagle ( <i>Hieraetus wahlbergi</i> )          | RNNT9 | Active, unattended                       | Uncertain                 | -23.726684° | 27.276801° | 14.8 km             |                                       |                    |   |
| <b>Point localities SCC individuals (not nests)</b>      |       |  |                           |             |            |                     |                                       |                    |   |
| Southern ground hornbill ( <i>Bucorvus leadbeateri</i> ) | SCC1  | Resident likely breeding                 | Tarantaalpan 132 KQ Ptn 1 | -24.375523° | 27.390125° | 3.7 km              | Avoid Ptn 1                           | -                  | Avoiding this farm should negate the need for temporal avoidance and other mitigation measures.   |
| White-Backed Vulture ( <i>Gyps africanus</i> )           | SCC2  | No nests detected                        | Colchester 17 KQ          | -24.085353° | 27.386085° | 3 km                | -                                     | -                  | No mitigation suggested as incidental sighting of perched bird not on nest..  |
| Black Stork ( <i>Ciconia nigra</i> )                     | SCC3  | Likely in Matlabas and Marakele Reserves | Schoonwater 950 KQ        | -24.096255° | 27.438688° | 1.9 km              | -                                     |                    | Keep to current route, placing between low-level bridge and railway servitude is optimal, keep disturbances to western side of servitude. |
| African Hawk-eagle ( <i>Aquila spilogaster</i> )         | SCC4  | -  | Pontes Estates 744 LQ Rem | -23.723090° | 27.428159° | 1.13 Km             | -                                     |                    | Distance precludes hard action.   |
| Shikra ( <i>Accipiter badius</i> )                       | SCC5  | -  | -                         | -23.889478° | 27.381593° | 2.3 km              | -                                     |                    | Distance precludes hard action.   |
| Pale Chanting Goshawk ( <i>Melierax canorus</i> )        | SCC6  | -  | -                         | -23.932492° | 27.376866° | 1.73 km             | -                                     |                    | Distance precludes hard action.   |
| <b>Suitable Raptor Nesting Habitat</b>                   |       |  |                           |             |            |                     |                                       |                    |   |
| Tall <i>Senegalia nigrescens</i> woodlands               | NH1   | -  | Statford 462 KQ Rem       | -24.545707° | 27.288933° | -                   | Keep east of road                     |                    |   |
| Tall <i>Senegalia nigrescens</i> woodlands               | NH2   | -  | Ruigtevly 97 KQ           | -24.316791° | 27.448844° | -                   | Limited                               |                    | Farms to east also sensitive.   |



## 12 Monitoring

### 12.1 General monitoring

The main aims of the avifaunal monitoring will be to gauge the success of the actions implemented to minimize loss and disturbances to local and migratory avifauna especially breeding SCC avifauna. The goal should be towards no SCC nest abandonment as a result of the project. As nest abandonment can be difficult to attribute to a single cause the measurable target will involve an assessment of the compliance with regards to the finalized avoidance strategies (spatial and temporal avoidances) and other mitigation measures committed to by the client (as specified by the avifaunal specialist and authorized by LEDET). Additionally, the monitoring study should include detailed monitoring of active nests situated within 1 km of the pipeline route and the data supplied to LEDET and the findings preferably published (at the clients' discretion) to actively contribute to the conservation of these species. This will necessitate a separate and additional scope of work to be conducted by an appropriately qualified and experienced avifaunal specialist. If relocation is required, the study will need to involve permitting. Additionally, any moved birds will need to be measured, ringed and preferably tracked via GPS telemetry. The specialist must as a minimum:

- Be SACNASP registered as a professional natural scientist in the field of Zoological Sciences;
- Have sufficient experience conducting avifaunal specialist studies or research (preferably > 5 years);
- Be proficient in GIS analysis;
- Be proficient with statistical analyses;
- Coordinate with relevant authorities (e.g. LEDET and EWT); and
- Telemetry experience preferable.

### 12.2 Noise Monitoring

Section 9.1 of this report identifies both the species prone to disturbances from excessive noise as well as the areas or hotspots where these species or sensitive receptors (e.g. raptor nests) tend to occur along the pipeline route.

In terms of disturbance-prone species, this report highlights 89 species as being prone to noise disturbances. Of these, 14 species are considered highly susceptible. These include African Fish Eagle, White-backed Vulture, Cape Vulture, Brown Snake Eagle, Pale Chanting Goshawk, Gabar Goshawk, Shikra, African Hawk Eagle, Booted Eagle, Wahlberg's Eagle, Martial Eagle, Black Stork, Red-crested Korhaan and Spotted Eagle-owl. These are all large-bodied, apex predatory, non-commensal species that (with the exception of Black Stork) are likely to breed on site.

The spatial distribution of the identified disturbance hotspots is provided in Figure 9-1. This figure shows that these areas coincide with all identified raptor nest sites as well as several areas where concentrations of disturbance prone species were particularly high. The spatial data of these areas can be provided to the specialist appointed to do the monitoring upon request.

It is recommended that the avifaunal monitoring to follow includes the monitoring of noise to gauge its effects on avifauna. The following is recommended with regards to noise monitoring from an avifaunal perspective:

- The avifaunal specialist appointed for monitoring should obtain pre-development baseline noise levels at each of the disturbance prone hotspots as identified in Figure 9-1.
- Noise levels should be recorded during construction at as many of the disturbance hotspots as practically possible while construction is happening.
- At disturbance hotspots readings should be taken at the construction site and then at 100 and 200 m distances from the site to gauge noise attenuation. It is recommended that the readings be taken by the noise specialist to avoid excessive duplication of fieldwork hours.
- During construction the bird specialist should monitor species richness and abundance by means of timed point counts in the same methodology as used in this report at as many of the high disturbance hotspots as practically possible. This should be done at preferably 30 noise impacted construction sites and 30 non-construction control sites (either in front of or behind the construction site, where construction noise and activity cannot be heard or seen by the observer). It would be preferable if samples could be taken at as many of the point count localities as used in this report for comparison with the baseline data, however this may prove difficult due to the slow progression of the construction line.
- This data can then be compared to baseline data for disturbance prone species at these points (which can be provided by The Biodiversity Company upon request).
- Nest attendance of all raptor nests along the pipeline (including presence of nesting bird/s or signs of recent presence in the form of droppings, chicks or fresh nest material) has already been recorded during the current survey (as a baseline). It is recommended that nest attendance be noted again post-construction (and where possible during construction) to assess any nest abandonment as a result of construction activities and then again during operation to assess whether this was temporary or permanent abandonment or whether nest attendance remained unaffected (or even inconclusive / unrelated).
- Refer to the mitigation and noise regulations as stipulated in the specialist noise impact assessment report.
- Adhere to the national SANS regulations regarding noise pollution.
- After applying all noise abatement and mitigation measures stipulated in the noise assessment if the results of the first season of monitoring surveys are showing a negative affect on avifaunal abundance and raptor nest attendance as a result of construction then it is recommended to employ temporal and if needed spatial avoidance of the remaining high disturbance hotspots.

Table 12-1 Recommended monitoring requirements.

| Environmental Parameters | Monitoring Locations                           | Requirements  |
|--------------------------|--|---|
| Avifauna (General)       | Re-survey all point count sampling localities. | <ul style="list-style-type: none"> <li>• Conduct standardized, timed point counts at the various locations that were established during the winter survey.</li> </ul> |

| Environmental Parameters | Monitoring Locations  | Requirements   |
|--------------------------|---|--|
|                          |   | <ul style="list-style-type: none"> <li>Data recorded at each point must include but not be limited to:               <ul style="list-style-type: none"> <li>Location / Site code</li> <li>Date, time</li> <li>Habitat</li> <li>Weather conditions</li> <li>Observer name</li> <li>Counts of all species detected within 100 m radius within 10 min period.</li> <li>Presence or absence of SCC nests.</li> <li>Activity (e.g. perched, flushed, commuting)</li> </ul> </li> </ul>  |
|                          | Re-visit all identified SCC nests and document any new nests encountered.   | <ul style="list-style-type: none"> <li>Data recorded at each nest site must include but not be limited to:               <ul style="list-style-type: none"> <li>Activity status (active / inactive)</li> <li>Breeding status (nest building, courtship, construction of inner wreath, eggs, young)</li> <li>Number of fledglings</li> <li>Fledgling age</li> <li>Nest diameter</li> <li>Nest depth</li> <li>Nest height above ground</li> <li>Tree species</li> <li>Prey supplied (if possible)</li> </ul> </li> </ul>             |
|                          | Re-visit all locations where SCC species were detected.   | Determine whether species is still present there or within vicinity.   |
|                          | Re-located birds  | <ul style="list-style-type: none"> <li>Same nesting data as above and;</li> <li>Any moved birds will need to be measured, ringed and preferably tracked via GPS telemetry</li> </ul>   |
| Noise                    | Preferably at all identified disturbance hotspots identified in sensitivity assessment otherwise conduct 30 samples near active construction and 30 far enough away not to hear the earthmoving machinery, again preferably at any of the established point count localities. Conduct nest attendance surveys at each of the identified raptor nest localities. | <ul style="list-style-type: none"> <li>Conduct standard point counts using the methodology used in this report.</li> <li>Survey nest attendance at known raptor nests (i.e. note presence or signs of attendance in form of droppings, fresh nest material or chicks).</li> <li>Correlate abundance and nest attendance information with noise data. Although it will be important to use noise data from noise specialist it is recommended that the avifaunal specialist take their own on site readings if possible.</li> </ul> |

### 12.3 Training

Training on how to identify SCC avifaunal nests that are likely to be encountered along route and what to do if a nest is encountered (if large SCC nests are encountered operations must be halted and the avifaunal specialist and ECO contacted for further advice). Each nest encountered will need to be photographed, and its position recorded by the avifaunal specialist. The on-site ECO will need to be informed so that the nest can be screened against the database of known nests and a way forward actioned accordingly (in line with the mitigation as set out in the CEMPr).

## 13 Conclusion

This study represents the culmination of two seasons' worth of dedicated point count bird surveying in all the major habitats along the length of the proposed pipeline route for the Mokolo Crocodile Water Augmentation Project Phase 2 (MCWAP-2). The assessment comprised both wet and dry season surveys. In total 2014 birds representing 177 species were counted from 150 point count samples spanning six habitats across the length of the pipeline route. An additional 7 species were added from anecdotal accounts provided by landowners. Species accumulation curves suggest adequate sampling effort and the inventory is deemed largely representative of the local avifaunal assemblages to be found along the pipeline routes. Species assemblages differed markedly between wet and dry season surveys. These findings highlighting the importance of multi-season surveys.

The six broad avifaunal habitats identified along the pipeline route included Pans and Dams, Riparian, Tall Thornveld, Open Thornveld, Rocky Outcrops and Transformed. Of these, diversity was highest (by a considerable margin) in the Pans and Dams habitat followed by Open Woodland, Tall Woodland, Riparian, Rocky and was lowest in Transformed habitats.

The proposed pipeline traverses large tracts of intact bushveld habitat. Here, at least 18 IUCN Red-listed species are considered highly likely to occur, a high number in the South African context. Moreover, most are Threatened species (those with a conservation status above Vulnerable). During the surveys, a total of six SCC were detected along the pipeline route and a further five SCC was confirmed based on strong anecdotal evidence provided by local landowners bringing the total confirmed SCC inventory to eleven. Of the various species perhaps the most threatened are the large-bodied raptors. White-backed Vulture for example are Critically Endangered. Sightings of these large raptors (and other vulture species) were, however, uncharacteristically scarce for the region and may be a manifestation of the drastically increased pressure on this species in recent years. The Waterberg mountains and particularly the Kranskop in Marakele support one of the largest colonies of Cape Vulture in Southern Africa. Another important trigger species along the route is the Southern Ground Hornbill. The species was re-introduced to Thaba Tholo Private Game Reserve as part of the Mabula Ground hornbill Project. These birds occur on farms Amsterdam 123 KQ., Tarantaalpan 132 KQ and Karoobuilt 126 KQ. All come from the Thaba Tholo group illustrating the wide-ranging nature of the species. Other important SCC observations included a flock of nine Yellow-billed Stork near the proposed weir along the Crocodile River near Thabazimbi and Black Stork from a pool along the Matlabas River.

Overall, the majority of SCC avifauna including Threatened raptor species and their nests were recorded in the southern half of the pipeline route. No nests of SCC or other raptor species were detected directly within the pipeline route, borrow pits or other related infrastructures (as provided) during the dry season survey. However, the pipeline route does pass through buffers assigned to both Threatened and non-Threatened raptor nests that were detected during the current survey. Of greatest significance in this regard is the Martial Eagle Nest on Karoobuilt 126 LQ. This nest is situated 630 m south of the proposed pipeline route which is placed to run within the Karoobuilt property before entering a servitude between the farms. The only other Threatened raptor species nest that intercepts the pipeline is that of Secretarybird on Mr Thinus' farm on Ruigtevley 97 KQ (Ptn. 5) however, this nest has been abandoned in recent years (last seen nesting on a low Acacia here in 2018). As such this



nesting site may not represent a problem as the species was again not detected during the summer survey. Most of the Wahlberg's Eagle nests (a breeding migrant) should be far enough from the route that disturbance capable of causing nest abandonment is deemed unlikely, under the assumption that construction passes these nests during winter when the birds are in the northern hemisphere.

Several areas considered to be important and sensitive from an avifaunal perspective were identified and mapped. These were based on a systematic layering process that took into account hotspots for disturbance prone species, localities of observed SCC and raptor nests, highly suitable tree and cliff nesting habitat for large-bodied raptors and lastly habitats identified as hosting unique and diverse avifaunal assemblages such as wetlands, rivers and riparian areas.

Overall, the project will inevitably result in the loss and fragmentation of sensitive avifaunal habitat. However, the majority of the proposed route parallels existing linear infrastructure servitudes. Disturbance will be the next most significant impact from an avifaunal perspective and particularly so for large bodied, predatory, locally breeding non-commensal species. Areas where these species occur in the highest abundances was modelled and included in the sensitivity mapping. However, the sensory disturbance associated with the increased noise, dust, vibrations and human presence are likely to be short lived. At this late stage in the project timeline, route re-alignment is an extremely difficult and contentious exercise. The developer needs to demonstrate efforts to avoid the identified sensitivity areas ranked as Very High and High or if they cannot be avoided then motivation as to why they cannot be avoided and what the trade-off will be needs to be put forward during the application to LEDET and DEFF.

Encouragingly, outright avoidance is not the only mitigation. The section on recommended management actions has been divided into scenarios designed to minimise disturbance to breeding SCC avifauna under scenarios where avoidance is feasible and where it is not. Under the first scenario one can minimize disturbance either by avoiding the nest by adhering to a spatial buffer or by timing the construction to pass the nest while the birds are not breeding at the nest. It is preferable to employ both spatial and temporal measures but a compromise of one or both may need to happen depending on project constraints. If the nest cannot be avoided at all that is when the avoidance not feasible scenario would apply. As we are dealing with species that are Threatened with extinction, we would need to involve LEDET in the decision and authorisation / permitting regarding the way forward and feasibility regarding the relocation of these species' nests.

It is important that the construction team be trained on how to identify SCC avifaunal nests that are likely to be encountered along route and what to do if a nest is encountered (if large SCC nests are encountered operations must be halted and the avifaunal specialist and ECO contacted for further advise). Avifaunal monitoring should continue through construction and for a period during operation to gauge the success of the actions implemented to minimize loss and disturbances to local and migratory avifauna especially breeding SCC avifauna. The monitoring study should include detailed monitoring of active nests situated within 1 km of the pipeline route and the data supplied to LEDET and the findings preferably published (at the clients' discretion) to actively contribute to the conservation of these species. This will necessitate a separate and additional scope of work to be conducted by an appropriately

qualified and experienced avifaunal specialist. If relocation is required, the study will need to involve permitting.

## 14 References

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## 15 Appendices

### **Appendix A Specialist declarations**

#### **DECLARATION**

I, Tyron Clark, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent

authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Tyron Clark

Pr. Sci. Nat. 121338 (Zoological Science)

The Biodiversity Company

November 2020



## Appendix B Avifauna species expected in the project area

| Common Name                  | Scientific Name                | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|------------------------------|--------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Common Ostrich               | <i>Struthio camelus</i>        |                                 |   |   | 1  | x            |           | x      |           | 67        |           |           |           |           | 75        |           |           |           | 33        |           | 50        |           |           |
| Coqui Francolin              | <i>Peliperdix coqui</i>        |                                 |   |   | 1  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Crested Francolin            | <i>Dendroperdix sephaena</i>   |                                 |   |   | 1  | x            |           | x      | 56        | 33        | 75        | 56        | 100       | 67        | 75        | 33        | 100       | 100       | 67        | 80        | 50        |           | 80        |
| Natal Spurfowl               | <i>Pternistis natalensis</i>   |                                 |   |   | 1  | x            |           | x      | 72        | 67        | 100       | 72        |           | 67        | 75        | 100       | 50        | 33        | 33        | 60        | 50        |           | 80        |
| Swainson's Spurfowl          | <i>Pternistis swainsonii</i>   |                                 |   |   | 1  | x            |           | x      | 50        | 67        | 0         | 50        | 50        | 67        | 50        |           | 50        | 67        | 33        |           | 50        |           | 20        |
| Helmeted Guineafowl          | <i>Numida meleagris</i>        |                                 |   |   | 1  | x            |           | x      | 61        | 100       | 25        | 61        | 50        | 33        | 75        |           | 50        | 33        | 67        | 60        | 100       |           | 80        |
| White-faced Whistling Duck   | <i>Dendrocygna viduata</i>     |                                 |   |   | 2  |              |           | x      |           | 33        |           |           |           | 33        | 50        |           |           |           |           |           |           |           | 20        |
| Egyptian Goose               | <i>Alopochen aegyptiaca</i>    |                                 |   |   | 1  | x            |           | x      | 17        | 67        |           | 17        |           | 33        | 100       |           |           |           | 33        | 20        |           |           |           |
| Spur-winged Goose            | <i>Plectropterus gambensis</i> |                                 |   |   | 1  | x            |           | x      | 17        |           |           | 17        |           | 0         | 25        |           |           |           |           | 20        |           |           |           |
| Knob-billed Duck             | <i>Sarkidiornis melanotos</i>  |                                 |   |   | 2  |              |           | x      | 11        |           |           | 11        |           |           | 50        |           |           |           |           |           |           |           |           |
| African Black Duck           | <i>Anas sparsa</i>             |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Yellow-billed Duck           | <i>Anas undulata</i>           |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Red-billed Teal              | <i>Anas erythrorhyncha</i>     |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Greater Honeyguide           | <i>Indicator indicator</i>     |                                 |   |   | 2  |              |           | x      |           |           | 25        |           |           | 33        |           |           |           |           |           |           |           |           | 20        |
| Lesser Honeyguide            | <i>Indicator minor</i>         |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |           |
| Bennett's Woodpecker         | <i>Campethera bennettii</i>    |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Golden-tailed Woodpecker     | <i>Campethera abingoni</i>     |                                 |   |   | 1  | x            |           | x      | 17        | 33        | 0         | 17        |           |           |           |           |           | 33        | 33        |           |           |           | 60        |
| Cardinal Woodpecker          | <i>Dendropicos fuscescens</i>  |                                 |   |   | 2  |              |           | x      | 11        |           | 50        | 11        | 50        | 33        | 50        | 33        | 50        |           |           |           |           |           | 20        |
| Bearded Woodpecker           | <i>Chloropicus namaquus</i>    |                                 |   |   | 1  | x            |           | x      | 11        | 33        | 0         | 11        | 0         | 33        | 25        |           | 50        | 33        | 0         | 20        | 50        |           | 20        |
| Yellow-fronted Tinkerbird    | <i>Pogoniulus chrysoconus</i>  |                                 |   |   | 1  |              |           | x      | 6         |           |           | 6         |           |           |           |           |           |           | 33        |           |           |           | 20        |
| Acacia Pied Barbet           | <i>Tricholaema leucomelas</i>  |                                 |   |   | 1  | x            |           | x      | 17        | 33        |           | 17        | 100       | 33        |           | 33        | 100       | 33        | 67        | 0         |           |           | 60        |
| Black-collared Barbet        | <i>Lybius torquatus</i>        |                                 |   |   | 1  | x            |           | x      | 17        | 33        | 50        | 17        | 50        |           | 25        |           |           |           | 0         |           | 50        |           | 20        |
| Black Stork                  | <i>Ciconia nigra</i>           | VU, LC                          |   |   | 1  | x            |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Crested Barbet               | <i>Trachyphonus vaillantii</i> |                                 |   |   | 1  | x            |           | x      | 50        | 33        | 25        | 50        |           | 33        | 0         | 33        |           | 33        | 33        | 60        | 50        |           | 20        |
| Southern Red-billed Hornbill | <i>Tockus rufirostris</i>      |                                 |   |   | 1  | x            |           | x      | 50        | 33        | 75        | 50        | 100       | 100       | 100       |           | 100       | 67        | 67        | 60        | 100       |           | 80        |

| Common Name                     | Scientific Name                 | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|---------------------------------|---------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Southern Yellow-billed Hornbill | <i>Tockus leucomelas</i>        |                                 |   |   | 1  | x            |           | x      | 72        | 67        | 75        | 72        | 100       | 33        | 75        | 67        | 100       | 67        | 100       | 60        | 100       |           | 100       |
| African Grey Hornbill           | <i>Lophoceros nasutus</i>       |                                 |   |   | 1  | x            |           | x      | 89        | 67        | 100       | 89        | 100       | 67        | 100       | 33        | 50        | 33        | 100       | 100       | 100       |           | 80        |
| Southern Ground-hornbill        | <i>Bucorvus leadbeateri</i>     | EN, VU                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| African Hoopoe                  | <i>Upupa africana</i>           |                                 |   |   | 1  | x            |           | x      | 17        | 67        |           | 17        |           | 33        | 75        |           | 50        |           |           |           |           |           | 60        |
| Green Wood-hoopoe               | <i>Phoeniculus purpureus</i>    |                                 |   |   | 1  | x            |           | x      | 44        | 67        | 75        | 44        | 50        |           | 50        | 33        | 100       | 100       | 67        | 40        |           |           | 20        |
| Common Scimitarbill             | <i>Rhinopomastus cyanomelas</i> |                                 |   |   | 2  |              |           | x      | 17        | 33        | 25        | 17        |           | 33        | 100       |           | 50        | 0         | 33        | 0         |           |           | 40        |
| European Roller                 | <i>Coracias garrulus</i>        | NT, LC                          |   |   | 2  |              |           | x      |           |           |           |           |           | 33        | 0         |           | 50        | 0         |           | 20        |           |           |           |
| Lilac-breasted Roller           | <i>Coracias caudatus</i>        |                                 |   |   | 1  | x            |           | x      | 56        | 67        | 50        | 56        |           | 100       | 75        | 100       | 100       | 67        | 67        | 60        | 100       |           | 40        |
| Purple Roller                   | <i>Coracias naevius</i>         |                                 |   |   | 1  | x            |           | x      | 33        |           | 25        | 33        | 50        | 67        | 25        | 33        | 50        | 33        | 33        | 40        | 50        |           | 60        |
| Half-collared Kingfisher        | <i>Alcedo semitorquata</i>      | NT, LC                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Malachite Kingfisher            | <i>Corythornis cristatus</i>    |                                 |   |   | 1  | x            |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| Grey-headed Kingfisher          | <i>Halcyon leucocephala</i>     |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Woodland Kingfisher             | <i>Halcyon senegalensis</i>     |                                 |   |   | 1  | x            |           | x      | 50        | 33        |           | 50        |           |           | 25        | 33        |           |           |           | 40        |           |           |           |
| Brown-hooded Kingfisher         | <i>Halcyon albiventris</i>      |                                 |   |   | 1  | x            |           | x      | 61        | 33        | 25        | 61        |           | 33        | 75        |           | 50        | 33        | 67        |           | 50        |           | 60        |
| Striped Kingfisher              | <i>Halcyon chelicuti</i>        |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           | 33        |           |           |           |           |           |           |           |           |           |
| Giant Kingfisher                | <i>Megaceryle maxima</i>        |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Pied Kingfisher                 | <i>Ceryle rudis</i>             |                                 |   |   | 1  | x            |           | x      | 28        |           |           | 28        |           | 33        | 100       | 67        |           |           |           |           |           |           | 20        |
| White-fronted Bee-eater         | <i>Merops bullockoides</i>      |                                 |   |   | 1  | x            |           | x      | 56        |           |           | 56        | 0         | 33        | 25        | 33        |           |           | 33        |           |           |           | 80        |
| Little Bee-eater                | <i>Merops pusillus</i>          |                                 |   |   | 1  | x            |           | x      | 6         |           | 25        | 6         |           |           | 50        |           | 0         | 0         | 33        | 20        |           |           | 20        |
| Swallow-tailed Bee-eater        | <i>Merops hirundineus</i>       |                                 |   |   | 1  | x            |           | x      |           |           |           |           | 50        | 33        | 50        | 33        |           |           | 33        |           |           |           | 0         |
| European Bee-eater              | <i>Merops apiaster</i>          |                                 |   |   | 1  | x            |           | x      | 50        | 33        | 50        | 50        | 0         | 67        | 25        | 33        | 50        | 33        | 33        | 60        |           |           | 40        |
| Southern Carmine Bee-eater      | <i>Merops nubicoides</i>        |                                 |   |   | 3  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| White-backed Mousebird          | <i>Colius colius</i>            |                                 |   |   | 1  | x            |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Speckled Mousebird              | <i>Colius striatus</i>          |                                 |   |   | 1  |              |           | x      | 28        |           |           | 28        | 50        |           |           |           |           | 33        | 33        |           |           |           |           |
| Red-faced Mousebird             | <i>Urocolius indicus</i>        |                                 |   |   | 1  | x            |           | x      | 33        | 0         | 25        | 33        | 50        | 33        | 25        | 33        | 100       | 100       | 67        |           | 100       |           | 60        |

| Common Name             | Scientific Name                | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|-------------------------|--------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Jacobin Cuckoo          | <i>Clamator jacobinus</i>      |                                 |   |   | 2  |              |           | x      | 22        | 33        | 25        | 22        |           | 33        | 0         |           |           |           |           | 20        |           |           |           |
| Levaillant's Cuckoo     | <i>Clamator levaillantii</i>   |                                 |   |   | 2  |              |           | x      | 6         | 0         |           | 6         |           |           |           |           |           | 0         |           | 20        |           |           |           |
| Red-chested Cuckoo      | <i>Cuculus solitarius</i>      |                                 |   |   | 1  | x            |           | x      | 44        |           | 50        | 44        |           |           |           |           |           |           |           | 40        |           |           |           |
| Black Cuckoo            | <i>Cuculus clamosus</i>        |                                 |   |   | 1  |              |           | x      |           | 33        | 50        |           |           | 33        |           |           | 50        |           |           |           |           |           |           |
| African Cuckoo          | <i>Cuculus gularis</i>         |                                 |   |   | 3  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Klaas's Cuckoo          | <i>Chrysococcyx klaas</i>      |                                 |   |   | 1  |              |           | x      | 17        | 33        | 25        | 17        |           |           |           |           |           |           |           |           |           |           |           |
| Diederik Cuckoo         | <i>Chrysococcyx caprius</i>    |                                 |   |   | 1  |              |           | x      | 33        | 33        | 25        | 33        |           | 33        | 25        |           |           |           | 33        |           |           |           | 40        |
| Burchell's Coucal       | <i>Centropus burchellii</i>    |                                 |   |   | 1  | x            |           | x      | 28        |           |           | 28        |           | 0         | 50        | 33        | 50        |           |           |           |           |           | 20        |
| Meyer's Parrot          | <i>Poicephalus meyeri</i>      |                                 |   |   | 1  | x            |           | x      | 44        | 33        |           | 44        |           |           |           |           |           |           |           |           | 50        |           |           |
| African Palm Swift      | <i>Cypsiurus parvus</i>        |                                 |   |   | 1  | x            |           | x      |           | 33        |           |           |           |           |           |           |           |           | 33        |           |           |           | 20        |
| Alpine Swift            | <i>Tachymarpis melba</i>       |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Common Swift            | <i>Apus apus</i>               |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           |           |           | 50        |           |           |           |           |           |           |
| African Black Swift     | <i>Apus barbatus</i>           |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Little Swift            | <i>Apus affinis</i>            |                                 |   |   | 1  | x            |           | x      | 11        | 0         |           | 11        | 100       | 67        |           | 33        | 100       |           | 33        |           |           |           | 40        |
| White-rumped Swift      | <i>Apus caffer</i>             |                                 |   |   | 1  | x            |           | x      |           | 0         |           |           | 0         | 33        | 0         | 67        | 50        |           | 33        | 20        |           |           | 20        |
| Grey Go-away-bird       | <i>Corythaixoides concolor</i> |                                 |   |   | 1  | x            |           | x      | 94        | 100       | 100       | 94        | 100       | 33        | 75        | 67        | 100       | 100       | 67        | 100       | 100       |           | 100       |
| African Scops owl       | <i>Otus senegalensis</i>       |                                 |   |   | 2  |              | x         | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| Spotted Eagle-owl       | <i>Bubo africanus</i>          |                                 |   |   | 1  | x            |           |        |           |           |           |           |           |           |           |           |           | 0         |           |           |           |           |           |
| Verreaux's Eagle-owl    | <i>Bubo lacteus</i>            |                                 |   |   | 2  |              | x         |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Pearl-spotted Owlet     | <i>Glaucidium perlatum</i>     |                                 |   |   | 1  | x            |           | x      | 6         | 33        |           | 6         |           | 33        | 25        |           | 50        | 33        | 33        |           |           |           |           |
| Fiery-necked Nightjar   | <i>Caprimulgus pectoralis</i>  |                                 |   |   | 1  |              | x         | x      |           |           |           |           |           |           | 50        | 33        |           |           |           |           |           |           |           |
| Freckled Nightjar       | <i>Caprimulgus tristigma</i>   |                                 |   |   | 2  |              | x         | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Rufous-cheeked Nightjar | <i>Caprimulgus rufigena</i>    |                                 |   |   | 2  |              |           | x      |           | 33        |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Rock Dove               | <i>Columba livia</i>           |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           |           |           | 50        |           | 20        |
| Speckled Pigeon         | <i>Columba guinea</i>          |                                 |   |   | 2  |              |           | x      | 6         | 33        |           | 6         | 0         | 33        | 50        |           |           |           | 0         | 20        |           |           |           |
| Laughing Dove           | <i>Spilopelia senegalensis</i> |                                 |   |   | 1  | x            |           | x      | 100       | 67        | 100       | 100       | 100       | 100       | 75        | 33        | 50        | 67        | 67        | 100       | 100       |           | 100       |

| Common Name                | Scientific Name                  | Status<br>(Regional,<br>Global) | S | E | LO | Point<br>Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|----------------------------|----------------------------------|---------------------------------|---|---|----|-----------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Cape Turtle Dove           | <i>Streptopelia capicola</i>     |                                 |   |   | 1  | x               |           | x      | 89        | 67        | 100       | 89        | 100       | 100       | 75        | 67        | 100       | 100       | 67        | 100       | 100       |           | 100       |
| Red-eyed Dove              | <i>Streptopelia semitorquata</i> |                                 |   |   | 1  | x               |           | x      | 83        | 67        | 25        | 83        |           | 67        | 50        |           | 50        |           | 33        | 60        | 50        |           | 60        |
| Emerald-spotted Wood Dove  | <i>Turtur chalcospilos</i>       |                                 |   |   | 1  | x               |           | x      | 83        | 33        | 50        | 83        | 50        | 100       | 50        | 100       | 100       |           | 67        | 40        | 100       |           | 60        |
| Namaqua Dove               | <i>Oena capensis</i>             |                                 |   |   | 1  | x               |           | x      | 11        | 33        |           | 11        |           |           | 50        |           | 50        | 0         | 33        | 40        | 100       |           | 80        |
| African Green Pigeon       | <i>Treron calvus</i>             |                                 |   |   | 2  |                 |           | x      | 11        |           |           | 11        |           |           |           |           |           |           |           |           |           |           |           |
| Kori Bustard               | <i>Ardeotis kori</i>             | NT, NT                          |   |   | 2  |                 | x         | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Kori Bustard               | <i>Ardeotis kori</i>             | NT, NT                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Red-crested Korhaan        | <i>Lophotis ruficrista</i>       |                                 |   |   | 1  | x               |           | x      |           | 33        | 25        |           | 50        | 33        | 100       |           | 50        | 33        | 67        | 0         | 100       |           | 60        |
| White-bellied Korhaan      | <i>Eupodotis senegalensis</i>    | VU, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| African Finfoot            | <i>Podica senegalensis</i>       | VU, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Black Crake                | <i>Amauromis flavirostra</i>     |                                 |   |   | 1  | x               |           | x      |           |           |           |           |           | 33        | 50        |           |           |           | 33        |           |           |           | 20        |
| Common Moorhen             | <i>Gallinula chloropus</i>       |                                 |   |   | 1  | x               |           | x      |           | 33        |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Red-knobbed Coot           | <i>Fulica cristata</i>           |                                 |   |   | 1  | x               |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Yellow-throated Sandgrouse | <i>Pterocles gutturalis</i>      | NT, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Double-banded Sandgrouse   | <i>Pterocles bicinctus</i>       |                                 |   |   | 1  | x               | x         | x      |           |           |           |           |           |           | 75        |           |           |           | 33        |           |           |           |           |
| Marsh Sandpiper            | <i>Tringa stagnatilis</i>        |                                 |   |   | 2  |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Common Greenshank          | <i>Tringa nebularia</i>          |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Wood Sandpiper             | <i>Tringa glareola</i>           |                                 |   |   | 1  | x               |           | x      |           |           |           |           |           |           | 25        |           |           |           | 33        |           |           |           | 20        |
| Common Sandpiper           | <i>Actitis hypoleucos</i>        |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           | 67        |           |           |           |           |
| Little Stint               | <i>Calidris minuta</i>           |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Greater Painted-snipe      | <i>Rostratula benghalensis</i>   | NT, LC                          |   |   | 2  |                 |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| Greater Painted-snipe      | <i>Rostratula benghalensis</i>   | NT, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| African Jacana             | <i>Actophilornis africanus</i>   |                                 |   |   | 1  |                 |           | x      |           |           |           |           |           | 33        | 50        | 67        |           |           |           |           |           |           |           |
| Water Thick-knee           | <i>Burhinus vermiculatus</i>     |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           | 75        |           |           |           | 33        |           |           |           |           |
| Spotted Thick-knee         | <i>Burhinus capensis</i>         |                                 |   |   | 1  | x               |           | x      |           | 67        |           |           |           | 33        | 25        |           |           |           |           | 20        |           |           |           |
| Black-winged Stilt         | <i>Himantopus himantopus</i>     |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           | 33        | 20        |           |           |           |



| Common Name               | Scientific Name                 | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|---------------------------|---------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Kittlitz's Plover         | <i>Charadrius pecuarius</i>     |                                 |   |   | 3  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Three-banded Plover       | <i>Charadrius tricollaris</i>   |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           | 33        | 50        | 33        |           |           | 33        |           |           |           |           |
| Blacksmith Lapwing        | <i>Vanellus armatus</i>         |                                 |   |   | 1  | x            |           | x      | 22        | 67        |           | 22        |           | 33        | 100       |           |           |           | 33        | 20        | 100       |           | 80        |
| African Wattled Lapwing   | <i>Vanellus senegallus</i>      |                                 |   |   | 1  | x            |           | x      | 6         |           |           | 6         |           | 33        | 75        |           |           |           |           |           |           |           |           |
| Crowned Lapwing           | <i>Vanellus coronatus</i>       |                                 |   |   | 1  | x            |           | x      | 50        | 33        | 75        | 50        |           | 33        | 75        | 33        |           | 67        |           | 40        |           |           | 40        |
| Temminck's Courser        | <i>Cursorius temminckii</i>     |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Black-winged Pratincole   | <i>Glareola nordmanni</i>       | NT, NT                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| White-winged Tern         | <i>Chlidonias leucopterus</i>   |                                 |   |   | 3  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Western Osprey            | <i>Pandion haliaetus</i>        |                                 |   |   | 3  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Black-winged Kite         | <i>Elanus caeruleus</i>         |                                 |   |   | 2  |              |           | x      | 28        |           |           | 28        |           | 33        |           | 33        |           |           |           |           |           |           | 20        |
| Yellow-billed Kite        | <i>Milvus aegyptius</i>         |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           | 1         |           |           |           |           |
| African Fish Eagle        | <i>Haliaeetus vocifer</i>       |                                 |   |   | 1  | x            | x         | x      | 39        |           |           | 39        | 50        |           | 100       | 33        |           |           | 33        |           | 50        |           | 40        |
| White-backed Vulture      | <i>Gyps africanus</i>           | CR, CR                          |   |   | 1  | x            | x         | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Cape Vulture              | <i>Gyps coprotheres</i>         | EN, EN                          |   |   | 1  | x            | x         | x      |           |           | 25        |           | 50        |           |           |           |           |           |           | 20        |           |           |           |
| Lappet-faced Vulture      | <i>Torgos tracheliotos</i>      | EN, EN                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Black-chested Snake Eagle | <i>Circaetus pectoralis</i>     |                                 |   |   | 2  |              |           | x      |           |           |           |           |           | 33        |           |           | 50        |           |           |           |           |           |           |
| Brown Snake Eagle         | <i>Circaetus cinereus</i>       |                                 |   |   | 1  |              | x         | x      | 6         |           | 25        | 6         |           | 67        | 25        |           | 50        |           |           |           | 50        |           | 20        |
| Bateleur                  | <i>Terathopius ecaudatus</i>    | EN, NT                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| African Marsh Harrier     | <i>Circus ranivorus</i>         | EN, LC                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| African Harrier-Hawk      | <i>Polyboroides typus</i>       |                                 |   |   | 1  |              | x         | x      |           |           |           |           |           | 33        |           |           |           |           |           |           |           |           |           |
| Lizard Buzzard            | <i>Kaupifalco monogrammicus</i> |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Pale Chanting Goshawk     | <i>Melierax canorus</i>         |                                 |   |   | 1  |              |           | x      |           |           |           |           |           |           | 100       | 33        |           |           |           |           |           |           |           |
| Gabar Goshawk             | <i>Micronisus gabar</i>         |                                 |   |   | 1  |              |           | x      | 17        |           |           | 17        |           |           | 25        |           |           |           | 0         |           | 50        |           | 20        |
| Shikra                    | <i>Accipiter badius</i>         |                                 |   |   | 1  |              |           | x      |           |           |           |           |           | 33        |           |           |           |           |           |           |           |           |           |
| Little Sparrowhawk        | <i>Accipiter minullus</i>       |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           | 33        |           |           |           |           |           |

| Common Name               | Scientific Name                 | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|---------------------------|---------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Common (Steppe) Buzzard   | <i>Buteo buteo</i>              |                                 |   |   | 2  |              |           | x      | 22        |           |           | 22        |           | 33        |           |           |           |           |           | 20        |           |           |           |
| Steppe Eagle              | <i>Aquila nipalensis</i>        | LC, EN                          |   |   | 2  |              |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Tawny Eagle               | <i>Aquila rapax</i>             | EN, VU                          |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| African Hawk Eagle        | <i>Aquila spilogaster</i>       |                                 |   |   | 1  | x            | x         | x      |           |           |           |           | 50        |           | 25        |           |           |           | 33        |           | 50        |           |           |
| Booted Eagle              | <i>Hieraaetus pennatus</i>      |                                 |   |   | 1  | x            |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Wahlberg's Eagle          | <i>Hieraaetus wahlbergi</i>     |                                 |   |   | 1  | x            | x         | x      |           | 33        | 25        |           |           |           |           |           | 50        |           | 67        |           |           |           |           |
| Martial Eagle             | <i>Polemaetus bellicosus</i>    | EN, VU                          |   |   | 1  |              | x         |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Martial Eagle             | <i>Polemaetus bellicosus</i>    | EN, VU                          |   |   |    |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Secretarybird             | <i>Sagittarius serpentarius</i> | VU, VU                          |   |   | 2  |              | x         | x      |           |           |           |           |           |           | 25        | 33        |           |           |           |           |           |           |           |
| Lesser Kestrel            | <i>Falco naumanni</i>           |                                 |   |   | 3  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Amur Falcon               | <i>Falco amurensis</i>          |                                 |   |   | 2  |              |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           | 40        |           |           |           |
| Lanner Falcon             | <i>Falco biarmicus</i>          | VU, LC                          |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Little Grebe              | <i>Tachybaptus ruficollis</i>   |                                 |   |   | 1  | x            |           | x      | 6         |           |           | 6         |           |           | 50        |           |           |           | 33        |           |           |           | 40        |
| African Darter            | <i>Anhinga rufa</i>             |                                 |   |   | 1  | x            |           | x      | 11        |           |           | 11        |           | 0         | 75        |           |           |           |           |           |           |           |           |
| Reed Cormorant            | <i>Microcarbo africanus</i>     |                                 |   |   | 1  | x            |           | x      | 17        |           |           | 17        |           | 33        | 100       | 67        |           |           |           |           |           |           |           |
| White-breasted Cormorant  | <i>Phalacrocorax lucidus</i>    |                                 |   |   | 2  |              |           | x      | 11        |           |           | 11        |           | 33        | 75        |           |           |           |           |           |           |           | 20        |
| Great Egret               | <i>Ardea alba</i>               |                                 |   |   | 2  |              |           |        |           |           |           |           |           | 0         |           |           |           |           |           |           |           |           |           |
| Grey Heron                | <i>Ardea cinerea</i>            |                                 |   |   | 1  | x            |           | x      | 17        |           |           | 17        |           |           | 50        |           |           |           |           |           |           |           |           |
| Black-headed Heron        | <i>Ardea melanocephala</i>      |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Purple Heron              | <i>Ardea purpurea</i>           |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Western Cattle Egret      | <i>Bubulcus ibis</i>            |                                 |   |   | 1  | x            |           | x      | 17        | 0         |           | 17        |           | 67        |           |           |           |           |           |           | 50        |           | 20        |
| Squacco Heron             | <i>Ardeola ralloides</i>        |                                 |   |   | 2  |              |           | x      |           |           |           |           |           | 33        |           |           |           |           |           |           |           |           |           |
| Green-backed Heron        | <i>Butorides striata</i>        |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           | 0         | 50        | 67        |           |           |           | 20        |           |           |           |
| Black-crowned Night Heron | <i>Nycticorax nycticorax</i>    |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Little Bittern            | <i>Ixobrychus minutus</i>       |                                 |   |   | 2  |              |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Dwarf Bittern             | <i>Ixobrychus sturmii</i>       |                                 |   |   | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |

| Common Name                 | Scientific Name                     | Status<br>(Regional,<br>Global) | S | E | LO | Point<br>Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|-----------------------------|-------------------------------------|---------------------------------|---|---|----|-----------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Hamerkop                    | <i>Scopus umbretta</i>              |                                 |   |   | 1  | x               |           | x      | 11        |           |           | 11        |           |           | 50        | 0         |           |           | 33        |           |           |           | 0         |
| Hadedda Ibis                | <i>Bostrychia hagedash</i>          |                                 |   |   | 1  | x               |           | x      | 33        | 33        |           | 33        |           | 67        | 50        |           | 50        |           | 33        | 20        |           |           | 0         |
| African Spoonbill           | <i>Platalea alba</i>                |                                 |   |   | 3  |                 |           | x      |           |           |           |           |           |           | 75        |           |           |           |           |           |           |           |           |
| Yellow-billed Stork         | <i>Mycteria ibis</i>                |                                 |   |   | 1  | x               |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Yellow-billed Stork         | <i>Mycteria ibis</i>                | EN, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Black Stork                 | <i>Ciconia nigra</i>                | VU, LC                          |   |   |    |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Abdim's Stork               | <i>Ciconia abdimii</i>              | NT, LC                          |   |   | 2  |                 |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| White Stork                 | <i>Ciconia ciconia</i>              |                                 |   |   | 2  |                 | x         | x      | 17        |           |           | 17        |           |           |           | 33        |           |           |           | 40        |           |           |           |
| Marabou Stork               | <i>Leptoptilos crumenifer</i>       | NT, LC                          |   |   | 3  |                 |           | x      | 6         |           |           | 6         |           | 0         |           |           |           |           |           |           |           |           |           |
| Eurasian Golden Oriole      | <i>Oriolus oriolus</i>              |                                 |   |   | 3  |                 |           | x      |           | 33        | 25        |           |           |           |           |           |           |           |           |           |           |           |           |
| Black-headed Oriole         | <i>Oriolus larvatus</i>             |                                 |   |   | 1  | x               |           | x      | 33        |           | 25        | 33        |           |           | 50        |           | 100       |           | 33        |           |           |           | 40        |
| Fork-tailed Drongo          | <i>Dicrurus adsimilis</i>           |                                 |   |   | 1  | x               |           | x      | 94        | 100       | 75        | 94        | 100       | 100       | 100       | 33        | 100       | 100       | 100       | 80        | 100       |           | 80        |
| African Paradise Flycatcher | <i>Terpsiphone viridis</i>          |                                 |   |   | 1  | x               |           | x      | 22        | 33        | 25        | 22        |           | 33        | 50        | 67        | 50        |           |           | 20        |           |           | 20        |
| Brubru                      | <i>Nilaus afer</i>                  |                                 |   |   | 1  | x               |           | x      |           | 33        | 25        |           | 100       | 67        | 50        | 100       | 100       | 33        | 33        | 20        | 50        |           | 40        |
| Black-backed Puffback       | <i>Dryoscopus cubla</i>             |                                 |   |   | 1  | x               |           | x      | 44        | 67        | 75        | 44        | 100       | 33        | 100       |           | 100       | 33        | 100       |           | 50        |           | 60        |
| Black-crowned Tchagra       | <i>Tchagra senegalus</i>            |                                 |   |   | 1  | x               |           | x      | 11        |           |           | 11        |           |           |           |           |           |           | 33        |           |           |           |           |
| Brown-crowned Tchagra       | <i>Tchagra australis</i>            |                                 |   |   | 1  | x               |           | x      | 28        | 33        | 50        | 28        | 50        | 100       | 25        | 33        | 100       | 33        | 67        | 60        | 50        |           | 80        |
| Southern Boubou             | <i>Laniarius ferrugineus</i>        |                                 |   |   | 1  | x               |           | x      | 22        |           | 50        | 22        |           |           |           |           |           |           |           |           |           |           |           |
| Crimson-breasted Shrike     | <i>Laniarius atrococcineus</i>      |                                 |   |   | 1  | x               |           | x      | 72        | 33        | 50        | 72        | 100       | 100       | 50        | 33        | 100       | 33        | 0         | 60        | 100       |           | 60        |
| Orange-breasted Bush-shrike | <i>Chlorophoneus sulfureopectus</i> |                                 |   |   | 1  | x               |           | x      | 44        | 33        | 50        | 44        | 50        | 33        | 25        |           |           |           | 33        | 20        | 50        |           | 40        |
| Grey-headed Bush-shrike     | <i>Malaconotus blanchoti</i>        |                                 |   |   | 2  |                 |           | x      | 17        | 33        | 50        | 17        |           |           |           |           | 50        |           |           | 20        |           |           |           |
| White-crested Helmet-shrike | <i>Prionops plumatus</i>            |                                 |   |   | 1  | x               |           | x      | 6         |           | 25        | 6         |           |           |           |           |           | 0         | 33        | 20        |           |           | 20        |
| Chinspot Batis              | <i>Batis molitor</i>                |                                 |   |   | 1  | x               |           | x      | 67        | 67        | 100       | 67        | 100       | 100       | 100       | 67        | 100       | 67        | 100       | 100       | 100       |           | 100       |
| Pied Crow                   | <i>Corvus albus</i>                 |                                 |   |   | 1  |                 |           | x      |           |           |           |           |           |           |           |           | 50        |           |           |           |           |           | 20        |
| Red-backed Shrike           | <i>Lanius collurio</i>              |                                 |   |   | 2  |                 |           | x      | 33        | 67        | 50        | 33        | 0         | 33        | 25        | 33        | 100       | 33        | 33        | 60        |           |           | 40        |

| Common Name                   | Scientific Name                  | Status<br>(Regional,<br>Global) | S | E  | LO | Point<br>Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|-------------------------------|----------------------------------|---------------------------------|---|----|----|-----------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Lesser Grey Shrike            | <i>Lanius minor</i>              |                                 |   |    | 2  |                 |           | x      | 44        |           |           | 44        |           | 67        | 25        | 33        |           | 33        |           | 40        |           |           | 40        |
| Southern (Common) Fiscal      | <i>Lanius collaris</i>           |                                 |   |    | 1  |                 |           | x      |           |           |           |           |           |           |           |           |           |           |           | 20        |           |           |           |
| Magpie Shrike                 | <i>Urolestes melanoleucus</i>    |                                 |   |    | 1  | x               |           | x      | 56        | 67        | 50        | 56        | 100       | 67        |           | 100       | 100       | 33        | 33        | 20        |           |           | 60        |
| Southern White-crowned Shrike | <i>Eurocephalus anguitimens</i>  |                                 |   |    | 1  | x               |           | x      | 17        | 0         | 25        | 17        | 50        | 67        | 50        |           | 50        | 67        |           | 20        | 50        |           | 100       |
| Black Cuckooshrike            | <i>Campephaga flava</i>          |                                 |   |    | 2  |                 |           | x      |           |           | 25        |           |           |           |           | 33        | 50        |           |           |           |           |           |           |
| Grey Penduline-tit            | <i>Anthoscopus caroli</i>        |                                 |   |    | 3  |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Cape Penduline-tit            | <i>Anthoscopus minutus</i>       |                                 |   |    | 3  |                 |           | x      |           |           |           |           |           |           |           |           | 50        |           |           |           | 50        |           |           |
| Southern Black Tit            | <i>Melaniparus niger</i>         |                                 |   |    | 1  | x               |           | x      | 11        | 33        | 75        | 11        |           | 33        | 25        |           | 100       | 33        | 33        |           | 50        |           | 60        |
| Ashy Tit                      | <i>Melaniparus cinerascens</i>   |                                 |   |    | 2  |                 |           | x      |           | 0         |           |           |           | 33        |           | 33        | 50        | 0         |           | 0         |           |           |           |
| Brown-throated Martin         | <i>Riparia paludicola</i>        |                                 |   |    | 1  | x               |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           | 20        |
| Barn Swallow                  | <i>Hirundo rustica</i>           |                                 |   |    | 1  | x               |           | x      | 44        | 67        | 50        | 44        | 0         | 100       | 25        | 100       | 100       | 33        | 67        | 40        |           |           | 40        |
| White-throated Swallow        | <i>Hirundo albigularis</i>       |                                 |   |    | 1  |                 |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Pearl-breasted Swallow        | <i>Hirundo dimidiata</i>         |                                 |   |    | 2  |                 |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Greater Striped Swallow       | <i>Cecropis cucullata</i>        |                                 |   |    | 1  | x               |           | x      | 6         | 33        | 100       | 6         |           |           | 0         |           |           |           | 33        | 40        |           |           |           |
| Lesser Striped Swallow        | <i>Cecropis abyssinica</i>       |                                 |   |    | 1  | x               |           | x      | 33        | 0         | 25        | 33        | 50        | 67        | 75        | 33        | 50        |           | 100       | 40        |           |           | 60        |
| Red-breasted Swallow          | <i>Cecropis semirufa</i>         |                                 |   |    | 2  |                 |           | x      | 28        | 67        | 0         | 28        | 50        | 67        | 25        | 33        |           |           | 33        | 40        |           |           | 20        |
| Rock Martin                   | <i>Ptyonoprogne fuligula</i>     |                                 |   |    | 4  |                 |           | x      |           |           |           |           | 50        |           |           |           |           |           |           |           |           |           |           |
| Dark-capped Bulbul            | <i>Pycnonotus tricolor</i>       |                                 |   |    | 1  | x               |           | x      | 28        |           | 100       | 28        | 50        | 33        | 75        | 33        |           | 33        |           |           | 100       |           | 40        |
| African Red-eyed Bulbul       | <i>Pycnonotus nigricans</i>      |                                 |   |    | 4  |                 |           | x      |           |           |           |           |           |           |           |           | 50        | 33        |           |           |           |           |           |
| Yellow-bellied Greenbul       | <i>Chlorocichla flaviventris</i> |                                 |   |    | 1  | x               |           | x      |           | 33        | 25        |           |           | 33        |           |           |           |           |           |           |           |           |           |
| Fairy Flycatcher              | <i>Stenostira scita</i>          |                                 |   | NE | 3  |                 |           | x      |           |           |           |           |           |           | 25        |           |           |           |           |           |           |           |           |
| Long-billed Crombec           | <i>Sylvietta rufescens</i>       |                                 |   |    | 1  | x               |           | x      | 61        | 33        | 50        | 61        | 100       | 100       | 50        |           | 100       | 67        | 100       | 60        | 100       |           | 100       |
| Yellow-bellied Eremomela      | <i>Eremomela icteropygialis</i>  |                                 |   |    | 1  | x               |           | x      |           |           |           |           |           | 33        |           |           | 50        |           |           |           |           |           |           |
| Burnt-necked Eremomela        | <i>Eremomela usticollis</i>      |                                 |   |    | 1  | x               |           | x      |           | 33        | 25        |           | 50        | 67        | 75        | 33        | 100       | 67        | 0         | 0         |           |           | 60        |
| Little Rush Warbler           | <i>Bradypterus baboecala</i>     |                                 |   |    | 2  |                 |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Marsh Warbler                 | <i>Acrocephalus palustris</i>    |                                 |   |    | 2  |                 |           | x      |           |           |           |           | 0         |           |           |           |           |           |           |           |           |           | 20        |



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|--|------------------------------------|---------------------------------|---|----|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Lesser Swamp Warbler                     | <i>Acrocephalus gracilirostris</i> |                                 |   |    | 1  | x            |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Willow Warbler                           | <i>Phylloscopus trochilus</i>      |                                 |   |    | 1  | x            |           | x      |           | 33        | 25        |           | 0         | 33        |           |           | 100       | 33        | 33        | 0         |           |           | 20        |
| Southern Pied Babbler                    | <i>Turdoides bicolor</i>           |                                 |   |    | 1  | x            |           | x      | 56        | 33        | 25        | 56        | 50        | 67        | 50        | 33        | 100       |           | 33        | 100       |           |           | 20        |
| Arrow-marked Babbler                     | <i>Turdoides jardineii</i>         |                                 |   |    | 1  | x            |           | x      | 78        | 67        | 75        | 78        | 50        | 33        | 50        | 33        | 100       | 67        | 33        | 100       | 50        |           | 80        |
| Chestnut-vented Tit-Babbler<br>(Warbler) | <i>Sylvia subcoerulea</i>          |                                 |   |    | 1  | x            |           | x      | 6         |           | 25        | 6         | 50        | 67        | 50        | 33        | 50        | 33        | 67        | 20        | 50        |           | 60        |
| Cape White-eye                           | <i>Zosterops virens</i>            |                                 |   | NE | 1  | x            |           | x      | 11        |           |           | 11        |           |           | 25        |           |           |           |           |           |           |           | 20        |
| Lazy Cisticola                           | <i>Cisticola aberrans</i>          |                                 |   |    | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Rattling Cisticola                       | <i>Cisticola chiniana</i>          |                                 |   |    | 1  | x            |           | x      | 67        | 67        | 75        | 67        | 100       | 100       | 100       | 33        | 100       | 33        | 100       | 80        | 50        |           | 100       |
| Levaillant's Cisticola                   | <i>Cisticola tinniens</i>          |                                 |   |    | 1  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Neddicky                                 | <i>Cisticola fulvicapilla</i>      |                                 |   |    | 1  | x            |           | x      | 17        | 0         | 100       | 17        | 0         | 33        |           | 33        | 100       | 67        | 33        | 20        |           |           | 20        |
| Zitting Cisticola                        | <i>Cisticola juncidis</i>          |                                 |   |    | 2  |              |           | x      |           |           |           |           |           | 33        |           | 33        |           |           |           | 20        |           |           | 20        |
| Desert Cisticola                         | <i>Cisticola aridulus</i>          |                                 |   |    | 1  | x            |           | x      | 22        |           |           | 22        |           |           |           | 33        |           |           |           | 20        |           |           |           |
| Tawny-flanked Prinia                     | <i>Prinia subflava</i>             |                                 |   |    | 1  | x            |           | x      | 94        | 33        | 100       | 94        |           | 100       | 50        | 33        |           |           |           | 100       |           |           | 40        |
| Black-chested Prinia                     | <i>Prinia flavicans</i>            |                                 |   |    | 1  | x            |           | x      | 11        |           |           | 11        |           | 33        | 0         | 33        | 50        | 33        | 33        | 0         |           |           | 60        |
| Bar-throated Apalis                      | <i>Apalis thoracica</i>            |                                 |   |    | 1  |              |           | x      | 6         |           |           | 6         |           |           |           |           |           |           | 33        |           |           |           |           |
| Green-backed Camaroptera                 | <i>Camaroptera brachyura</i>       |                                 |   |    | 2  |              |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| Grey-backed Camaroptera                  | <i>Camaroptera brevicaudata</i>    |                                 |   |    | 1  | x            |           | x      | 11        | 33        | 75        | 11        | 50        | 33        | 25        |           | 100       | 33        | 33        | 0         |           |           | 60        |
| Barred Wren-warbler                      | <i>Calamonastes fasciolatus</i>    |                                 |   |    | 1  | x            |           | x      | 6         | 33        | 25        | 6         | 50        | 67        |           | 33        | 100       | 33        |           |           |           |           | 40        |
| Monotonous Lark                          | <i>Mirafr passerina</i>            |                                 |   |    | 2  |              | x         | x      |           | 33        |           |           |           | 33        | 25        |           |           |           |           |           |           |           |           |
| Rufous-naped Lark                        | <i>Mirafr africana</i>             |                                 |   |    | 1  | x            |           | x      |           | 33        | 25        |           |           |           | 25        | 33        |           |           | 33        | 80        |           |           |           |
| Sabota Lark                              | <i>Calendulauda sabota</i>         |                                 |   |    | 1  | x            |           | x      |           |           |           |           |           | 33        | 50        |           | 50        |           | 67        |           |           |           | 40        |
| Fawn-coloured Lark                       | <i>Calendulauda africanoides</i>   |                                 |   |    | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Chestnut-backed Sparrow-lark             | <i>Eremopterix leucotis</i>        |                                 |   |    | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Red-capped Lark                          | <i>Calandrella cinerea</i>         |                                 |   |    | 2  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Groundscraper Thrush                     | <i>Turdus litsirupa</i>            |                                 |   |    | 1  | x            |           | x      | 22        | 33        |           | 22        |           |           | 50        |           |           |           | 33        | 20        |           |           | 20        |

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|-----------------------------|-----------------------------------|---------------------------------|---|----|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Kurrichane Thrush           | <i>Turdus libonyana</i>           |                                 |   |    | 2  |              |           | x      | 17        | 33        | 25        | 17        | 50        |           |           | 33        |           |           | 33        |           |           |           | 60        |
| Karoo Thrush                | <i>Turdus smithi</i>              |                                 |   | NE | 1  |              |           | x      | 6         |           |           | 6         |           |           |           |           |           |           |           |           |           |           |           |
| Marico Flycatcher           | <i>Melaenornis mariquensis</i>    |                                 |   |    | 1  | x            |           | x      | 22        | 67        |           | 22        | 50        | 33        | 100       | 33        | 50        | 67        | 67        | 40        | 100       |           | 60        |
| Southern Black Flycatcher   | <i>Melaenornis pammellaina</i>    |                                 |   |    | 1  | x            |           | x      | 39        |           |           | 39        |           | 33        |           |           | 50        |           |           | 40        |           |           |           |
| Fiscal Flycatcher           | <i>Melaenornis silens</i>         |                                 |   | NE | 1  |              |           | x      | 11        |           |           | 11        |           |           |           |           |           |           |           |           |           |           |           |
| Spotted Flycatcher          | <i>Muscicapa striata</i>          |                                 |   |    | 2  |              |           | x      | 28        | 33        | 50        | 28        | 0         | 33        |           | 33        | 100       | 33        | 33        | 80        |           |           | 60        |
| Grey Tit-flycatcher         | <i>Myioparus plumbeus</i>         |                                 |   |    | 1  | x            |           | x      | 17        |           | 25        | 17        | 50        | 67        | 25        |           |           |           |           | 0         |           |           | 40        |
| White-throated Robin-chat   | <i>Cossypha humeralis</i>         |                                 |   |    | 1  | x            |           | x      | 22        | 33        | 50        | 22        |           |           | 25        | 67        | 50        |           |           | 20        |           |           | 40        |
| White-browed Scrub Robin    | <i>Cercotrichas leucophrys</i>    |                                 |   |    | 1  | x            |           | x      | 78        | 33        | 100       | 78        | 100       | 100       | 50        | 67        | 100       | 33        | 100       | 60        | 100       |           | 100       |
| Kalahari Scrub Robin        | <i>Cercotrichas paena</i>         |                                 |   |    | 1  | x            |           | x      | 6         |           |           | 6         |           |           | 25        | 33        | 100       |           | 33        | 20        | 50        |           | 20        |
| Capped Wheatear             | <i>Oenanthe pileata</i>           |                                 |   |    | 2  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Familiar Chat               | <i>Oenanthe familiaris</i>        |                                 |   |    | 2  |              |           | x      |           |           | 25        |           |           |           |           |           |           |           | 33        |           |           |           | 20        |
| Ant-eating Chat             | <i>Myrmecocichla formicivora</i>  |                                 |   |    | 2  |              |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Red-winged Starling         | <i>Onychognathus morio</i>        |                                 |   |    | 2  |              |           | x      | 6         |           |           | 6         | 0         |           | 50        |           |           |           |           |           |           |           | 20        |
| Cape Glossy (Cape) Starling | <i>Lamprotornis nitens</i>        |                                 |   |    | 1  | x            |           | x      | 89        | 100       | 100       | 89        | 100       | 100       | 75        | 33        | 50        | 67        | 33        | 100       | 100       |           | 80        |
| Greater Blue-eared Starling | <i>Lamprotornis chalybaeus</i>    |                                 |   |    | 4  |              |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Burchell's Starling         | <i>Lamprotornis australis</i>     |                                 |   |    | 1  | x            |           | x      | 33        | 33        |           | 33        | 100       |           | 75        |           |           | 67        |           | 20        |           |           | 20        |
| Violet-backed Starling      | <i>Cinnyricinclus leucogaster</i> |                                 |   |    | 2  |              |           | x      | 33        | 33        | 50        | 33        |           | 33        |           | 33        |           |           |           | 40        |           |           | 20        |
| Wattled Starling            | <i>Creatophora cinerea</i>        |                                 |   |    | 1  | x            |           | x      | 6         |           |           | 6         |           | 33        | 25        |           | 50        |           |           |           |           |           |           |
| Common Myna                 | <i>Acridotheres tristis</i>       |                                 | I |    | 1  | x            |           | x      | 28        | 33        | 50        | 28        |           |           | 25        |           |           |           |           | 20        |           |           |           |
| Red-billed Oxpecker         | <i>Buphagus erythrorhynchus</i>   |                                 |   |    | 1  | x            |           | x      | 33        | 100       | 50        | 33        | 50        | 33        | 75        |           | 50        | 33        |           | 60        | 50        |           | 20        |
| Amethyst Sunbird            | <i>Chalcomitra amethystina</i>    |                                 |   |    | 2  |              |           | x      | 17        |           | 25        | 17        |           |           |           |           |           |           | 33        |           |           |           |           |
| White-bellied Sunbird       | <i>Cinnyris talatala</i>          |                                 |   |    | 1  | x            |           | x      | 50        | 33        | 50        | 50        | 100       | 33        | 25        | 33        | 50        | 33        | 100       | 0         | 50        |           | 80        |
| Marico Sunbird              | <i>Cinnyris mariquensis</i>       |                                 |   |    | 1  | x            |           | x      | 11        | 33        | 75        | 11        | 100       | 33        | 25        | 33        | 50        | 33        |           | 40        |           |           | 80        |
| Red-billed Buffalo Weaver   | <i>Bubalornis niger</i>           |                                 |   |    | 1  | x            |           | x      | 28        | 0         |           | 28        |           |           | 50        |           |           |           | 33        | 60        |           |           | 40        |
| Scaly-feathered Finch       | <i>Sporopipes squamifrons</i>     |                                 |   |    | 1  | x            |           | x      |           |           |           |           |           | 33        | 75        | 33        | 100       | 0         | 33        | 20        |           |           | 20        |

| Common Name                 | Scientific Name                 | Status<br>(Regional,<br>Global) | S | E | LO | Point<br>Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|-----------------------------|---------------------------------|---------------------------------|---|---|----|-----------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| White-browed Sparrow-weaver | <i>Plocepasser mahali</i>       |                                 |   |   | 1  | x               |           | x      | 0         | 0         |           | 0         |           |           | 50        |           |           | 67        | 33        |           | 100       |           |           |
| Lesser Masked Weaver        | <i>Ploceus intermedius</i>      |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           |           | 20        |           |           | 20        |
| Southern Masked Weaver      | <i>Ploceus velatus</i>          |                                 |   |   | 1  | x               |           | x      | 94        | 33        | 50        | 94        | 0         | 33        | 50        | 33        | 50        | 67        | 0         | 80        | 100       |           | 60        |
| Village Weaver              | <i>Ploceus cucullatus</i>       |                                 |   |   | 1  | x               |           | x      | 17        |           |           | 17        |           | 33        |           | 33        | 50        |           |           |           |           |           |           |
| Red-headed Weaver           | <i>Anaplectes rubriceps</i>     |                                 |   |   | 1  |                 |           | x      | 22        | 33        | 25        | 22        |           |           | 25        |           | 50        |           | 33        |           | 50        |           |           |
| Red-billed Quelea           | <i>Quelea quelea</i>            |                                 |   |   | 1  | x               |           | x      | 22        |           | 50        | 22        | 50        | 67        | 50        | 33        | 100       | 33        | 0         |           |           |           | 40        |
| Southern Red Bishop         | <i>Euplectes orix</i>           |                                 |   |   | 2  |                 |           | x      |           |           | 25        |           |           |           |           |           |           |           |           |           |           |           |           |
| White-winged Widowbird      | <i>Euplectes albonotatus</i>    |                                 |   |   | 2  |                 |           | x      | 22        |           |           | 22        |           |           |           |           |           |           |           | 20        |           |           |           |
| Thick-billed Weaver         | <i>Amblyospiza albifrons</i>    |                                 |   |   | 2  |                 |           | x      | 17        |           |           | 17        |           |           |           |           |           |           |           |           |           |           |           |
| African Quail-finch         | <i>Ortygospiza atricollis</i>   |                                 |   |   | 1  |                 |           | x      |           |           |           |           |           |           |           | 33        | 50        |           |           |           |           |           | 20        |
| Red-headed Finch            | <i>Amadina erythrocephala</i>   |                                 |   |   | 2  |                 |           | x      | 11        |           |           | 11        |           |           |           |           |           |           |           |           |           |           |           |
| Cut-throat Finch            | <i>Amadina fasciata</i>         |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           |           |           | 50        |           |           |
| Black-faced Waxbill         | <i>Estrilda erythronotos</i>    |                                 |   |   | 2  |                 |           | x      | 6         |           |           | 6         |           | 33        | 25        | 33        |           |           |           |           |           |           |           |
| Common Waxbill              | <i>Estrilda astrild</i>         |                                 |   |   | 1  | x               |           | x      | 17        |           |           | 17        |           | 67        |           | 33        |           |           |           |           |           |           | 20        |
| Violet-eared Waxbill        | <i>Uraeginthus granatinus</i>   |                                 |   |   | 1  | x               |           | x      |           |           | 50        |           |           | 33        | 0         | 33        | 50        | 0         | 33        | 80        |           |           |           |
| Blue Waxbill                | <i>Uraeginthus angolensis</i>   |                                 |   |   | 1  | x               |           | x      | 83        | 67        | 50        | 83        | 100       | 100       | 100       | 100       | 100       | 100       | 100       | 80        | 100       |           | 100       |
| Green-winged Pytilia        | <i>Pytilia melba</i>            |                                 |   |   | 1  | x               |           | x      | 22        |           | 25        | 22        | 50        | 67        | 25        | 33        | 100       | 67        | 67        | 80        | 50        |           | 80        |
| Red-billed Firefinch        | <i>Lagonosticta senegala</i>    |                                 |   |   | 1  | x               |           | x      | 61        |           |           | 61        |           |           |           |           | 50        | 33        |           | 20        |           |           | 20        |
| African Firefinch           | <i>Lagonosticta rubricata</i>   |                                 |   |   | 1  | x               |           |        |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| Jameson's Firefinch         | <i>Lagonosticta rhodopareia</i> |                                 |   |   | 1  | x               |           | x      | 6         |           | 0         | 6         |           |           |           |           | 50        | 33        | 67        | 20        | 50        |           | 40        |
| Bronze Mannikin             | <i>Lonchura cucullata</i>       |                                 |   |   | 1  | x               |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Pin-tailed Whydah           | <i>Vidua macroura</i>           |                                 |   |   | 1  |                 |           | x      | 11        |           | 0         | 11        |           |           |           | 33        |           |           | 33        |           |           |           |           |
| Long-tailed Paradise Whydah | <i>Vidua paradisaea</i>         |                                 |   |   | 2  |                 |           | x      | 22        | 0         | 0         | 22        | 50        | 33        | 25        |           | 100       | 33        | 67        | 100       |           |           | 20        |
| Shaft-tailed Whydah         | <i>Vidua regia</i>              |                                 |   |   | 2  |                 |           | x      | 6         | 0         | 25        | 6         | 0         |           | 25        | 33        | 50        | 33        |           | 80        |           |           |           |
| Village Indigobird          | <i>Vidua chalybeata</i>         |                                 |   |   | 2  |                 |           | x      | 17        |           |           | 17        |           |           |           | 33        |           | 0         |           |           |           |           | 20        |
| Dusky Indigobird            | <i>Vidua funerea</i>            |                                 |   |   | 2  |                 |           | x      |           |           |           |           |           |           |           |           |           |           |           | 20        |           |           |           |

| Common Name                  | Scientific Name               | Status<br>(Regional,<br>Global) | S | E | LO | Point Counts | Anecdotal | SABAP2 | 2435_2715 | 2420_2720 | 2425_2720 | 2420_2725 | 2415_2725 | 2410_2725 | 2405_2725 | 2400_2720 | 2350_2720 | 2340_2725 | 2340_2730 | 2430_2715 | 2425_2715 | 2345_2725 | 2340_2735 |
|------------------------------|-------------------------------|---------------------------------|---|---|----|--------------|-----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| House Sparrow                | <i>Passer domesticus</i>      |                                 | I |   | 1  |              |           | x      |           |           |           |           | 0         | 33        |           |           |           |           | 33        |           |           |           |           |
| Great Sparrow                | <i>Passer motitensis</i>      |                                 |   |   | 2  |              |           | x      |           |           |           |           | 50        |           |           |           |           |           |           |           |           |           |           |
| Cape Sparrow                 | <i>Passer melanurus</i>       |                                 |   |   | 1  |              |           | x      |           |           |           |           |           |           |           |           |           |           |           |           | 50        |           |           |
| Southern Grey-headed Sparrow | <i>Passer diffusus</i>        |                                 |   |   | 1  | x            |           | x      | 33        | 33        | 75        | 33        | 50        | 100       | 75        | 33        | 100       | 67        | 67        | 60        |           |           | 60        |
| Yellow-throated Petronia     | <i>Gymnoris supercilialis</i> |                                 |   |   | 2  |              |           | x      |           |           | 25        |           | 50        |           |           |           |           |           | 0         |           |           |           |           |
| African Pied Wagtail         | <i>Motacilla aguimp</i>       |                                 |   |   | 1  | x            |           | x      | 11        |           |           | 11        |           |           |           |           |           |           |           |           |           |           | 20        |
| Cape Wagtail                 | <i>Motacilla capensis</i>     |                                 |   |   | 1  |              |           | x      |           |           |           |           |           |           |           |           |           |           | 33        |           |           |           |           |
| Striped Pipit                | <i>Anthus lineiventris</i>    |                                 |   |   | 3  |              |           | x      |           |           |           |           |           |           |           | 67        |           |           |           |           |           |           |           |
| African Pipit                | <i>Anthus cinnamomeus</i>     |                                 |   |   | 1  | x            |           | x      |           | 33        |           |           |           |           | 50        |           |           |           |           |           |           |           | 20        |
| Bushveld Pipit               | <i>Anthus caffer</i>          |                                 |   |   | 3  |              |           | x      |           |           |           |           |           |           |           | 33        |           |           |           |           |           |           |           |
| Yellow-fronted Canary        | <i>Crithagra mozambica</i>    |                                 |   |   | 1  | x            |           | x      | 28        |           | 50        | 28        | 0         | 33        | 25        | 67        | 100       |           | 33        |           | 50        |           | 60        |
| Black-throated Canary        | <i>Crithagra atrogularis</i>  |                                 |   |   | 1  | x            |           | x      |           |           |           |           |           |           | 25        | 33        | 50        |           | 33        |           |           |           | 40        |
| Streaky-headed Seedeater     | <i>Crithagra gularis</i>      |                                 |   |   | 4  |              |           | x      |           |           |           |           |           |           |           |           |           |           |           |           | 50        |           |           |
| Lark-like Bunting            | <i>Emberiza impetuani</i>     |                                 |   |   | 3  |              |           | x      |           | 33        |           |           |           |           |           |           | 50        |           | 33        |           |           |           |           |
| Cinnamon-breasted Bunting    | <i>Emberiza tahapisi</i>      |                                 |   |   | 1  | x            |           | x      |           | 33        | 75        |           |           | 33        | 25        |           | 0         |           | 33        |           |           |           | 20        |
| Golden-breasted Bunting      | <i>Emberiza flaviventris</i>  |                                 |   |   | 1  | x            |           | x      | 6         | 67        | 50        | 6         | 100       | 100       | 50        | 33        | 100       | 33        | 0         | 100       | 50        |           | 60        |