Appendix G.7

AVIFAUNA ASSESSMENT

Avifauna Scoping Assessment for the Proposed Verkykerskop WEF Cluster: Groothoek WEF

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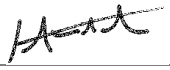
Report Name	**Avifauna Scoping Assessment for the Proposed Verkykerskop WEF Cluster: Groothoek WEF**
Submitted to	**Groothoek Wind Power (Pty) Ltd**
Lead Specialist (Fieldwork and Report Writing)	**Tyron Clark**  Tyron Clark (Pr. Sci. Nat. 121338) has more than decade's worth of experience conducting biodiversity assessments in a number of African countries, affording him good experience in variety of development types, particularly avifaunal assessments. He attained his MSC in Zoological science from the University of the Witwatersrand. His research interests centre on biogeography and ecological niche modelling. Tyron has also completed courses in wetland delineation and management hosted by the University of the Free State.
Reviewer	**Ryno Kemp**  Ryno Kemp is Pr Sci Nat registered (117462/17) in Zoological Science and is finalising his PhD in Zoology from the University of Pretoria. Ryno is a qualified Avifauna specialist with over three years of experience, three years of experience in conservation and more than eight years of scientific research experience across South Africa.
Reviewer	**Andrew Husted**  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 16 years' experience in the environmental consulting field.
Fieldwork	Core: Lloyd Mhlongu (Phd candidate), Susan Abell (MSc), Tyron Clark (MSc). Contributors: Dr. Ryno Kemp, Andre van Tonder (MSc), Cheri Clark, Ernest Porter, Geoff Lockwood, Samantha Bradley.
Declaration	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. 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.

Grey Crowned Crane (*Balearica regulorum*) flock in morning light

DECLARATION

I, Tyron Clark, declare that:

- I act as the independent specialist in this application;
- I have performed 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)

Avifaunal Lead (Meraki Consulting Pty Ltd)

For: The Biodiversity Company

January 2025

Table of Contents

List of Tables

List of Figures

1. Introduction

Due to the advanced progress of the avifaunal monitoring program, this scoping report details key findings from both the scoping fieldwork as well as the first year of avifaunal monitoring conducted for the proposed Groothoek Wind Power (Pty) Ltd Wind Energy Facility (WEF). The Groothoek WEF forms part of the Verkykerskop WEF Cluster (VWC). The VWC is situated in the Thabo Mofutsanyane District Municipality and Phumelela Local Municipality, near the town of Harrismith, in the Free State Province of South Africa near Verkykerskop, South Africa.

The VWC consists of three separate WEF applications, each with their own 132 kV Grid Connections, within an area (Figure 1) spanning approximately 17958 ha in extent. The individual WEFs include Groothoek (6170 ha, 300 MW), Kromhof (5721 ha, 300 MW) and Normandien (6067 ha, 300 MW). The project triggers three species-specific best practice guidelines as published by BirdLife South Africa for (1) Cape Vulture (within 50 km of three roosts one of which breeding; Pfeiffer and Ralston-Paton, 2018), (2) Verreaux's Eagle (within 10 km of at least one confirmed nest; Ralston-Paton and Murgatroyd, 2021) and (3) Black Harrier (within suitable non-breeding foraging grounds; Simmons et al. 2020). Collectively, these guidelines impose, inter-alia, two years' worth of intensive pre-construction monitoring (including 72 hours of vantage point surveying by two observers per year).

The purpose of this scoping assessment was to highlight any potential flags associated with the Groothoek WEF or the project as a whole and to establish and refine the sampling sites and survey protocol to be adopted for the pre-construction monitoring. The approach is designed to comply with all relevant global and national legislation and best practice standards. This includes, *inter alia*, the International Finance Corporation (IFC) Performance Standard 6 (IFC, 2019) and Equator Principles (EP4, 2020) but also leading global best practice standards specifically with regards to birds and wind energy particularly Jenkins et al. (2015). This scope of study caters to comply with the species-specific best practice guidelines for Cape Vulture (BLSA, 2018), Verreaux's Eagle (BLSA, 2017) and Black Harrier (BLSA, 2020). For reference purposes, the Area of Influence or "AOI", as referred to in this study, was defined so as to include all potential Cape Vulture roost sites within a 50 km radius of the project area and was refined to follow natural or man-made boundaries such as roads or escarpments. The term "region" refers to all areas within the greater Phumelela local municipality.

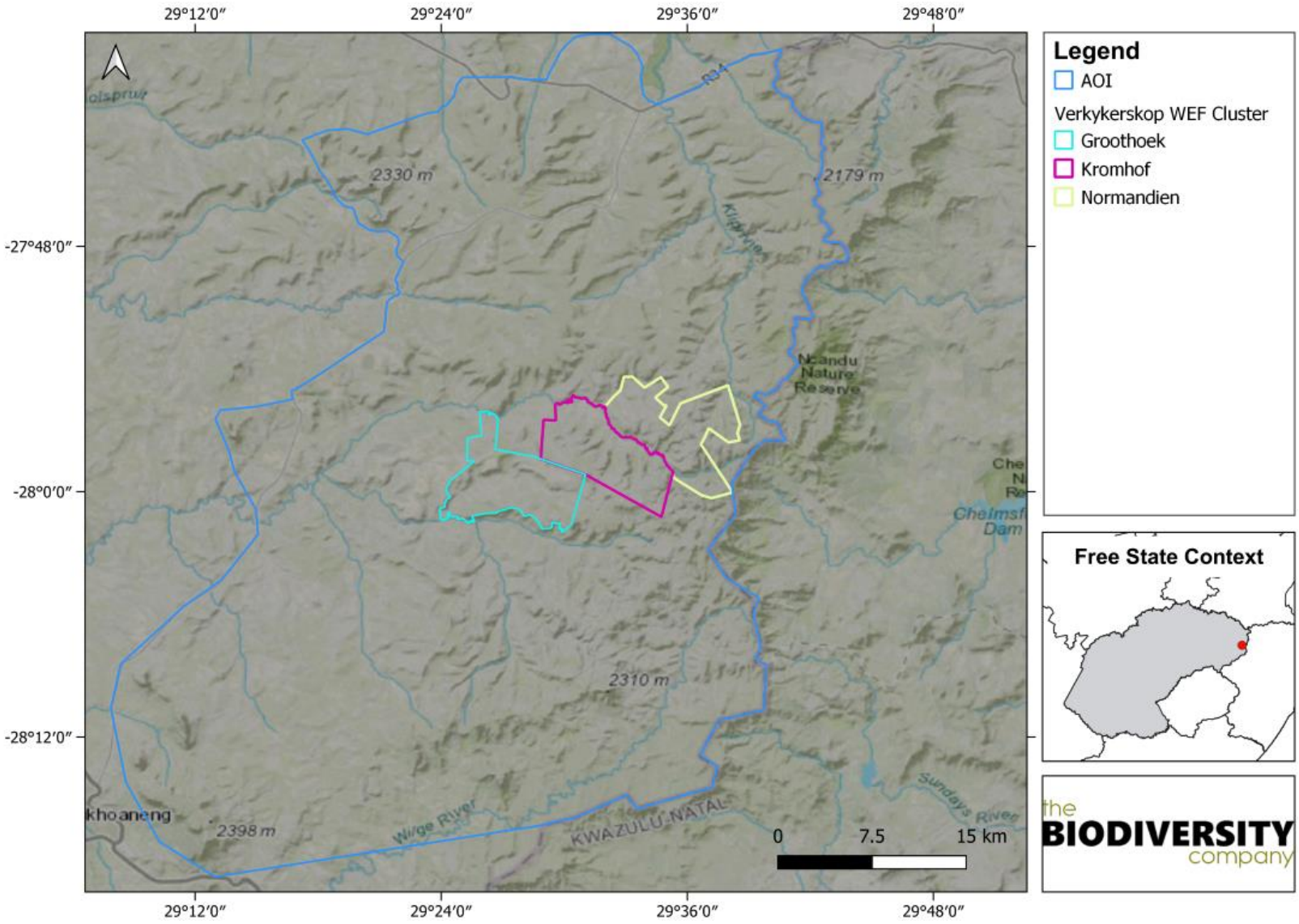


Figure 1-1 Overview of the location of the Groothoek WEF in relation to the greater Verkykerskop WEF Cluster

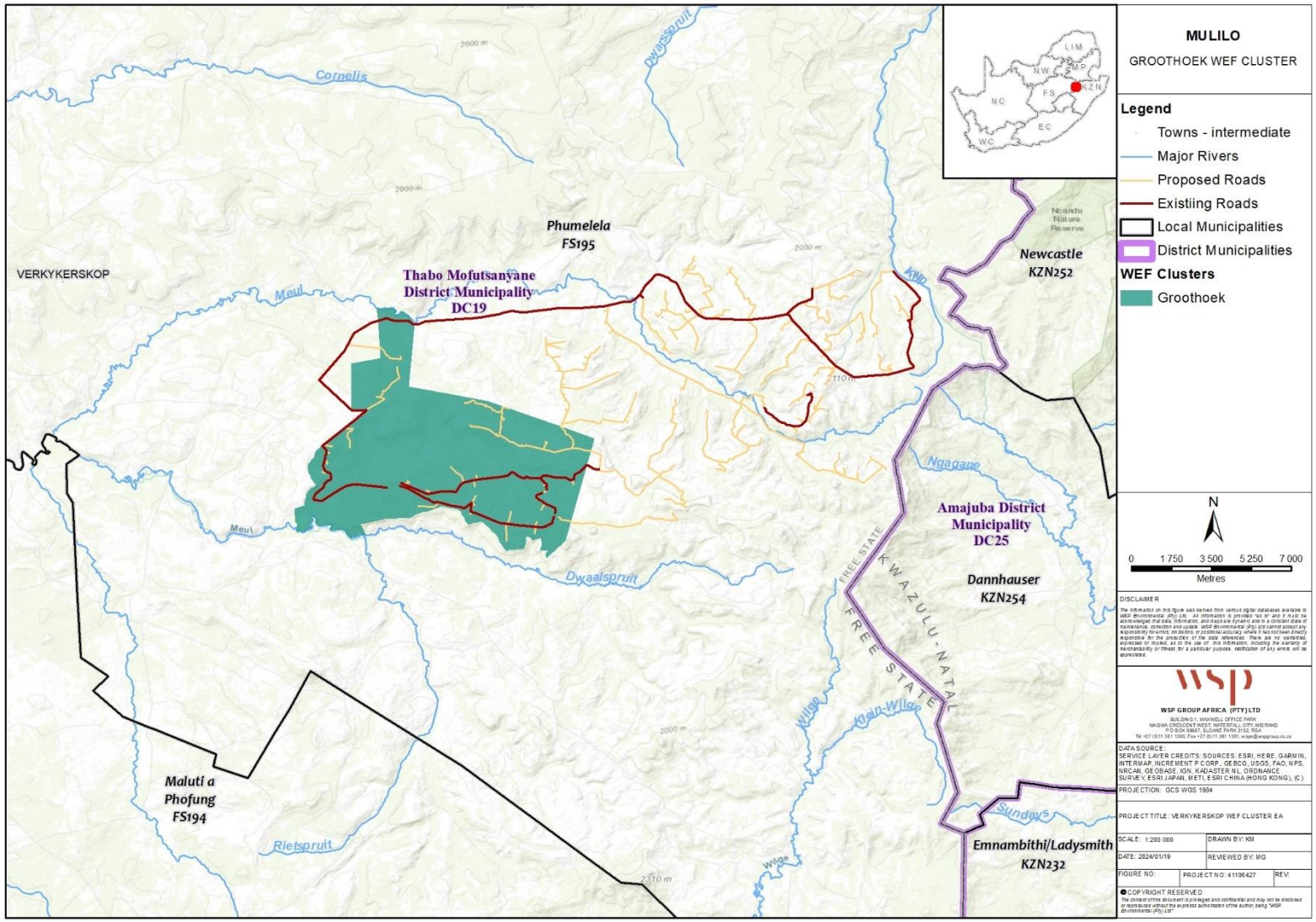


Figure 1-2 Location of the Groothoek WEF

1.1 Project Description

The Groothoek Wind Power Project is divided into two separate applications. The first being the WEF itself (up to 300 MW) which is subject to the full Scoping and EIA (S&EIA), The second is the Grid Connection (132 KV) which is subject to a Basic Assessment (BA) process. As such only the WEF will be considered for the purposes of the scoping assessment.

The WEF is situated in the west of the cluster and spans an area of 6170 ha. It covers six farm portions namely Schoonzicht No.80, Groothoek No. 89, Kromdraai No. 273, Kransbank No.288, Kranspunt No.459, Van Kope No.1319. At present, the Groothoek WEF is planned to comprise:

- A total of 55 wind turbines (Goldwing) with a rotor diameter of 200 m, a hub height of 140 m and a total height of 240 m. The hard standing area is < 0.8 ha per turbine;
- A reticulation network of 33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical;
- A 132kV onsite collector substation (<2 ha);
- Concrete batching plant (1 ha);
- Construction camp and site office (4 ha);
- Materials laydown area (8 ha);
- Internal roads (8 m width);
- O&M building (<1 ha); and
- An 800MWH Battery Energy Storage System or BESS (7 ha).

1.2 Legislative Setting

The legislation, policies and guidelines listed below are applicable to the current project with regard to avifauna. The list below, although extensive, is not exhaustive and other legislation, policies and guidelines may apply in addition to those listed below (**Error! Reference source not found.**).

Table 1-1 A list of key legislative requirements relevant to these studies in the Free State

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	African-Eurasian Waterbird Agreement (AEWA)
	Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia.
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Spatial Biodiversity Assessment (NSBA)

	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	White Paper on Biodiversity
	South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.2020.
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998
Provincial	Free State Nature Conservation Ordinance 8 of 1969

1.3 Assumptions and Limitations

The following limitations should be noted for the assessment:

- Access was only arranged for survey work within the VWC.
- The number and locations of turbines within the turbine area has been provisionally provided but will only be finalised over the course of the two-year monitoring programme.
- No information has yet been provided on the location and length of the linear grid connection infrastructure.
- No information has yet been provided on the location and length of access roads to the turbines for maintenance and construction.
- No information has yet been provided on the location and length of access roads to the turbines nor the location of any Battery Energy Storage Systems (BESS).

2. Methodology

This scoping report includes methodologies and key results from the first year of avifaunal monitoring conducted at the Verkykerskop WEF Complex. Note long term avifaunal monitoring is still ongoing at the time of compiling this report, the results of which will advise the final specialist impact assessment report in the EIA phase of the project). The monitoring methodology was designed to comply with all relevant global and national legislation and best practice standards. In addition to the species-specific guidelines for Cape Vulture, Verreaux's Eagle and Black Harrier, this includes the International Finance Corporation (IFC) Performance Standard 6 (IFC, 2019) Equator Principles (EP4, 2020) and Jenkins et al. (2015).

2.1 Desktop Assessment

The following resources were consulted during the desktop assessment and for the compilation of the expected species list:

- Chittenden et al. (2016), Roberts Birds of Guide (2nd Edition.). The primary source for species identification, geographic range, life history information and birding routes in the AOI;
- Sinclair and Ryan (2010), Birds of Africa. Secondary source for identification;
- South African Bird Atlas Project (SABAP 2). Full protocol atlassing data from nine pentads cover the project area was used to construct the expected species list. These included 2755_2920, 2800_2920, 2755_2925, 2800_2925, 2750_2930, 2755_2930, 2800_2930, 2750_2935, 2755_2935;
- Taylor et al. (2015), Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Used for conservation status, nomenclature and taxonomical ordering;

- Birdlife South Africa website. For information on Important Bird Areas;
- Birds and wind energy best practice guidelines (Jenkins et al. 2015);
- Cape Vulture and wind farms best practice guidelines (BLSA, 2018);
- Verreaux's Eagle and wind farms best practice guidelines (BLSA, 2017);
- The National Web-Based Environmental Screening Tool DEA website (2022);
- South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna Protocols for environmental impact assessments in South Africa;
- South African National Biodiversity Institute, Pretoria. Version 1.2020; and
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998.

2.2 Fieldwork

Fieldwork was conducted in line with the birds and wind energy best practice standards (Jenkins et al. 2015) as well as the species-specific guidelines for Cape Vulture (Pfeiffer and Ralston-Paton, 2018), Verreaux's Eagle (Ralston-Paton and Murgatroyd, 2021) and Black Harrier (Simmons et al. 2020). All data was logged on BirdLasser to standardise entries among observers and expedite data processing.

Sampling was conducted within an AOI spanning an area (281494 ha) from Memel in the north to Harrismith and Van Reenen in the south and from Verkykerskop in the west to the Great Escarpment in the east. However, the standardised, formal sampling (vantage points, walked transects, driven transects and point counts) was restricted to within the 17958 ha WEF Complex and specifically with regards to Groothoek WEF this involved an area of 6170 ha. Sampling within the remainder of the AOI was limited to incidental observations of priority species and focal point surveys (primarily roost and nest investigations).

Sampling was always conducted by at least three observers at a time. Two observers were assigned to a vantage point while the third (floater) observer was tasked with conducting either walked transects, driven transects, point counts or focal points at the same time. Observer tasks were rotated to avoid fatigue. Aside from the eight-day scoping investigation, Year 1 monitoring effort involved six surveys typically 20-23 days each, (of which 5 days were reserved for Groothoek WEF) representing a total of 429 person days (90 person days for Groothoek WEF) spanning a period from June 2022 - October 2023. Fieldwork was conducted primarily by Lloyd Mhlongu (PhD candidate), Susan Abell (MSc) and Tyron Clark (MSc). Additional contributors included Andre Van Tonder (MSc), Cheri Clark, Ernest Porter, Geoff Lockwood and Ryno Kemp (PhD candidate), Dr. Gareth Tate and Dr. Robin Colyn. Avifaunal surveys for the Verkykerskop project conducted up to the end of year 1 include:

- Pre-scoping:
    - Remotely Piloted Aircraft System (RPAS) survey of threatened bird nests near the eastern Drakensberg Escarpment Part 1: Verkykerskop and Potter's Hill: 23-27 May 2022. EWT (2022);
- Scoping:
    - Scoping: 8 days, 18-25 July 2022;
- Standard pre-construction monitoring surveys (completed and data considered in this report):
    - Survey 1: 20 days, 3-12 August and 15-25 August, winter (5 days for Groothoek WEF);
    - Survey 2: 20 days, 16-25 November and 28 November-07 December 2022 (5 days for Groothoek WEF);

- Survey 3: 23 days, 1-10 February, 13-22 February and 15-17 March (5 days for Groothoek WEF);
- Survey 4: 23 days, 11-20 April, 2-11 May and 17-19 May 2023 (5 days for Groothoek WEF);
- Survey 5: 23 days, 3-12 July, 17-26 July and 4-6 August 2023 (5 days for Groothoek WEF);
- Survey 6: 22 days 31July-8 Aug, 11-20 September and 26-28 September 2023 (5 days for Groothoek WEF);

- Supplementary Investigations:
  - Cape Vulture Roost Investigation Survey 1: 11-14 June 2023 Ryno Kemp (PhD candidate);
  - Cape Vulture Roost Investigation Survey 2: 12-14 October 2023 Tyron Clark; and
  - Martial Eagle Investigation: 12-14 October 2023 Tyron Clark.

Sampling was designed to account for seasonal variation in order to facilitate the detection of the best possible spectrum of migratory avifauna, including both Intra-African and Palearctic migrants. A map of the various sampling points and transects is given in Figure 2-2. Details on the specific protocol to be followed at or along each are discussed in greater detail below. Year 2 surveys completed but not included this year 1 summary and scoping report include:

- Survey 7, Year 2: Leg 1 (20-29 November 2023), Leg 2 (5-16 December 2023);
- Survey 8, Year 2: Leg 1 (19 February -1 March 2024), Leg 2 (6-15 March 2024);
- Survey 9 Year 2 Leg 1 (4 April -15 April 2024), Leg 2 (16-21 May 2024), Leg 3 (3-9 June);
- Survey 10 Year 2 Leg 1 (18 – 27 June 2024), Leg 2a (22 June -2 August 2024);
- Survey 11 Year 2: Leg1 (21-30 August), Leg 2 (3 -14 September 2024); and
- Survey 12 Leg1 (2-11 October), Leg 2 (14-25 October 2024).

2.2.1 Vantage Point Surveys

Five of the 18 Verkykerskop WEF Complex vantage points (including the control) were sampled in the Groothoek WEF. In accordance with the species-specific best practice guidelines for Cape Vulture, each vantage point was sampled by two observers for 72 hours per year. The position of these vantage points within the Groothoek WEF is shown in Figure 2-1. Each VP was carefully selected using a combination of digital elevation models and GIS processing to ensure > 75% coverage of the developable area, which is taken as the turbine footprint area (Figure 2-1). This was done in accordance with best practice requirements (Jenkins et al. 2015). This calculation assumes a maximum 2 km radial detection limit on each VP (also in accordance with best practice) with a 360° viewshed. Information recorded during vantage point surveys included, *inter alia*, climatic conditions, wind speed, wind direction, visibility, species, counts, activity (perched, flying, on grounds, on water), flight direction, flight height, flight duration and flight path (mapped visually on Google Earth).

2.2.2 Walked Transects

One walked transect was conducted at each vantage point in the Groothoek WEF and at the control site. The length of each transect differed slightly, but all were roughly 2 km long. The aim of the transects was to gather data on the diversity and relative abundance of birds on site, particularly with regard to smaller passerines that are not always adequately represented in the vantage point surveys, which are designed to record flights.

2.2.3 Driven Transects

Three driven transects were sampled within the Groothoek WEF (DT1-3) and one at the control site (DT Control). The total distance covered by the three driven transects within the WEF was 42.9 km, with an average transect length of 14.3 km. The control-driven transect was 17.3 km long. The variables recorded are the same as for walked transects. However, the primary objective of the driven transects was to cover ground in search of wide-ranging mobile species, such as large-bodied priority species such as cranes, bustards, korhaans, storks, eagles and vultures that are less easily encountered during the much shorter and more rigid walked transects.

2.2.4 Focal Point Surveys

Three focal points were assigned to the Groothoek WEF (FP1-3). Avifaunal abundance is hardly ever evenly distributed throughout a project area. Instead, birds tend to congregate in hotspots centred around prominent landscape features with higher primary productivity and moisture levels, such as a pan, lake, dam, wetland or rocky outcrop. Sampling involved an adapted form of point count sampling for a more extended (yet fixed duration) at the same time of day during each site visit. The observer utilised either a spotting scope or binoculars to maximise detection and identification. Breeding areas for red-listed species or other key areas likely to support/attract significant congregations of local and migratory species were prioritised for the focal surveys. In Groothoek, this involved monitoring of Southern Bald Ibis Roost 2 (FP2), Jackal Buzzard Nest 1 (FP3) and a large dam (FP1). Efforts were made to visit the various focal points at the appropriate time of day to maximise observation. For example vulture roosts were surveyed after 14:00 or before 09:00 (when most vultures are on the roost).

2.2.5 Point counts

Additionally, 47 standardised point counts were made throughout the Groothoek WEF. The point counts were conducted to gather data on the composition of species and the relative abundance of species within the various habitats within the project area. Each point count is run over a 5 min period. The horizontal detection limit was set at 200 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), flight direction and general notes on habitat and nesting suitability for conservation important species.

2.2.6 Incidental Searches

Diurnal incidental searches are also included to supplement the species inventory with cryptic and illusive species that may not have been detected within the rigid point count protocol. This involved opportunistic sampling of species between vantage points, transects focal points and point counts.

2.2.7 Cape Vulture Roost Investigation

Initial planning (conducted before scoping) involved utilising digital elevation data and satellite imagery to identify potential roost sites for Cape Vulture within a 50 km radius of the project area (defined as the Verkykerskop WEF cluster). During scoping and the course of the first pre-construction monitoring trip, these sites were briefly visited to verify signs of vulture use. Three roost sites were identified (see Section 3). Contact was then made with Dr. Gareth Tate from the Endangered Wildlife Trust (together with Mulilo) to establish the extent of knowledge regarding the three roosts identified within the Area of Influence (AOI). Efforts were also made to organise permission from landowners to access the roost sites. Valuable insights were also obtained from landowners Rick Dillon and Graham Hobbs.

Fieldwork was conducted over two separate trips. It was decided that the first trip should take place in May-August (preferably June) to coincide with peak egg-laying and nest attendance. The first visit was conducted from 11-14 June 2023 by Ryno Kemp (The Biodiversity Company) and involved a visit to all three roosts. Tyron Clark (sub-contracted by The Biodiversity Company) conducted the second follow-

up visit from 12-14 October 2023. The second trip focused on Nelson's Kop with the aim of assessing breeding success.

Most observation time was spent non-intrusively surveying roosting birds from a nearby vantage using a combination of spotting scopes and binoculars. Photographs were taken using both a 400 mm Canon telephoto lens on a Canon 7D DSLR Body and a 600 mm Sigma telephoto lens on a mirrorless camera body. Fieldwork was heavily contingent on suitable weather conditions, as clouds and mist can obscure entire roosts. Suspected breeding birds or active nests were more closely inspected using a DJI Mavic Pro.

2.2.8 Martial Eagle Nest Investigation

Mulilo requested that a high-level reconnaissance survey with the specific aim of searching suitable habitat and locating Martial Eagle Nests within the AOI surrounding the Verkykerskop development be conducted. This investigation was commissioned on the basis of the large potential implications for the wind farm should Martial Eagle nests be found in or in close proximity to the proposed development. Although ongoing incidental searches for priority species nests are carried out during the course of pre-construction monitoring surveys, the project area is exceptionally large and Martial Eagles are notoriously wide-ranging. Consequently, the chances of finding important nests such as this in between the rigorous survey protocol, without dedicating full-day target searches to the species is low.

In response, two full days were dedicated solely to finding and locating Martial Eagle Nests. The initial stages of the investigation were dedicated to collecting all known locality data on Martial Eagle Nests from the area. This involved collating data from the specialist's (T. Clark's) personal nest records as well as any information provided by locals. The rest of the field time was spent searching for new nests and visiting known nests.

2.2.9 Data Analysis

For the sake of this scoping report, only vantage points and general spatial data were analysed. Data from the BirdLasser cards was captured into Excel. Most statistical analyses were performed in the R statistical environment (R Core Team, 2024). Spatial analyses and models were performed in QGIS.

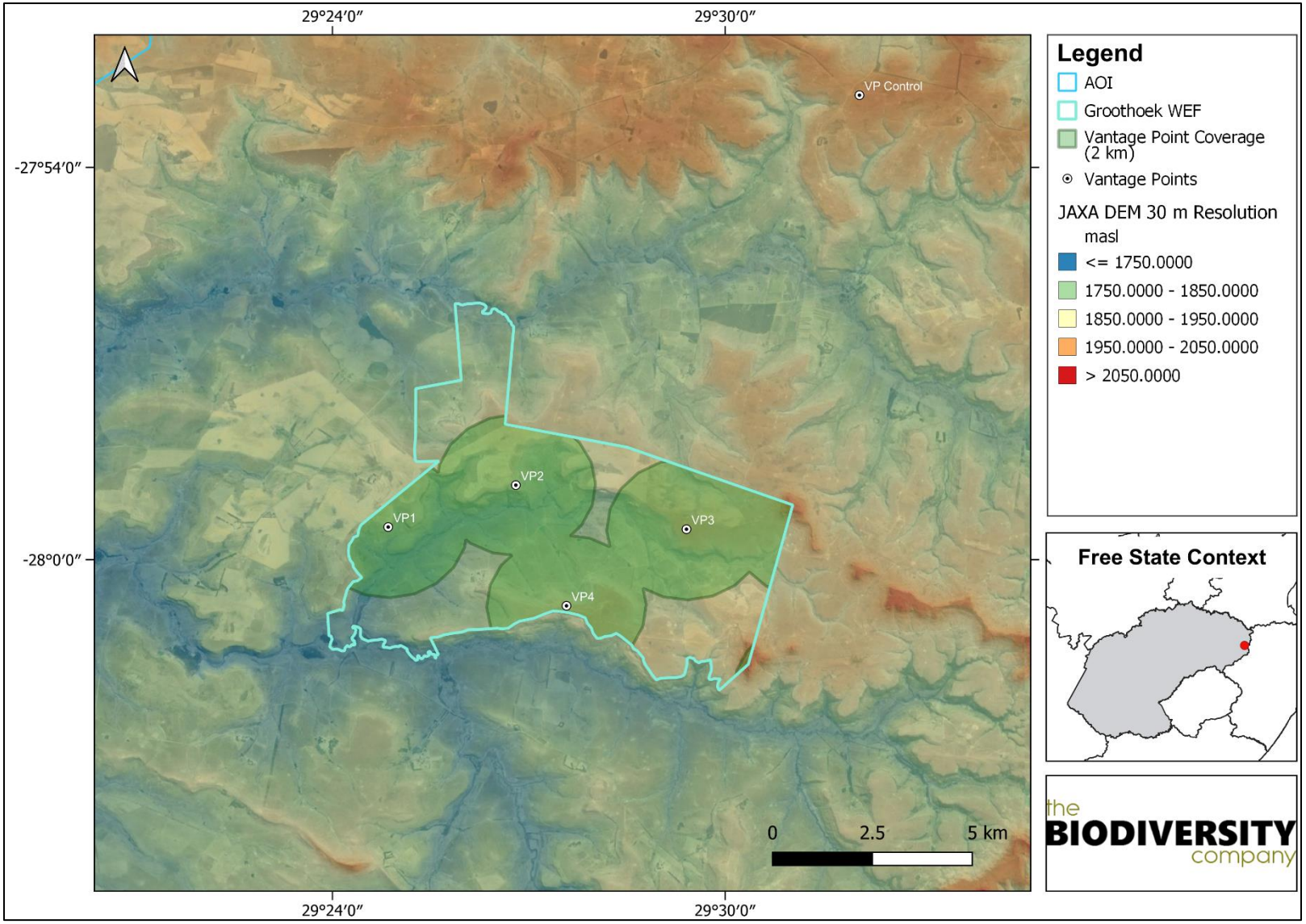


Figure 2-1 Spatial depiction of viewshed coverage from vantage points in relation to developable area (proposed turbine footprint area)

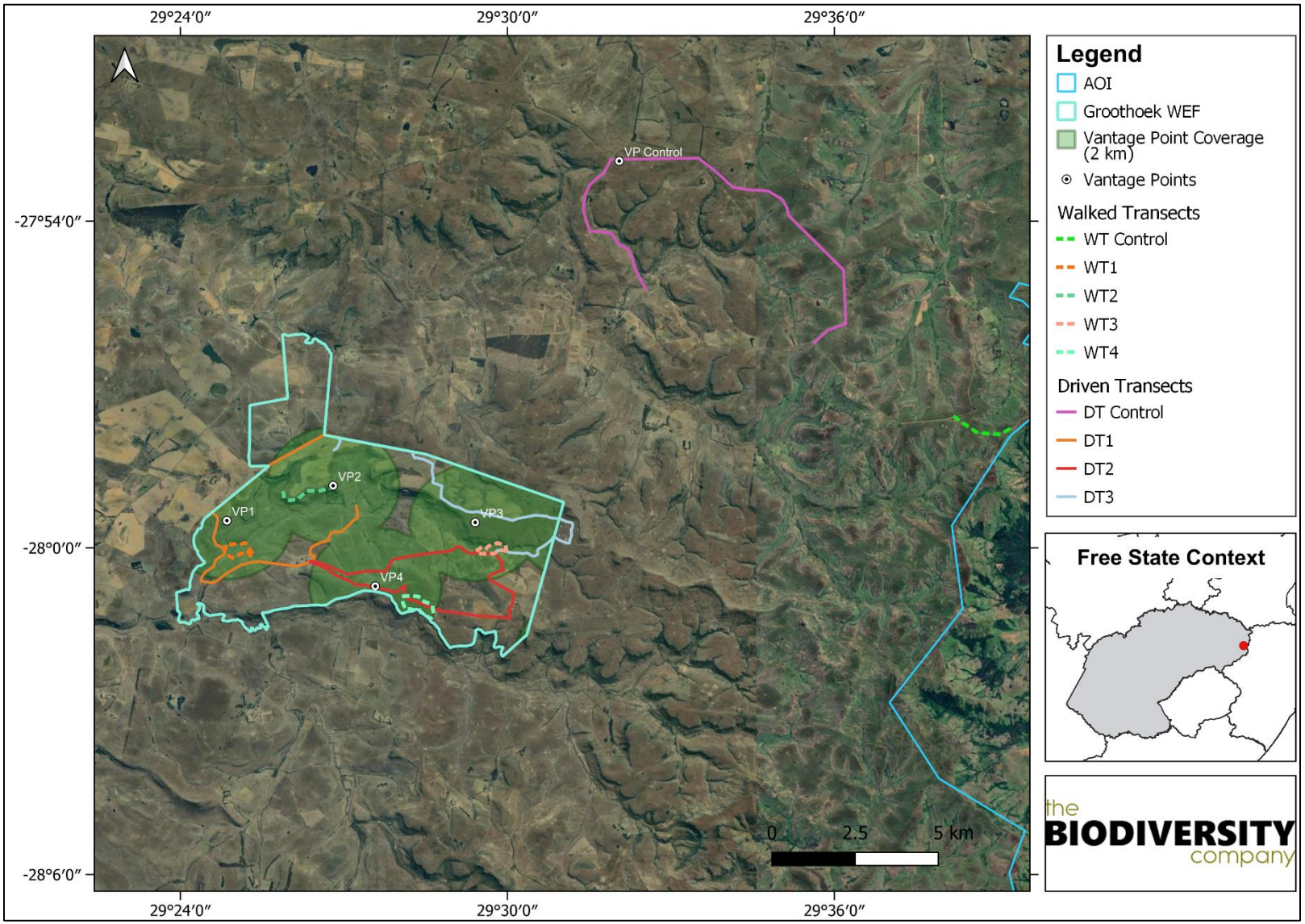


Figure 2-2 Location of walked and driven transects in relation to the vantage points

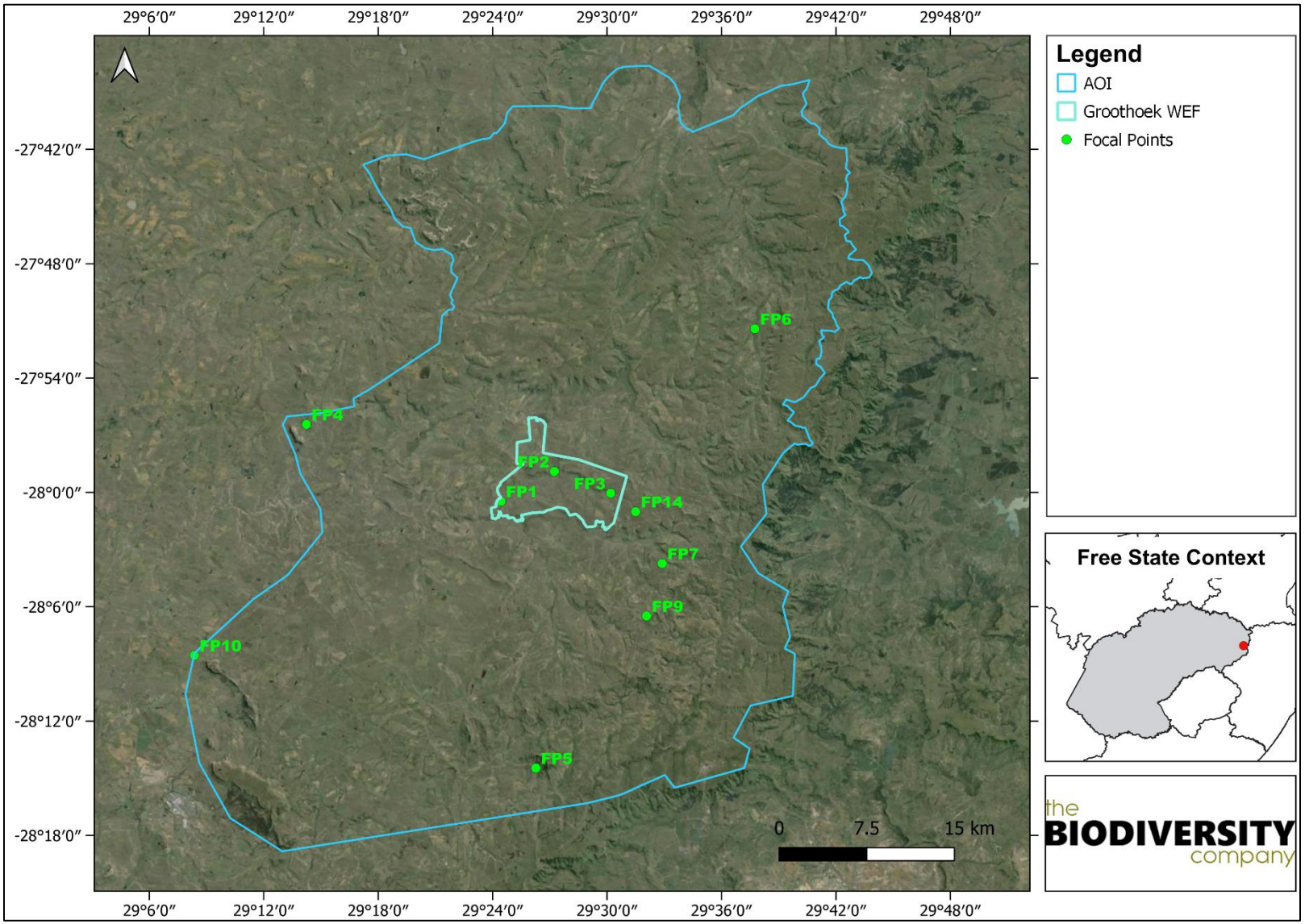


Figure 2-3 Spatial arrangement of key focal points in the AOI

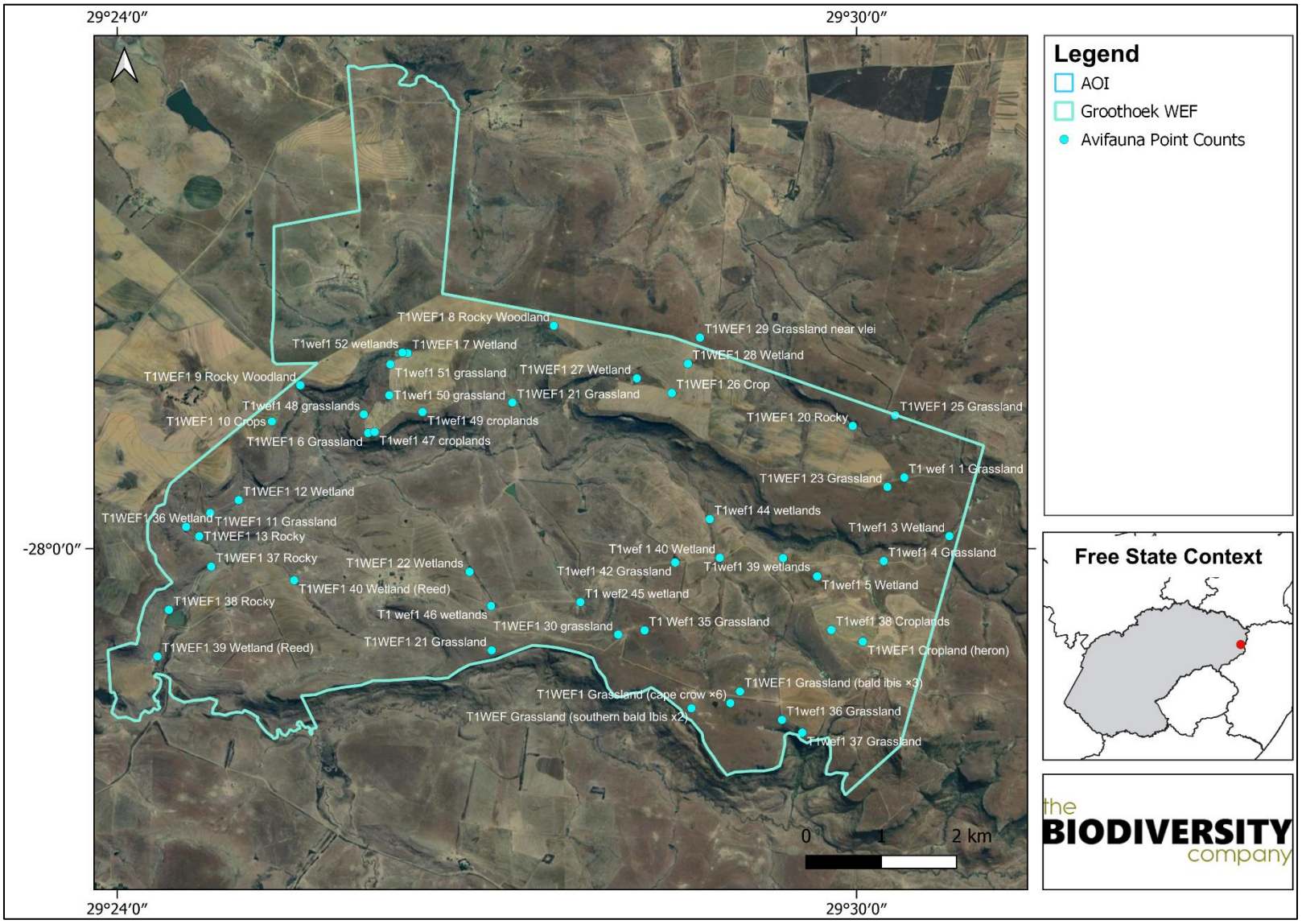


Figure 2-4 Spatial arrangement of the various point counts in the project area

3. Receiving Environment

The region is renowned for its birdlife. The greater AOI intersects with five IBAs and six statutorily protected areas. The Memel birding route (as described in Roberts Birds Application) traverses portions of the WEF cluster and AOI. The birding route is highlighted as one of the best and most extensive habitats for high-altitude grassland endemics in South Africa (Chittenden et al. 2017).

3.1 Free State Biodiversity Conservation Plan

At Groothoek WEF most of the southern and eastern portions of the WEF (especially those closer to the Drakensburg Escarpment) are classified as CBA1. In contrast the north-western corner of WEF is classified as and ESA2 (Figure 3-1).

The Free State Biodiversity Conservation spatial layer was developed to illustrate the province's most Critical Biodiversity Areas. These areas need to be maintained to meet the province's biodiversity targets. The broad categories recognised are: Protected Areas (PA), Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONA), and Modified Areas.

CBAs represent areas of high biodiversity significance in the province (SANBI-BGIS, 2017).

ESAs 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. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

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 (SANBI-BGIS, 2017).

Degraded Areas (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (SANBI-BGIS, 2017). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

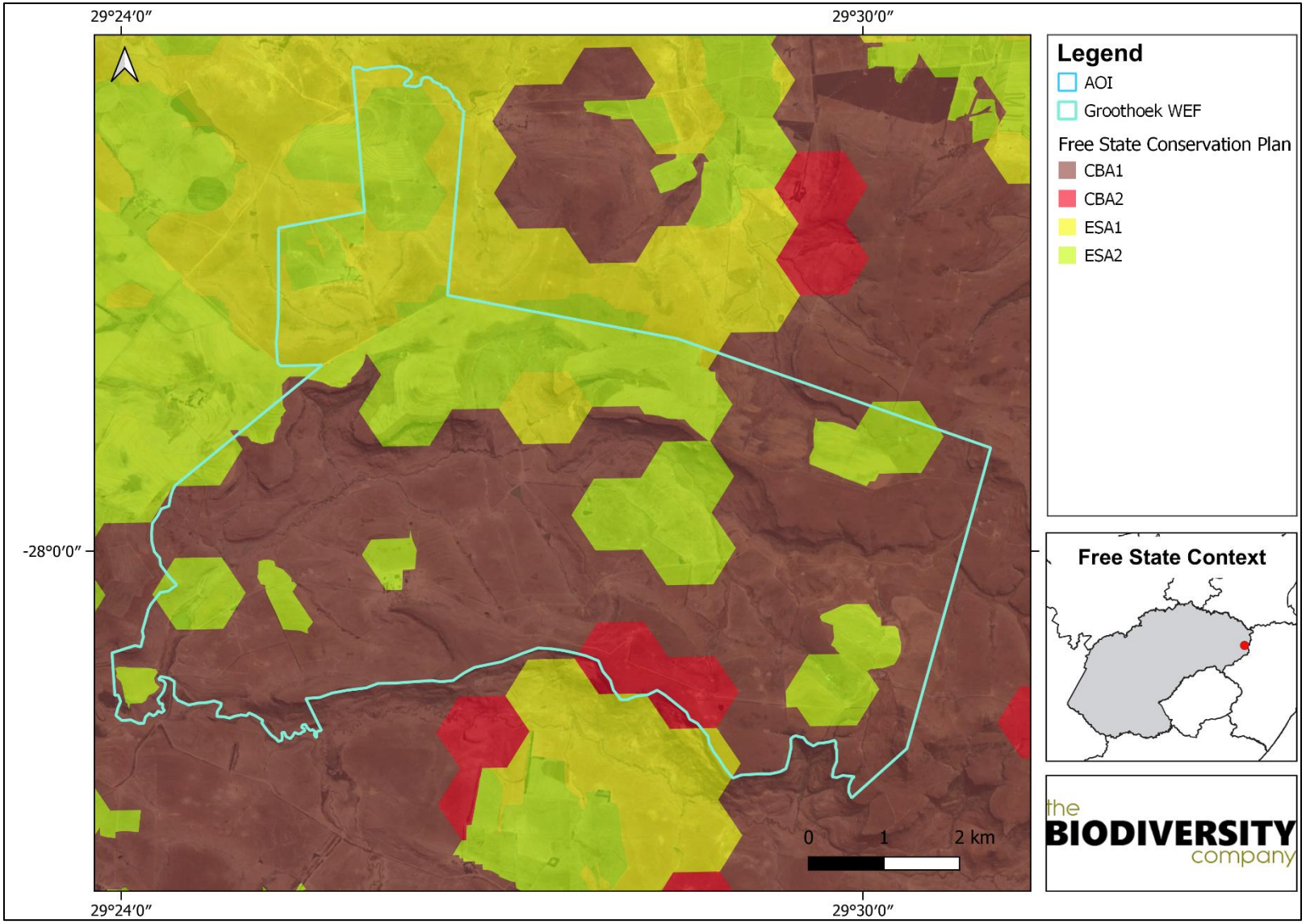


Figure 3-1 Project area in relation to the Free State Biodiversity Conservation Plan

3.2 National Environmental Screening Tool

The National Environmental Screening tool is a web-based application hosted by the Department of Environmental Affairs that allows developers to screen their prospective site for environmental sensitives. Importantly, this tool now serves as the first step in the environmental authorisation process as laid out in the gazetted assessment protocols for each environmental theme. The Species Environmental Assessment Guideline (SANBI, 2020) provides guidance towards achieving these protocols for terrestrial biodiversity, which, in turn, relies on the results of the screening tool to inform the level of assessment required. The screening tool was used to inform the desktop-level assessment of the sensitivity of the AOI prior to fieldwork. There are three sensitivity layers produced by the screening tool that are of relevance for this study, namely (1) Avian Theme, (2) Animal Species Theme, and (3) Terrestrial Biodiversity Theme. The receptors triggering each sensitivity theme, their sensitivity rating and their mapped potential occurrence (i.e. modelled potentially suitable habitat) according to DFFE are summarised in Table 3-1 and spatially depicted in Figure 3-2 to Figure 3-6. The DFFE Avian Theme Screening Tool indicates the presence of a Vulture Restaurant within 20km of the site but without information on its location or activity status.

Table 3-1 Receptors triggering each sensitivity theme according to the DFFE data at Groothoek WEF

Receptor	Sensitivity	DFFE Mapped Occurrence (Project Area)
Avian Theme		
Within 20 km of Vulture Restaurants	High	Large radial buffer overlapping eastern third of project area
Areas beyond buffer on Vulture Restaurants	Low	All other areas.
Animal Species Theme (Avifauna)		
Southern Bald Ibis (*Geronticus calvus*)	High	Ubiquitous. Most grassland areas, excluding cultivated lands.
Yellow-breasted Pipit (*Anthus chloris*)	High & Medium	High altitude grasslands, particularly in south and eastern portions of project area.
Grey Crowned Crane (*Balearica regulorum*)	High & Medium	Lower altitude wetlands and grasslands in the central regions of the WEF (along Muel floodplain)
White-bellied Korhaan (*Eupodotis senegalensis*)	High & Medium	High altitude plateau grasslands.
Denham's Bustard (*Neotis denhami*)	High & Medium	High altitude plateau grasslands.
Secretarybird (*Sagittarius serpentarius*)	High & Medium	Most areas, excluding actively cultivated lands.
Rudd's Lark (*Heteromirafra ruddi*)	Medium	Restricted. Higher altitude, heavily grazed grassland. Marginal in grasslands along northern boundary.
Botha's Lark (*Spizocorys fringillaris*)	Medium	Extremely restricted. Higher altitude, heavily grazed grassland. Marginal in grasslands along northern boundary.
African Grass Owl (*Tyto capensis*)	Medium	Wetland areas in the eastern regions of the WEF.
Terrestrial Biodiversity Theme		
CBA 1	Very High	Most of site except north-western corner.

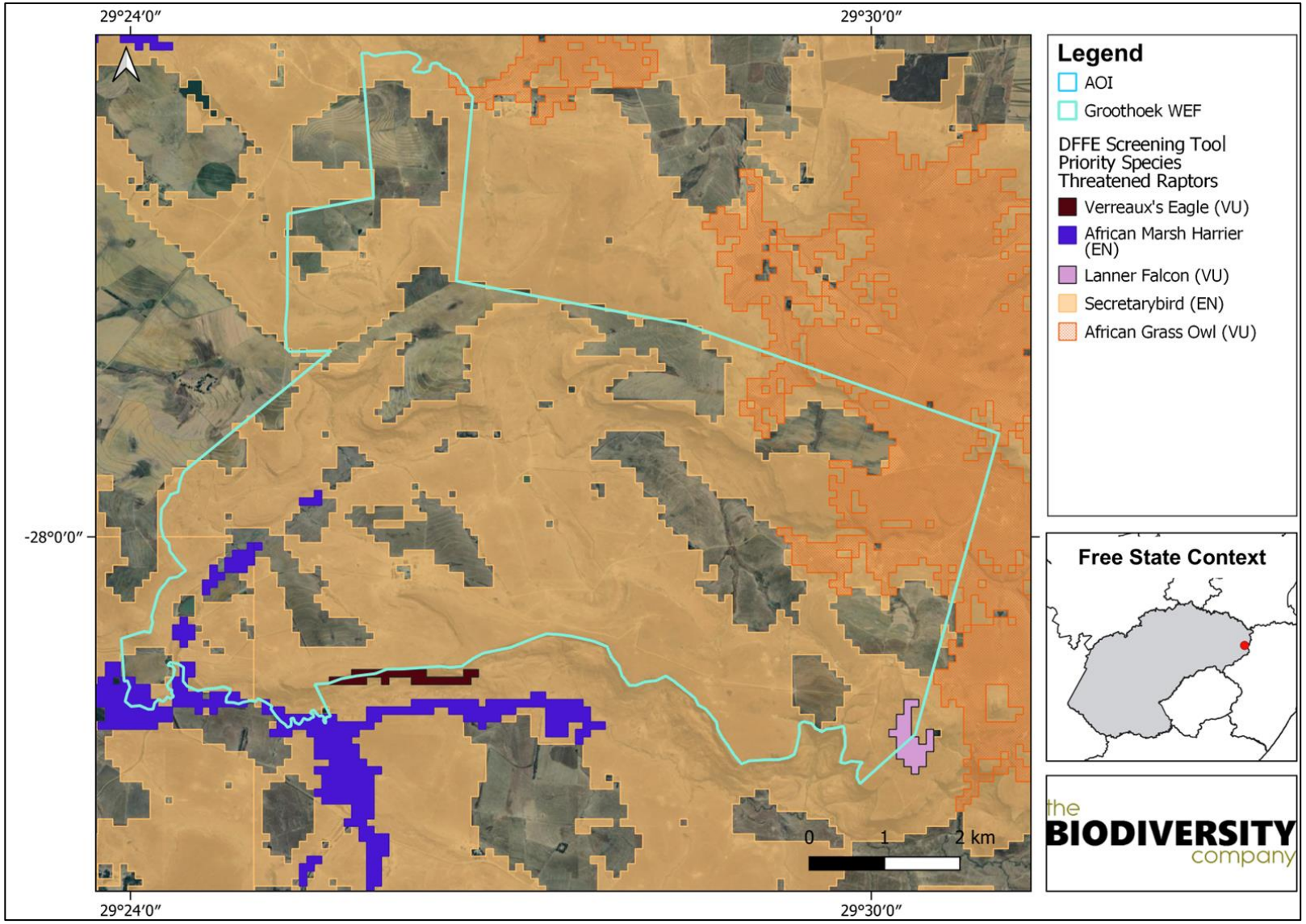


Figure 3-2 Modelled potential occurrence of threatened raptors in the project area as provided in the national screening tool (DFFE)

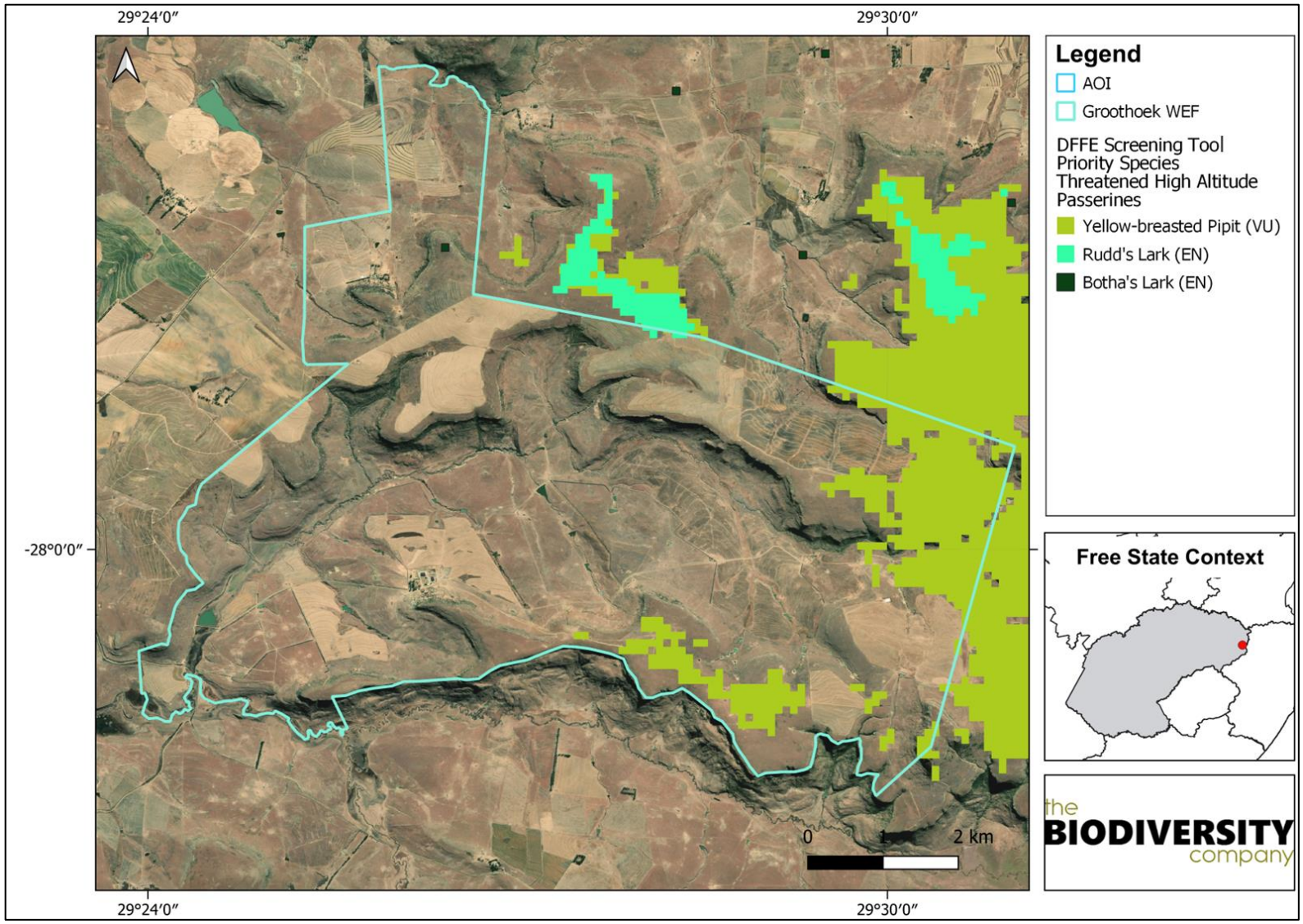


Figure 3-3 Modelled potential occurrence of threatened high altitude passerines in the project area as provided in the national screening tool (DFFE)

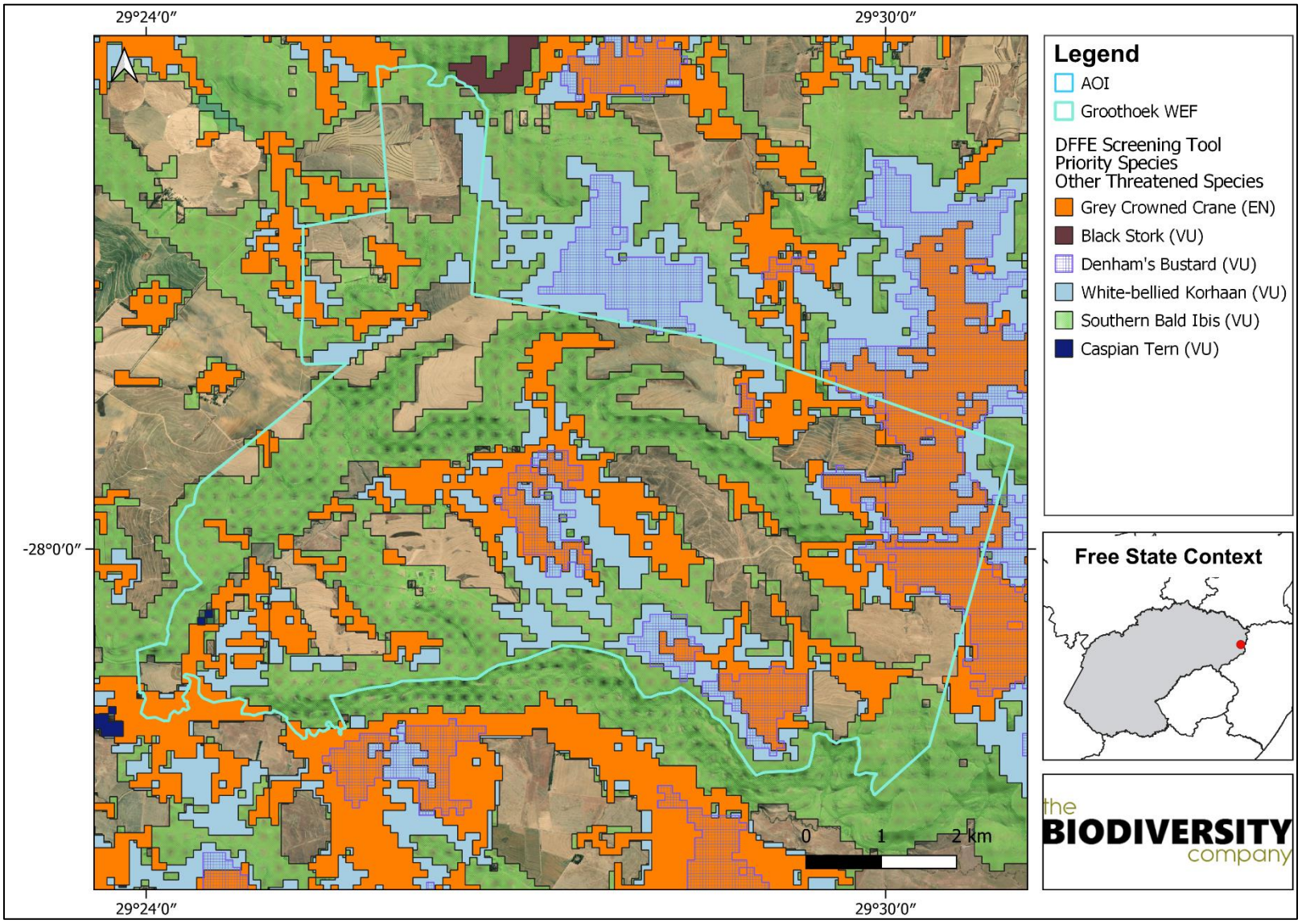


Figure 3-4 Modelled potential occurrence of other threatened avifauna in the project area as provided in the national screening tool (DFFE)

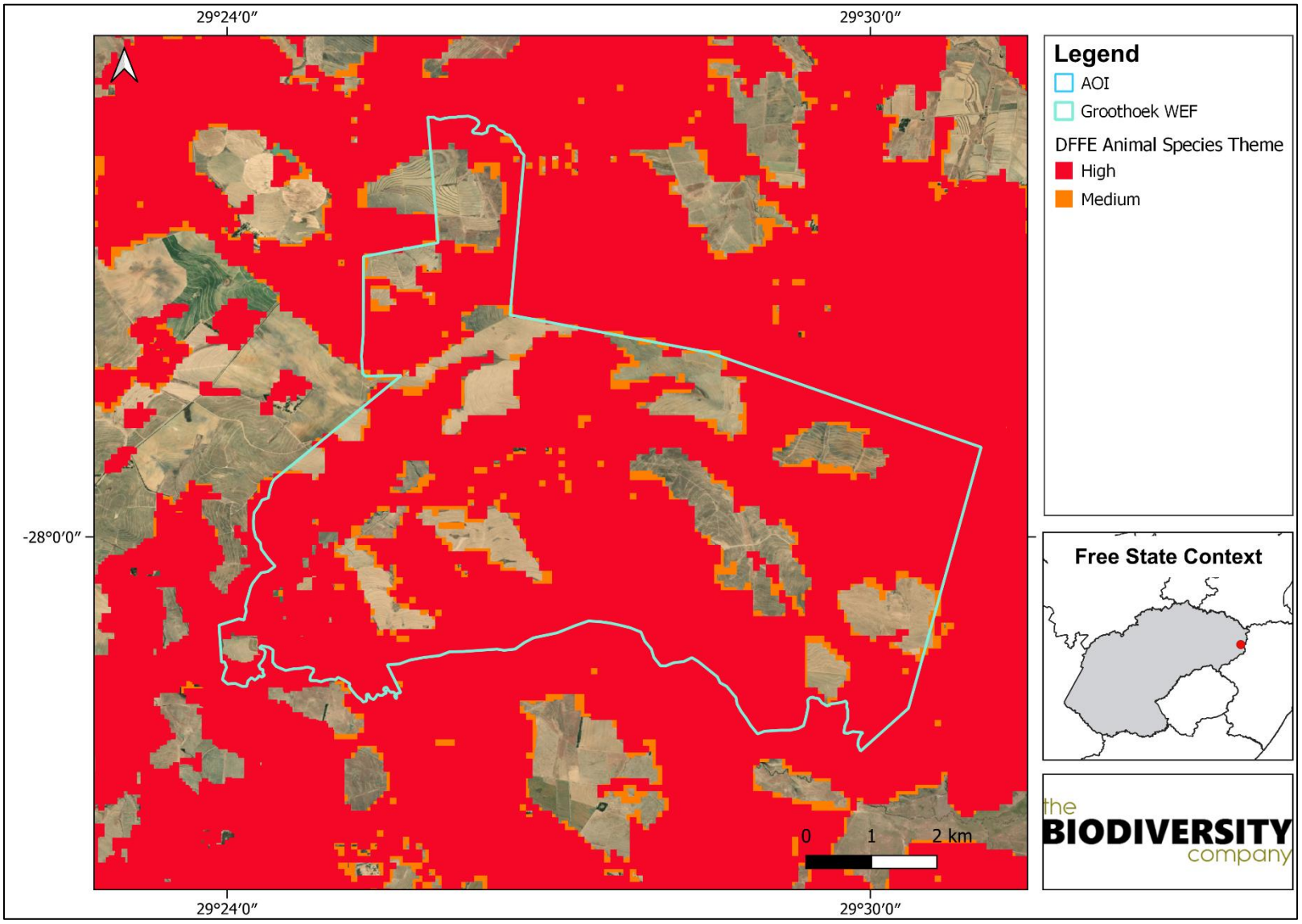


Figure 3-5 Visual representation of the DFFE Animal Species theme of the national screening tool sensitivities as applicable to avifauna

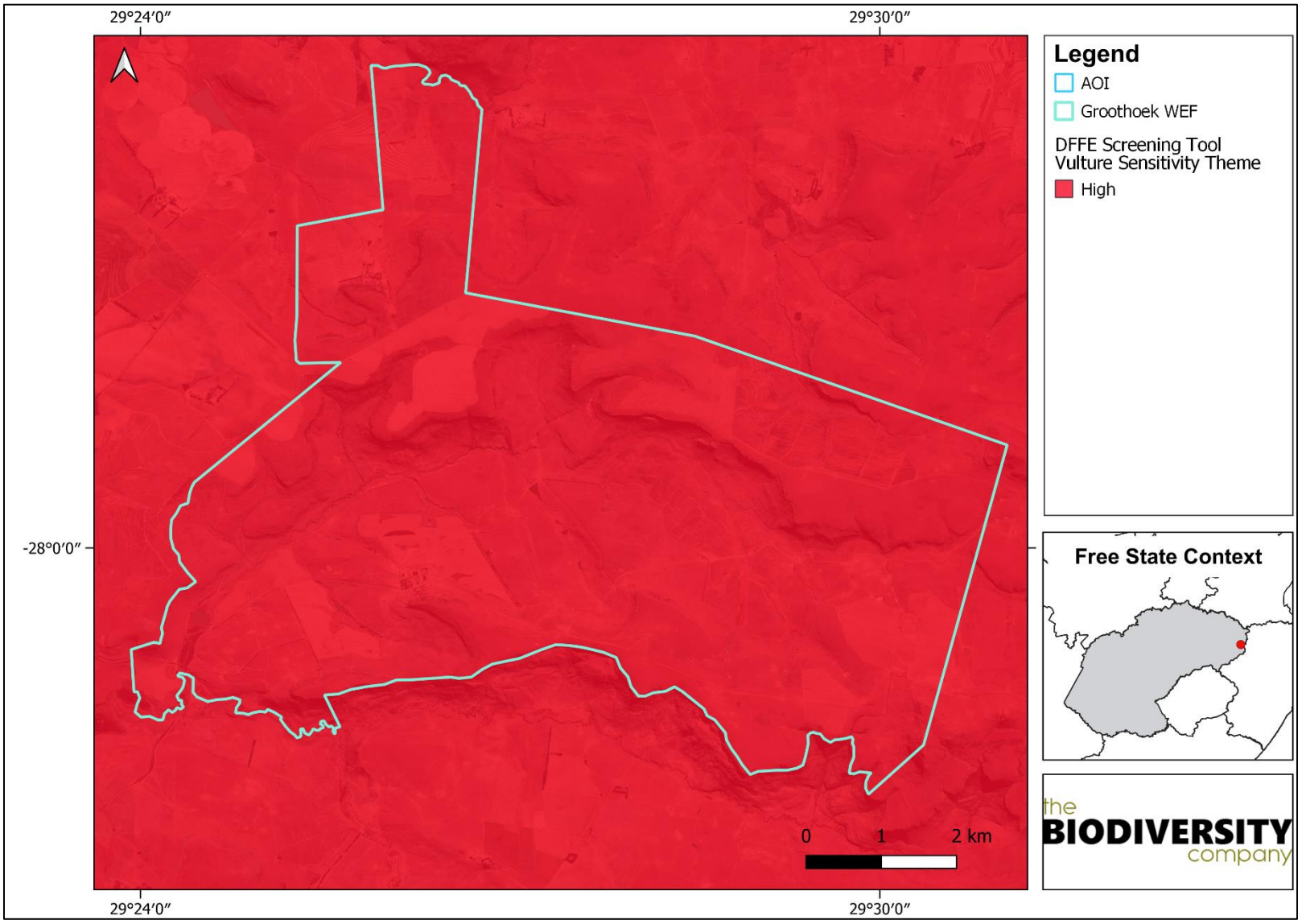


Figure 3-6 Visual representation of the DFFE vulture sensitivity theme of the national screening tool

3.3 Important Bird Areas

Important Bird and Biodiversity Areas (IBAs) represent a network of sites considered to be of global significance for bird and other biodiversity conservation. They are identified on a per-country basis using globally standardised, quantitative and scientifically agreed criteria (Birdlife International, 2022).

3.3.1 Grasslands (SA020)

Overlaps NE WEF corner. A large area of higher altitude plateau to escarpment grassland encompassing the towns of Volksrust, Wakkerstroom and Memel. The area includes a number of reserves. Seekoeivlei (near Memel) is the closest and most relevant to the project area. The IBA is renowned for hosting the core populations of most of South Africa's Threatened and endemic grassland species. Most notably, this includes most of the Endangered White-winged Flufftail (*Sarothrura ayres*) population (three wetlands), all three South African crane species (all Threatened), 85% of the global population of Rudd's Lark (*Heteromirafra ruddy*) and substantial breeding colonies of Southern Bald Ibis (*Geronticus calvus*). Many other red-listed species and high-altitude endemics occur. The larger wetlands in the IBA support significant global congregations of local and migratory waterbirds.

3.3.2 Ingula Nature Reserve (SA043)

Situated 10 km S of the project area. This high altitude (1700-1800 masl) IBA is centred on the private farms of Wilge River, Chatsworth and Bedford. It includes the pristine large Wilge River Floodplain wetland and surrounding grasslands of the Little Drakensberg. The IBA hosts some 280 bird species. It is renowned for supporting four of South Africa's Critically Endangered species, namely the White-winged Flufftail (*Sarothrura* ayresi), Wattled Crane (*Bugeranus carunculatus*), Rudd's Lark (*Heteromirafra ruddi*) and Eurasian Bittern (*Botaurus stellaris*). Importantly, the wetland hosts the largest single population of White-winged Flufftails in South Africa. Many of the escarpment's red-listed and endemic grassland species occur at Ingula, including a breeding pair of Martial Eagles (*Polemaetus bellicosus*).

3.3.3 Alexpan (SA042)

Situated 19.5 km SE of the project area. This IBA is centred on a large (7.5 ha) pan in high-altitude grassland 20 km NE of Harrismith. The IBA hosts an inventory of just over 100 species but is most known for being one of the few places where the Wattled Crane (*Bugeranus carunculatus*), Grey Crowned Crane (*Balearica regulorum*) and Blue Crane (*Anthropoides paradiseus*) regularly occur together. Excellent habitat occurs here for Rudd's Lark (*Heteromirafra ruddi*) and Botha's Lark (*Spizocorys fringillaris*).

3.3.4 Chelmsford Nature Reserve (SA059)

Situated 20 km E of the project area. This IBA encompasses the Chelmsford Nature Reserve. The reserve is centred on the large Ntshingwayo Dam and protects a good example of Northern KwaZulu-Natal Moist Grassland. The reserve is frequently visited by Southern Bald Ibis (*Geronticus calvus*), Grey Crowned Crane (*Balearica regulorum*) and Blue Crane (*Anthropoides paradiseus*). Other wetland and grassland species of concern are African Marsh Harrier *Circus ranivorus*, Corn Crake (*Crex crex*), African Grass Owl (*Tyto capensis*), Secretarybird (*Sagittarius serpentarius*) and White-bellied Korhaan (*Eupodotis senegalensis*). The rocky outcrops hold Ground Woodpeckers (*Geocolaptes olivaceus*).

3.3.5 Murphy' Rust (SA045)

Situated 30 km SSE of the project area. The Murphy's Rust IBA is situated 20 km east of Harrismith. It is centred on a large *Phragmites* dominated palustrine wetland. The site was created to protect the White-winged Flufftail (*Sarothrura ayresi*).

3.4 Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are sites which contribute most significantly to the global persistence of biodiversity in terrestrial, freshwater and marine ecosystems (IUCN, 2016). Both SANBI and BirdLife South Africa have recognise the importance of mapping, monitoring conserving these areas of global biodiversity importance through the implementation of the Key Biodiversity Areas Program. To date a network of 263 terrestrial KBAs have been identified and assessed against the global standard set by the IUCN. The areas will ultimately supersede IBAs as the main currency for identifying areas of high avian importance in the country. A significant portion of the eastern region of the Groothoek WEF overlaps the Eastern Free State Escarpment KBA. This KBA is recognised primarily for its importance in supporting a high diversity of threatened and range-restricted avifauna. The KBA is classified as 100% irreplaceable. This KBA envelops the Grasslands and Alexpan IBAs (KBA Partnership, 2024).

3.5 Statutorily Protected Areas

The proposed development site does not intersect any protected areas. However, the AOI intersects with seven statutorily protected areas. The most significant of which being the Upper Wilge Protected Environment championed by BirdLifeSA. The majority of the Groothoek WEF falls within an area identified by the National Protected Areas Expansion Strategy. These are not statutorily protected areas but rather areas earmarked for potential expansion of the protected areas network. It is important to note that, based on communications with Birdlife SA, a request has recently been submitted to declare additional properties as part of the Sneeuberg Protected Environment in the area between the existing PE and the proposed Verkykerskop WEF Cluster.

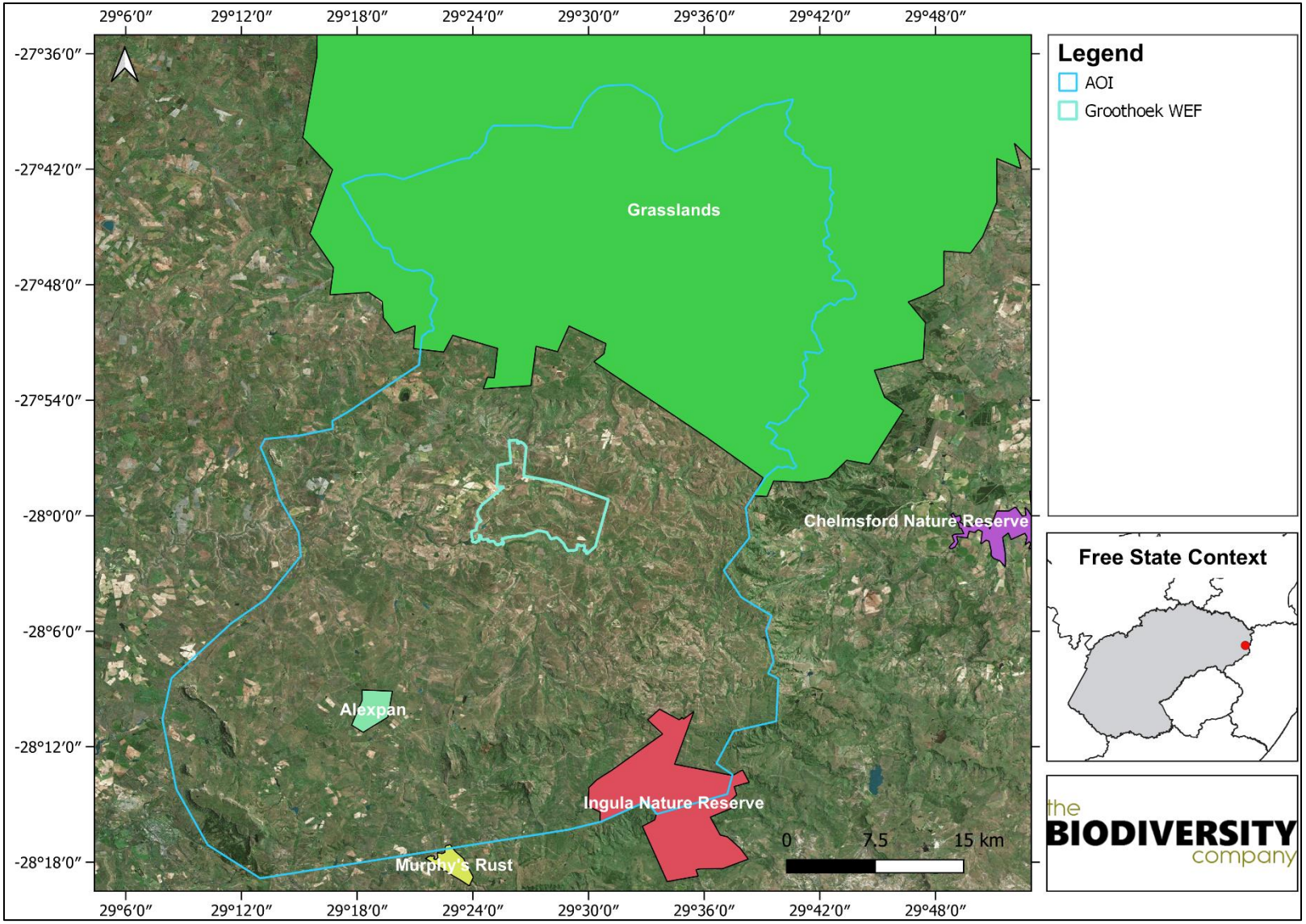


Figure 3-7 Important Bird and Biodiversity Areas in relation to the project area

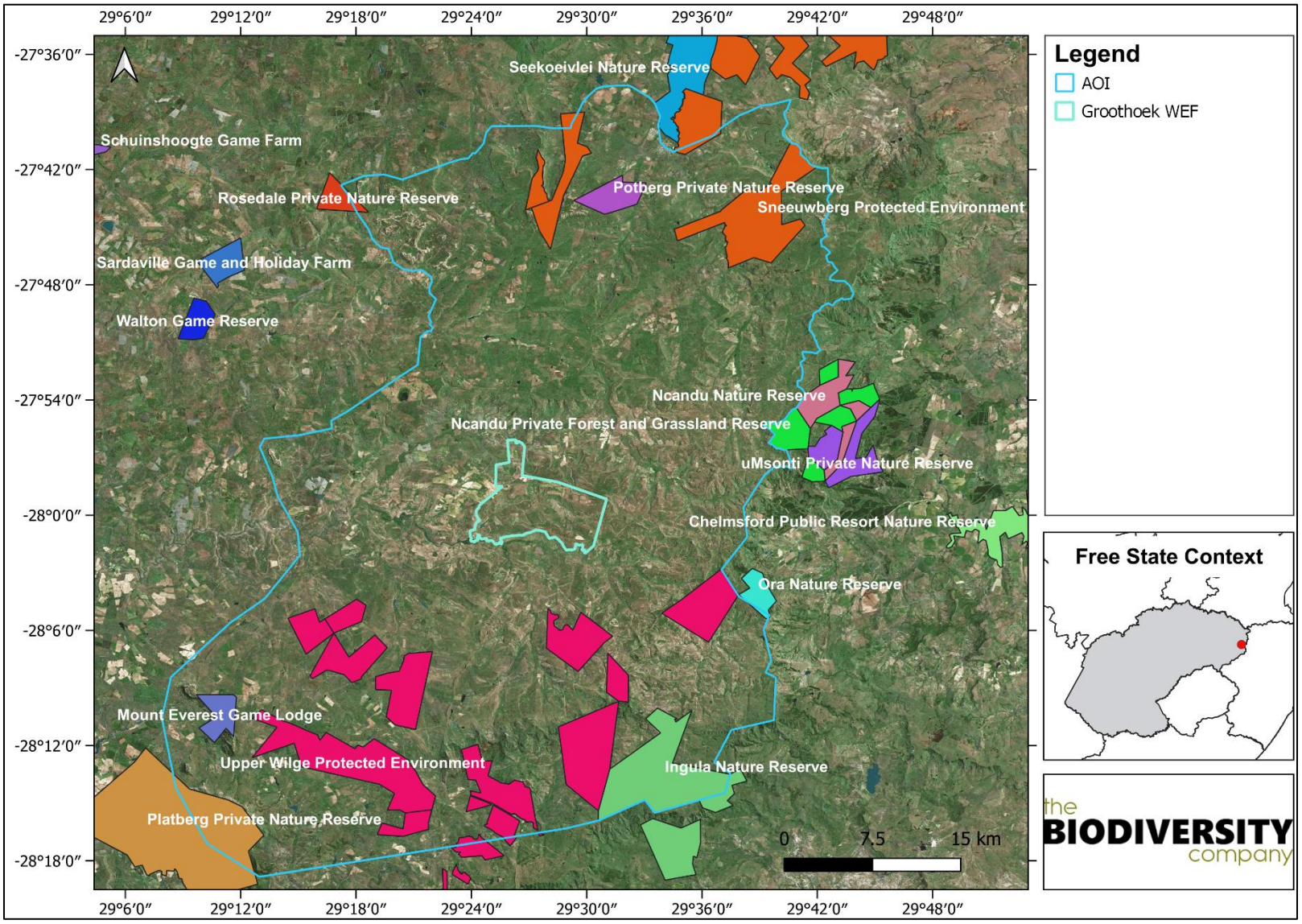


Figure 3-8 Position of nationally protected areas in relation to the project area

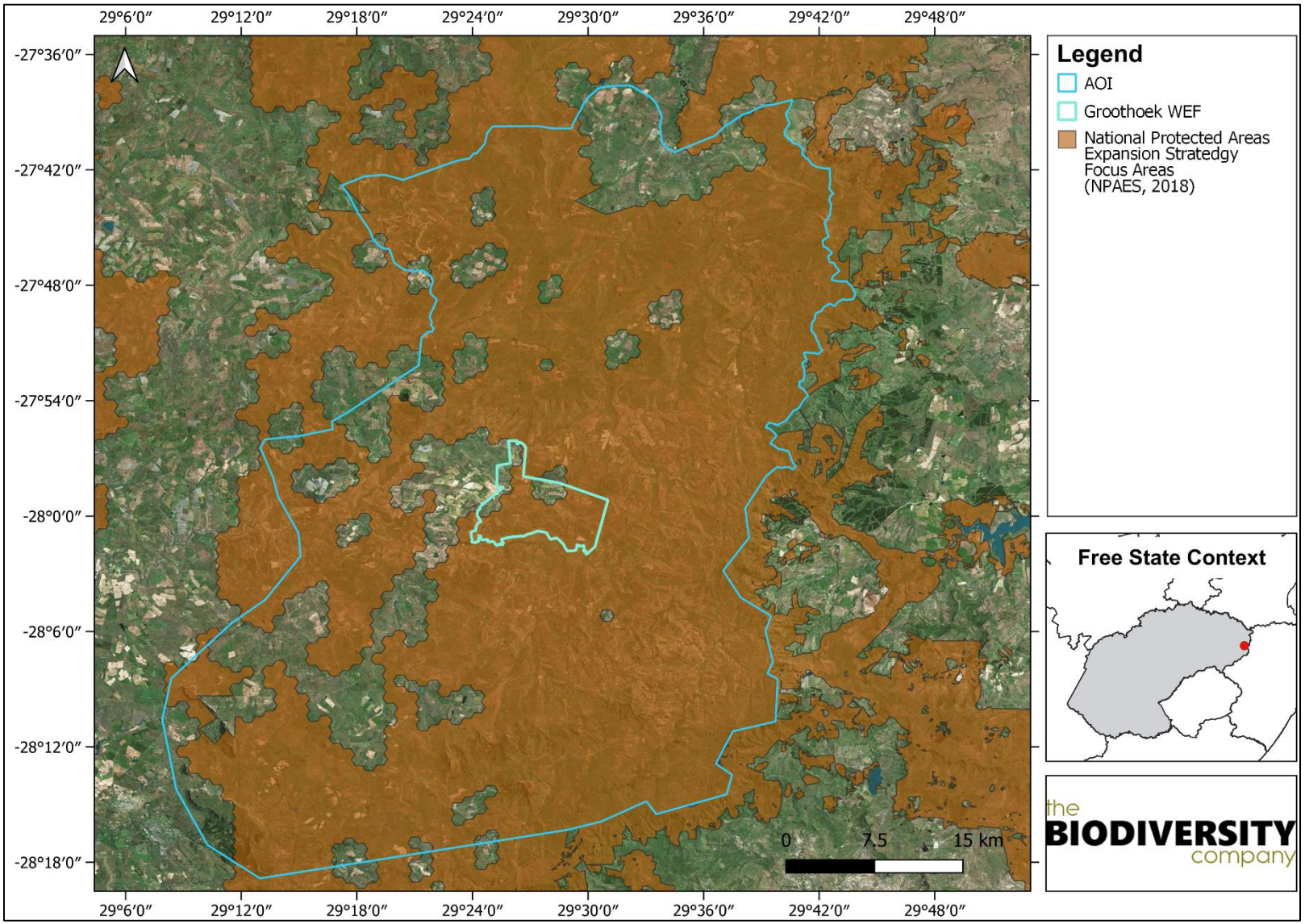


Figure 3-9 Extent of the national protected areas expansion strategy in relation to the project area

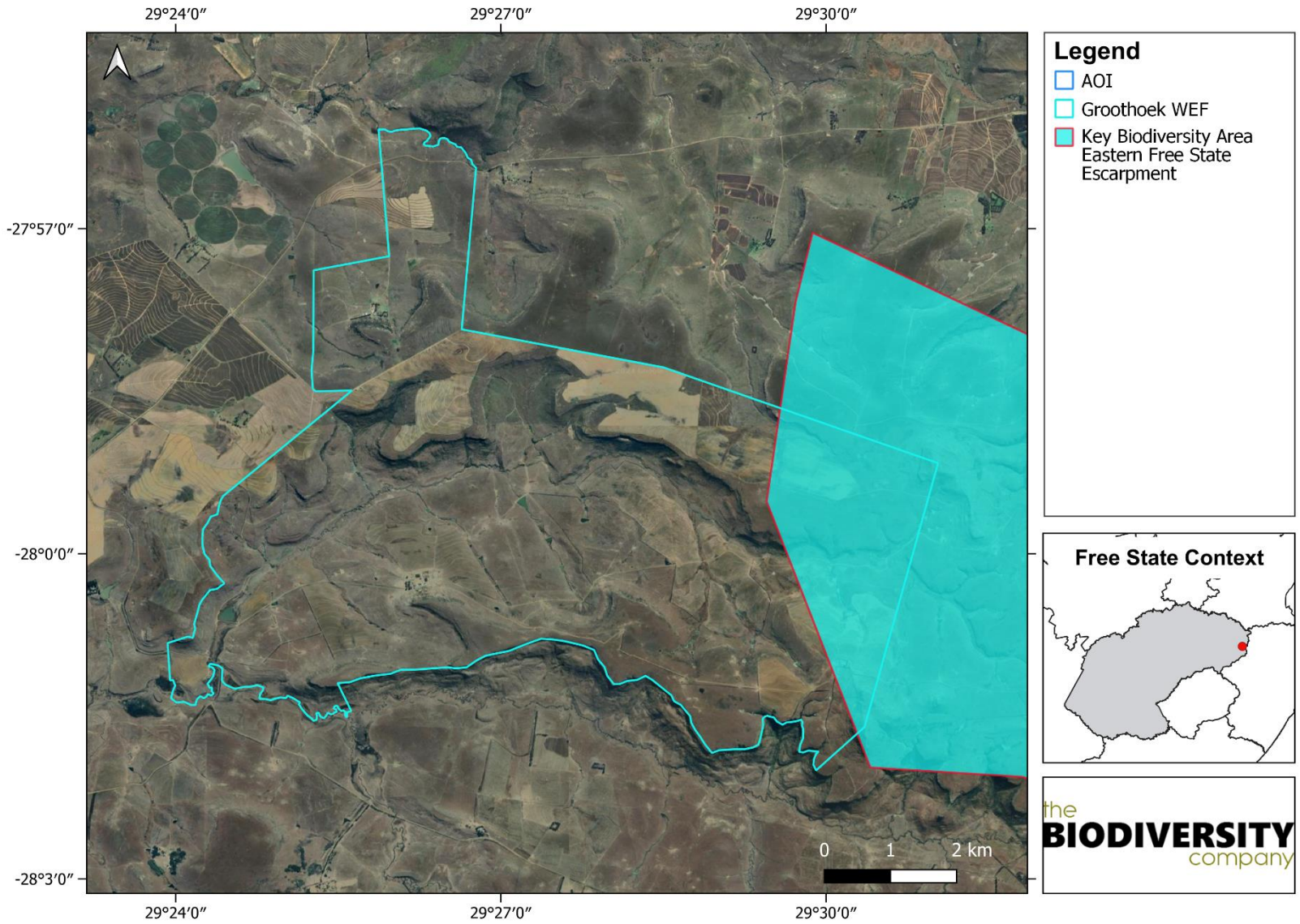


Figure 3-10 Project area in relation to Key Biodiversity Areas

4. Pertinent Findings (Year 1)

4.1 Local Avian Diversity

4.1.1 Habitats

The more westerly position of the Groothoek WEF affords it a noticeably drier climate relative to the other three WEFs within the VWC. The land use is predominantly natural grasslands (under grazing), interspersed with commercial croplands and pasture lands. The prevailing biome is grassland. More specifically, Eastern Free State Sandy Grassland predominates (Mucina and Rutherford, 2006). However, the incised mountainous topography creates a diversity of structural, edaphic and microclimatic conditions which gives rise to several clearly distinct vegetation units. At this stage at least four broad habitats as relevant to avifauna were identified. These included Open Grassland, Rocky Grassland, Wetlands and Croplands.

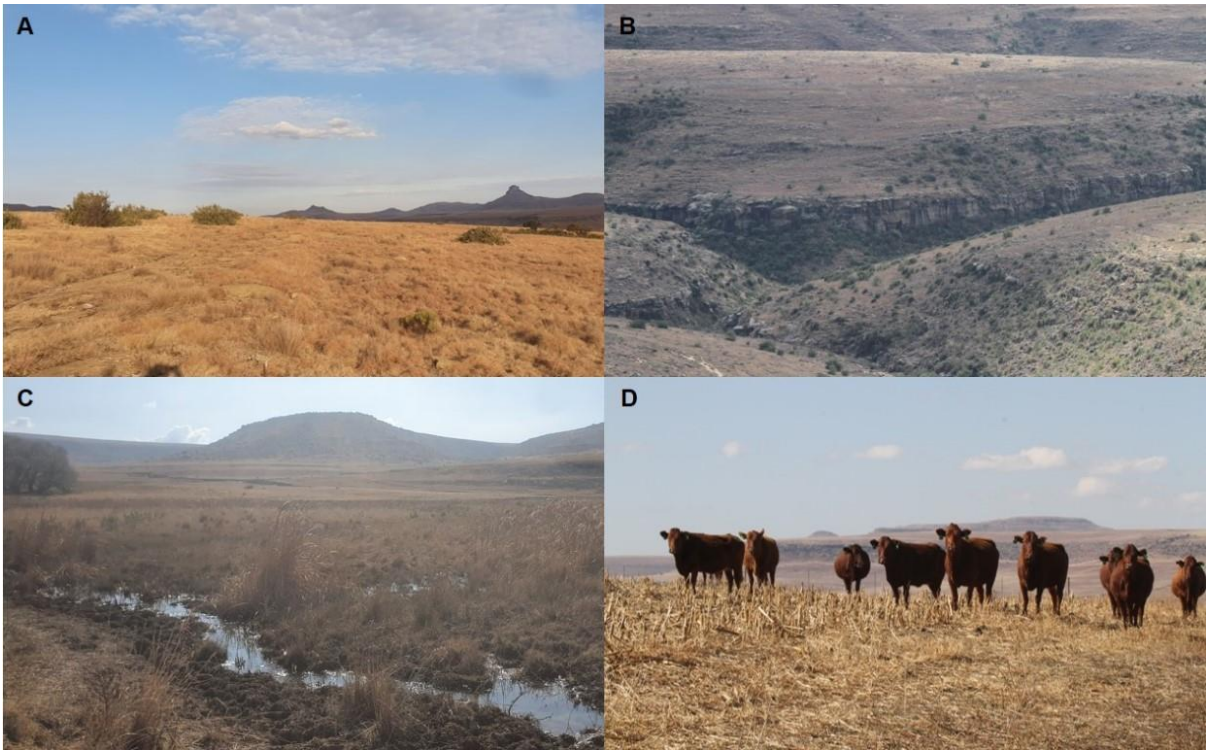


Figure 4-1 Examples of the four main avifaunal habitats identified in the project area; A) Open Grassland, B) Rocky Grassland, C) Wetlands and D) Croplands

4.1.1.1 Open Grassland

As a consequence of the climate and commercial cattle farming the grass sward in Groothoek WEF is distinctly shorter and more open than other parts of the VWC. This habitat tends to occur in all areas of flat to gently undulating topography, especially on the plateaus. It is characterised by a dense, short and relatively homogenous grass sward dominated by *Eragrostis* spp. and *Themeda triadra*. At this stage at least two sub-classifications could be distinguished as relevant for avifauna which include lower altitude moist grasslands (in the valleys particularly in north-east) and higher altitude short grassland (on the hill-top plateaus). The Plateau grasslands are likely to support most of the regionally occurring high altitude endemics and red-listed species.

At Groothoek most of the threatened high- altitude grassland passerines such as Rudd's Lark (*Heteromirafra ruddi*), Botha's Lark (*Spizocorys fringillaris*), Yellow-breasted Pipit (*Anthus chloris*) and Denham's Bustard (*Neotis denhami*) are likely to frequent more heavily grazed and shortly cropped,

higher altitude grasslands, but are likely to be restricted to the north and eastern margins of the site where the grass sward is higher and more intact. In contrast, areas of lower-lying taller grassland on the slopes and in the main valley are likely to be occupied by species such as White-bellied Korhaan (*Eupodotis senegalensis*) and Secretarybird (*Sagittarius serpentarius*). Species such Blue Crane (*Anthropoides paradiseus*), Southern Bald Ibis (*Geronticus calvus*) and Melodious Lark (*Mirafra cheniana*) are likely to have a more ubiquitous occurrence throughout the Open Grasslands Habitat. To date, surveys at Groothoek have yielded evidence of Yellow-breasted Pipit, Blue Crane, Denham's Bustard, White-bellied Korhaan, Blue Korhaan, Secretarybird and Southern Bald Ibis.

4.1.1.2 Rocky Grassland

This habitat typically occurs in areas with a more than 20 % slope gradient. This habitat includes the boulder strewn mid to upper slopes in the project area. For the time being, it also includes the crests which support sandstone cliffs and scarp-like Leucosidea-dominated forest scrub. Most of the boulder-strewn mid to upper slopes are covered in a sparse Leucosidea scrub, which increases in density and species composition towards the base of the crest, especially in more fire-protected areas at the base of large crest cliffs or gorges. Structural complexity, vegetation diversity, food, cover and microclimatic niche differentiation are highest in this habitat type. This habitat type is likely to be most important in terms of supporting rupicolous high-altitude endemics, raptors and cliff-nesting species.

Due to its more westerly position (further from the escarpment), the forest scrub at Groothoek WEF is noticeably drier than in other WEFs of the VWC. This appears to preclude the presence of species such as Bush Blackcap (*Sylvia nigricapillus*) and Cape Batis (*Batis capensis*). These scarp patches also appear to lack the structural complexity frequented by most of the true forest specialists such as Cape Parrot (*Poicephalus robustus*) and White-starred Robin (*Pogonocichla stellata*). Nevertheless, the rocky grasslands at Groothoek are important in terms of supporting rupicolous high-altitude endemics such as African Rock Pipit (*Anthus crenatus*), as well as smaller cliff-nesting raptors such as Jackal Buzzard (Nest 1) and three Southern Bald Ibis Roosts (Roosts 2, 4 and 11). Flight paths of most of the regionally occurring red-listed raptor species are strongly associated with the deeply incised Rocky Grassland and associated cliffs habitat, especially in areas with a slope gradient of >20%. These include Cape Vulture (*Gyps coprotheres*), Martial Eagle (*Polemaetus bellicosus*), Verreaux's Eagle (*Aquila verreauxii*), Lanner Falcon (*Falco biarmicus*).

4.1.1.3 Wetlands

The main wetland is the large central floodplain (tributary of the Muel River) that flows east to west through the middle of the project area. Other wetlands include channelled and unchanneled valley bottoms but also hillslope seeps, bench (or plateau) seeps depressions and mountain streams. The central floodplain is perennially inundated. Most of the larger wetlands are lined by a thin riparian belt of *Leucosidea* scrub, and due to the high erosivity of the soils, most in Groothoek WEF are also deeply eroded (gulley erosion). This habitat is likely to be most significant in terms of supporting wetland specialists as well as cranes and harriers.

A crane species that frequents wetlands and dams in the project area is Grey Crowned Crane (*Balearica regulorum*). Blue Crane breed also breed in a number of wetlands throughout the WEF, but no sign of Crowned or Wattle Crane Breeding has yet been confirmed. Marginally suitable habitat exists along the main floodplain for African Marsh Harrier (*Circus ranivorus*). Observed once on Groothoek. Regularly forage over some of the floodplains and larger valley-bottom wetlands in the far north-eastern regions of the AOI. No immediately obvious, suitable breeding habitat (dense *Phragmites* reedbeds) for this species has been found in Groothoek (although a large dam along the entrance road to the house could be utilised), but very likely occurs in some larger wetlands within the AOI, particularly along the Klip floodplain in the north-east. Intensive efforts have been made to search for signs of African Grass Owl (*Tyto capensis*), but no signs have been encountered in the Groothoek WEF, and it would seem there is a scarcity of suitably dense and tall, *Imperata cylindrica* dominated grassland along wetlands that

could facilitate breeding. Indeed, no signs of their presence have been found to date in the greater VWC and it would appear that their occurrence in the region is marginal. It would appear that the floodplain and perennial streams at Groothoek WEF are too sparsely wooded to support breeding populations of Half-collared Kingfisher (*Alcedo semitorquata*). Wetland habitat at Groothoek does not appear suitable for white-winged flufftail, which are known to occur in the region.

4.1.1.4 Croplands

Croplands occur on some of the flatter hilltop plateaus and lower-lying areas, particularly in the western third of the project area, where the topography becomes more gently undulating as it gets further from the escarpment to the east. These croplands mostly produce fodder crops for livestock (mainly cattle), typically maize and oats. This habitat also includes patches of seeded pasture lands. This habitat supports a high abundance but low diversity of birds comprising mainly seed-eaters but occasionally supports large flocks of Blue Crane.

4.1.2 Expected Site Diversity

A total of 218 bird species have been recorded during atlassing surveys (SABAP2, 2022) within the nine pentads that overlap the VWC (see figure below). This inventory is considered to be a relatively accurate, if not slightly under-representative, portrayal of regional diversity. Consequently, this list was supplemented with additional species known to occur based on Chittenden et al. (2016) and expert knowledge of avifauna from the region. This integrated inventory, totalling 294 species, was used as the basis for the project's species probability list, as presented in Appendix A.

Of these regionally occurring species, around 230 are considered highly likely to occur on a regular basis in the Groothoek WEF. However, when considering seasonal variation in species assemblages and local movements, the number of species likely to be encountered on any day in the project area is typically to be < 120 species.

4.1.3 Observed Site Diversity

Over the course of the Year 1 pre-construction monitoring, a total of 168 bird species were recorded by the project team within Groothoek WEF (which represents 75% of the 224 species recorded in the AOI). This inventory will gradually increase over time but should be considered a good representation of the typical bird assemblage in the project area. Although this represents moderate diversity in South Africa, it is important to remember that a very high proportion are red-listed and/or endemic species.

4.2 Priority Species

Table 4-1 provides a list of the 70 regionally occurring priority species along with their likelihood of occurrence within the project area. This list also details their level of endemism and conservation status at global, national and provincial levels. The birds in

Table 4-1 have been short-listed as priority species based on their conservation status, level endemism, rarity, degree of habitat specialisation and potential susceptibility to impacts from wind energy developments. To date, 34 of the 70 regionally occurring priority species have been recorded in the Groothoek WEF (see LO column in

Table 4-1). The GPS location of each Year 1 sighting has been documented in a database for the entire Verkykerskop WEF Cluster of 1620 point localities with a total count of 7748. This point locality data is shown in Figure 4-13 and represents the basis of the kernel density model which was used to map hotspots for priority species as portrayed in Figure 4-14. This map shows that priority species are concentrated in at least six main hotspot areas throughout the Verkykerskop WEF Cluster, of which two occur in the Groothoek WEF. This data was later used to delineate core habitat areas for threatened high altitude, wetland and raptor species.

Table 4-1 List of present and potentially occurring priority species

Common Name	Scientific Name	Conservation Status					LO Groothoek	VK Cluster	AOI
		Global	Regional	TOPS	FS	Endemicity			
Wattled Crane	*Grus carunculata*	VU	CR	CR	PG		3	x	x
White-winged Flufftail	*Sarothrura ayresi*	CR	CR		PG		4		
Bearded Vulture	*Gypaetus barbatus*	NT	CR		PG		3	x	x
Grey Crowned Crane	*Balearica regulorum*	EN	EN	EN	PG		1	x	x
Black Harrier	*Circus maurus*	EN	EN		PG	NE	1	x	x
Cape Vulture	*Gyps coprotheres*	VU	EN	EN	PG		1	x	x
Rudd's Lark	*Heteromirafra ruddi*	EN	EN		PG	E	3	x	x
Martial Eagle	*Polemaetus bellicosus*	EN	EN	EN	PG		1	x	x
Botha's Lark	*Spizocorys fringillaris*	EN	EN		PG		3	x	x
Secretarybird	*Sagittarius serpentarius*	EN	VU		PG		1	x	x
Maccoa Duck	*Oxyura maccoa*	EN	NT		PG		3		x
African Marsh Harrier	*Circus ranivorus*	LC	EN		PG		1	x	x
Yellow-billed Stork	*Mycteria ibis*	LC	EN		PG		2	x	x
Bush Blackcap	*Sylvia nigricapillus*	VU	VU		PG		3	x	x
Yellow-breasted Pipit	*Anthus chloris*	VU	VU		PG		1	x	x
Southern Bald Ibis	*Geronticus calvus*	VU	VU	VU	PG		1	x	x
Blue Crane	*Grus paradisea*	VU	NT		OG		1	x	x
Red-footed Falcon	*Falco vespertinus*	VU	NT		PG		1	x	x
Denham's Bustard	*Neotis denhami*	NT	VU	VU	PG		1	x	x
Striped Flufftail	*Sarothrura affinis*	LC	VU		PG		3	x	x
Verreaux's Eagle	*Aquila verreauxii*	LC	VU		PG		1	x	x
Black Stork	*Ciconia nigra*	LC	VU		PG		3	x	x
White-bellied Korhaan (Bustard)	*Eupodotis senegalensis*	LC	VU		PG		1	x	x
Lanner Falcon	*Falco biarmicus*	LC	VU		PG		1	x	x
Short-tailed Pipit	*Anthus brachyurus*	LC	VU		PG		3		
Half-collared Kingfisher	*Alcedo semitorquata*	LC	NT		PG		3	x	x
African Rock Pipit	*Anthus crenatus*	LC	NT		PG		1	x	x
Crowned Eagle	*Stephanoaetus coronatus*	NT	VU		PG		4		
African Grass Owl	*Tyto capensis*	LC	VU		PG		4		
Blue Korhaan	*Eupodotis caerulescens*	NT	LC		PG		1	x	x
Ground Woodpecker	*Geocolaptes olivaceus*	NT	LC		PG		1	x	x
Sentinel Rock Thrush	*Monticola explorator*	NT	LC		PG		2	x	x
Pallid Harrier	*Circus macrourus*	NT	NT		PG		4		
Black-winged Pratincole	*Glareola nordmanni*	NT	NT		PG		4		
Abdim's Stork	*Ciconia abdimii*	LC	NT		PG		3		
Marabou Stork	*Leptoptilos crumenifer*	LC	NT		PG		4		
Forest Buzzard	*Buteo trizonatus*	NT	LC		PG	E	3		
Black Sparrowhawk	*Accipiter melanoleucus*	LC	LC		PG		2	x	x
Little Sparrowhawk	*Accipiter minullus*	LC	LC		PG		2	x	x
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	LC	LC		PG		1	x	x
Marsh Owl	*Asio capensis*	LC	LC		PG		2	x	x
African Cuckoo Hawk	*Aviceda cuculoides*	LC	LC		PG		4		

Common Name	Scientific Name	Conservation Status					LO Groothoek	VK Cluster	AOI
		Global	Regional	TOPS	FS	Endemicity			
Barratt's Warbler	*Bradypterus barratti*	LC	LC		PG	NE	2	x	x
Spotted Eagle-Owl	*Bubo africanus*	LC	LC		PG		1	x	x
Cape Eagle-Owl	*Bubo capensis*	LC	LC		PG		1	x	x
Common (Steppe) Buzzard	*Buteo buteo*	LC	LC		PG		1	x	x
Jackal Buzzard	*Buteo rufofuscus*	LC	LC		PG	NE	1	x	x
White Stork	*Ciconia ciconia*	LC	LC		PG		3	x	x
Brown Snake Eagle	*Circaetus cinereus*	LC	LC		PG		4		
Black-chested Snake Eagle	*Circaetus pectoralis*	LC	LC		PG		3		
Montagu's Harrier	*Circus pygargus*	LC	LC		PG		3		
White-necked Raven	*Corvus albicollis*	LC	LC				1	x	x
Chorister Robin-Chat	*Cossypha dichroa*	LC	LC		PG	E	4		
Forest Canary	*Crithagra scotops*	LC	LC		PG	E	1		
Black-winged Kite	*Elanus caeruleus*	LC	LC		PG		1	x	x
Sickle-winged Chat	*Emarginata sinuata*	LC	LC		PG	NE	1	x	x
Amur Falcon	*Falco amurensis*	LC	LC		PG		1	x	x
Lesser Kestrel	*Falco naumanni*	LC	LC		PG		2	x	x
Peregrine Falcon	*Falco peregrinus*	LC	LC		PG		1	x	x
Greater Kestrel	*Falco rupicoloides*	LC	LC		PG		1	x	x
Rock Kestrel	*Falco rupicolus*	LC	LC		PG		1	x	x
Eurasian Hobby	*Falco subbuteo*	LC	LC		PG		3		
African Fish Eagle	*Haliaeetus vocifer*	LC	LC		PG		1	x	x
Booted Eagle	*Hieraaetus pennatus*	LC	LC		PG		1	x	x
Black-bellied Bustard	*Lissotis melanogaster*	LC	LC		PG		3		x
Yellow-billed Kite	*Milvus aegyptius*	LC	LC		PG		1	x	x
Melodious Lark	*Mirafra cheniana*	LC	LC		PG	NE	2	x	x
Cape Rock Thrush	*Monticola rupestris*	LC	LC		PG	E	1	x	x
African Harrier-Hawk	*Polyboroides typus*	LC	LC		PG		2	x	x
Grey-winged Francolin	*Scleroptila afra*	LC	LC		OG	E	1	x	x

Key: Pa = Project Area; AOI = Area of Influence. Status: CR = Critically Endangered; DD = Data Deficient; EN = Endangered; LC = Least Concern; NA = Not Assessed; NT = Near Threatened; OG = Ordinary Game; PG = Protected Game; PS = Protected Species; VU = Vulnerable. Likelihood of Occurrence (LO): A – anecdotal; 1 = Confirmed to occur; 2 = High; 3 = Moderate; 4 = Low / None; X = observed during SABAp2 surveys. Sources: Taylor et al. (2015); BirdLife South Africa (2016); SABAP 2 (2022)

*Only when in large murmuration flocks exceeding several hundred individuals.

4.2.1.1 Red-listed Species

A total of 37 red-listed species are known to occur in the region based on a combination of distribution data provided by Chittenden et al. (2016), the 9 pentads covering the VWC (SABAP2, 2024) and expert knowledge. Of these, 19 species are considered highly likely to occur in the project area based on habitat suitability. To date, 17 red-listed species have been recorded in the project area. Species which are highly likely to occur but remain undetected include Yellow-billed Stork (*Mycteria ibis*) and Sentinel Rock Thrush (*Monticola explorator*). Particularly noteworthy observations from the Groothoek WEF include:

- Cape Vulture (Endangered):

    - On S2 Cape Vulture were seen on multiple occasions. Group sizes were typically small (around six individuals), and occurrence was sporadic, apparently governed to a large degree by weather conditions (most seen in the morning during hot windy conditions). It was observed that Cape Vulture appear to spend considerable time soaring at rotor sweep height (subsequent analyses of year 1 data confirmed this as statistically significant). The nearest confirmed breeding roost is on Nelson's Kop 20 km south-west of the project area. This was confirmed through a dedicated dual season vulture roost survey;
    - On S3 Cape Vultures were seen at many locations. Group size averaged 6.7 individuals. One group soared low over VP3 for 75 min in a single observation;
    - During S4 a large flock perched overnight (Eastern boundary of Farm Groothoek between VP3 and VP10). On 6 May 2023, observed six on same lines;
    - No large flocks observed during S5 survey within project area. Average group size of 3 individuals; and
    - Presence during S6 notably lower than other surveys. Only seen on two occasions at VP 4 (n=3)
- Martial Eagle (Endangered):
    - Observed flying over VP4 on several occasions.
- African Marsh Harrier (Endangered):
    - Single adult observed sitting on the ground in the valley near the Bibbey residence on Groothoek WEF.
- Secretarybird (Endangered):
    - Observed fairly regularly.
- Yellow-breasted Pipit (Vulnerable):
    - Observed in intact grasslands in the far east of the Groothoek WEF.
- Denham's Bustard (Vulnerable):
    - Absent on S1, 2, 5 and 6; and
    - On S4 observed for the last time flying from VP3 to VP1 for 2 minutes on 14 April 2023.
- Verreauxs' Eagle (Vulnerable):
    - Observed fairly regularly.
- Southern Bald Ibis (Vulnerable):
    - Breeding is inferred at Roost 2 based on the new observation of nesting material on the cliff ledge. A large Bald Ibis Breeding Roost was also recorded on the mountains behind Magpela Guest Farm (20 km north-west of the project area). This is a known roost which is renowned for being the largest in the world. Roost 4 is overnight roost. Roost 11. Breeding Colony 9 adults observed starting courtship, allopreening (-28.106904; 29.405151).
- Lanner Falcon (Vulnerable):
    - Seen regularly.
- White-bellied Bustard (Vulnerable):
    - Observed much more infrequently than Blue Korhaan: and
    - It mostly occurs around VP 3. Appears to be resident.
- Blue Korhaan (Near Threatened):

    - Mainly active in summer up to 16 April 2023.
- Blue Cranes (Vulnerable):
    - Confirmed multiple successful breeding attempts (chicks reared to juvenile / sub-adult) in Groothoek WEFs.
- Amur Falcon (Least Concern):
    - During Survey 3, a very large migratory flock (numbering over a thousand birds) was observed moving across the project area in a dense swarm. Migratory flocks of this size are of global significance. The potential for a significant collision event is a distinct possibility and represents a considerable risk in terms of wind farm development.

The following noteworthy additional observations were made by the bat specialists (Inkululeko Wildlife Services) during the fieldwork in the greater VWC:

- The observation of an estimated 200 Cape Vultures at 28,04783 S, 29,52242 E within the Cluster. During IWS site visits, vultures were observed utilising a variety of habitats and flying in and out of rotor sweep whilst flying above ridges, between ridges, and down from ridges into the central valleys.
- More than 25 Cape Vultures were observed near Biggs' Farm at 28,04455 S, 29,54404 E, soaring above the ridge, utilising updraughts/thermals, and moving continually within turbine rotor sweep height.
- Martial Eagle was seen near Mount Pelan Auction Kraals.
- Two Black Harrier were observed on the R35 outside Memel.

4.2.1.2 Cape and Bearded Vulture

At present, five Cape Vulture roosts (of which one is a confirmed breeding colony) and one Bearded Vulture nest have been confirmed to occur in the AOI (all within 50 km of the VWC). Initially, during scoping fieldwork, the specialist (Tyron Clark) identified three Cape Vulture roosts on three distinct inselbergs to the south of VWC. Due to the proximity of the VWC to the roosts and in accordance with the BirdLife Cape Vulture and wind energy best practice guidelines, the specialist recommended that the status of these roosts (in terms of breeding and seasonal occupancy) be thoroughly investigated. However, completing an investigation of this nature was difficult to achieve during the pre-construction monitoring surveys due to the exceptionally tight fieldwork schedule and the vast distances involved in travelling between roosts on bad roads and the general remoteness of the roosts. As such, a dedicated vulture roost investigation was motivated and subsequently conducted for the proposed VWC. The need for the investigation was raised during a meeting between TBC and Mulilo, and a decision was made for a basic, high-level, dual-season investigation of the breeding status of these roosts to be carried out.

Roosts were visited and tentatively ascribed as non-breeding natural roosts which are used regularly. This section summarises the findings of the vulture roost investigations to date. Photographs of are given in **Error! Reference source not found.** and each roost/nest is described in **Error! Reference source not found.** along with its proximity to the closest boundary on Groothoek WEF. The location of each roost is represented spatially in **Error! Reference source not found.**.

Table 4-2 Vulture roost details

Number	Inselberg	Description	Closest Distance (Km)	Centre Distance (Km)
CV Roost 1	Arend's Kop	Cape Vulture Roost (large, regular non-breeding). Inselberg near Harrismith. Roost is on west facing aspect on north-western end of inselberg.	31	42

CV Roost 2	Scheurklip	Cape Vulture Roost (regular non-breeding). On large distinctive (lobster claw-shaped cliff) inselberg closest to project area. Roost is on north aspect.	10	20
CV Roost 3	Nelson's Kop	Cape Vulture Breeding Roost (large colony) and Bearded Vulture Nesting Site. Roost is on the southern aspect of the north-western buttress of Nelson's Kop.	21	31
CV Roost 4	Witkoppe	Cape Vulture Roost (regular non-breeding). Situated on the eastern most spur of the Witkoppe Inselberg. Roost is on north facing aspect of spur. Bearded Vulture observed nesting status uncertain.		
CV Roost 5	Verkykerskop	Cape Vulture Roost (small non-breeding). Situated on the western aspect of Verkykerskop Inselberg. Roost is on north facing aspect of spur.		
BV Nest 1	Nelson's Kop	Bearded Vulture Nest on Nelson's Kop. Breeding Pair.	21	31

Note: Another roost occurs just beyond 50 km on Rensburgskop near Manyenyeza Peak and the Love Alive Lions Sanctuary (Vulpro pers. comm. 2025)

Following several detailed visits to the roosts, evidence of breeding has only been recorded at Nelson's Kop. The remaining roosts appear, at this stage, to be non-breeding "spillover" roosts. The first official vulture roost investigation carried out in June 2023 and subsequent fieldwork in April 2024 yielded no evidence of breeding at any roosts other than Nelson's Kop. Of the non-breeding roosts Arend's Kop is the more significant. It is apparent, based on multiple season observations (focal point counts from the R722 road) that Arend's Kop roost is utilised very regularly throughout the year. The inselberg was hiked during preconstruction Survey 5 (27 July 2023). However, upon closer inspection no active nests or signs of breeding (nesting material, mating birds, eggs, chicks) were observed, although suitable nest leges do occur (although limited) and the possibility for breeding once the colony reaches critical mass should not be conclusively ruled out (Geoff Lockwood pers. comm). At Nelson's Kop, during the June 2023 vulture investigation, two breeding birds (**Error! Reference source not found.**) were found to be incubating after reassessing the photographs. Approximately 200 birds were observed roosting at Nelson's Kop that trip.

The second follow-up visit to Nelson's Kop was carried out over two days. The first was a reconnaissance day (information gathering from local landowners and general scoping of the greater inselberg from afar). The second day involved a full day hike to the base of the vulture colony and a detailed count. Noteworthy findings were as follows:

- Cape Vulture breeding status: One of the two nests (that were observed on 13 June 2023) has yielded a chick (**Error! Reference source not found.**). The nest is situated towards the top left-hand side of the main roost (when facing north). The chick is currently in a transition phase from downy to feathered plumage with an approximate age 50 days (as of 13 October 2023 and depending on hatch date). The chick is tended by both parents and is actively guarded. The attempt made by the second incubating pair appears to have been unsuccessful, but the pair still sit faithfully at the failed nest site. Recently the number of Cape Vultures breeding at Nelsonskop has increased to an estimated 7 nests (based on expert input received from Sonja Krueger and Brent Coverdale (Ezemvelo KZN Wildlife) during a visit in November 2024.
- Cape Vulture colony size: A detailed afternoon inbound count conducted on 13 June 2023 yielded 131 adult birds. It is, however, likely that more birds may have landed on other parts of the inselberg not visible at the time of the count and it is likely that the colony regularly supports well over 200 birds;
- Bearded Vulture breeding: A particularly significant finding was that Bearded Vulture (*Gypaetus barbatus*) breed at Nelson's Kop. The species is listed as Critically Endangered in South Africa. Nelson's Kop represents the most northerly breeding site for the species in the country and the only one away from the main Drakensberg escarpment. The nest has been monitored on an *ad hoc* basis since 2006 by Rick Dillon with the last successful breeding attempt (**Error! Reference source not found.**) documented in 2014 by R. Dillon and Sonja Kruger. BirdLife South Africa also monitors the nest annually on behalf of the Bearded Vulture Task Force. Following a period

where no birds were present, they have returned in recent years (est. around 2021 or 2022) and have shown definite breeding behaviour even though a specific nest could not be located (BirdlifeSA pers. comm. 2024) Another nest was, however, found on the western face which may represent a new nest site. A single adult (**Error! Reference source not found.**) was observed landing in close proximity to this nest;

- Vulture restaurants: At present, the only confirmed vulture restaurant is situated at Nambiti Game Reserve 57 km southeast of Nelson's Kop. However, the vultures have been observed feeding on carcasses in the VWC and AOI on numerous occasions;
- Black Stork: A single individual was observed flying over the Cape Vulture colony. It is suspected that the species may be nesting on the northern aspect of Nelson's Kop;
- Lanner Falcon: A pair were observed actively fending off any birds which came to close to the western cliff face. It is suspected that they have an active nest on Nelson's Kop;
- Verreaux's Eagle: A single adult bird flew over Nelson's Kop; and
- Barrat's Warbler: A pair was heard calling from a Yellowwood tree at the base of the cliff.

Overall, the Cape Vulture roost investigation highlights the importance of Nelson's Kop in supporting breeding populations of several threatened cliff-nesting species which include Bearded Vulture (Critically Endangered), Cape Vulture (Endangered), Lanner Falcon (Vulnerable) and Black Stork (Vulnerable). The other four roosts appear, at this stage, appear to be non-breeding "spillover" roosts. The project's spatial dataset has been updated to include the Bearded Vulture nest and its recommended 10 km Very High exclusion buffer as well as the two new roosts at Verkykerskop and the Witkoppe. The VWC (and therefore Groothoek WEF) falls outside of the 18 km Very High buffer zone as stipulated by BirdLife South Africa for breeding colonies of Cape Vulture. However, it does fall within the 50 km High sensitivity buffer of all five roosts. Although the VWC falls beyond the 10 km suggested buffer radius for Bearded Vulture (Brink, 2020), their presence is a cause for concern given their wide-ranging nature. The sporadic occurrence of Bearded Vulture, particularly juveniles in the project area is supported by locality records as provided in Reid et al (2015). Overall, Groothoek WEF and the VWC is situated within an area likely to be frequently used by >200 Cape Vultures and infrequently used by at least a pair of Bearded Vulture from Nelson's Kop as well as their dispersing juveniles but other birds may also visit the site from the Central and Northern Drakensburg.

Figure 4-2 Photographs of the three Cape Vulture roosts; A) Roost 1 Arendskop, B) Roost 2 Scheurklip, C) Roost 3 Nelson's Kop, D) Roost 4 Witkoppe

Figure 4-3 ***Photographs of the Nelson's Kop roost taken during the second follow up visit in October 2023 showing A) the location of the two breeding pairs. Note only CVN1 successfully hatched a chick, B) The chick at CVN1 and C) the nest cup of CVN1.***

Figure 4-4 ***Photographs of Bearded Vulture taken at Nelson's Kop. The first column represents observations of the currently presumed nest location (A and C) and the recently observed adult (E and G) while the second column represents observations of the known breeding location(B and D) and birds including the 2014 fledgling (F and H).***

4.2.1.3 Martial Eagle

Overall, five Martial Eagle nests were documented (**Error! Reference source not found.**). The location[1] of these nests is shown in **Error! Reference source not found.**. The nests are labelled "Martial Nests 1-5" in the project's Priority Species Nests shapefile. Of these, the most significant with regard to the VWC and Groothoek WEF cluster is Martial Eagle Nest 2**.** The nest borders on farm Bath and has marginal implications for the Groothoek WEF. A single juvenile fledged from the nest in October 2023. The presence of the nest was suspected to occur from flight activity patterns observed during Survey 6. As mentioned in the general progress above, two adults were seen hovering in this area (Farm Bath), mostly in rotor sweep height for 4 hours. It is likely that a pair may be nesting just over the escarpment edge either in or very close to Ncandu Nature Reserve. However, this nest could not be located.

Table 4-3 Martial Eagle nest details

Nest	Description	Status	Distance from WEF	Buffer implications for WEF
1	Nest ca 12 m high in poplar tree in a Eucalyptus bushclump on Clan Leslie Estates farm, private property. Approximately halfway between Verkykerskop and Warden.	Active, last documented activity, single juvenile flew from nest November 2022	32 km W	No
2	Nest ca. 18 m high in tallest tree of Eucalyptus bushclump on land bordering Farm Bath.	Active, last documented activity, single juvenile flew from nest October 2023	4.6 KM SE	Yes
3	Nest in *Eucalyptus* bushclump	Active, breeding success uncertain	14 km N	No
4	Nest in escarpment forest in Ingula Nature Reserve.	Active, pair have successfully fledged juveniles	27.6 km S	No
5	Nest in Eucalyptus tree at headwaters of wetland	Active	11 km NNE	NO

[1] Note, due to the sensitivities regarding the poaching and disturbance of these birds and given their Threatened conservation status the map shown here and precise location of these nests should be kept confidential and should not be shared or published in the public domain.

Figure 4-5 Photographs of Martial Eagle nests A) 2, B) 1, C) 4 and D) 3

4.2.1.4 Southern Bald Ibis

To date, 11 Southern Bald Ibis roosts have been found within the AOI. Of these three, namely Roosts 2, 4 and 11. This breeding has been confirmed at Roost 11 and inferred at Roost 2, while Roost 4 is an overnight roost. Overall, four roosts in the AOI (roosts 7, 8, 9 and 10) are actively monitored by Carina Pienaar (Ingula and Grassland Conservation Project Manager at BirdLife South Africa). The most significant are roosts 8 and 9 on the Witkoppe inselberg, approximately 20 km northwest of the project area, which hosts the world's largest breeding colony of Southern Bald Ibis. Based on the high number of foraging individuals encountered within the project area (considerably higher than the number of birds observed roosting at night in the project area) it would appear that many individuals from this (and other roosts even further afield) make regular foraging excursions to the grasslands in the project area. Of the various roosts, six have buffer implications for the Verkykerskop WEF complex. Of particular importance are Roosts 2, 5, 11 and especially 6 (large active breeding colony located on Markraaf's Rest property).

Table Southern Bald Ibis nest details

Roost	Description and Status	Significance	Buffer implications for WEF
1	Uncertain. Likely breeding roost but unconfirmed. Situated in sheltered crag on Waterkop near Markgraaf's Rest WEF.	Medium	No
2	Breeding roost. Inactive. Evidence of nesting, but erratic. Approximately 8 birds.	High	Yes (very high and high sensitivity zones)
3	Non-breeding roost. No breeding observed to date. Situated on crag on entrance road to farm Bath on Markgraaf's Rest WEF.	Low	No
4	Non-breeding roost behind residence.	Low	Yes (very high and high sensitivity zone)
5	Breeding roost. Nesting observed 2022 but not 2023. On cliffs along river.	High	No
6	Breeding roost large. Active. Breeding confirmed. At least 17 individuals. Two nests observed. Pair of chicks on one and pair of eggs on other. In small gorge.	High	Yes (high sensitivity zones)
7	Breeding roost. Four birds observed sitting on nests. Roost monitored by Renette Steyn and Carina Nel Meissie.	High	No
8	Breeding roost. Active breeding colony. Witkoppe Inselberg. Part of largest in the world.	Very High	No
9	Breeding roost. Witkoppe Inselberg. Largest in world.	Very High	No
10	Breeding roost. Active. Breeding confirmed. Cliff over river near low level bridge on R722.	High	No
11	Breeding roost. Active. Breeding confirmed. One nest with two chicks. Centrally situated on portion land between Groethoek, Kromhom and Markgraaf's Rest WEFs	High	Yes (very high and high sensitivity zones)

Figure 4-6 Evidence of Southern Bald Ibis breeding activity; A) adult tending nest, B) eggs on nest, C) downy chick, D) feathered chicks, E) adult incubating, F) courtship

4.2.1.5 Verreaux's Eagle

Three Verreaux's Eagle nests occur within the AOI, none of which are in the VWC or Groothoek WEF. Of these, breeding has only been confirmed at Nest 3 on Verkykerskop, 17.6 km west of the Groothoek WEF. This nest is actively tended by a pair and signs of breeding include the construction of an inner wreath. The occupancy and breeding status of the remaining two, especially nest 1, remains uncertain due to the remoteness and inaccessibility of their locations. Verreaux's Eagle Nest 2 on Mont Pelaan (although currently appears inactive, and has not been positively confirmed as a Verreaux's Eagle nest) has the greatest potential significance for the project due to its proximity.

Table 4-4 Verreaux's Eagle nest details

Name	Description	In WEF	Buffer Implications for WEF
Verreaux's Eagle Nest 1	Uncertain	No	No
Verreaux's Eagle Nest 2	Inactive	No	No
Verreaux's Eagle Nest 3	Active	No	No

4.2.2 Endemic Species

A total of 15 South African endemics occur in the region. Non-red listed include Grey-winged Francolin (*Scleroptila afra*), Forest Buzzard (*Buteo trizonatus*) Cape Rock Thrush (*Monticola rupestris*), Buff-streaked Chat (*Campicoloides bifasciata*) and Pied Starling (*Lamprotornis bicolor*). All except, Forest Buzzard were recorded during Year 1 monitoring. Except for Pied Starling (which is ubiquitous) all of these species tend to frequent the higher altitude Plateau Grassland and Rocky Grassland habitat.

4.2.3 Migratory Species

Many large flocks of migratory birds move across the project area in early summer, the most notable of which being a globally significant migratory flock of Amur Falcons (numbering over a thousand individuals which moved along the Meul River valley for several days.

4.2.4 Other keystone species

Other than Red-listed species, a further 26 species (

Table 4-1) are also considered priority species. These include mainly raptors as well as a few large-bodied birds. Nests of five other priority species occur in the AOI. This includes one African Harrier-hawk nest, four Black Sparrowhawk nests, three Jackal Buzzard nests, one Lanner Falcon nest and one Secretarybird nest. Of these, only the three Jackal Buzzard nests and the Lanner Falcon nest occur in the VWC. Breeding has been positively confirmed at Jackal Buzzard Nests 1 and 3 and Lanner Falcon Nest 1 but not Jackal Buzzard Nest 2. The full breeding cycle from eggs to fledged juvenile has been monitored at Jackal Buzzard Nest 1 (a focal point) on farm Groothoek. The 2023 breeding attempt at Jackal Buzzard Nest 3 was unsuccessful due to the predation of a chick by a pair of Verreaux's Eagle. Two nests of other priority species have buffer implications Groothoek, namely Jackal Buzzard Nest 1 and Black Sparrowhawk Nest 4.

Table 4-5 Other priority species nest details

Name	Description	Buffer Implications for WEF
African Harrier-hawk Nest 1	Active	No
Black Sparrowhawk Nest 1	Active	No
Black Sparrowhawk Nest 2	Status Uncertain	No
Black Sparrowhawk Nest 3	Inactive	No
Black Sparrowhawk Nest 4	Inactive	Yes
Jackal Buzzard Nest 1	Active	Yes
Jackal Buzzard Nest 2	Inactive	No
Jackal Buzzard Nest 3	Active	No
Lanner Falcon Nest 1	Active	No
Secretarybird	Active	No

Figure 4-7 Nests of cliff-nesting raptors A) Jackal Buzzard Nest 3, Lanner Falcon Nest 1, Jackal Buzzard nest 1 with eggs, D) Verreaux's Eagle Nest 3

Figure 4-8 ***Photographs of red-listed raptors observed in the AOI;A) Cape Vulture, B) Bearded Vulture, C) Martial Eagle carrying a Denham's Bustard, D) Verreaux's Eagle, E) Secretarybird, F) Lanner Falcon***

Figure 4-9 ***Photographs of small to medium-sized red-listed species observed in the AOI; A) Rudd's Lark, B)Yellow-breasted Pipit, C) African Rock Pipit, D) Ground Woodpecker, E) Bush Blackcap, F) Maccoa Duck, G and H) Southern Bald Ibis***

Figure 4-10 ***Photographs of large-bodied priority species observed in the AOI; A) Blue Crane, B)Grey Crowned Crane, C) Wattled Crane, D) Denham's Bustard, E) Black-bellied Bustard, F) Blue Korhaan, G) White Stork, H) Black Stork***

Figure 4-11 ***Photographs of other priority raptor species observed in the AOI; A) Amur Falcon, B) Peregrine Falcon, C) Juvenile Jackal Buzzard, D) African Harrier-hawk, E) Rufous-breasted Sparrowhawk, F) Black-winged Kite***

Figure 4-12 ***Photographs of other generally rare or illusive species observed in the AOI; A) African Crake, B) Sickle-winged Chat, C) Barrat's Warbler, D) Black-winged Lapwing, E) Cape Rock Thrush, F) Grey-winged Francolin***

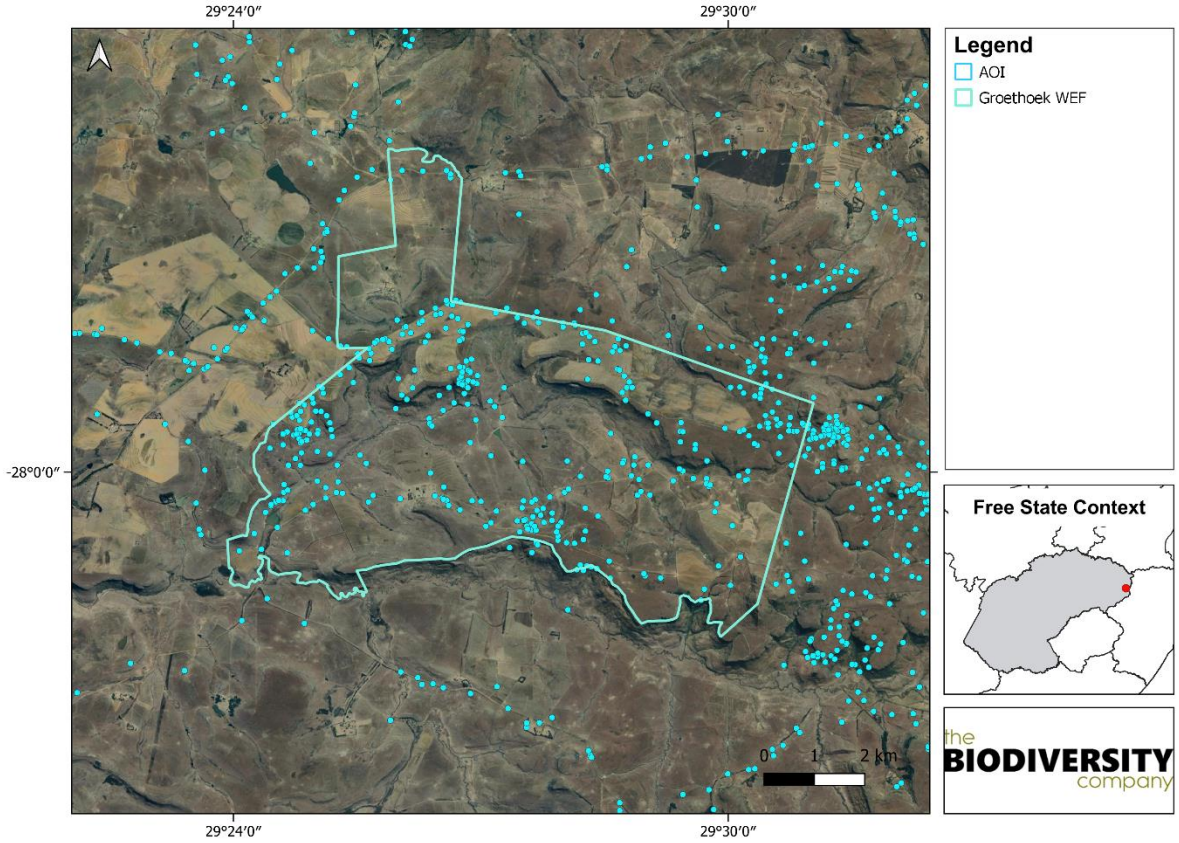


Figure 4-13 Point localities of year 1 priority species observations

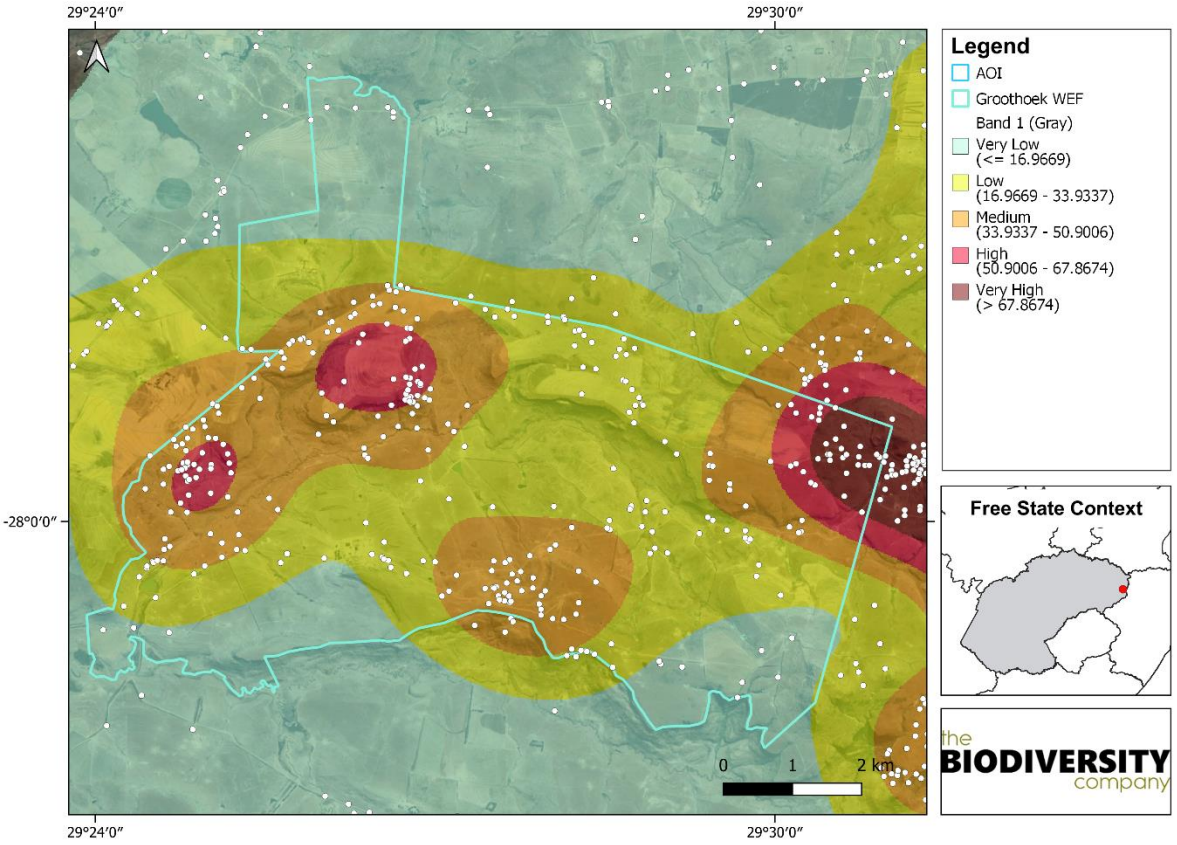


Figure 4-14 Kernel density model portraying hotspots of priority species occurrence.

4.3 Flight Activity

4.3.1 All Priority Species

Year 1 flight activity data for the Groothoek WEF (n= 4, 12-hour VPs over 6 surveys totalling 72 hours) and the control site (1VP for the same period) for all priority species and Cape Vulture are summarised in the table below. Overall, 1224 hours of observation from vantage points in the project area yielded a total of 508 flights of priority species, totalling 73.17 hours with a passage rate of 1.76 birds^{-hour}. This passage rate is considerably more than that observed at the control site (0.97 birds^{-hour}). For the sake of this scoping report and project planning purposes, Cape Vulture was singled out for further analysis on flight activity, see Section 4.3.2 below for details.

Table 4-6 Summarised Year 1 flight activity data from both the project area and the control site (for all priority species and Cape Vulture)

Site	Variable	VPs (n)	Surveys/Year	Hours	Hours/VP	No. Fly. Ind.	Passage Rate	Flight Hours
Groothoek WEF	Priority Species	4	6	288	72	508	1.76	73.170
Groothoek WEF	Cape Vulture	4	6	288	72	190	0.66	59.712
Control	Priority Species	1	6	72	72	66	0.92	7.453
Control	Cape Vulture	1	6	72	72	1	0.01	0.017

When comparing passage rates of priority species among VPs per survey VP3 and VP4 stand out with a mean annual passage rate of 1.94 birds^{-hour} and 1.83 birds^{-hour} respectively. Overall, the Groothoek WEF had a mean passage rate of priority species > 1 birds^{-hour}. When considering variation among surveys, a marked phenological response in priority species activity is revealed. It is clear that the highest passage rates are encountered from Summer through Autumn with a distinct peak in Summer (S3, 3.6 birds^{-hour}). This is expected given the higher activity associated with increased primary productivity (and consequently insect, seed and other food availability) during this time in this summer rainfall region, breeding and influx of migrants. This period was not only characterised by an influx of Palearctic and intra-African migrants but was found to also be also strongly influenced by altitudinal migration from several Southern African residents (species which move away from these colder highlands to warmer, moister regions below the escarpment and nearer the coast during winter.

Table 4-4-7 Passage rates of priority species among VPs per survey

	Passage Rate						
Survey	S1	S2	S3	S4	S5	S6	Mean
Season	Winter	Spring	Summer	Autumn	Winter	Spring	
Control	0.08	0.08	5.08	0.25	0.00	0.00	0.92
1	0.33	0.58	0.92	3.75	0.33	0.33	1.04
2	0.92	1.17	1.92	4.42	0.75	0.33	1.58
3	0.33	1.08	7.92	0.92	1.08	0.33	1.94
4	1.17	1.58	2.17	3.08	1.58	1.42	1.83
Mean	0.566667	0.9	3.6	2.483333	0.75	0.483333	

When comparing passage rates among the 31 priority species observed over the six surveys, two species emerge as having notably higher passage rates than any other. These include Cape Vulture (0.78 birds^{-hour}) and Southern Bald Ibis (0.5 birds^{-hour}). Black Harrier was the only exclusively winter visitor to the Verkykerskop Cluster and, at this stage, has exclusively been recorded on the Groothoek WEF. Winter is characterised by a noticeable reduction in the diversity and abundance of large terrestrial birds such as cranes, ibises, korhaans and bustards. Most notable was the reduction in the prevalence of Blue and Crowned Cranes (to almost zero). It was subsequently established that most of the regional crane populations that occur in the project area during summer leave the project area to aggregate and overwinter, in large non-breeding flocks (of several hundred birds), at one of the two

known congregation sites situated on Farm Nugget near Verkykerskop and the dairy farm near Memel. Exclusively summer visitors include Bd Yellow-billed Kite, Booted Eagle, Common Buzzard, Denham's Bustard, and Lesser Kestrel.

Table 4-8 Passage rates among the 31 priority species observed over the six surveys

Common Name	Winter	Spring	Summer	Autumn	Winter	Spring	Mean
	S1	S2	S3	S4	S5	S6	
African Harrier-Hawk		0.063					0.013
Amur Falcon			0.292				0.058
Black Harrier	0.021						0.004
Black Sparrowhawk							
Black-winged Kite		0.021		0.021	0.021		0.013
Blue Crane	0.083	0.104	0.313	0.146		0.083	0.129
Booted Eagle			0.021				0.004
Cape Vulture	0.063	0.313	1.521	1.750	0.229	0.083	0.775
Common Buzzard							
Denham's Bustard				0.021			0.004
Greater Kestrel	0.021						0.004
Grey Crowned Crane		0.063	0.125				0.038
Ground Woodpecker						0.021	
Jackal Buzzard	0.146	0.104	0.083	0.188	0.063	0.167	0.117
Lanner Falcon					0.042	0.042	0.008
Lesser Kestrel					0.021		0.004
Little Sparrowhawk							
Martial Eagle					0.021		0.004
Melodious Lark							
Peregrine Falcon					0.021	0.063	0.004
Rock Kestrel						0.021	
Rudd's Lark							
Rufous-breasted Sparrowhawk					0.021		0.004
Secretarybird				0.021	0.042		0.013
Southern Bald Ibis	0.229	0.250	0.771	0.896	0.375	0.021	0.504
Verreaux's Eagle							
Wahlberg's Eagle							
White-necked Raven	0.125	0.188	0.083		0.083	0.104	0.096
Yellow-billed Kite			0.021				0.004
Yellow-billed Stork							
Yellow-breasted Pipit							

Flight activity was also found to be influenced by time of day with trends in daily activity patterns having varied significantly among the four main time slots. Early mornings (06:30-09:30), as would be expected, are characterised by a peak in total species richness and abundance (particularly with regards to small-passerines). Late mornings (09:30-12:30) are associated with a timeous and drastic increase in the prevalence of soaring birds, which appears related to an increase in temperature and, subsequently, wind speed (particularly above 10 km/h). Early afternoons (12:30-15:30) are considerably quieter with bird activity decreasing drastically. Late afternoon (15-30-18:30) bird activity starts slow before a last increase in priority species flights towards nightfall with peak activity around and just after sunset as many species (particularly Bald Ibis and large raptors) begin their commute back to their roosts/nests.

Flight paths of all priority species observed during vantage point surveys within the project area are mapped in Figure 4-15. From this figure, it is apparent that the most frequent flights are made by Amur

Falcon (n=770). Migratory flocks aside, Southern Bald Ibis (n = 523), Cape Vulture (455) and Jackal Buzzard (206) constituted by far the majority of flight passes. What is also apparent is that Cape Vulture and Martial Eagle made the furthest flights. To better understand the spatial distribution of flights over the project area a flight path intersection density model was made (Figure 4-16). This model (essentially kernel density estimation applied to intersecting lines) subsequently formed the basis of the flight corridors sensitivity layer included in the sensitivity assessment. This figure shows that although priority species flights cross the entire project area, they are concentrated in at least eight “hotspot” areas for flight activity. These include (1) a large portion of the Dwaalspruit Valley on farm Groothoek, (2) a low point in the crest near VP 4 (also on Groothoek) which represents a channel to bird movement from the flats to the south, (3) the gorges on farm Bath, near VPs 7 and 8 (which are also tributaries of Dwaalspruit) (4) the ridge-line running westwards from Mont Pelaan, (5) the confluence of gorges at the Jackal Buzzard nest near VP9 the Meul River valley and associated cliffs, (6) the high lying plateaus and koppies around VP 15, (7) the upper catchment of the Klip River system and (8) the upper catchment basin of the Meul river which is used as a channel to over the Great Escarpment.

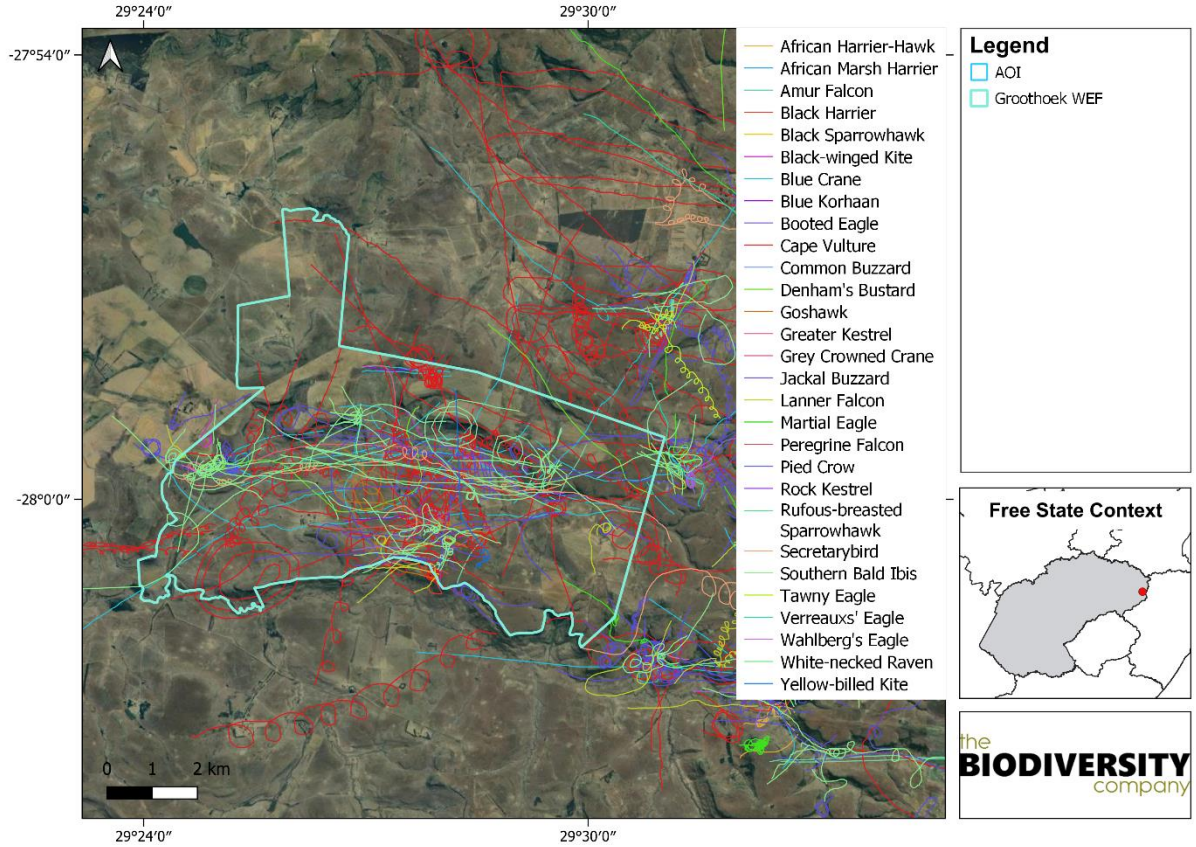


Figure 4-15 Flight paths of priority species

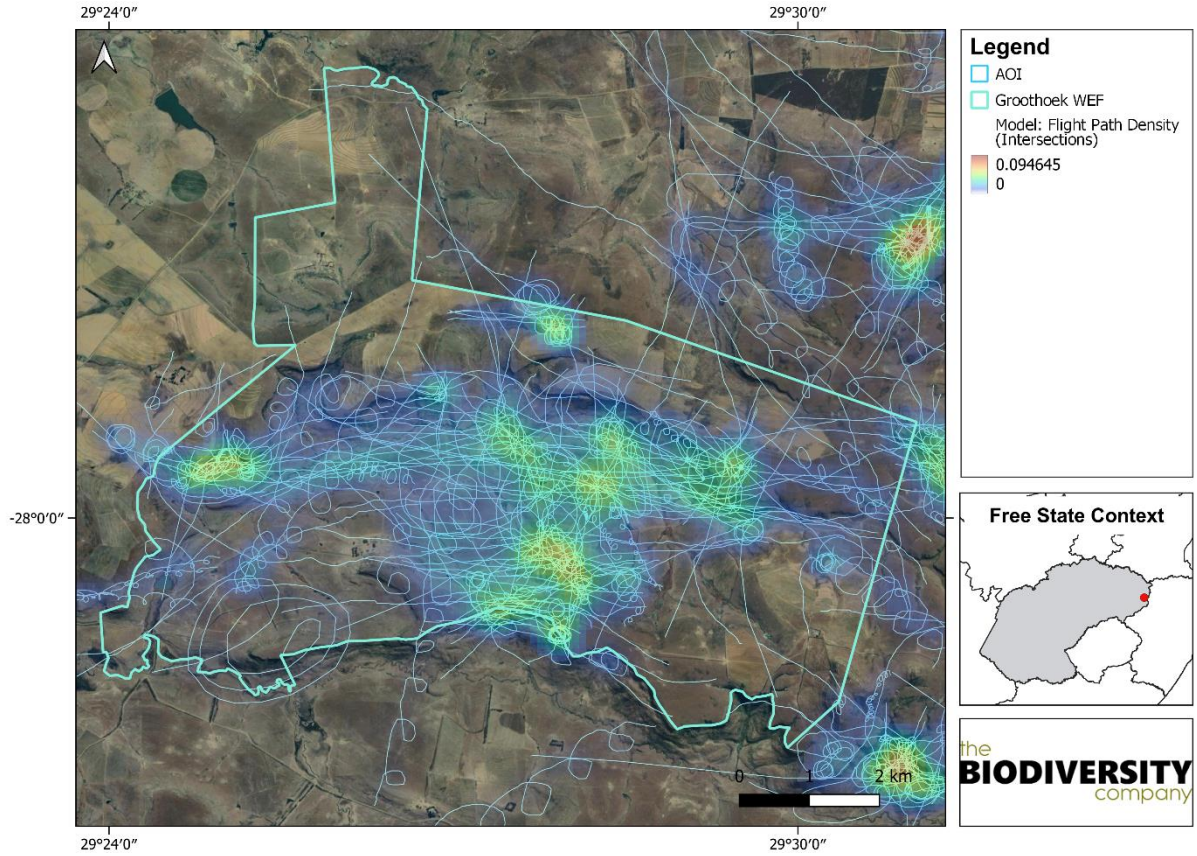


Figure 4-16 Flight path density model

4.3.2 Cape Vulture

At Groothoek WEF a total of 190 individual Cape Vulture passages were recorded from the four on-site vantage points (n= 288 hours) during the Year 1 monitoring. Each flight path across the Groothoek WEF is represented spatially in Figure 4-15. This represents an average passage rate of 0.66 birds^{-hour}. Essentially double that of the average for the WEF cluster as a whole, suggesting an elevated prevalence compared to some of the other WEFs in the complex. Cape Vulture are present year-round in the WEF and the complex as a whole, although a strong seasonal variation in passage rate was observed. Cape Vulture passages over the project area were generally low during winter (0.063 birds^{-hour} during S1 and 0.083 birds^{-hour} during S5) and high during the summer and early autumn seasons (1.521 birds^{-hour} during S3 and 1.750 birds^{-hour} during S4). It is important to remember although the passage rate data provides information on the regularity and frequency of vulture flights it does not account for the duration and time spent flying at rotor height nor the spatial variation thereof.

Table 4-9 Cape Vulture flight time below, within and above rotor sweep height.

Zone	Flight Hours	Mean	SD	SE
H1 (below)	6.68	0.0352	0.066	0.005
H2 (within)	41.1	0.216	0.318	0.023
H3 above)	14.42	0.076	0.112	0.008

The above table shows that the Cape Vultures collectively spent a total of 59.71 hours flying over the project area 69% (41.1 hours) of this time was spent flying at potential rotor height. Both parametric (one-way ANOVA) and non-parametric (Kruskal-Wallis) tests revealed that this observation was highly statistically significant ($p<0.001$). This trend is visualised in the figure below. From this graph, it is evident that more flights were recorded at rotor height and that these flights were, on average, significantly longer than at any other height class. At Groothoek the birds typically fly low along the gorges and cliff lines. As the day warms and thermal activity increases, the groups begin to circle and gradually ascend over the flatter regions as they leave the project area, usually in a northerly to north-westerly direction towards the Witkoppe Mountains. Full day focal points at the various roost sites show that vultures tend to start returning to their roosts from midday with most having returned by around 15:30 in summer.

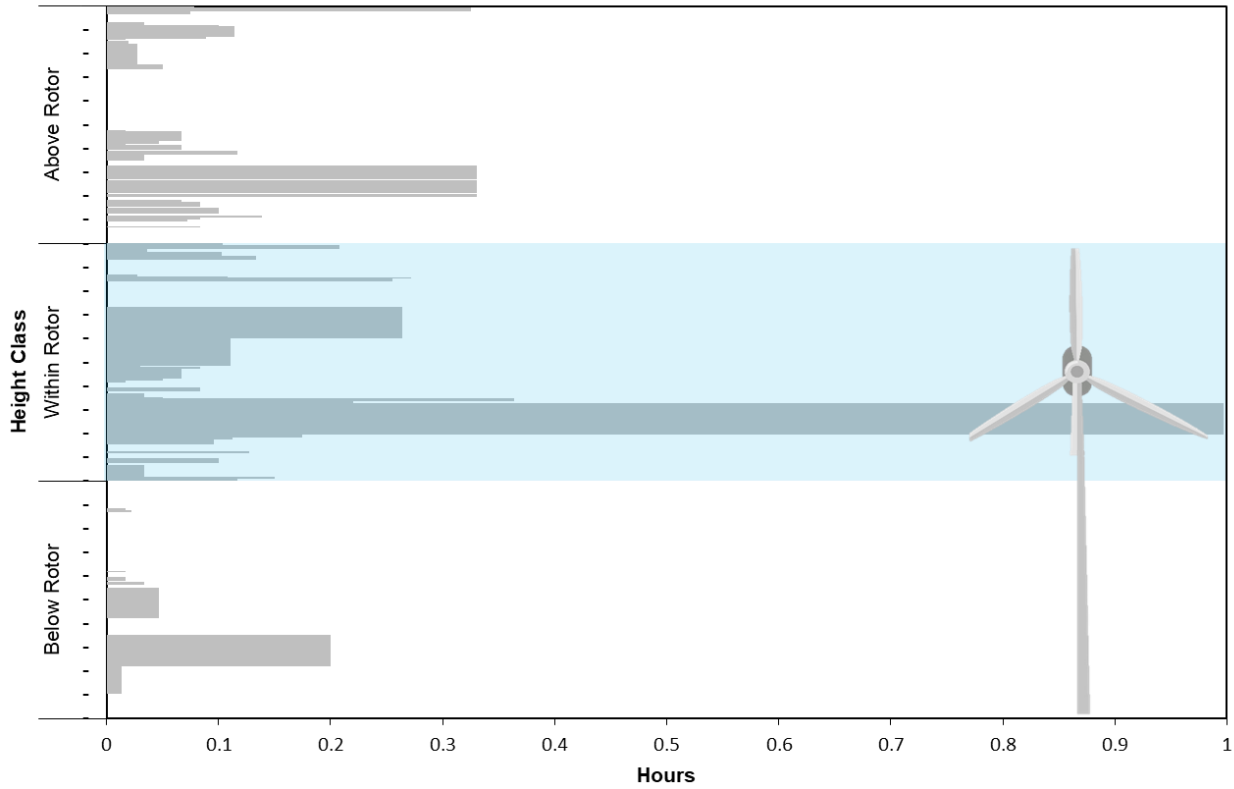


Figure 4-17 Cape vulture flight hours below, within and above rotor sweep heights

Cape Vulture were recorded at from all four VPs (VPs 1-4) and the Control (Figure 4-17). However, considerable variation in flight time at rotor height was observed among the VPs with VPs 2 and 3 showing significantly longer flights at rotor height than most other VPs in the Verkykerskop Cluster. The differences in mean flight time at rotor height per VP are shown in Figure 4-18.

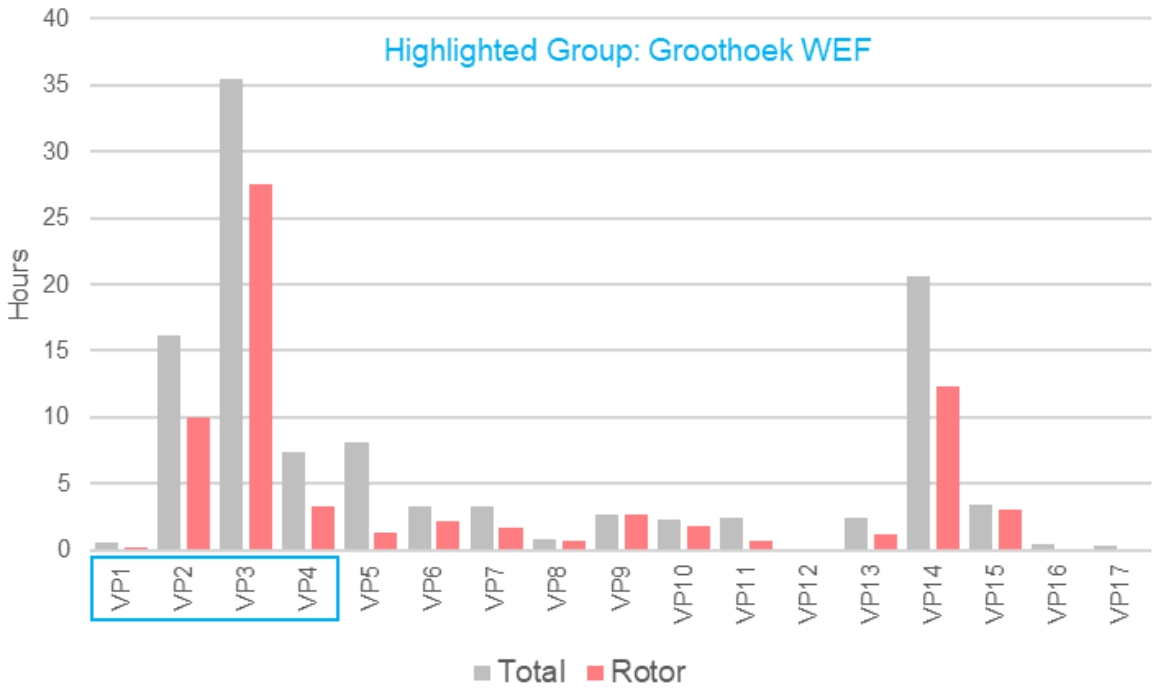


Figure 4-18 Duration of Cape Vulture flights in total and at rotor sweep height per VP

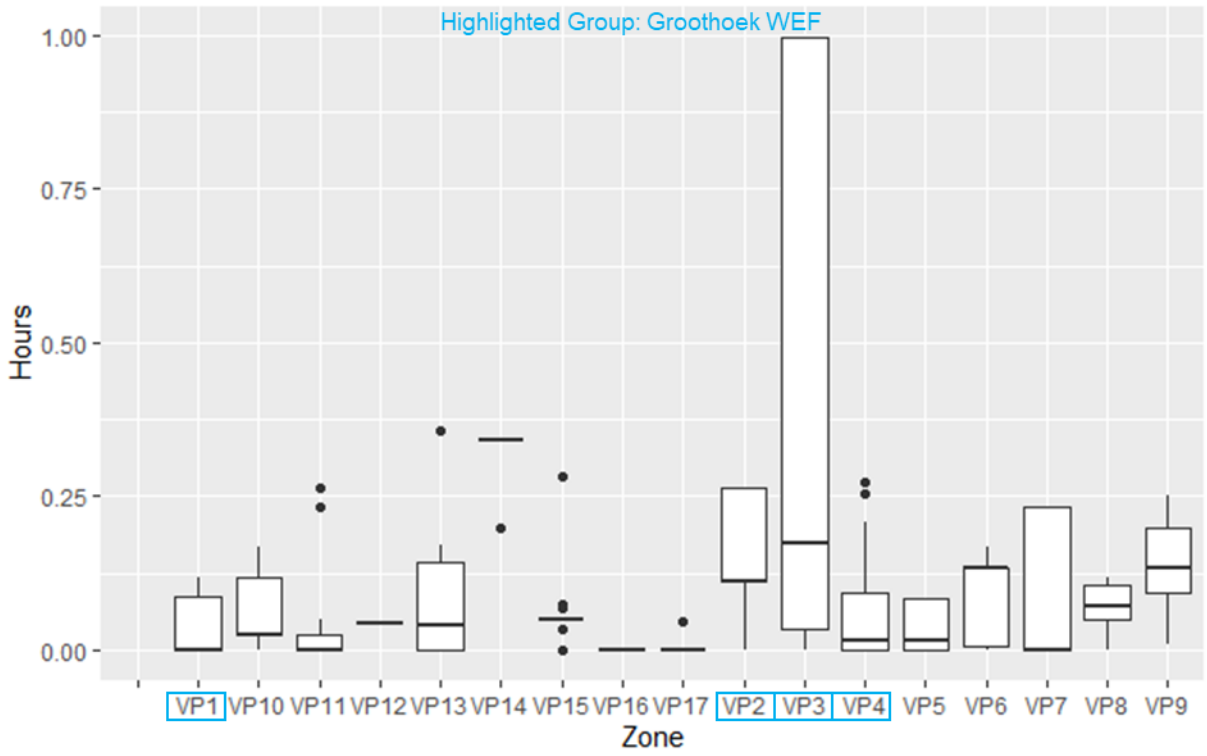


Figure 4-19 Boxplot of mean Cape Vulture flight time at rotor sweep height per VP

5. Site Sensitivity Verification and Preliminary Sensitivity Assessment

At a regional scale, the Verkykerskop WEF Cluster area is surrounded by five IBAs (within 30 km radius) including one that marginally overlaps the north-western corner of the project area (Grasslands SA020). Additionally, several well-established birding routes traverse the AOI. At a local scale the Groothoek WEF intersects 17 nest buffers of priority species which includes the 50 km High sensitivity buffer of five Cape Vulture Roosts (one of which is a breeding roost). The presence of Martial Eagle Nest 2, Southern Bald Ibis Roosts 2, 4, 6, and especially 11, Jackal Buzzard Nest 1 all have significant buffer implications for the Groothoek WEF. Additionally, the project area supports one distinct plateau grassland core habitat for Threatened high altitude species (i.e. Rudd's Lark, Yellow-breasted Pipit, Southern Bald Ibis and Denham's Bustard), one high passage rate flight corridor for priority species and an abundance of rugged terrain for threatened raptors.

Most of the high-altitude, moist, plateau grasslands within the WEF represent highly sensitive and important habitat for montane grassland endemics. These higher lying areas and particularly those closer to the Escarpment are also associated with higher Cape Vulture activity. Bearded Vulture and Wattled Crane have been observed in the AOI and some of the wetlands may provide potential habitat for White-winged Flufftail which, are known to be present in the Memel area. All three are Critically Endangered in South Africa. These findings highlight the sensitivity of the project area.

The key receptors underpinning the sensitivity map (Figure 5-1), the sensitivity ratings and justifications are given in Table 5-1 below. These areas of avifaunal sensitivity within the project area spatially depicted in Figure 5-1.

Table 5-1 Receptors underpinning the prescribed buffers and justification within the AOI and their Implications for Groothoek WEF

Name	Description	Buffer1[2] (m)	Buffer2[3] (m)	Buffer3[4] (m)	Justification	Buffer Implications for Groothoek WEF
African Harrier-hawk Nest 1	Active	750	0	0	Specialist recommendation. Some flexibility typically allowed.	No
African Harrier-hawk Nest 2	Status Uncertain. Presumed African Harrier-hawk	750	0	0	Specialist recommendation. Some flexibility typically allowed.	No
Bearded Vulture Nest 1	Inactive as of October 2023, new nest suspected. Only one bird observed over last two months. Status of second bird uncertain either gone or tending nest. Last known chick fledged in 2014 but requires more investigation as nest has not been comprehensive	5500	10000	0	Krueger, S & Amar, A. (2021). The Ecology and Management of a Critically Endangered Population of Bearded Vultures. Imperilled: The Encyclopaedia of Conservation 10.1016/B978-0-12-821139-7.00168-9.	No
1Black Sparrowhawk Nest 1	Active	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
1Black Sparrowhawk Nest 2	Status Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
1Black Sparrowhawk Nest 3	Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 4	Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	Yes
Black Sparrowhawk Nest 5	Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 6	Status Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 7	Status Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Black Sparrowhawk Nest 8	Status Uncertain	750	0	0	Specialist recommendation. Some flexibility typically allowed	Yes
Blue Crane Nest 1	Active. Two eggs November 2023. On ground in grassland no nest material.	150	300	0	DFFE stipulation.	No
Blue Crane Nest 2	Active. Two eggs found November 2023. Nest significant mound in permanent zone of wetland	150	300	0	DFFE stipulation.	No
Blue Crane Nest 3	Chicks hatched and moved on. Nest on ground in grassland no nest material	150	300	0	DFFE stipulation.	No

[2] Very High sensitivity, Infrastructure exclusion zone
[3] High sensitivity, turbine and other infrastructure minimisation and intensive mitigation zone
[4] High sensitivity zone applied to 50 km radial buffer on Cape Vulture roosts. Turbine mitigation zone.

Name	Description	Buffer1[2] (m)	Buffer2[3] (m)	Buffer3[4] (m)	Justification	Buffer Implications for Groothoek WEF
Blue Crane Nest 4	Active chicks hatched December 2023 and moved off. Nest on ground in grassland no nest material.	150	300	0	DFFE stipulation.	No
Cape Vulture Roost 1	Non-breeding Roost	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 2	Non-breeding Roost	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 3	Breeding Roost one chick as of October 2023	18000	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 4	Non-breeding Roost	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Cape Vulture Roost 5	Non-breeding Roost	0	0	50000	Cape Vulture species-specific guidelines (BLSA, 2018) for all colonies and roosts. Field Verified.	Yes
Grey Crowned Crane Nest 1	Adult on nest	1000	0	0	Specialist recommendation. Endangered species.	No
Ground Woodpecker Nest 1	Confirmed nest hole	150	300	0	Specialist recommendation. Endangered species.	No
Ground Woodpecker Nest 2	Confirmed nest hole	150	300	0	Specialist recommendation. Endangered species.	No
Half-collared Kingfisher Nest 1	Active nest hole in upper Klip River catchment tended by resident pair.	1000	0	0	Pairs typically defend a 1-3 km reach of river (Chittenden et al. 2016). Threatened Species.	No
Jackal Buzzard Nest 1	Active	750	0	0	Specialist recommendation. Some flexibility typically allowed	Yes
Jackal Buzzard Nest 2	Inactive	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Jackal Buzzard Nest 3	Active	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Jackal Buzzard Nest 4	Status Uncertain. Presumed Jackal Buzzard Nest.	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Lanner Falcon Nest 1	Active	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	No
Lanner Falcon Nest 2	Lanner Falcon	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	Yes
Lanner Falcon Nest 3	Active. Pothole on cliff. Two chicks tended by both adults.	1000	3000	0	Core turbine exclusion of 1000 m based on specialist recommendation and industry best practice. High sensitivity 3000 m buffer based on DFFE avian theme sensitivity.	No
Martial Eagle Nest 1	Active	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Martial Eagle Nest 2	Active chick fledged October 2023	5000	0	0	DFFE stipulation and Brink, R. (2020).	Yes
Martial Eagle Nest 3	Currently Inactive as of 2024	5000	0	0	DFFE stipulation and Brink, R. (2020).	No

Name	Description	Buffer1[2] (m)	Buffer2[3] (m)	Buffer3[4] (m)	Justification	Buffer Implications for Groothoek WEF
Martial Eagle Nest 4	Active, location approximate	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Martial Eagle Nest 5	Active	5000	0	0	DFFE stipulation and Brink, R. (2020).	No
Rock Kestrel Nest 1	Rock Kestrel	750	0	0	Specialist recommendation. Some flexibility typically allowed	No
Secretarybird Nest 1	Active	500	1000	0	Specialist recommendation. Some flexibility typically allowed	No
Southern Bald Ibis Roost 1	Uncertain. Likely breeding roost but unconfirmed	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 2	Breeding roost. Inactive. Breeding confirmed but irratic	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Southern Bald Ibis Roost 3	Non-breeding roost. No breeding observed to date.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 4	Non-breeding roost.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Southern Bald Ibis Roost 5	Breeding roost. Nesting observed 2022 but not 2023.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 6	Breeding roost large. Active. Breeding confirmed. At least 17 individuals. Two nests observed. Pair of chicks on one and pair of eggs on other.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Southern Bald Ibis Roost 7	Breeding roost. Four birds observed sitting on nests. Roost monitored by Renette Steyn and Carina Nel Meissie.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 8	Breeding roost. Active breeding colony, part of largest in the world	1000	5000	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 9	Breeding roost. Largest in world	1000	5000	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 10	Breeding roost. Active. Breeding confirmed.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 11	Breeding roost. Active. Breeding confirmed. One nest with two chicks.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Southern Bald Ibis Roost 12	Breeding roost. Two nests with adults sitting and potential baby	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 13	Breeding roost. One adult on nest	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Southern Bald Ibis Roost 14	Non-breeding roost. No breeding observed to date.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 15	Breeding roost. Significant Southern bald ibis roost and breeding spot - 22 birds counted	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No

Name	Description	Buffer1[2] (m)	Buffer2[3] (m)	Buffer3[4] (m)	Justification	Buffer Implications for Groothoek WEF
Southern Bald Ibis Roost 16	Non-breeding roost. No breeding observed to date.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 17	Uncertain breeding status. No breeding observed to date.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 18	Non-breeding roost. No breeding observed to date.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	No
Southern Bald Ibis Roost 19	Breeding Roost. Breeding erratic.	1000	2500	0	Specialist recommendation and consultation with Albert Froneman.	Yes
Verreaux's Eagle Nest 1	Uncertain	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
Verreaux's Eagle Nest 2	Inactive	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
Verreaux's Eagle Nest 3	Active	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
Verreaux's Eagle Nest 4	Inactive, but signs of recent use	3700	5200	0	Verreauxs' Eagle species-specific guidelines (BLSA, 2017) for all nests (including alternate nests).	No
White-necked Raven Nest 1	Active. Adult on nest.	750	0	0	Specialist recommendation.	Yes

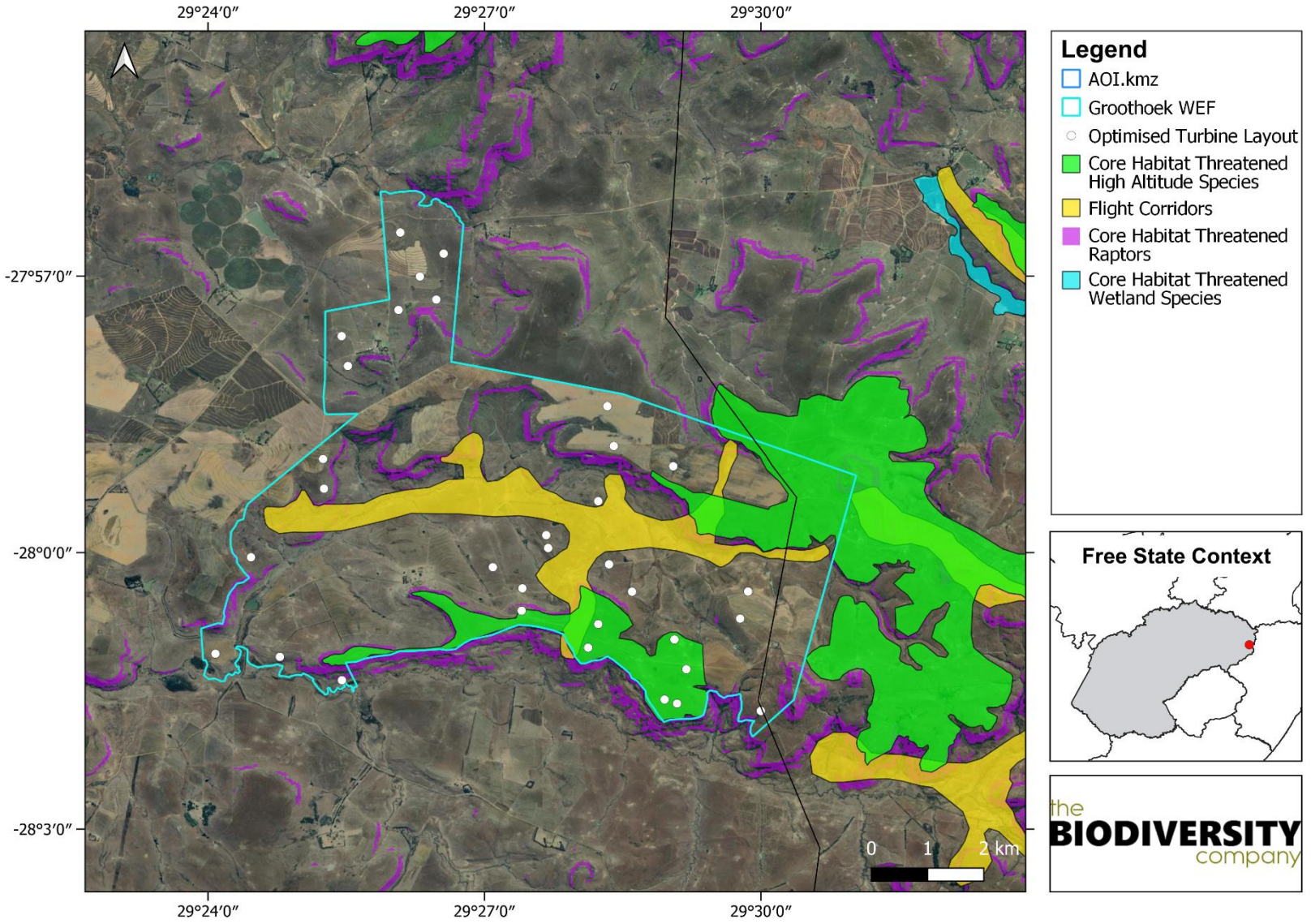


Figure 5-1 Map depicting key flight paths and core habitats for threatened high altitude, wetland and raptor species

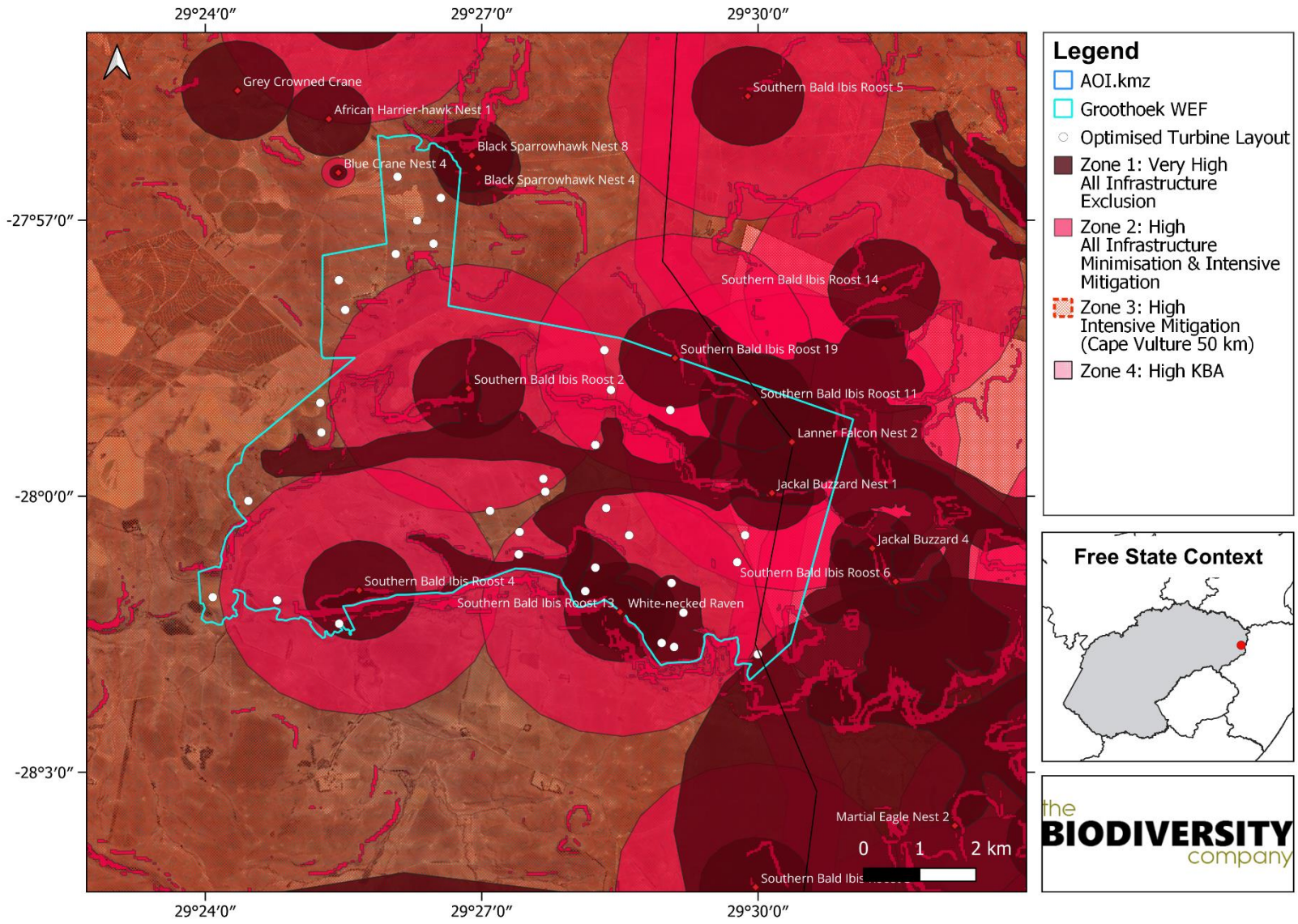


Figure 5-2 Preliminary Avifaunal sensitivity map for Groothoek WEF

6. Identification of Impacts

6.1 Existing Impacts

The following existing impacts were observed:

- Livestock Grazing. The predominant livestock is beef cattle but sheep and horses also occur. The grazing intensity is moderate with most grasslands being kept shortly cropped;
- Crop Cultivation. Large areas have been set aside in most of the flatter plateau areas for cattle fodder production. Most fields are under a specific maize cultivar tailored for silage production. Other crops include oats and radish. These croplands displace natural grassland habitat;
- Perennial Pastures. In addition to commercial crop cultivation, large grassland areas have been converted to perennial pastures. These pastures are fenced off from the cattle and are cut and bailed regularly for hay production. Pastures also displace natural grassland habitat;
- Fences. The project area is criss-crossed by many well-maintained cattle fences (many of which are 8-stranded). These pose a risk of collision and entrapment for many bird species, particularly large-terrestrial species, such as the Secretarybird;
- Powerlines. Many powerlines occur throughout the WEF. The most significant is a large transmission line that runs along the eastern region of the Groothoek WEF, traversing several wetlands and mountain slopes. No bird flappers have been installed on the earth cables along this line;
- Erosion. Most of the larger valley-bottom wetlands and many of the hillslope seeps are deeply eroded. Longstanding head cut erosion (from overgrazing) has led to the formation of very large galleys. Insufficiently designed dams in some wetlands have exacerbated the erosion, especially when they fail following high rainfall events;
- Roads. There are many sand roads in the WEF. The main roads service Normandien and Collin's Passes but also run towards Verkykerskop and Memel. These are large busy sand roads which pose a direct collision risk to many birds, especially small seed-eating passerines; and
- Dust. Large amounts of dust are generated from the strong winds moving over fallow croplands and from vehicles moving along the sand roads.

Figure 6-1 ***Existing impacts; A) Dust, B) annual burning, C) collision risks (fences and powerlines), D) earth line without flappers, E) cattle farming; F) roads***

6.2 Preliminary Anticipated Impacts

As this is a scoping report only a very preliminary and cursive indication of some of the more significant potential impacts of the proposed development are identified below. The full impact assessment will be compiled after year 2 of the pre-construction monitoring has been completed. As per WSP stipulation these scoping level impacts are rated for pre-mitigation significance only.

6.2.1 Construction

6.2.1.1 Loss or Alteration of Habitat

6.2.1.1.1 Impact Description

Habitat loss from wind farm developments is mainly associated with the construction of access roads, the turbine footprint itself, the electrical transmission infrastructure and the Battery Energy Storage Facility. However, the turbine field is relatively large (n=55) with difficult access in steep, largely pristine terrain which, without mitigation and avoidance has the potential to result in a significant impact for range-restricted or threatened grassland species. Most susceptible in this regard are the Threatened high-altitude grassland passerines such as Yellow-breasted Pipit, Rudd's Lark, Botha's Lark. All three species, particularly the latter two show a high degree of habitat specialisation tending to be restricted to small patches of more intact, high rainfall, plateau grassland above 1700 masl with a slope of less than 10%. The occurrence of these species is patchily distributed throughout the project area. Consequently, an effort was made to identify "hotpots" or core habitat areas for these species through a combination of kernel density distribution modelling, slope analysis and visual delineation using satellite imagery. In total four core habitats were identified and mapped (Figure 5-1). These areas were associated with a considerably higher abundance of these and other red-listed, grassland species providing suitable habitat for Denham's Bustard, White-bellied Bustard, Blue Korhaan, Southern Bald Ibis African Rock Pipit, Ground Woodpecker and Sentinel Rock Thrush. Consequently, even relatively small habitat losses or alterations in these areas could have a significant impact on these highly range-restricted and rare habitat specialists. At Groothoek the consequence of this impact is highest in the areas of remaining natural plateau grassland along its southern boundary and particularly in the north-eastern corner of the WEF, an area that overlaps with a zone identified as core habitat for threatened high altitude passerines see Figure 5-1. Another potential impact is the possible degradation of wetland integrity for threatened wetland species through sedimentation from road and turbine construction. The pre-mitigation impact is therefore anticipated to be of **High** significance.

Table 6-1 Scoping-level, pre-mitigation impact significance rating for loss or alteration of habitat.

Impact	Probability	Consequence	Significance
Loss or Alteration of Habitat	4	3	High

6.2.1.1.2 Preliminary Mitigation

- Complete spatial avoidance of the identified highly sensitive core habitat areas for threatened high altitude species;
- Effective and gazetted conservation of these and other remaining natural grasslands through conservation stewardship and appropriate land management practices could reduce the significance of the residual impact.;
- Offsetting. Compilation and implementation of a biodiversity offset strategy with key focus on the conservation of high-altitude plateau grassland for threatened and/or endemic avifauna;

- Based on TBC's recommendation Mulilo has recently commissioned Dr. Robin Colyn of Afri-Avian to conduct detailed habitat modelling and acoustic monitoring for White-winged Flufftail; and
- Afri-Avian have been tasked with conducting detailed habitat suitability modelling for several selected threatened species. It is recommended that these additional modelling exercises should include as a minimum species such as such as Rudd's Lark, Botha's Lark, Yellow-breasted Pipit, Denham's Bustard, Southern Bald Ibis and Wattled Crane.
- Consult the Birdlife 6 October 2022 Guidance Note: Minimising the impacts of infrastructure development on Secretarybirds *Sagittarius serpentarius.* The main tenets being the minimisation of large tracts of contiguous grassland habitat, respecting nest buffers and conserving habitat between nest sites and optimal foraging habitat..

6.2.1.2 Roadkill and other mortalities

6.2.1.2.1 Impact Description

The influx of people and motor vehicle movement during construction will invariably increase bird-vehicle collisions. This can, however, be mitigated to a large degree through signage warning of bird hotspots along the access road and enforcing speed limits of staff and contractors in the project area and educating them on bird sensitivities during inductions. Vehicle movement, particularly on farm Groothoek, is, at present, fairly frequent, and the birds on site appear fairly well adapted to vehicle movement. A slightly more pressing threat would be the destruction of nestlings of ground-nesting species during access road construction. Overall, the pre-mitigation impact is anticipated to be of **Low** significance. The impact rating could be reduced noticeably with mitigation.

Table 6-2 Scoping-level, pre-mitigation impact significance rating for roadkill and other mortalities.

Impact	Probability	Consequence	Significance
Roadkill and other mortalities	2	2	Low

6.2.1.2.2 Preliminary Mitigation

- Signpost the entry of roads into areas zoned as core habitat for threatened high altitude species as "Environmentally Sensitive Area Reduce Speed"; and
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.

6.2.1.3 Sensory Disturbance

6.2.1.3.1 Impact Description

At Groothoek WEF, the greatest and most potentially direct construction-related sensory threat would be the potential disturbance of Southern Bald Ibis from their roosts, particularly breeding colonies at Roosts 2, 6 and 11. Focal point surveys at these roosts have shown that the birds are nervous and quick to vacate their roosts. Southern Bald Ibis are largely endemic to the Great escarpment. Since, the majority of past WEF applications have been concentrated in the Western, Northern and Eastern Cape, for which the species is absent (except small intrusion into Eastern Cape) comparatively little is known regarding the interaction between Southern Bald Ibis and wind farm developments. However, their collision potential has been recognised by BirdLife who have ranked the species 8th in terms of overall collision risk priority score out of the 107 species highlighted as priority species for wind farm collisions

in South Africa in Ralston Paton et al. (2017). Telemetry on tracked birds from the Witkoppe (currently being conducted by Carina Pienaar) and Modelling work (currently being conducted by Robin Colyn in association with Albert Froneman) will help provide more informed decision-making regarding home range utilisation and buffer zones for wind farms in the near future. At present, for the sake of this project, we have opted for a 1000 m core buffer (very high sensitivity turbine exclusion zone) and a 2500 m foraging and movement buffer (high sensitivity infrastructure minimisation and intensive mitigation zone which is) based on communications with Albert Froneman.

It is also highly probable that large species such as cranes, korhaans, bustards and Secretarybirds may be displaced during construction. The 5 km radial buffer on Martial Eagle Nest 2 overlaps the Groothoek WEF, but it is doubtful that construction activities would disturb the nesting pair at this distance (4.6 km SE). Disturbance associated with construction is expected to be short term and the effects largely temporary, although some of Southern Bald Ibis roosts may be more long-lasting. Most birds on site are, however, already subject to sounds and operation of heavy farming machinery (e.g. tractors, combine harvesters and graders).

Table 6-3 Scoping-level, pre-mitigation impact significance rating on sensory disturbance during construction.

Impact	Probability	Consequence	Significance
Sensory disturbance during construction	2	2	Low

6.2.1.3.2 Preliminary Mitigation

- Spatial avoidance. Adhering to the prescribed nest and roost buffers; and
- Temporal avoidance. Timing construction is to take place outside the critical breeding window for Southern Bald Ibis (near breeding roosts) and threatened high-altitude grassland species.

6.2.2 Operation

6.2.2.1 Collisions With Turbines

6.2.2.1.1 Impact Description

The high abundance and diversity of priority species (which included 25 red-listed species) recorded within the Groothoek WEF suggests a high potential risk for significant mortalities during operation. Vantage point data (VPs 1-4) from the first year of pre-construction monitoring (288 hours) revealed a total of 508 flights by priority species, totalling 73.17 hours with a passage rate of 1.76 birds^{-hour}. Rudimentary extrapolations on fatality rate (assuming 98% avoidance) predict that as many as 17.6 priority species may be killed in the turbine field (n=55) per year. Additionally, the fatality rates that are projected for Cape Vulture are 7.7 birds^{-year} and Southern Bald Ibis 5.03 birds^{-year}. These projected fatality rates are high and must be avoided. Overall, the potential impact of collisions on priority species is afforded a Very High significance. Due to the sensitivity of the project area and magnitude of this impact, mitigation and avoidance strategies are unlikely to reduce the impact significance appreciably.

Cape Vulture ranks first on BirdLife South Africa's priority list of collision prone species (Ralston Paton et al. 2017). This assertion, which was made almost 7 years ago with very limited data, is now backed by observed mortality rates from multiple wind farms. This data was recently presented in the Birdlife Conservation Conversations Webinar entitled "*Sharing the Sky*" which demonstrated that Cape Vultures have one of the highest mortality rates of any priority species in the country of 0.011 birds per turbine per year, placing them third only to Jackal Buzzard and Amur Falcon. In the project area a total of 190 individual Cape Vulture passages were recorded from the 4 on-site vantage points at a passage rate of 0.66 birds^{-hour} during the Year 1 monitoring. Indeed, Cape Vulture was the most frequently flying priority species at Groothoek WEF, even more so than Jackal Buzzard and Amur Falcon. Cape Vulture residents are in the area, although a strong seasonal variation in flight activity was observed, with a

significant increase in autumn by 1.75 birds-hours. The birds are coming from three roosts to the south of the project area (all within a 50 km radius), with the bulk emanating from the breeding colony at Nelson's Kop (ca. 200 individuals). Particularly, they have been recorded to spend 59.7 hours flying over the project area, most (41.1 hours or 69%) was spent flying at rotor sweep height. This observation was found to be highly statistically significant under both parametric and non-parametric tests, suggesting this is more likely to represent an actual trend than random chance. The general trend is for groups to emerge from the haze on the horizon at low altitude from the direction of one of the three roosts to the south of the project area (typically 09:30 to 11:30 am in winter and 08:00 to 10:30 am in summer), fly low across the project area before gaining height as they leave the project in a northerly direction, often towards the Witkoppe Mountains. A number of factors likely underpin the high attendance of Cape Vultures. These include the close proximity of roosts, ample carcass opportunities (major cattle farmers in the region), and the presence of a large Eskom Transmission line that bisects the project area and provides a corridor for movement and overnight roosting. At times up to 120 birds were seen roosting on these powerlines overnight and more than 200 birds have been observed feeding at carcasses on the northerly boundary of Groothoek.

Other red-listed soaring species found to occur at Groothoek that are of particular concern from a collision risk perspective include Black Harrier (exclusively during winter), Martial Eagle, Verreaux's Eagle, Secretarybird, Lanner Falcon and Southern Bald Ibis. The latter, in particular, appear to be resident and occur in fairly high abundance with several roost sites in the project area. They were observed to make routine flights back to their roosts at roughly the same time around or just after sunset every day. Additionally, the WEF supports ideal habitat for several Threatened high altitude grassland passerines, namely Rudd's Lark, Botha's Lark and Yellow-breasted Pipit which are highly prone to collisions as they occupy plateau grasslands (where most of the turbines are likely to be placed) and spend a large amount of time (up to 40 min at a time) displaying at rotor sweep height.

Table 6-4 Projected fatality rates for the various priority species. Methodology adapted from that used by Wild Skies

Common Name	Annual Passage Rate	VP Birds^{-year}	Birds at Rotor^{-year}	Projected Fatalities^{-year}
African Harrier-Hawk	0.013	54.75	6.23	0.12
Amur Falcon	0.058	127.40	14.50	0.29
Black Harrier	0.004	18.25	2.08	0.04
Black Sparrowhawk		0.00	0.00	0.00
Black-winged Kite	0.013	54.75	6.23	0.12
Blue Crane	**0.129**	**565.75**	**64.40**	**1.29**
Booted Eagle	0.004	18.25	2.08	0.04
Cape Vulture	**0.775**	**3394.50**	**386.40**	**7.73**
Common Buzzard		0.00	0.00	0.00
Denham's Bustard	0.004	18.25	2.08	0.04
Greater Kestrel	0.004	18.25	2.08	0.04
Grey Crowned Crane	0.038	164.25	18.70	0.37
Ground Woodpecker		0.00	0.00	0.00
Jackal Buzzard	**0.117**	**511.00**	**58.17**	**1.16**
Lanner Falcon	0.008	36.50	4.15	0.08
Lesser Kestrel	0.004	18.25	2.08	0.04
Little Sparrowhawk		0.00	0.00	0.00
Martial Eagle	0.004	18.25	2.08	0.04
Melodious Lark		0.00	0.00	0.00
Peregrine Falcon	0.004	18.25	2.08	0.04
Rock Kestrel		0.00	0.00	0.00
Rudd's Lark		0.00	0.00	0.00
Rufous-breasted Sparrowhawk	0.004	18.25	2.08	0.04

Secretarybird	0.013	54.75	6.23	0.12
Southern Bald Ibis	**0.504**	**2208.25**	**251.37**	**5.03**
Verreaux's Eagle		0.00	0.00	0.00
Wahlberg's Eagle		0.00	0.00	0.00
White-necked Raven	0.096	419.75	47.78	0.96
Yellow-billed Kite	0.004	18.25	2.08	0.04
Yellow-billed Stork		0.00	0.00	0.00
Yellow-breasted Pipit		0.00	0.00	0.00
Total		7755.90	882.86	17.66

Table 6-5 Scoping-level, pre-mitigation impact significance rating on collisions with turbines

Impact	Probability	Consequence	Significance
Collisions with turbines	4	4	Very high

6.2.2.1.2 Preliminary Mitigation

- Mitigation efficacy is limited by high Cape Vulture flight prevalence (cumulative passage rate and flight time at rotor height) over the WEF and highlighted as a significant risk;
- Spatial Avoidance. In the event that the WEF is authorised, then spatial avoidance is paramount. The most important mitigation measure in this regard centres on spatial planning. All infrastructure should be completely avoided in areas designated in the sensitivity map as Very High sensitivity. Infrastructure should be minimised unless completely unavoidable in all areas of High sensitivity;
- Temporal avoidance. One aspect that should be thoroughly investigated would be the possibility for curtailment during peak flight times. The vantage point data revealed a strong diurnal variation in flight activity of priority species. By far the majority of flight activity occurred between 09:30 and 12:30 in winter and 08:30 to 11:30 in summer. Another peak occurs for about an hour before and following sunset when most priority species, particularly Southern Bald Ibis and Martial Eagle, commute back from foraging. Complete shutdown of the entire wind farm, or the shutdown of the majority of selected “risky” turbine locations, during these times will drastically reduce the risk of turbine collisions. Another key event to consider is the annual migration of Amur Falcon which peaks for only a few days. Observer-based shutdown could be critical to the avoidance of mass strikes;
- Any turbines placed in High sensitivity areas must be subject to intense mitigation measures such as intelligent camera systems (e.g. Identiflight or Bioseco), automated curtailment using Artificial Intelligence (AI) models and GPS flight data, radar and bird spotters to inform shutdown on demand, blade painting. Given the site's sensitivity, as a minimum, all planned turbines which currently overlap Very High and High buffers should be removed from the turbine layout;
- Observer led shut down on demand (SDOD) should be implemented. It is, however, important to note that the efficacy of this system will be significantly limited by the extreme and highly erratic climatic conditions on site. Cloud, mist and rain can dramatically hamper visibility and, therefore, the efficacy of this system for several days at a time. However, vultures and other priority species were still observed flying in these conditions. It is recommended that selected turbines may need to be shut down in periods of intense mist and cloud cover. This would involve a massive undertaking by a very large team of well-trained observers capable of working (and surviving) at sub-zero temperatures in harsh conditions, including snow blizzards. The

team would require radios and satellite phones as a minimum and be linked to an emergency response team.

- One blade should be painted in the recommended patterned red. Anticipate and budget for communications and authorisations from CAA;
- A Cape Vulture Food Management Programme will need to be designed and implemented to ensure all dead livestock/wildlife on site are removed as soon as possible and transferred to designated vulture restaurants sufficiently far awa from the WEF. This would need to be an intensive undertaking by a team of full-time rangers working in close radio communication with the farmers;
- Develop a contingency mitigation budget to cater for significant mortality events. This budget should allow for research into and effective implementation of adaptive management strategies such as human-based turbine shutdown on demand, habitat alteration, bird deterrence from site, and any others identified as feasible;
- A Biodiversity Management Plan (BMP) must be compiled for the project by an ornithologist prior to construction, outlining critical thresholds for fatalities and the appropriate management response;
- Inform and collaborate with relevant NGOs such as VULPRO, BirdLife South Africa and the Endangered Wildlife Trust (EWT). It is imperative that these organisations be given ample opportunity to provide information (e.g. tracking data, models and reports) that is critical to informing project planning regarding feasibility. Some collaboration with EWT and Birdlife is underway, but VULPRO remains uninformed;
- Track martial eagles within the project area. Mulilo recently commissioned a study of this nature, and Dr. Gareth Tate of EWT has already captured and fitted a GPS logger on the first male eagle (May 2024);
- Track Southern Bald Ibis. Dr Carina Pienaar is currently busy tracking bald ibises from the Witkoppe Roost. It is recommended that she be contacted to consider fitting GPS loggers to fledglings from within the VWC; and
- Collision Risk Modelling. Mulilo is currently engaging with TBC and Afri-Avian to design and compile a detailed collision risk model for five species anticipated most prone to collision with the proposed wind turbines.

6.2.2.2 Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure

6.2.2.2.1 Impact Description

It is currently uncertain as to the extent, position or length of any new transmission lines to be established for the WEF or where exactly the grid connection point will be. However, the establishment of any transmission lines, and any overhead internal reticulation lines, poses a potential collision and electrocution risk to birds especially larger-bodied, less manoeuvrable species such as cranes, korhaans, bustards, storks, Secretarybirds and raptors.

The undulating landscape and frequent misty/rainy conditions of the Eastern Free State, contribute to high powerline collision rates for birds, even when the lines are marked with conventional flappers or alternating black/white pigtails. Increased wind speeds during winter, when mist/rain are less likely, makes manoeuvrability for large species like cranes more difficult (BirdlifeSA pers.comm. 2025).

This can however be mitigated to a large degree through placement (route prioritisation to avoid large wetlands, cliffs, gorges and other areas of high avian abundance or sensitivity), burying internal reticulation lines between turbines, and by installing bird diverters and flappers at strategic locations deemed to be of higher collision risk where avoidance is not possible (e.g. wetland crossings and large valley crossings).

Table 6-6 Scoping-level, pre-mitigation impact significance rating on Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure.

Impact	Probability	Consequence	Significance
Collisions and Electrocutions with Electrical Transmission Lines and Auxiliary Infrastructure	3	3	Medium

6.2.2.2.2 Preliminary Mitigation

- Install Eskom-approved flappers or coils (flight diverters), along the entire length of the 500 m line at no more than 10 m intervals. Flight diverter structures should ideally alternate between light and dark shades to maximise visibility and contrast against background as seen from powerline level. The structures must be installed as the powerlines are being spanned. This will drastically help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated (Martin et al. 2010);
- Anti-perch devices should be intensified on main Eskom powerlines to further reduce perch suitability;
- All power cables between panels and the battery energy storage system (BESS) within the project area should be thoroughly insulated and buried in demarcated corridors; and
- All above ground electrical transmission infrastructure should be fitted with the latest Eskom approved anti-bird structures and anti-collision line marking devices.
- Quarterly monitoring at Ingula Nature Reserve can be used to help assess the likely significance of powerline collisions, after mitigation. An average of 5 priority threatened species (e.g. Cape Vulture, cranes, Denham's Bustard) are killed by collision per annum along the Ingula-Majuba 400kV line, which traverses a similar habitat type, land use, and avifaunal species composition (BirdlifeSA, pers.comm. 2025).

6.2.2.3 Sensory Disturbance

6.2.2.3.1 Impact Description

The main sensory disturbance to birds during operation centres on the noise the turbines generate. The noise generated by a wind turbine can often exceed 30 dBA even at a distance of 800 m (Katinas et al., 2016; Rogers et al., 2006), the distance most often associated with avoidance behaviour (Santos et al., 2021). In this regard, it is important to consider that a change of 3 dBA already reduces the hearing range of birds by 50% while a change in excess of 12dBA effectively reduces the hearing range of a bird by more than 90% meaning that at the core of the wind turbine noise-polluted area, birds are expected to barely perceive any other acoustic cues in their environment at all Barber et al. (2010).

Empirical research on the effects of turbine noise nose on birds is an emerging field. The few existing studies show that turbine-related noise impacts are likely to be hardest felt by songbirds which rely on vocalisations for a wide array of critical behavioural interactions from courtship and territory defence to rearing of young and alarm signalling causing them to either vacate the area or change the acoustic parameters of their calls with behavioural consequences. For example, a study by Lehnardt et al. (2021) using a simulated broadcast of turbine noise at a site in Israel noted a 45% and 36% decrease in

abundance for the lesser whitethroat (*Sylvia curruca*) and Sardinian warbler (*Sylvia melanocephala momus*), respectively. Another study by Zwart et al. (2015) showed that male European Robins (*Erithacus rubecula*) called at higher frequencies in the presence of wind turbine noise, presumably in an attempt to combat acoustic masking at the expense of lower frequency contact calls used for territorial disputes. The consequence is a decreased ability to deter a rival through scolding alone, leading to an increased energy expenditure, risks of injury, and, ultimately, breeding success.

Of the various songbirds susceptible to noise in the project area, three species, namely Rudd's Lark, Botha's Lark and Yellow-breasted Pipit, are of particular significance regarding the Groothoek WEF. The males of all three species spend a considerable proportion of their time during the breeding season, calling during protracted aerial displays, which can last more than 40 minutes at a time. Consequently, due to a combination of their Threatened status and acoustic-dependant breeding behaviour, it stands to reason that these species may be significantly adversely affected by turbine noise.

Table 6-7 Scoping-level, pre-mitigation impact significance rating on sensory disturbance during operation.

Impact	Probability	Consequence	Significance
Sensory disturbance during operation	3	4	High

6.2.2.3.2 Preliminary Mitigation

- Spatial Avoidance. Avoid the placement of turbines in areas identified as core habitats identified for threatened high-altitude species; and
- Temporal Avoidance. Employ temporal avoidance measures. Attempt as far as possible to conduct most of the high-intensity construction activities during winter to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging). Ideally activities and operations should take place during the least sensitive periods (migration, nesting and breeding periods, mainly July-September).

6.2.3 Effect on Migratory and Congregatory Species

6.2.3.1.1 Impact Description

Many flocks of migratory birds move across the project area in early summer. One of the most potentially significant flocks in this regard is the annual migration of Amur Falcon. During Survey 3 a very large migratory flock (numbering in the thousands) was observed moving along the Meul River valley (mainly in the Kromhof WEF) in a dense swarm numbering over a thousand birds. Migratory flocks of this size are of global significance. The potential for a large collision event is a possibility and represents a large risk in terms of wind farm development. Projected fatality rates suggest that as many as 21 birds could be killed in the turbine field on an annual basis.

Another potentially significant aspect is the project's proximity to the Great Escarpment (1.3 km from the westernmost corner). The escarpment is important from a national and regional bird movement perspective. Many of South Africa's resident grassland species make seasonal altitudinal movements across the escarpment in response to climate and food availability (between high-altitude grasslands and lower-altitude savannahs). Additionally, the lift created through thermals in these steep mountainous areas provides ideal conditions for large-bodied, red-listed soaring species such as Bearded Vulture, Cape Vulture, Verreaux's Eagle, Secretarybird, Martial Eagle, Black Stork and Yellow-billed Stork, which frequently move along the escarpment to access foraging grounds on either side of it.

Table 6-8 Scoping-level, pre-mitigation impact significance rating on effect on migratory and congregatory species.

Impact	Probability	Consequence	Significance
Effect on migratory and congregatory species	3	3	High

6.2.3.1.2 Preliminary Mitigation

- Due to the seasonal arrival of large migratory flocks, it is possible to employ a combination of observer-based shut-down on demand and temporal avoidance to reduce the probability of collisions. The potential for, as well as the possible magnitude and severity of a significant collision event (e.g., with Amur Falcons) at Groothoek is lower than some of the other WEFs in the VWC but should still be regarded as potentially significant.

6.2.4 Cumulative Impact

The AOI is largely natural and, in most areas, pristine. There are no operational wind energy facilities in or within 50 km surrounding the project area. However, there are two other proposed Mulilo WEF projects in the region: Phumelela (avifauna assessment conducted by TBC) and Goedehoop (avifauna monitoring conducted by Dr. Steven Evans). Additionally, EDF has WEF proposed WEF projects for most of the land in between these WEFs. Including this project, there are at least 4 prospective wind developments planned for the Phumelela region. There is, however, also a vested birding interest in the region (e.g. Roberts Memel Birding Site, Memel Getaway Birding Routes) and NGOs such as BirdLife and EWT are distinctly aware of the avifaunal importance and are actively working in the region. The proposed VWC is not located within one of the promulgated Renewable Energy Development Zones (REDZ) and a portion of the northern end of the VWC overlaps the Grasslands IBA. Known projects located within a 50km radius of the are listed in Table 6-10 and mapped in Figure 6-2. Based on the information, the cumulative impact of wind energy developments in this region is likely to have a significant consequence for birdlife on a national to global scale.

Table 6-9 Scoping-level, pre-mitigation impact significance rating on the cumulative impact.

Impact	Probability	Consequence	Significance
Cumulative impact	4	4	Very High

Table 6-10 Projected fatality rates for the various priority species. Methodology adapted from that used by Wild Skies

Project Name	Applicant	Status	Reference Number	Distance away (KM)
Newcastle Gas Engine Power Plant (NGEPP), Newcastle, KwaZulu-Natal Province.	Newcastle Energy (Pty) Ltd	Refused	14/12/16/3/3/2/2074	36
Proposed Upgrade of Karbochem boilers and electricity project in Newcastle	Distributed Energy Generation (Pty) Ltd	In process	14/12/16/3/3/1/1164	37
Proposed Upgrade of Karbochem boilers and	Distributed Energy Generation (Pty) Ltd	Approved	14/12/16/3/3/1/1164/AM1	37

electricity project in Newcastle - Amendment				
Proposed Newcastle solar energy facility near Newcastle, KwaZulu-Natal Province	Building Energy (Pty) Ltd	Refused	14/12/16/3/3/1/1225	38

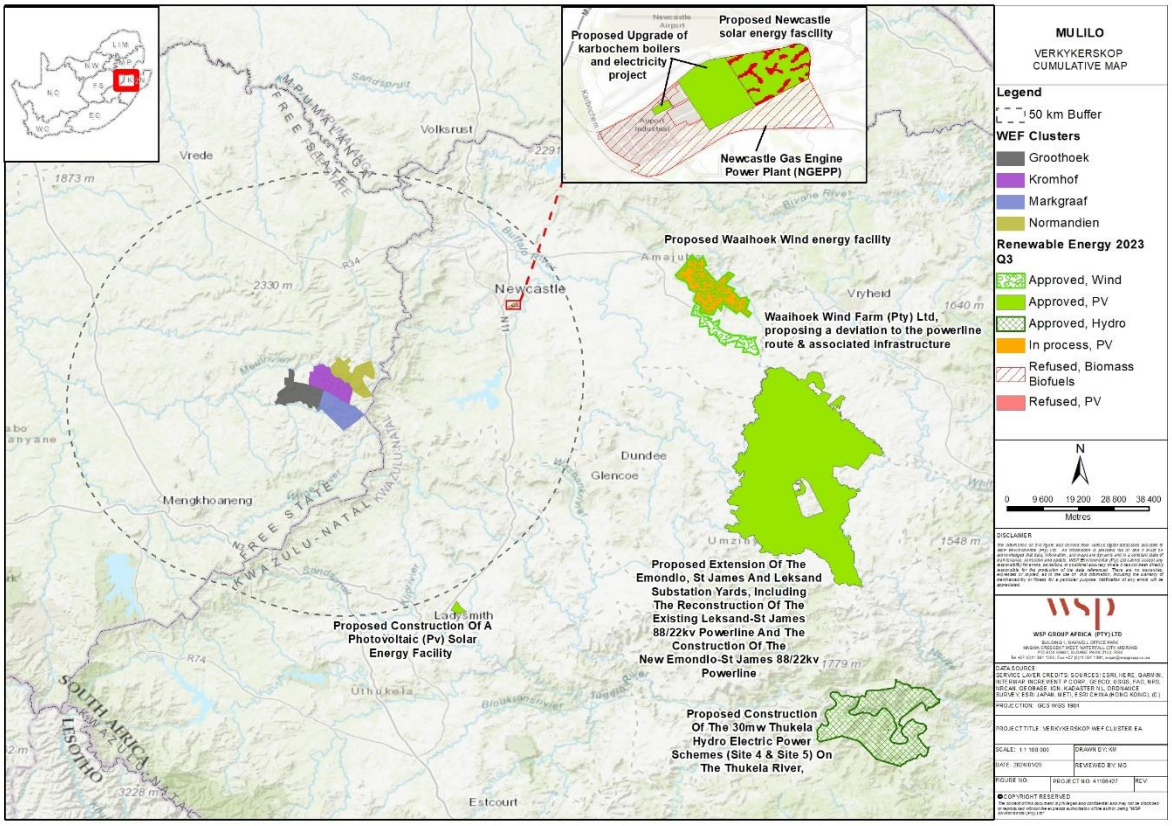


Figure 6-2 Renewable energy applications within a 50 km radius of the VWC. Note this map excludes several proposed wind energy projects in the Phumelela / Memel Area.

7. Plan of Study – Pre-construction Monitoring

Based on the information provided, the developer will seek to establish up to four wind energy facilities within the VWC, of which Groothoek WEF is one. Each will have its own grid connection linear infrastructure. As the position and length of each grid connection corridor are currently unknown, this project allows for two 15-km alternatives for the Groothoek WEF.

7.1 Compliance

The approach outlined below has been designed to comply with the following global and national legislation and best proactive standards:

- International Finance Corporation (IFC) Performance Standard 6 (IFC, 2019);
- Equator Principles (EP4, 2020);
- Birds and wind energy best practice guidelines (Jenkins et al. 2015);
- Cape Vulture and wind farms best practice guidelines (BLSA, 2018);
- Verreaux's Eagle and wind farms best practice guidelines (BLSA, 2017);

- The National Web-Based Environmental Screening Tool DEA website (2022); and
- South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna Protocols for environmental impact assessments in South Africa;
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 when applying for Environmental Authorisation (Gazetted October 2020); and
- Protocol for the specialist assessment and minimum report content requirements for environmental impacts on avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110 – 20 March 2020).

7.2 Schedule and Deliverables

Scoping fieldwork involved an eight-day reconnaissance survey from 18-25 July 2022 (two days per WEF). Due to the scale of the project, there are six surveys in a year as opposed to the conventional four. Each survey for the VWC is run over two 22-day periods (which translates to ca. 5-6 days for Groothoek WEF per survey). Based on the two-year monitoring requirement, fieldwork sessions were thus planned to end in late 2024, assuming no unforeseen catastrophic events or pandemic restrictions. The scoping reports are set to be submitted in January 2025. Then, allowing for data processing and reporting, the first draft submission deadline for all four WEF reports (one for each WEF) would be April 2025 (with progress reports after each sampling season). The following plan and scope of work is anticipated.

1. Information requests session (bullet point list and one remote meeting, completed).
2. Scoping Assessment (desktop study followed by 8-day site visit divided into 2 days per WEF project and a brief report (**completed**).
3. Use results of scoping assessment to inform initial layout planning of WEF and establish more precise scope of avifauna monitoring (**completed**).
4. Species specific guidelines **are** warranted, therefore:
    - Two-year cycle
    - Intensive pre-construction monitoring conducted according to national and international best practice as well as the species-specific guidelines for Verreauxs' Eagle, Cape Vulture.
    - Fieldwork per annual cycle:
        - Three in-field observers per site visit, which includes one avifaunal lead and two competent avifaunal field assistants;
        - This is broken into Six, 22-day field sessions (one in each main season and others in peak breeding season). This equates to six, 5-6 day trips per WEF project per year. Note the sessions are broken into two WEFs at a time (two site visit legs per survey). This essentially means 12 trips to and from our base in northern Gauteng per year so 12 surveys or 24 trips over the 2-year cycle;
        - A total of 17 Vantage Points and one Control for the VWC. Average of four vantage points per WEF;
        - 12 hours of surveying per vantage point **per season totalling 72 hours per VP per year conducted by two observers simultaneously**;

- Two to four driven transects per WEF (including one control) conducted by the third observer in rotation with the vantage point observers;
- One walked transect at each VP (including one control);
- Several focal point surveys scattered throughout the VWC and AOI;

- Progress report after each fieldwork session (6 per year);
- Three pre-construction monitoring reports (one for each WEF) after 24-month cycle completed;
- Three Avifaunal Impact Assessment Reports (one for each WEFs grid connection infrastructure) submitted after the two-year monitoring WE reports have been completed; and
- Mulilo will be initiating a carcass management project within the project area in collaboration with the local landowners and their staff. The Biodiversity Company was commissioned to extend the avifaunal monitoring by two surveys to note any changes in vulture attendance.

Note: The VWC is situated 23 km north of a known Cape Vulture colony on Nelson's Kop as well as two other roost sites (<35 km radius of the project area). The status of this colony has been confirmed as a breeding colony. As such, the decision-making hierarchy / philosophy was be based on the flow diagram for Cape Vultures as presented in the 2018 best practice document entitled Cape Vulture and Wind Farms Guidelines for Impact Assessment, monitoring and Mitigation (see **Error! Reference source not found.**).

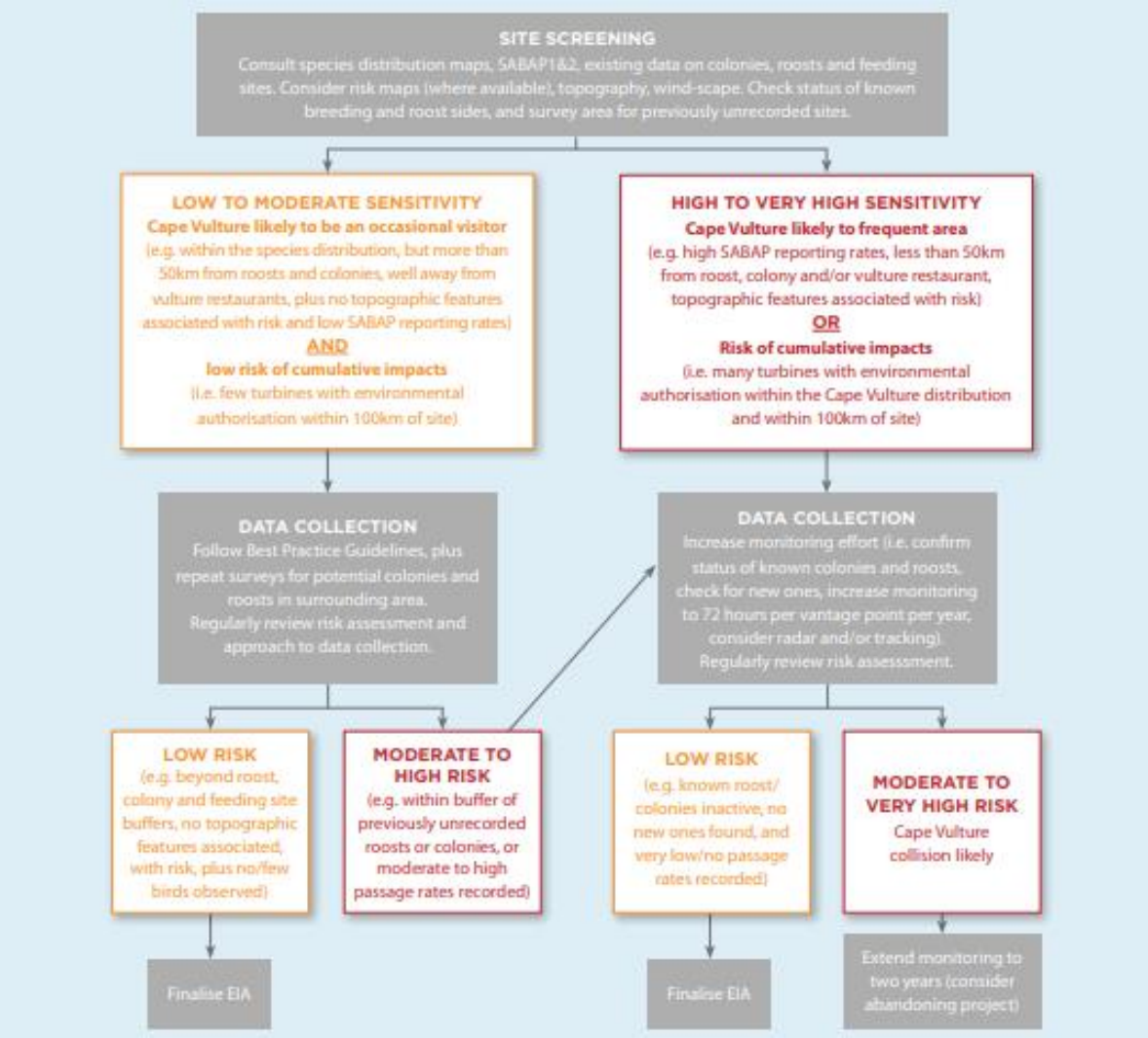


Figure 7-1 Decision hierarchy as applicable to Cape Vulture sensitive areas (BLSA, 2018).

8. Conclusion

The Groothoek WEF (and the VWC as a whole) can best be described as supporting a moderate abundance of birds, of which a very high proportion are of conservation importance. To date, 17 red-listed species (of which 15 are Threatened) have been documented within the Groothoek WEF, a high number in the South African context. This includes seven Threatened Raptor species, namely Cape Vulture, Martial Eagle, Verreaux's Eagle, Black Harrier, African Marsh Harrier, Lanner Falcon, and Secretarybird. Although Bearded Vulture breeds in the AOI, they have not yet been observed in the Groothoek WEF itself, but the possibility of occasional visitation remains a distinct possibility (as tracking data suggests that dispersing juveniles do cross the VWC). The 15 recorded raptor species attest to the favourable soaring conditions in the project area. Additionally, the higher-altitude grasslands along the southern border and in the northeastern corner provide ideal habitat for threatened passerines such as Rudd's Lark, Botha's Lark and Yellow-breasted Pipit. Of the various threatened species occupying the project area, Cape Vulture, Martial Eagle and Southern Bald Ibis emerge as being of particular significance for the proposed Groothoek WEF cluster due to their abundance, frequency of occurrence, flight activity patterns, residency (year-round), nest/roost proximity, conservation status and susceptibility to collision with turbines and electrical infrastructure.

In terms of Cape Vulture, five distinct roosts on separate inselbergs have been identified within a 50 km radius of the Groothoek WEF. These include three to the south of the project area, one to the west and one to the northwest. Of these, successful breeding was confirmed at Roost 3 on Nelson's Kop (21 km south). Cape Vulture are frequently observed roosting in large flocks (up to 122 birds) on the large transmission lines which traverse the eastern portion of Groothoek WEF, highlighting the size of the regional population and the importance of the powerline route as a movement corridor. Cape Vulture were the single most frequently encountered priority species in the project area. A strong seasonal variation in their flight activity was uncovered, with flight activity peaking in summer and autumn. Of particular concern is that Cape Vultures at Groothoek spend considerably more time flying at rotor sweep height than any other height class, a result which was found to be strongly statistically significant.

Southern Bald emerge as the second most frequently flying priority species at Groothoek. This is expected given the high number of roosts (11) in the AOI (including the largest, globally, on the Witkoppe 21 km north) and the suitability of the foraging habitat. Of the various bald ibis roosts, four have buffer implications for the Groothoek WEF. Four Martial Eagle nests have been documented in the region. Of these, the most significant regarding the Groothoek WEF is Martial Eagle Nest 2 (4.6 km SE).

Regarding avifaunal sensitivity, at a regional scale, the project area is surrounded by five IBAs (within 30 km radius). A significant portion of the eastern region of the Groothoek WEF overlaps the Eastern Free State Escarpment KBA. Additionally, several well-established birding routes traverse the AOI. At a local scale the Groothoek WEF intersects 17 nest / roost buffers of priority species. The presence of Martial Eagle Nest 2, Southern Bald Ibis Roosts 2, 4, 6, and especially 11, Jackal Buzzard Nest 1 all have significant buffer implications for the Groothoek WEF. Additionally, the project area supports one distinct plateau grassland core habitat for Threatened high altitude species (i.e. Rudd's Lark, Yellow-breasted Pipit, Southern Bald Ibis and Denham's Bustard), one high passage rate flight corridor for priority species and an abundance of rugged terrain for threatened raptors.

9. Preliminary Specialist Statement

Given the largely intact, high-altitude grassland nature of the project area, its close proximity to the Drakensburg Escarpment (important for localised movements and actively utilised by soaring birds), high diversity and abundance of red-listed and/or endemic species and high number of priority species

nests and roosts (including five Cape Vulture roosts within 50 km of the WEF), it is apparent that the project area is situated in an area of high avifaunal importance and sensitivity, particularly from a threatened vulture perspective. The establishment of wind turbines in this area (in spite of micro-siting and mitigation) may pose a significant risk to local birdlife, particularly in terms of Cape Vulture but also in terms of threatened high-altitude grassland endemics and migratory species. Based on the flight activity data and projected fatality rates it is cautioned that significant mortalities of several Threatened species are likely to occur annually. There are currently no operational wind energy facilities on high-altitude plateau grasslands associated with the Great Escarpment in the eastern Free State and as such our knowledge regarding the collision risk of many of these grassland endemics is limited. A thorough exploration of the realistic mitigation and spatiotemporal avoidance options is required which includes the incorporation of findings from the ongoing habitat modelling for selected threatened passerines and the Martial Eagle tracking into the final report. It is recommended that the pursuit of this application be carefully considered, given the high avifaunal sensitivity of the region and the significant risk of collision posed to a high number of threatened bird species.

10. References

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Appendix 1: Present and Potentially Occurring Avifauna

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Common Ostrich	*Struthio camelus*	LC	LC					5			2
Grey-winged Francolin	*Scleroptila afra*	LC	LC		OG	E	x	1	x	x	6
Red-winged Francolin	*Scleroptila levaillantii*	LC	LC		OG			1	x	x	5
Shelley's Francolin	*Scleroptila shelleyi*	LC	LC		OG			4			
Natal Spurfowl	*Pternistis natalensis*	LC	LC		OG			1	x	x	2
Red-necked Spurfowl	*Pternistis afer*	LC	LC		OG			1	x	x	
Swainson's Spurfowl	*Pternistis swainsonii*	LC	LC		OG			1	x	x	10
Common Quail	*Coturnix coturnix*	LC	LC		OG			1	x	x	10
Helmeted Guineafowl	*Numida meleagris*	LC	LC		OG			1	x	x	13
White-faced Whistling Duck	*Dendrocygna viduata*	LC	LC		PG			2	x	x	
White-backed Duck	*Thalassornis leuconotus*	LC	LC		PG			2	x	x	
Maccoa Duck	*Oxyura maccoa*	EN	NT		PG		x	3		x	
Egyptian Goose	*Alopochen aegyptiaca*	LC	LC		PG			1	x	x	15
South African Shelduck	*Tadorna cana*	LC	LC		OG			1	x	x	6
Spur-winged Goose	*Plectropterus gambensis*	LC	LC		OG			1	x	x	9
Knob-billed Duck	*Sarkidiornis melanotos*	LC	LC		PG			3			
African Black Duck	*Anas sparsa*	LC	LC		PG			1	x	x	6
Yellow-billed Duck	*Anas undulata*	LC	LC		OG			1	x	x	14
Cape Shoveler	*Spatula smithii*	LC	LC		PG			2	x	x	2
Red-billed Teal	*Anas erythrorhyncha*	LC	LC		OG			1	x	x	5
Common (Kurrichane) Buttonquail	*Turnix sylvaticus*	LC	LC		PG			2	x	x	
Greater Honeyguide	*Indicator indicator*	LC	LC		PG			2	x	x	2
Lesser Honeyguide	*Indicator minor*	LC	LC		PG			3			
Brown-backed Honeybird	*Prodotiscus regulus*	LC	LC		PG			3			
Red-throated Wryneck	*Jynx ruficollis*	LC	LC		PG			1	x	x	10
Ground Woodpecker	*Geocolaptes olivaceus*	NT	LC		PG	E	x	1	x	x	14

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Olive Woodpecker	*Dendropicos griseocephalus*	LC	LC		PG			1	x	x	
Acacia Pied Barbet	*Tricholaema leucomelas*	LC	LC		PG			2	x	x	1
Black-collared Barbet	*Lybius torquatus*	LC	LC		PG			2	x	x	2
Crested Barbet	*Trachyphonus vaillantii*	LC	LC		PG			2	x	x	
African Hoopoe	*Upupa africana*	LC	LC		PG			2	x	x	9
Green Wood-hoopoe	*Phoeniculus purpureus*	LC	LC		PG			1	x	x	2
Lilac-breasted Roller	*Coracias caudatus*	LC	LC		PG			3	x	x	
Half-collared Kingfisher	*Alcedo semitorquata*	LC	NT		PG		x	3	x	x	1
Malachite Kingfisher	*Corythornis cristatus*	LC	LC		PG			2	x	x	7
Brown-hooded Kingfisher	*Halcyon albiventris*	LC	LC		PG			2		x	1
Giant Kingfisher	*Megaceryle maxima*	LC	LC		PG			2	x	x	6
Pied Kingfisher	*Ceryle rudis*	LC	LC		PG			2	x	x	2
European Bee-eater	*Merops apiaster*	LC	LC		PG			1	x	x	
Speckled Mousebird	*Colius striatus*	LC	LC					1	x	x	8
Red-faced Mousebird	*Urocolius indicus*	LC	LC					1	x	x	
Jacobin Cuckoo	*Clamator jacobinus*	LC	LC		PG			4			
Great Spotted Cuckoo	*Clamator glandarius*	LC	LC		PG			4			
Red-chested Cuckoo	*Cuculus solitarius*	LC	LC		PG			1	x	x	4
Black Cuckoo	*Cuculus clamosus*	LC	LC		PG			3			1
Common Cuckoo	*Cuculus canorus*	LC	LC		PG			4			
Klaas's Cuckoo	*Chrysococcyx klaas*	LC	LC		PG			1	x	x	
Diederik Cuckoo	*Chrysococcyx caprius*	LC	LC		PG			1	x	x	5
Alpine Swift	*Tachymarptis melba*	LC	LC		PG			1	x	x	6
Common Swift	*Apus apus*	LC	LC		PG			1	x	x	1
African Black Swift	*Apus barbatus*	LC	LC		PG			1	x	x	10
Little Swift	*Apus affinis*	LC	LC		PG			1	x	x	2
Horus Swift	*Apus horus*	LC	LC		PG			1	x	x	2

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
White-rumped Swift	*Apus caffer*	LC	LC		PG			1	x	x	11
Western Barn Owl	*Tyto alba*	LC	LC		PG			2	x	x	
African Grass Owl	*Tyto capensis*	LC	VU		PG		x	3			
Southern White-faced Owl	*Ptilopsis granti*	LC	LC		PG			2			
Cape Eagle-Owl	*Bubo capensis*	LC	LC		PG		x	1	x	x	2
Spotted Eagle-Owl	*Bubo africanus*	LC	LC		PG		x	1	x	x	3
Marsh Owl	*Asio capensis*	LC	LC		PG		x	2	x	x	
Fiery-necked Nightjar	*Caprimulgus pectoralis*	LC	LC		PG			1	x	x	1
Freckled Nightjar	*Caprimulgus tristigma*	LC	LC		PG			2			
Rock Dove	*Columba livia*	LC	LC		PG			2			4
Speckled Pigeon	*Columba guinea*	LC	LC					1	x	x	13
African Olive Pigeon	*Columba arquatrix*	LC	LC		PG			1	x	x	2
Laughing Dove	*Spilopelia senegalensis*	LC	LC					1	x	x	10
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*	LC	LC					1	x	x	16
Red-eyed Dove	*Streptopelia semitorquata*	LC	LC		PG			1	x	x	15
Namaqua Dove	*Oena capensis*	LC	LC		PG			1	x	x	3
Denham's Bustard	*Neotis denhami*	NT	VU	VU	PG		x	1	x	x	4
Blue Korhaan	*Eupodotis caerulescens*	NT	LC		PG	E	x	1	x	x	5
White-bellied Korhaan (Bustard)	*Eupodotis senegalensis*	LC	VU		PG		x	1	x	x	3
Black-bellied Bustard	*Lissotis melanogaster*	LC	LC		PG		x	3		x	
Grey Crowned Crane	*Balearica regulorum*	EN	EN	EN	PG		x	1	x	x	10
Blue Crane	*Grus paradisea*	VU	NT	PS	OG		x	1	x	x	12
Wattled Crane	*Grus carunculata*	VU	CR	CR	PG		x	3	x	x	1
Striped Flufftail	*Sarothrura affinis*	LC	VU		PG		x	3	x	x	
White-winged Flufftail	*Sarothrura ayresi*	CR	CR		PG		x	4			
African Rail	*Rallus caerulescens*	LC	LC		PG			2	x	x	1
African Crake	*Crecopsis egregia*	LC	LC		PG			2	x	x	

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Corn Crake	*Crex crex*	LC	LC		PG			3			
Black Crake	*Zapornia flavirostra*	LC	LC		PG			2			1
Baillon's Crake	*Zapornia pusilla*	LC	LC		PG			3			
African (Purple) Swamphen	*Porphyrio madagascariensis*	LC	LC		PG			2			2
Common Moorhen	*Gallinula chloropus*	LC	LC		PG			1	x	x	6
Red-knobbed coot	*Fulica cristata*	LC	LC		OG			1	x	x	13
African Snipe	*Gallinago nigripennis*	LC	LC		PG			1	x	x	1
Common Greenshank	*Tringa nebularia*	LC	LC		PG			3			1
Common Sandpiper	*Actitis hypoleucos*	LC	LC		PG			2	x	x	
African Jacana	*Actophilornis africanus*	LC	LC		PG			3	x	x	
Spotted Thick-knee	*Burhinus capensis*	LC	LC		PG			1	x	x	2
Black-winged Stilt	*Himantopus himantopus*	LC	LC		PG			2	x	x	
Pied Avocet	*Recurvirostra avosetta*	LC	LC		PG			3			
Common Ringed Plover	*Charadrius hiaticula*	LC	LC		PG			3			
Kittlitz's Plover	*Charadrius pecuarius*	LC	LC		PG			3			
Three-banded Plover	*Charadrius tricollaris*	LC	LC		PG			1	x	x	2
Blacksmith Lapwing	*Vanellus armatus*	LC	LC		PG			1	x	x	9
African Wattled Lapwing	*Vanellus senegallus*	LC	LC		PG			2	x	x	4
Black-winged Lapwing	*Vanellus melanopterus*	LC	LC		PG			3	x	x	2
Crowned Lapwing	*Vanellus coronatus*	LC	LC		PG			1	x	x	4
Black-winged Pratincole	*Glareola nordmanni*	NT	NT		PG		x	4			
Whiskered Tern	*Chlidonias hybrida*	LC	LC		PG			3			2
African Cuckoo Hawk	*Aviceda cuculoides*	LC	LC		PG		x	4			
Black-winged Kite	*Elanus caeruleus*	LC	LC		PG		x	1	x	x	15
African Fish Eagle	*Haliaeetus vocifer*	LC	LC		PG		x	1	x	x	4
Bearded Vulture	*Gypaetus barbatus*	NT	CR	CR	PG		x	3		x	
Cape Vulture	*Gyps coprotheres*	VU	EN	EN	PG		x	1	x	x	7

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Black-chested Snake Eagle	*Circaetus pectoralis*	LC	LC		PG		x	3			1
Brown Snake Eagle	*Circaetus cinereus*	LC	LC		PG		x	4			1
African Marsh Harrier	*Circus ranivorus*	LC	EN		PG		x	2	x	x	1
Black Harrier	*Circus maurus*	EN	EN		PG	NE	x	1	x	x	2
Pallid Harrier	*Circus macrourus*	NT	NT		PG		x	4			
Montagu's Harrier	*Circus pygargus*	LC	LC		PG		x	2			
African Harrier-Hawk	*Polyboroides typus*	LC	LC		PG		x	2	x	x	6
Little Sparrowhawk	*Accipiter minullus*	LC	LC		PG		x	2	x	x	
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	LC	LC		PG		x	1	x	x	3
Black Sparrowhawk	*Accipiter melanoleucus*	LC	LC		PG		x	2	x	x	2
Common (Steppe) Buzzard	*Buteo buteo*	LC	LC		PG		x	1	x	x	12
Forest Buzzard	*Buteo trizonatus*	NT	LC		PG	E	x	3			2
Jackal Buzzard	*Buteo rufofuscus*	LC	LC		PG	NE	x	1	x	x	14
Verreaux's Eagle	*Aquila verreauxii*	LC	VU		PG		x	1	x	x	2
Booted Eagle	*Hieraaetus pennatus*	LC	LC		PG		x	1	x	x	
Martial Eagle	*Polemaetus bellicosus*	EN	EN	EN	PG		x	1	x	x	1
Crowned Eagle	*Stephanoaetus coronatus*	NT	VU		PG		x	4			
Secretarybird	*Sagittarius serpentarius*	EN	VU		PG		x	1	x	x	9
Lesser Kestrel	*Falco naumanni*	LC	LC		PG		x	2	x	x	1
Rock Kestrel	*Falco rupicolus*	LC	LC		PG		x	1	x	x	9
Greater Kestrel	*Falco rupicoloides*	LC	LC		PG		x	1	x	x	1
Red-footed Falcon	*Falco vespertinus*	VU	NT		PG		x	1			2
Amur Falcon	*Falco amurensis*	LC	LC		PG		x	1	x	x	14
Eurasian Hobby	*Falco subbuteo*	LC	LC		PG		x	3			
Lanner Falcon	*Falco biarmicus*	LC	VU		PG		x	1	x	x	7
Little Grebe	*Tachybaptus ruficollis*	LC	LC		PG			1	x	x	7
African Darter	*Anhinga rufa*	LC	LC		PG			2			1

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Reed Cormorant	*Microcarbo africanus*	LC	LC					1	x	x	11
White-breasted Cormorant	*Phalacrocorax lucidus*	LC	LC					2		x	4
Black Heron	*Egretta ardesiaca*	LC	LC		PG			4			
Little Egret	*Egretta garzetta*	LC	LC		PG			2	x	x	2
Yellow-billed (Intermediate) Egret	*Ardea intermedia*	LC	LC		PG			1	x	x	4
Great Egret	*Ardea alba*	LC	LC		PG			2	x	x	1
Grey Heron	*Ardea cinerea*	LC	LC		PG			1	x	x	6
Black-headed Heron	*Ardea melanocephala*	LC	LC		PG			1	x	x	16
Goliath Heron	*Ardea goliath*	LC	LC		PG			3			
Purple Heron	*Ardea purpurea*	LC	LC		PG			1	x	x	
Western Cattle Egret	*Bubulcus ibis*	LC	LC		PG			1	x	x	14
Squacco Heron	*Ardeola ralloides*	LC	LC		PG			2			
Green-backed (Striated) Heron	*Butorides striata*	LC	LC		PG			3			
Black-crowned Night Heron	*Nycticorax nycticorax*	LC	LC		PG			4			
Little Bittern	*Ixobrychus minutus*	LC	LC		PG			4			
Eurasian Bittern	*Botaurus stellaris*	LC	LC		PG			4			
Hamerkop	*Scopus umbretta*	LC	LC		PG			1	x	x	8
Glossy Ibis	*Plegadis falcinellus*	LC	LC		PG			1	x	x	2
Hadeda (Hadada) Ibis	*Bostrychia hagedash*	LC	LC		PG			1	x	x	16
Southern Bald Ibis	*Geronticus calvus*	VU	VU	VU	PG	E	x	1	x	x	16
African Sacred Ibis	*Threskiornis aethiopicus*	LC	LC		PG			1	x	x	7
African Spoonbill	*Platalea alba*	LC	LC		PG			1	x	x	4
Yellow-billed Stork	*Mycteria ibis*	LC	EN		PG		x	2	x	x	
Black Stork	*Ciconia nigra*	LC	VU		PG		x	2	x	x	1
Abdim's Stork	*Ciconia abdimii*	LC	NT		PG		x	2			
White Stork	*Ciconia ciconia*	LC	LC		PG		x	3	x	x	7
Marabou Stork	*Leptoptilos crumenifer*	LC	NT		PG		x	4			

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Fork-tailed Drongo	*Dicrurus adsimilis*	LC	LC		PG			1	x	x	5
African Paradise Flycatcher	*Terpsiphone viridis*	LC	LC		PG			2	x	x	3
Brubru	*Nilaus afer*	LC	LC		PG			3	x	x	
Southern Boubou	*Laniarius ferrugineus*	LC	LC		PG			1	x	x	6
Bokmakierie	*Telophorus zeylonus*	LC	LC		PG			1	x	x	17
Orange-breasted Bush-Shrike	*Chlorophoneus sulfureopectus*	LC	LC		PG			4			
Olive Bush-Shrike	*Chlorophoneus olivaceus*	LC	LC		PG			3			1
Cape Batis	*Batis capensis*	LC	LC		PG			4	x	x	2
Chinspot Batis	*Batis molitor*	LC	LC		PG			3			
Cape Crow	*Corvus capensis*	LC	LC					1	x	x	17
Pied Crow	*Corvus albus*	LC	LC					1	x	x	10
White-necked Raven	*Corvus albicollis*	LC	LC				x	1	x	x	3
Red-backed Shrike	*Lanius collurio*	LC	LC		PG			1	x	x	1
Southern (Common) Fiscal	*Lanius collaris*	LC	LC		PG			1	x	x	17
Black Cuckooshrike	*Campephaga flava*	LC	LC		PG			2			
Sand Martin	*Riparia riparia*	LC	LC		PG			2			1
Brown-throated Martin	*Riparia paludicola*	LC	LC		PG			2	x	x	10
Banded Martin	*Neophedina cincta*	LC	LC		PG			1	x	x	16
Barn Swallow	*Hirundo rustica*	LC	LC		PG			1	x	x	16
White-throated Swallow	*Hirundo albigularis*	LC	LC		PG			1	x	x	12
Greater Striped Swallow	*Cecropis cucullata*	LC	LC		PG			1	x	x	16
Lesser Striped Swallow	*Cecropis abyssinica*	LC	LC		PG			1	x	x	1
South African Cliff Swallow	*Petrochelidon spilodera*	LC	LC		PG	E		1	x	x	13
Rock Martin	*Ptyonoprogne fuligula*	LC	LC		PG			1	x	x	12
Common House Martin	*Delichon urbicum*	LC	LC		PG			2			3
Dark-capped Bulbul	*Pycnonotus tricolor*	LC	LC					1	x	x	15
African Red-eyed Bulbul	*Pycnonotus nigricans*	LC	LC					4			1

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Fairy Flycatcher	*Stenostira scita*	LC	LC		PG	NE		1	x	x	
Cape Grassbird	*Sphenoeacus afer*	LC	LC		PG	NE		1	x	x	4
Long-billed crombec	*Sylvietta rufescens*	LC	LC		PG			3			
Little Rush Warbler	*Bradypterus baboecala*	LC	LC		PG			1	x	x	3
Barratt's Warbler	*Bradypterus barratti*	LC	LC		PG	NE	x	1	x	x	2
Common Reed Warbler	*Acrocephalus scirpaceus*	LC	LC		PG			2			1
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	LC	LC		PG			1	x	x	3
Willow Warbler	*Phylloscopus trochilus*	LC	LC		PG			2			2
Arrow-marked Babbler	*Turdoides jardineii*	LC	LC		PG			4			
Bush Blackcap	*Sylvia nigricapillus*	VU	VU		PG	E	x	3	x	x	1
Cape White-eye	*Zosterops virens*	LC	LC		PG	NE		1	x	x	10
Orange River White-eye	*Zosterops pallidus*	LC	LC		PG			2			1
Lazy Cisticola	*Cisticola aberrans*	LC	LC		PG			1	x	x	2
Wailing Cisticola	*Cisticola lais*	LC	LC		PG			1	x	x	9
Levaillant's Cisticola	*Cisticola tinniens*	LC	LC		PG			1	x	x	14
Neddicky	*Cisticola fulvicapilla*	LC	LC		PG			1	x	x	9
Zitting Cisticola	*Cisticola juncidis*	LC	LC		PG			1	x	x	12
Desert Cisticola	*Cisticola aridulus*	LC	LC		PG			3			2
Cloud Cisticola	*Cisticola textrix*	LC	LC		PG	N-end		1	x	x	12
Pale-crowned Cisticola	*Cisticola cinnamomeus*	LC	LC		PG			1	x	x	6
Wing-snapping Cisticola	*Cisticola ayresii*	LC	LC		PG			1	x	x	15
Tawny-flanked Prinia	*Prinia subflava*	LC	LC		PG			1	x	x	1
Black-chested Prinia	*Prinia flavicans*	LC	LC		PG			1	x	x	3
Drakensberg Prinia	*Prinia hypoxantha*	LC	LC		PG	E		1	x	x	8
Bar-throated Apalis	*Apalis thoracica*	LC	LC		PG			2	x	x	2
Melodious Lark	*Mirafra cheniana*	LC	LC		PG	NE	x	3	x	x	1
Rufous-naped Lark	*Mirafra africana*	LC	LC		PG			3	x	x	2

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Eastern clapper Lark	*Mirafra fasciolata*	LC	LC		PG			1	x	x	4
Rudd's Lark	*Heteromirafra ruddi*	EN	EN		PG	E	x	2	x	x	2
Spike-heeled Lark	*Chersomanes albofasciata*	LC	LC		PG			1	x	x	8
Eastern Long-billed Lark	*Certhilauda semitorquata*	LC	LC		PG	E		1	x	x	9
Red-capped Lark	*Calandrella cinerea*	LC	LC		PG			1	x	x	14
Botha's Lark	*Spizocorys fringillaris*	EN	EN		PG	E	x	3	x	x	1
Cape Rock Thrush	*Monticola rupestris*	LC	LC		PG	E	x	1	x	x	5
Sentinel Rock Thrush	*Monticola explorator*	NT	LC		PG	E	x	1	x	x	3
Groundscraper Thrush	*Turdus litsitsirupa*	LC	LC		PG			2		x	1
Olive Thrush	*Turdus olivaceus*	LC	LC		PG			1	x	x	3
Southern Black flycatcher	*Melaenornis pammelaina*	LC	LC		PG			2			
Fiscal Flycatcher	*Melaenornis silens*	LC	LC		PG	NE		1	x	x	1
Spotted flycatcher	*Muscicapa striata*	LC	LC		PG			2			
African Dusky Flycatcher	*Muscicapa adusta*	LC	LC		PG			2			1
Cape Robin-Chat	*Cossypha caffra*	LC	LC		PG			1	x	x	14
White-browed Robin-Chat	*Cossypha heuglini*	LC	LC		PG			4	x	x	
Chorister Robin-Chat	*Cossypha dichroa*	LC	LC		PG	E	x	4			1
African StoneChat	*Saxicola torquatus*	LC	LC		PG			1	x	x	17
Buff-streaked Chat	*Campicoloides bifasciatus*	LC	LC		PG	E		1	x	x	8
Mountain Wheatear	*Myrmecocichla monticola*	LC	LC		PG			1	x	x	12
Sickle-winged Chat	*Emarginata sinuata*	LC	LC		PG	NE	x	1	x	x	
Familiar Chat	*Oenanthe familiaris*	LC	LC		PG			1	x	x	9
Ant-eating Chat	*Myrmecocichla formicivora*	LC	LC		PG			1	x	x	16
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*	LC	LC					1	x	x	3
Red-winged Starling	*Onychognathus morio*	LC	LC					1	x	x	10
Cape Glossy (Cape) Starling	*Lamprotornis nitens*	LC	LC		PG			1	x	x	13
Pied Starling	*Lamprotornis bicolor*	LC	LC			E	x	1	x	x	16

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Common Myna	*Acridotheres tristis*	LC	LC					1	x	x	
Amethyst Sunbird	*Chalcomitra amethystina*	LC	LC		PG			1	x	x	1
Malachite Sunbird	*Nectarinia famosa*	LC	LC		PG			1	x	x	11
Greater Double-collared Sunbird	*Cinnyris afer*	LC	LC		PG	E		1	x	x	1
White-browed Sparrow-Weaver	*Plocepasser mahali*	LC	LC					1	x	x	2
Lesser Masked Weaver	*Ploceus intermedius*	LC	LC					1	x	x	
Cape Weaver	*Ploceus capensis*	LC	LC			NE		1	x	x	16
Southern Masked Weaver	*Ploceus velatus*	LC	LC					1	x	x	16
Village Weaver	*Ploceus cucullatus*	LC	LC					1	x	x	
Red-billed Quelea	*Quelea quelea*	LC	LC					1	x	x	13
Yellow-crowned Bishop	*Euplectes afer*	LC	LC					1	x	x	14
Southern Red Bishop	*Euplectes orix*	LC	LC					1	x	x	16
Yellow Bishop	*Euplectes capensis*	LC	LC					2	x	x	5
Fan-tailed Widowbird	*Euplectes axillaris*	LC	LC					1	x	x	5
White-winged Widowbird	*Euplectes albonotatus*	LC	LC					1	x	x	2
Red-collared Widowbird	*Euplectes ardens*	LC	LC					2			4
Long-tailed Widowbird	*Euplectes progne*	LC	LC					1	x	x	16
Orange-breasted Waxbill	*Amandava subflava*	LC	LC		PG			1	x	x	1
African Quail-finch	*Ortygospiza atricollis*	LC	LC		PG			1	x	x	14
Red-headed Finch	*Amadina erythrocephala*	LC	LC		PG			2			
Swee Waxbill	*Coccopygia melanotis*	LC	LC		PG	NE		1	x	x	1
Common Waxbill	*Estrilda astrild*	LC	LC		PG			1	x	x	14
African Firefinch	*Lagonosticta rubricata*	LC	LC		PG			3			1
Pin-tailed Whydah	*Vidua macroura*	LC	LC		PG			1	x	x	14
Shaft-tailed Whydah	*Vidua regia*	LC	LC		PG			2			1
Cuckoo Finch	*Anomalospiza imberbis*	LC	LC					3			
Cape Sparrow	*Passer melanurus*	LC	LC					1	x	x	11

Common Name	Scientific Name	Conservation Status					Priority Spp	LO Groothoek	VK Cluster	AOI	SABAP
		Global	Regional	TOPS	FS	Endemicity					
Southern Grey-headed Sparrow	*Passer diffusus*	LC	LC		PG			1	x	x	12
Yellow-throated Petronia	*Gymnoris superciliaris*	LC	LC		PG			2		x	
Cape Wagtail	*Motacilla capensis*	LC	LC		PG			1	x	x	15
Cape Longclaw	*Macronyx capensis*	LC	LC		PG			1	x	x	17
Yellow-breasted Pipit	*Anthus chloris*	VU	VU		PG	E	x	1	x	x	5
African Rock Pipit	*Anthus crenatus*	LC	NT		PG	E	x	1	x	x	4
African Pipit	*Anthus cinnamomeus*	LC	LC		PG			1	x	x	16
Plain-backed Pipit	*Anthus leucophrys*	LC	LC		PG			1	x	x	3
Buffy Pipit	*Anthus vaalensis*	LC	LC		PG			2			5
Nicholson's Pipit	*Anthus nicholsoni*	LC	LC		PG			1	x	x	1
Short-tailed Pipit	*Anthus brachyurus*	LC	VU		PG		x	3			
Cape Canary	*Serinus canicollis*	LC	LC		PG			1	x	x	16
Yellow-fronted Canary	*Crithagra mozambica*	LC	LC		PG			1	x	x	2
Black-throated Canary	*Crithagra atrogularis*	LC	LC		PG			1	x	x	6
Forest Canary	*Crithagra scotops*	LC	LC		PG	E	x	4			1
Yellow Canary	*Crithagra flaviventris*	LC	LC		PG			1	x	x	1
Brimstone Canary	*Crithagra sulphurata*	LC	LC		PG			2			1
Streaky-headed Seedeater	*Crithagra gularis*	LC	LC		PG			1	x	x	1
Lark-like Bunting	*Emberiza impetuani*	LC	LC		PG			3			2
Cinnamon-breasted Bunting	*Emberiza tahapisi*	LC	LC		PG			2	x	x	1
Cape Bunting	*Emberiza capensis*	LC	LC		PG			1	x	x	12
Golden-breasted Bunting	*Emberiza flaviventris*	LC	LC		PG			2	x	x	
Yellow-billed Kite	*Milvus aegyptius*	LC	LC		PG		x	1	x	x	1
Peregrine Falcon	*Falco peregrinus*	LC	LC		PG		x	1	x	x	

Key: Status: CR = Critically Endangered; DD = Data Deficient; EN = Endangered; LC = Least Concern; NA = Not Assessed; NT = Near Threatened; OG = Ordinary Game; PG = Protected Game; PS = Protected Species; VU = Vulnerable. Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate. Sources: Taylor et al. (2015); BirdLife South Africa (2016); SABAP 2 (2022)