AVIFAUNAL SCOPING REPORT FOR THE PROPOSED SOYUZ 5 WIND ENERGY FACILITY NEAR BRITSTOWN, NORTHERN CAPE PROVINCE

For

Soyuz 5 (Pty) Ltd

June 2022

Prepared By:

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Registered in South Africa No. 2015/416206/07

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1 INTRODUCTION

The applicant Soyuz 5 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 46 km South of Britstown within the Ubuntu Local Municipality and the Pixley ka Seme District Municipality in the Northern Cape Province.

Five additional WEF's are concurrently being considered on the surrounding properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained in Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Soyuz 1 WEF, Soyuz 2 WEF, Soyuz 3 WEF, Soyuz 4 WEF and Soyuz 6 WEF.

A preferred project site with an extent of approximately 125 000 ha has been identified as a technically suitable area for the development of the six WEF projects. It is proposed that each WEF will comprise of up to 75 turbines with a contracted capacity of up to 480 MW. It is anticipated that each WEF will have an actual (permanent) footprint of up to 150 ha.

The Soyuz 5 WEF project site covers approximately 16 800 ha and comprises the following farm portions:

- The Farm Lekkervlei No. 142
- Remaining Extent of the Farm Gediertesfontein No. 134.
- Portion 4 of the Farm Schram Fontein No. 21
- Portion 4 (Beschuid Kuil) of the Farm Schramfountain No. 23
- Remaining Extent (Portion 0) of the Farm Schram Fontein No. 21
- Portion 1 of the Farm Schram Fontein No. 21
- Remaining Extent of Portion 2 of the Farm Draayfountain No 24

The Soyuz 5 WEF project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 480 MW:

- Up to 75 wind turbines with a maximum hub height of up to 160 m and a rotor diameter of up to 200 m;
- A transformer at the base of each turbine;
- Concrete turbine foundations;
- Turbine, crane and blade hardstands;
- Temporary laydown areas (with a combined footprint of up to 14 ha) which will accommodate the boom erection, storage and assembly area;
- Cabling between the turbines, to be laid underground where practical;
- Two on-site substations with a combined footprint of up to 4 ha in extent to facilitate the connection between the wind farm and the electricity grid;
- Access roads to the site and between project components inclusive of storm-water infrastructure. A 12 m road corridor may be temporarily impacted upon during construction and rehabilitated to 6m wide after construction. The WEF will have a total road network of up to 125 km.
- A temporary site camp establishment and concrete batching plants (with a combined footprint of up to 2 ha); and
- Operation and Maintenance buildings (with a combined footprint of up to 2 ha) including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre; and
- Battery Energy Storage System with a footprint of up to 5 ha.

In order to evacuate the energy generated by the WEF to the national grid, a separate Basic Assessment will be undertaken to assess two grid connection alternatives:

- Alternative 1: A 132 / 400kV overhead powerline (OHL) within a 500 m assessment corridor from the Switching Station on site to a proposed new 132 / 400 kV MTS located north of the WEF and adjacent to the Hydra – Kronos 400 kV line.
- Alternative 2: A 132 / 400 kV overhead powerline (OHL) within a 500 m assessment corridor from the Switching Station on site to a proposed new 132 / 400 kV MTS located south of the WEF and adjacent to the Droërivier - Hydra 400 kV line.

The EA applications for the wind farm project and grid connection infrastructure are being undertaken in parallel as they are co-dependent, i.e. one will not be developed without the other.

1.1 Terms of Reference

This report was developed to align with Government Gazette 43110 (GN. 320) "*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 20 Megawatts or more*" dated 20 March 2020 ('The Protocol'), the Species Environmental Assessment Guideline[1], the Birds and Wind-Energy Best-Practice Guidelines[2] and the requirements prescribed therein. This report also considers the National Environment Management Act, 1998 (Act 107 0f 1998).

The aims of the study were to:

- Determine the proposed Project Area of Influence ('PAOI') in relation to avifauna;
- Determine the avifaunal habitats present across the PAOI;
- Determine the potential avifaunal species that could occur across the PAOI;
- Determine the potential avifaunal Species of Conservation Concern ('SCCs') relevant to the proposed development activities;
- Determine the Site Ecological Importance ('SEI') of the PAOI in relation to the development activity proposed and relevant avifaunal SCCs;
- Produce an avifaunal sensitivity map to inform potential layout designs;
- Identify the potential impacts of the proposed development to the avifaunal community;
- Identify relevant mitigation measures (if any) to reduce the potential impact to the avifaunal community.

2 METHODS

The Protocol indicates that a site-specific Avifaunal Specialist Assessment is to be undertaken for all sensitivity ratings provided by the National Web-based Screening Tool as the present level of knowledge on bird behaviour and species population precludes confident predictions on the sustainability of priority or threatened species nationally.

The process for undertaking the Avifaunal Impact Assessment will therefore comprise:

- A Reconnaissance Study including:
  - Desktop Study; and
  - Initial Site Visit.
- The preparation of a Pre-Application Avifaunal Monitoring Plan ('PAAMP');
- Seasonal Pre-Construction Avifaunal Monitoring Data collection; and

[1] 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 2.1 2021.

[2] Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M., Smit-Robinson, H.A. and Ralston, S. 2015. Birds and Wind-Energy Best-Practice Guidelines: Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa. Third Edition. BirdLife South Africa / Endangered Wildlife Trust.

- The Avifaunal Impact Assessment Reporting (to be conducted in the EIA phase).

2.1 Reconnaissance Study

2.1.1 Desktop Study

The desktop study included data obtained from the following sources:

- Broad vegetation types present on the project site were obtained from the updated National Vegetation Map 2018 (NVM 2018) database[3] and the vegetation descriptions were obtained from Mucina & Rutherford (2006)[4];
- Bird distribution data of the Southern African Bird Atlas Project 2 ('SABAP2') obtained from the Avian Demography Unit of the University of Cape Town[5];
- Co-ordinated Avifaunal Road Count ('CAR') project[6];
- Co-ordinated Water-bird Count ('CWAC') project[7];
- The Important Bird Areas of southern Africa ('IBA') project[8];
- Output from the National Web-based Screening Tool[9] ('Screening Tool');
- The output from the Verreaux's Eagle Risk Assessment ('VERA') Tool as provided by the applicant;
- Habitat suitability maps compiled by BirdLife South Africa ('BLSA');
- Publically available satellite imagery; and
- The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland[10].

2.1.2 Initial Site Visit

- Date: 2021-07-12 to 2021-07-20
- Duration: 8 days.
- Season: July.
- Season Relevance: The timing of the site inspection coincided with the early breeding season of Verreaux's Eagle (May – July) when flight activity is usually increased and was sufficient to determine the current land-use in the area as well as the identification of suitable vantage points (VPs) for the avifaunal monitoring programme.

2.2 Reporting

The following definitions were applied in the compilation of the report:

- Priority species: all species occurring on the BLSA and Endangered Wildlife Trust ('EWT') Avian Sensitivity Map priority species list[11]. This list consists of 107 species with a priority score of 170 or more. The priority score was determined by BLSA and EWT after considering various factors including bird families most impacted upon by WEFs

[3] South African National Biodiversity Institute (2006-2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018 accessed January 20 2020.

[4] Mucina, L. and Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland, in Strelitzia 19. South African National Biodiversity Institute, Pretoria.

[5] http://sabap2.birdmap.africa/ Accessed 17 June 2021.

[6] Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. Big birds on farms: Mazda CAR Report 1993-2001. Avian Demography Unit: Cape Town.

[7] Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. Coordinated waterbird Counts in South Africa, 1992-1997. Avian Demography Unit, Cape Town.

[8] Marnewick, M.D., Retief, E.F., Theron, N.T., Wright, D.R., Anderson, T.A. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.

[9] https://screening.environment.gov.za/

[10] Taylor, M.R., Peacock, F., and Wanless, R.M., 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Updated in 2022 by BirdLife South Africa.

[11] Retief, E, Anderson, M., Diamond, M., Smit, H., Jenkins, A. & Brooks, M., 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures used. Priority species list updated in 2014 by BirdLife South Africa.

including physical size, species behaviour, endemism, range size and conservation status;

- Red Data species: Species whose regional conservation status is listed as Near Threatened, Vulnerable, Endangered or Critically Endangered in the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015);
- Endemic or Near-endemic: Endemic or near endemic (i.e., ~70% or more of population in RSA) to South Africa (not southern Africa as in field guides) or endemic to South Africa, Lesotho and Swaziland. Taken from BLSA Checklist of Birds in South Africa, 2022.
- Species of Conservation Concern ('SCC'): all species that are assessed according to the IUCN Red List Criteria as Critically Endangered ('CR'), Endangered ('EN'), Vulnerable ('VU'), Near Threatened ('NT') or Data Deficient ('DD'), as well as range-restricted species which are not declining and are nationally listed as Rare or Extremely Rare (also referred to in some Red Lists as Critically Rare)[1]. These species and subspecies are important for South Africa's conservation decision-making processes.
- Target species: those particular bird species that are to be recorded by a specific survey method. Target species per survey method:
  - Vantage Point ('VP') Surveys: all raptors; all large (non-passerine) priority species;
  - Walked Transects ('WT'): all birds; and
  - Incidental Observations: all raptors; all large (non-passerine) priority species.

2.2.1 Pre-Application Avifaunal Monitoring Plan (PAAMP)

The PAAMP was informed by the desktop study and reconnaissance site visit and outlined the recommended avifaunal monitoring programme (Appendix B). The number and location of Vantage Points (VPs) were selected to focus coverage of the indicative wind turbine generator (WTG) positions initially received. The avifaunal monitoring programme included the survey of the whole WEF cluster concurrently to provide a greater time spent in the broader area during each survey period to maximize the likelihood of recording infrequent events such as an influx of bustards to the area.

2.2.2 Site Ecological Importance (SEI)

SEI is considered to be a function of the biodiversity importance ('BI') of the receiving environment (e.g. species of conservation concern and the habitat type present on the site) and its resilience to impacts (i.e. receptor resilience ['RR']). The BI of the receiving environment is in turn a function of the conservation importance ('CI') and the functional integrity ('FI') of the receiving environment.

Conservation importance is defined as: '*The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.*'

Functional integrity (FI) of the receiving environment/habitats is defined as its current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions, i.e. a measure of the ecological condition of the receiving environment as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts. The degree of connectivity between habitat patches varies greatly with the dispersal ability of the taxa in question and similarly, existing impacts will have differential effects on each species.

As biodiversity importance (BI) is a function of conservation importance (CI) and the functional integrity (FI), the biodiversity importance can be determined.

Receptor resilience (RR) is the intrinsic capacity of the receptor to resist major damage from an impact and/or to recover to its original state with limited or no human intervention. Resilience can be linked to a particular disturbance/impact or time of year; e.g. large birds of prey have different levels of resilience to noise disturbance depending on whether they are breeding or not.

The highest calculated SEI corresponding with each habitat/land-use category that represented the preferred habitats used by each species was mapped.

3 RESULTS

3.1 Assumptions and Limitations

Many areas of South Africa have not been well studied, with the result that the species lists derived for an area do not always adequately reflect the actual species present at a site. To address this potential limitation database searches were extended well beyond the proposed development site.

Nest locations for Verreaux's Eagle were provided to Arcus at the outset along with the output of the Verreaux's Eagle Risk Assessment (VERA) Tool. It was assumed that the nest survey was thorough (as this task was not conducted by Arcus) and it appeared to be based on the VERA output. It was assumed that higher sensitivity areas will be avoided for the placement of WTGs. Given the large area under consideration it was impractical to survey the entire site and therefore monitoring efforts were focussed around indicative WTG positions supplied based on the assumption that these areas represent the focus areas for WTG development. Should the applicant intend on placing WTGs in areas without adequate monitoring coverage to inform the assessment thereof, further specialist investigation will be required for those areas.

The baseline avifaunal monitoring data included to inform this report does not include data from the full monitoring programme (currently ongoing) and is therefore considered preliminary. The analyses of the full dataset and assessment will be conducted during the EIA phase. Species not confirmed to be on site during the site visits conducted to-date have been assumed to occur on the proposed development site following the precautionary principal and their probability of occurrence in each habitat type was evaluated based on the species' habitat preference.

3.2 Desktop Study

3.2.1 Project Area of Influence (PAOI)

The PAOI for the purposes of the more detailed mapping generated for this report was considered to be the proposed development area of interest provided by the client. It is acknowledged that the potential area of influence of a WEF could extend beyond the boundary of the project area, particularly with respect to the avifaunal community being assessed as several species are highly mobile. The development envelope will, however, be much smaller relative to the size of the project site identified and therefore the PAOI is considered appropriate to determine potential impacts on the local avifaunal community of the receiving environment. The potential impacts on local and regional populations of species have nevertheless been considered during the assessment process.

3.2.2 Regional Context

The proposed development site falls within the nama-Karoo biome in a transition zone between two broad vegetation types, where the southern extent of the Northern Upper Karoo meets the northern extent of the Eastern Upper Karoo (Figure 1). The proposed development site lies to the west of the Platberg-Karoo Conservancy Important Bird Area

(IBA, SA037). This is a large IBA that covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns. The landscape consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. The land is used primarily for grazing and agriculture. Commercial livestock farming is mostly extensive wool and mutton production, with some cattle and game farming. This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane, Ludwig's Bustard, Kori Bustard, Blue Korhaan, Black Stork, Secretarybird, Martial Eagle, Verreaux's Eagle and Tawny Eagle.

3.2.3 Local Context

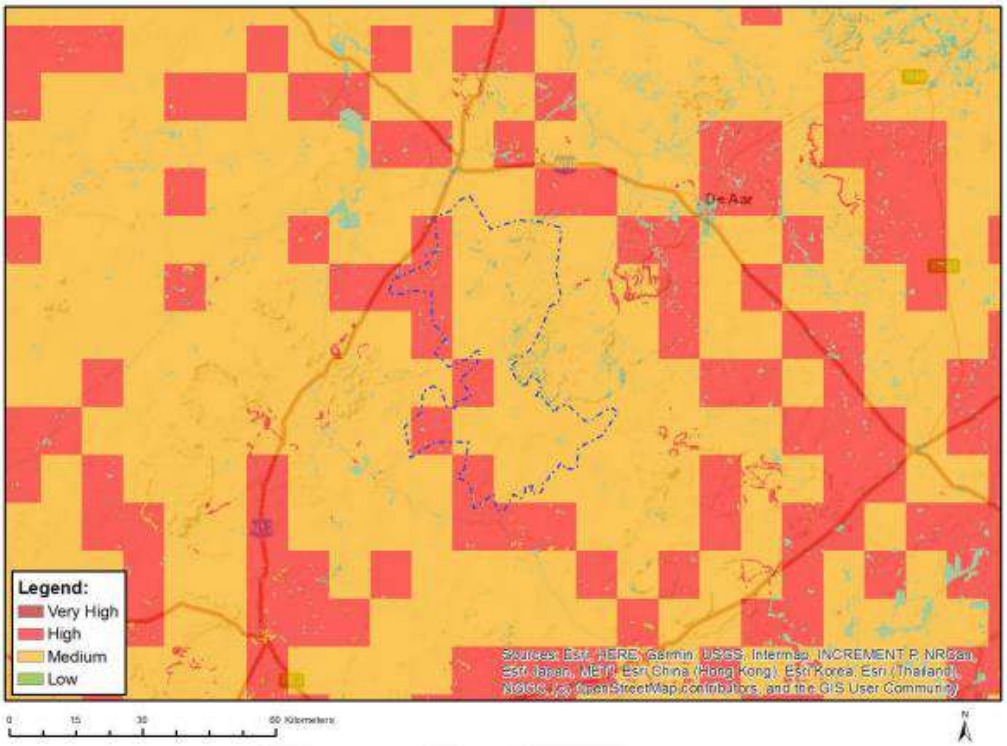
The majority of the proposed development site comprises relatively flat shrubland plains, with higher elevation areas found along the eastern border of the site and scattered in the north (Figure 1). These areas include Upper Karoo Hardeveld vegetation and provide higher levels of habitat complexity than the flatter areas below. The cliffs and outcrops associated with dolerite rings and intrusions are prominent features that potentially provide nesting and foraging habitat for Verreaux's Eagle while the flatter areas may support cranes, bustards, korhaans, Secretarybird and Martial Eagle. Flat areas experience sheet runoff and some areas are relatively barren or are 'washes' with low density vegetative cover. Only a few scattered areas are under cultivation (Figure 2).

The water bodies noted within the broader area are mostly man-made dams and may support certain red-listed species such as flamingos, large numbers of congregatory species, and potentially provide nocturnal roosting sites for Blue Cranes.

3.2.4 Screening Tool

In terms of avifauna, the output from the Screening Tool (updated 2022-05-03) identified the site to be of High Sensitivity in the Relative Animal Species Theme due to the presence of Ludwig's Bustard and Medium Sensitivity due to the potential presence of Verreaux's Eagle (Figure 3).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Mammalia-Felis nigripes
High	Aves-Neotis ludwigii
Low	Low sensitivity
Medium	Aves-Neotis ludwigii
Medium	Aves-Aquila verreauxii
Medium	Mammalia-Bunolagus monticularis

Figure 3: The output from the National Web-based Screening Tool

The broader project area was determined by the Screening Tool to be outside of sensitivities in the Avian (Wind) Theme as it did not intersect with any sensitivity layers contained in the database at the time of reporting.

3.2.5 South African Bird Atlas Project 2 (SABAP2)

SABAP2 data were examined for 32 pentads (which are approximately 8 km x 8 km squares) in and around the PAOI (Figure 1). Adjacent pentads were included to ensure that all species potentially occurring within the PAOI, whether resident, nomadic, or migratory, are identified. A total of 145 species were recorded during full protocol SABAP2. This included

19 Priority Species, 8 species classified as *Endangered*, *Near Threatened* or *Vulnerable* and 17 endemic or near-endemic species (Appendix A). Due to the relatively few full protocol surveys conducted in some of the pentads this list cannot be considered to be complete.

3.2.6 Co-ordinated Avifaunal Roadcounts Project (CAR)

There are 10 CAR routes (NK033, NK201, NK202, NK203, NK321, NK322, NK323, NK451, NK452, and NK453) that run through the proposed development area. Blue Crane, Karoo Korhaan, Northern-black Korhaan, Ludwig's Bustard, and Secretarybird have been recorded along these routes (Figure 1).

3.2.7 Co-ordinated Waterbird Counts Project (CWAC)

Four CWAC sites (Nuwejaarsfontein Farm Dam, Nuwejaarsfontein House Dam, De Aar Sewage Works and Wortelfontein Dam) are located near the proposed development area, between 22 and 31 km in an easterly direction. Priority Species that have been recorded at these sites include Black Stork, African Fish Eagle, Greater Flamingo and Maccoa Duck (Figure 1).

3.2.8 Important Bird Areas (IBA)

The proposed development area is located adjacent the Platberg–Karoo Conservancy (SA037) IBA, with its closest point less than 2 km away (Figure 1). The IBA was established specifically due to the presence of several globally and regionally threatened species of large terrestrial birds and raptors, certain biome-restricted passerines, and congregatory species. Globally threatened bird species include Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, Martial Eagle, Blue Korhaan, Black Harrier and Denham's Bustard. Regionally threatened species include Black Stork, Lanner Falcon, Tawny Eagle, Karoo Korhaan and Verreaux's Eagle. Biome-restricted species include Karoo Lark, Karoo Long-billed Lark, Karoo Chat, Tractrac Chat, Sickle-winged Chat, Namaqua Warbler, Layard's Tit-Babbler, Pale-winged Starling, and Black-headed Canary. Besides the presence of large resident raptors, congregatory species such as Amur Falcon and Lesser Kestrel also occur here, with almost 10% of the global population of Lesser Kestrels roosting in this conservancy during summer. The IBA is also seasonally important for White Stork during insect outbreaks.

3.2.9 Verreaux's Eagle Risk Assessment Tool (VERA)

The applicant provided Arcus with the results of the VERA tool that included several previously identified Verreaux's Eagle nest locations on the Kombuisfonteinberg and Waterval se Berge in the central-eastern portion of the site as well as on the dolerite intrusions on Perdepoort and Twyfelhoek. The output of the VERA tool was used in conjunction with the Verreaux's Eagle habitat suitability model to determine areas likely to be utilised by the species.

3.3 Expected Species

The species predicted to occur on the project site was determined by the desktop study results (Table 1). The desktop study revealed 29 potential Priority or Avifaunal Species of Conservation Concern (SCC) that are known to occur in and around the study area, including the Endangered Ludwig's Bustard and Martial Eagle, as well as the Vulnerable Secretarybird and Verreaux's Eagle. In addition to these red-listed species, Priority Species such as Northern Black Korhaan, Blue Korhaan, and Jackal Buzzard have been recorded in the area and likely occur in the broader impact zone in good numbers. Long-term data on waterbird numbers reveal that most red-listed water-dependant species appear to occur infrequently at low densities in the area, but include the Vulnerable Black Stork, as well as the Near-Threatened Maccoa Duck and Greater Flamingo.

Table 1: List of Priority and Avifaunal Species of Conservation Concern to Potentially Occur in the Proposed Project Area.

Species	Scientific Name	Regional Status	Global Status	Endemic or Near-endemic	Priority Score	SABAP2	IBA	CWAC	CAR
African Fish Eagle	*Haliaeetus vocifer*	Least Concern	Least Concern		290	x		x	
African Harrier-hawk	*Polyboroides typus*	Least Concern	Least Concern		190	x			
African Rock Pipit	*Anthus crenatus*	Near Threatened A2c+3c; C1; E	Near Threatened C1	X	200	x			
Amur Falcon	*Falco amurensis*	Least Concern	Least Concern		210		x		
Black Harrier	*Circus maurus*	Endangered C1+2a(ii)	Endangered C2a(ii)	X	345		x		
Black Stork	*Ciconia nigra*	Vulnerable A2c; D1	Least Concern		330		x	x	
Blue Crane	*Anthropoides paradiseus*	Near Threatened A2acde	Vulnerable A 3cde+4cde		320	x	x		x
Blue Korhaan	*Eupodotis caerulescens*	Least Concern	Near Threatened A3c; C1		270		x		
Booted Eagle	*Hieraaetus pennatus*	Least Concern	Least Concern		230	x			
Cape Eagle-owl	*Bubo capensis*	Least Concern	Least Concern		250				
Denham's Bustard	*Neotis denhami*	Vulnerable A2bcd+3bcd +4bcd; C1	Near Threatened A2bcd+3bcd +4bcd		300		x		
Greater Flamingo	*Phoenicopterus roseus*	Near Threatened A2bd	Least Concern		290			x	
Greater Kestrel	*Falco rupicoloides*	Least Concern	Least Concern		174	x			
Grey-winged Francolin	*Scleroptila afra*	Least Concern	Least Concern	X	190	x			
Jackal Buzzard	*Buteo rufofuscus*	Least Concern	Least Concern	X		x			
Karoo Korhaan	*Eupodotis vigorsii*	Near Threatened A2c	Least Concern		240	x	x		x
Kori Bustard	*Ardeotis kori*	Near Threatened A2bcd+3bcd +4bcd	Near Threatened A2bcd+3bcd +4bcd		260	x	x		
Lanner Falcon	*Falco biarmicus*	Vulnerable A2bc; C1	Least Concern		300	x	x		
Lesser Kestrel	*Falco naumanni*	Least Concern	Least Concern		214	x	x		
Ludwig's Bustard	*Neotis ludwigii*	Endangered A4cd	Endangered A4cd		320	x	x		x
Martial Eagle	*Polemaetus bellicosus*	Endangered A2cde ; C1	Endangered A2acde+3cde+4acde		350		x		

Species	Scientific Name	Regional Status	Global Status	Endemic or Near-endemic	Priority Score	SABAP2	IBA	CWAC	CAR
Maccoa Duck	*Oxyura maccoa*	Near Threatened C1	Endangered A2acde					x	
Northern Black Korhaan	*Afrotis afraoides*	Least Concern	Least Concern		180	x			x
Secretarybird	*Sagittarius serpentarius*	Vulnerable A4acd; C1	Endangered A2acde+3cde+4acde		320	x	x		x
Spotted Eagle-owl	*Bubo africanus*	Least Concern	Least Concern		170	x			
Tawny Eagle	*Aquila rapax*	Endangered A2bc+3bc; C1	Vulnerable A2ace+3ce+4ace		290		x		
Verreaux's Eagle	*Aquila verreauxii*	Vulnerable A2c; C1	Least Concern		360		x		
Verreaux's Eagle-owl	*Bubo lacteus*	Least Concern	Least Concern		210	x			
White Stork	*Ciconia ciconia*	Least Concern	Least Concern		220	x	x		

The shrubland plains habitat usually supports a relatively low diversity of bird species comprising both small passerines and non-passerines. The passerine species assemblage of the site is expected to be typical of similar areas in the Nama Karoo Biome, with the most commonly encountered species expected to be African Rock Pipit (Near-Threatened), Eastern Clapper Lark, Spike-heeled Lark, African Pipit, Rufous-eared Warbler, and Large-billed Lark. We therefore predict to find many endemic and near-endemic passerine species throughout the study site. Many of the red-listed non-passerines usually occur in shrubland plains and therefore it is highly likely for them to occur in the study site. It is also predicted that raptors use the ridges on a regular basis in addition to the plains.

3.4 Pre-construction Avifaunal Monitoring

The avifaunal monitoring programme and data analyses are currently underway. The results of the first three avifaunal surveys have nevertheless informed the evaluation of site risk for the scoping phase.

3.4.1 Observed Species

3.4.1.1 Vantage Point Surveys

The most frequently recorded target species across the proposed development site was Northern Black Korhaan, followed by Pale-chanting Goshawk, Ludwig's Bustard, Blue Crane, and Jackal Buzzard. Flight activity was not particularly high and the species composition was typical for relatively flat areas of the karoo. Only four flights of Black Harrier were recorded during the first three surveys across the whole site. A large flock of White Stork were recorded on one occasion and flocks of up to 128 Lesser Kestrel were also recorded.

3.4.1.2 Walk Transects

While more detailed analyses on walk transect data will follow the final survey, such as density and diversity of smaller birds, Ludwig's Bustard were recorded on several occasions.

3.4.1.3 Drive Transects

The most frequently recorded target species during drive transects was Northern Black Korhaan, followed by Blue Crane, Pale Chanting Goshawk and Ludwig's Bustard. Secretarybird, Tawny Eagle, Lappet-faced Vulture, Verreaux's Eagle and Martial Eagle were also recorded (amongst others). The Lappet-faced Vulture observation was unexpected and this species is globally and regionally Endangered (A3d; C2a[ii]). A single Black Harrier observation was recorded during the drive transects.

3.5 Sensitivity Mapping

The list of expected and observed species to-date was used to inform the sensitivity mapping below based on the species conservation status, conservation importance and relevance to the nature and potential impacts of the proposed development.

3.5.1 Current Impacts

Several impacts are already present across the proposed project area. These include road networks and areas used for various levels of livestock grazing. Stands of alien invasive *Eucalyptus* trees and man-made farm dams are scattered throughout, but provide habitat for species attracted to these features.

3.5.2 Site Ecological Importance (SEI)

Site ecological importance and additional/reduced avifaunal sensitivities may become apparent following the analysis of flight path and occurrence data from all seasons of avifaunal surveys. It is nevertheless possible to map areas of elevated avifaunal site ecological importance at this stage. The SEI has been calculated for each species through the combination of various attributes (Table 3) through the consideration of site-specific factors (e.g. land-use, habitat functionality etc.) in combination with the nature of the potential impacts associated with the proposed development. The highest SEI corresponding with each habitat/land-use category that represented the preferred habitats used by each species was mapped for the PAOI.

The interpretation of the SEI classifications in relation to proposed development activities as outlined in the guidelines is presented in Table 2 below.

Table 2: Interpretation of Site Ecological Importance Classifications

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.

Site Ecological Importance	Interpretation in relation to proposed development activities
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

Table 3: Site Ecological Importance evaluated for Each Potential Species of Conservation Concern (and other notable species) that May Occur in the Area

Species of Conservation Concern	Habitat	EOO (km^2)	Status Used	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
African Fish-eagle	Dams		LC	Low	High	Medium	Very High	**Very Low**
African Harrier-hawk	Dams, Wetlands		LC	Low	High	Medium	Very High	**Very Low**
African Rock Pipit	Rocky Slopes		NT (A2, 3; C1; E)	Medium	High	Medium	Very High	**Very Low**
Amur Falcon	Scrublands		LC	Low	High	Medium	Very High	**Very Low**
Black Harrier	Scrublands	> 10	EN (C1+2)	High	High	Medium	High	**Medium**
Black Stork	Wetlands, Rivers	> 10	VU (A2, D1)	Low	High	Medium	High	**Low**
Blue Crane	Scrublands, Wetlands, Dams	> 10	VU (A3, 4)	Medium	High	Medium	Very High	**Very Low**
Blue Korhaan	Scrublands		NT (A3; C1)	Low	Medium	Low	Very High	**Very Low**
Booted Eagle	Scrublands		LC	Low	Very High	Medium	Very High	**Very Low**
Cape Eagle-owl	Rocky Slopes		LC	Low	Very High	Medium	Very High	**Very Low**
Denham's Bustard	Shrubland	> 10	VU (A2, 3, 4, C1)	High	Medium	Medium	Very High	**Very Low**
Greater Flamingo	Dams		NT (A2)	Medium	High	Medium	Very High	**Very Low**
Greater Kestrel	Scrublands		LC	Low	Very High	Medium	Very High	**Very Low**
Grey-winged Francolin	Scrublands		LC	Low	Very High	Medium	Very High	**Very Low**
Jackal Buzzard	Scrublands, Rocky Slopes		LC	Low	Very High	Medium	Very High	**Very Low**
Karoo Korhaan	Scrublands		NT (A2)	Medium	Very High	High	Very High	**Low**
Kori Bustard	Scrublands		NT (A, 3, 4)	Medium	Very High	High	Very High	**Low**
Lanner Falcon	Scrublands	> 10	VU (A2: C1)	High	Very High	Very High	Very High	**Medium**
Lappet-faced Vulture	Scrublands	> 10	EN (A2, 3, 4; C2)	High	Medium	Medium	Very High	**Very Low**
Lesser Kestrel	Scrublands		LC	Low	Very High	Medium	Very High	**Very Low**
Ludwig's Bustard	Scrublands	> 10	EN (A4)	High	Very High	Very High	Very High	**Medium**
Maccoa Duck	Dams	> 10	EN (A2)	Low	High	Medium	Very High	**Very Low**

Species of Conservation Concern	Habitat	EOO (km^2)	Status Used	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Martial Eagle	Scrublands	> 10	EN (A2; C1)	High	Very High	Very High	Very High	**Medium**
Northern Black Korhaan	Scrublands		LC	Low	Very High	Medium	Very High	**Very Low**
Secretarybird	Scrublands	> 10	EN (A2 , 3, 4)	Medium	Very High	High	Very High	**Low**
Spotted Eagle-owl	Tree Stands		LC	Low	Very High	Medium	Very High	**Very Low**
Tawny Eagle	Scrublands	> 10	EN (A2, 3; C1)	High	Very High	Very High	Very High	**Medium**
Verreaux's Eagle	Rocky Slopes	> 10	VU (A2; C1)	High	Very High	Very High	Very High	**Medium**
Verreaux's Eagle-owl	Large Tree Stands		LC	Low	Low	Low	Very High	**Very Low**
White Stork	Scrublands, Cultivated Fields		LC	Low	Very High	Medium	Very High	**Very Low**

3.5.3 Avifaunal Sensitivity

Based on the above exercise the site is generally of low to very low ecological importance for the majority of the species considered, however the site is of medium ecological importance for Ludwig's Bustard, Martial Eagle and Tawny Eagle as they are Endangered with relatively broad habitat availability across the proposed project site. Martial Eagle and Tawny Eagle are somewhat restricted in terms of available breeding locations in the karoo relying on transmission pylons and alien trees for nesting opportunities, however they do forage over a large area and mitigation measures are to be implemented. The locations of two Tawny Eagle nests were obtained[12], these are positioned on the Hydra-Kronos-1 400 kV overhead power line beyond the northern boundary of the proposed development site. An area with a radius of 3 km around these nests has been categorised as high sensitivity, however these buffers do not overlap with the proposed project boundary. The whole area is considered to be of elevated avifaunal sensitivity for Ludwig's Bustard with respect to overhead power lines and mitigation measures are to be implemented.

Verreaux's Eagle largely favour rocky cliffs and mountainous areas and are not expected to frequent areas outside of those identified by the VERA model. High and medium sensitivity areas for this species have been included in the sensitivity map. The site is positioned outside of the primary foraging habitat for Black Harrier (e.g. Figure 4), however migratory routes could occasionally result in this species traversing the site, albeit with a low frequency. Patches of preferred habitat across the project area have nevertheless been classified as medium sensitivity for this species along with Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) (Figure 5).

The avifaunal sensitivity map should at this stage be used to inform the site layout and suitability of the proposed development proceeding into the EIA phase from an avifaunal perspective. The sensitivity map is subject to alteration following analyses of the complete dataset obtained from the avifaunal monitoring programme to be conducted for the EIA phase.

4 IDENTIFICATION OF IMPACTS

The following key potential impacts on avifauna, arising from the proposed development of the WEF and associated infrastructure have been identified for assessment:

- Construction Phase:
  - Direct Habitat Destruction – modification, removal and clearing of natural vegetation for development of infrastructure such as temporary laydown areas, site buildings, WTG bases, access roads and servitudes;
  - Disturbance/Displacement – indirect habitat loss and/or reduced breeding success due to displacement by noise and activity associated with machinery and construction activity; and
  - Direct Mortality – fatalities of avifauna due to vehicle collision, entrapment, entanglement or collision with temporary infrastructure (e.g. fencing), entrapment in uncovered excavations and increased predation pressure.
- Operational Phase:
  - Disturbance/Displacement – indirect habitat loss, reduced breeding success, obstruction of movement corridors due to displacement by infrastructure and noise/activity associated with ongoing, routine operational tasks/maintenance activity; and

[12] Courtesy of Dr. Megan Murgatroyd of Hawkwatch International

- Direct Mortality – fatalities of avifauna due to WTG collision, collision or entrapment with perimeter fencing, collision with overhead power lines, and electrocution from electrical components.

- Decommissioning Phase:
  - As per construction phase.

5 EVALUATION OF SITE RISK

The primary impact associated with wind energy facilities to avifauna relate to fatalities resulting from collisions with infrastructure such as WTGs and overhead power lines. Disturbance and displacement can result in indirect habitat loss and loss of breeding potential, however when positioned away from breeding areas this impact can be minimised. Direct habitat loss associated with the clearing of vegetation is often not significant as the development footprint of a wind energy facility (e.g. turbine base and roads) is often small relative to the overall size of the area under consideration and can be minimised through the maximal use of existing infrastructure such as farm roads and tracks. The risk of collisions can also be reduced through the mitigation hierarchy by the considered placement of WTGs outside of areas of elevated avifaunal sensitivity and the implementation of mitigation measures such as shut-down-on-demand, blade painting, burying of overhead power lines, the use of bird flight diverters on overhead power lines where not buried and the placement of pylons near existing power lines. The proposed layout provided for this scoping phase, avoids areas of high avifaunal sensitivity and therefore is unlikely to impose a significant risk to the long-term viability or persistence of the avifaunal community in the receiving environment.

The avifaunal SCCs of particular relevance to the proposed development in the area are generally large-bodied species that are easy to see and therefore even observer-based shut-down-on-demand would likely be a very effective mitigation measure to reduce the likelihood of collisions (if required).

5.1 Cumulative Impact

At least 6 onshore wind facilities and onshore wind/solar PV combined facilities are being considered according to the DFFE Renewable Energy database (Q4 2021) within 50 km of the proposed development site, mostly towards the town of De Aar the north-east.

Following the implementation of the mitigation hierarchy at this stage it is not expected that the proposed development will have a significant contribution to the overall cumulative risks to avifauna in the area, as the position of the development site is within an area characterised by extensive available avifaunal habitat that is largely contiguous in the broader surrounds and avoids particularly sensitive features such as cliffs and ridges.

5.2 No-Go' Alternative

The 'No-Go' alternative considers that the proposed development is not constructed. Most of the potential impacts associated with the development itself and assessed above would therefore not be imposed on the avifaunal community of the receiving environment.

The 'No-Go' alternative reduces the opportunity to progress the de-carbonisation transition of the economy and achieve various climate change mitigation targets outlined by the South Africa's Low Emission Development Strategy, The National Development Plan, The National Climate Change Response Policy, Integrated Resource Plan, the National Climate Change Adaptation Strategy (amongst others) and ultimately South Africa's commitment to the Paris Agreement. The proposed development site appears to be well suited for the development of renewable energy facilities as proposed.

6 PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

At present, preliminary data obtained from only three of the four pre-construction monitoring surveys has been collected, analysed and included in this report. Once a full dataset has been obtained for the entire monitoring campaign, then further analyses will take place and inform the relevant Environmental Impact Assessment, where the potential impacts will be assessed based on the methodology provided by the Environmental Assessment Practitioner.

A significance rating and impact assessment will be determined for each impact and mitigation measures provided where appropriate. For each impact, the significance will be determined by identifying the status, extent, duration, consequence, probability of occurrence, and reversibility of the impact (as well as the irreplaceability of resource loss) in the absence of any mitigation ('without mitigation'). Mitigation measures will be identified and the significance will be re-rated, assuming the effective implementation of the mitigation ('with mitigation'). Any comments received during the scoping phase will be addressed and incorporated into the EIA Report.

Cumulative impacts will be assessed as the incremental impact of the proposed activity on the baseline, when added to the impacts of other past, present or reasonably foreseeable future activities within a 50 km radius.

The outcome of the EIA study will be a description of avifaunal activity at the proposed project sites, an evaluation of potential risks/impacts to avifauna (including cumulative impacts), recommendations for WEF layouts and design mitigation measures to reduce impacts to be included in the environmental management programme for the project.

7 CONCLUSION

The avifaunal sensitivity map for the Soyuz 5 WEF (Figure 5) should be used at this stage to inform the layout to reduce the potential impacts on the avifauna of the receiving environment. The primary potential impact associated with the proposed development relates to fatalities of avifauna resulting from collision with infrastructure including overhead power lines and WTGs. The avifaunal SCCs differ in their susceptibility to collision impacts, with overhead power lines posing a proportionally higher risk to heavy-bodied, terrestrial species such as korhaans and bustards. The proposed development site largely represents medium site ecological importance for Ludwig's Bustard and the risk of collision with overhead power lines is to be mitigated against by burying internal connector power lines wherever practically possible. In terms of collisions with WTGs, areas of potentially suitable habitat for Black Harrier (e.g. CBAs, ESAs) are of medium sensitivity and these areas are to be avoided as far as possible. WTGs with rotor-swept-areas encroaching on medium sensitivity areas are permitted following the implementation of additional mitigation measures. Areas corresponding to the output of the VERA model are to be avoided for the development of WTGs, including the rotor-swept-area. The proposed layout considered here avoids all areas of high avifaunal sensitivity for the placement of WTGs, however it is recommended that the WTGs positioned near the edge of the medium sensitivity areas identified by the VERA model be adjusted so that the rotor-swept-area falls outside of those areas. WTGs in or near medium sensitivity areas should be relocated where practically possible to areas of lower avifaunal sensitivity.

The data from the avifaunal monitoring programme will be analysed together with the existing avifaunal data to determine passage rates across the proposed project area and be included in collision risk determinations. Any additional avifaunal sensitivities identified will be duly considered during the EIA process and assessment of infrastructure positions and layout. Similarly, the SEI of some areas may be reduced or increased following the assessment of all activity data once a more complete understanding of how the proposed project area is utilised by certain species is obtained.

8 AVIFAUNAL SPECIALIST STATEMENT

Based on the scoping assessment conducted for the Soyuz 5 WEF and associated infrastructure (including cumulative impacts), it is the avifaunal specialist's opinion at this stage that the proposed development will not have a significant negative impact on the viability or persistence of avifaunal populations (particularly avifaunal SCCs) in the area following the implementation of mitigation measures and that the project ***can proceed*** into the EIA phase.

ARCUS

- Proposed Project Boundary
- Vantage Point
- Walk Transect
- Drive Transect
- Important Bird Area
- Besemkaree Koppies Shrubland
- Eastern Upper Karoo
- Northern Upper Karoo
- Upper Karoo Hardeveld
- Pentads

1:300,000 Scale @ A3

0 6 12 km

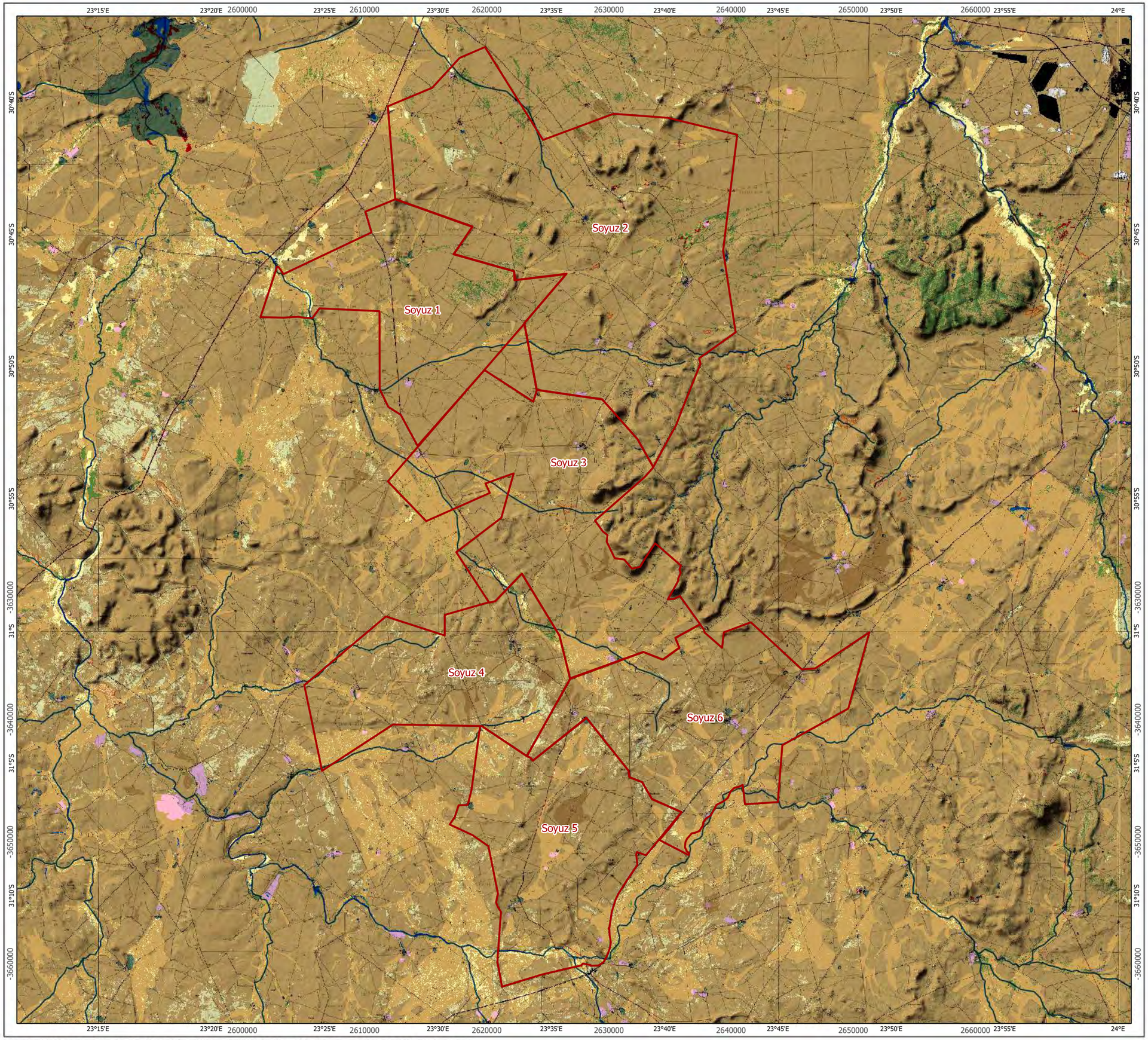
NORTH

Produced By: OD	Ref: 4331-SCR-0001
Checked By: AB	Date: 6/14/2022

Location and Vegetation
Figure 1

Soyuz WEF Cluster
Avifaunal Scoping Report

G:\Projects\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster2.aprx\4331-SCR-0001 Fig1 Locations



ARCUS

- Site Boundary
- Barren Land
- Built-up
- Cultivated
- Forested land
- Grassland
- Shrubland
- Waterbodies
- Wetlands

1:300,000 Scale @ A3

0 6 12 km

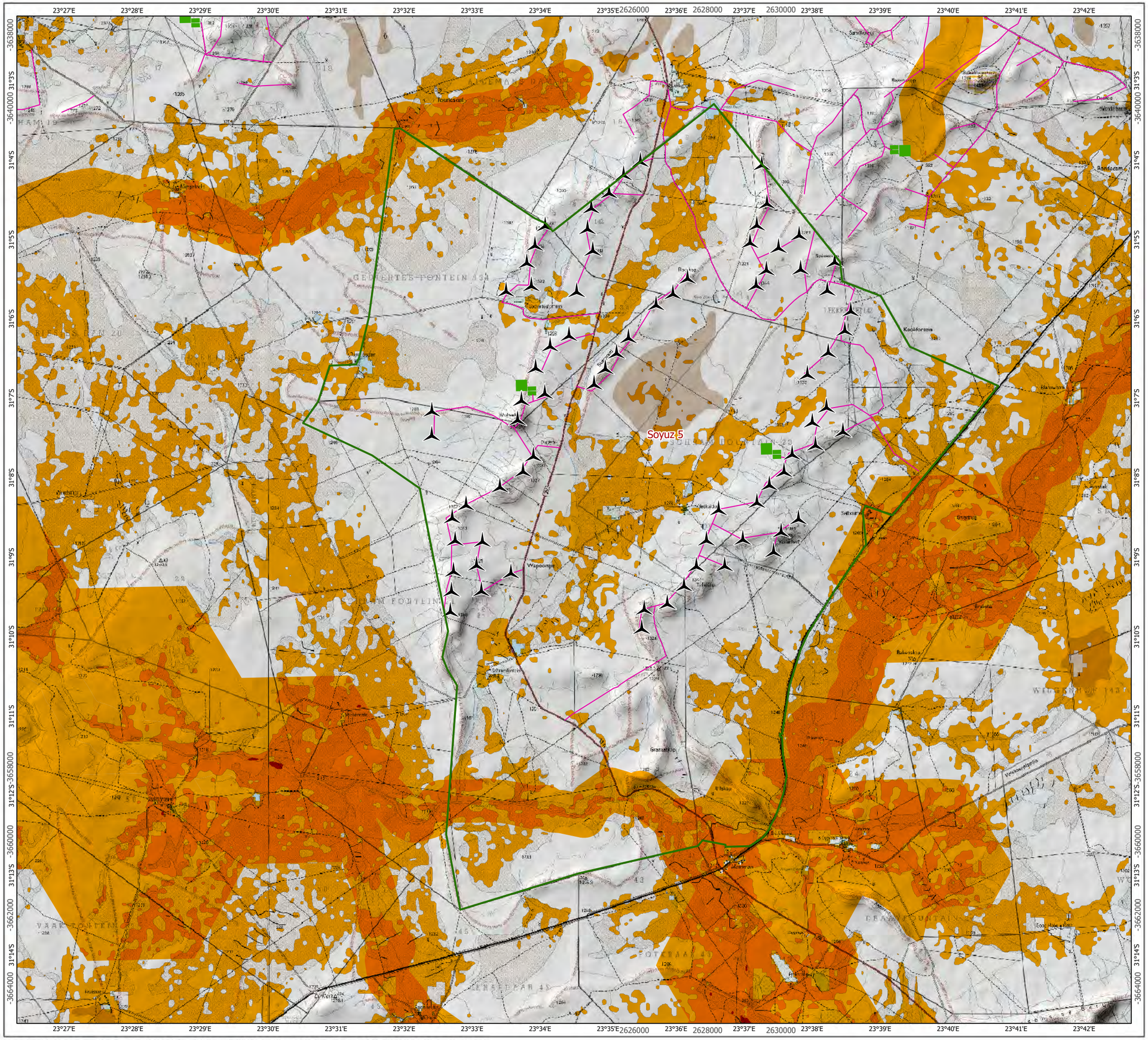
NORTH

Produced By: OD	Ref: 4331-SCR-0002
Checked By: AB	Date: 6/14/2022

Cluster Position and Landcover
Figure 2

Soyuz WEF Cluster
Avifaunal Scoping Report

G:\Projects\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster2.aprx\4331-SCR-0002 Fig2 Land Cover



ARCUS

- Soyuz 5
- Indicative WTG Position
- Internal Road Network
- Substation and Laydown Areas
- Medium Sensitivity

1:100,000 Scale @ A3

0 2 4 km

NORTH

Produced By: OD	Ref: 4331-SCR-0008
Checked By: AB	Date: 6/15/2022

Avifaunal Sensitivity Map
Figure 5

Soyuz 5 WEF
Avifaunal Scoping Report

G:\Projects\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster\4331 Britstown WEF Cluster2.aprx\4331-SCR-0008 Fig 5 SensitivitySoy5

APPENDIX A: SABAP2 REPORTING RATES FOR PENTADS IN AND AROUND THE PROPOSED DEVELOPMENT AREA

Species	3035_2325	3035_2330	3040_2325	3040_2335	3040_2340	3045_2320	3045_2325	3045_2330	3045_2335	3045_2340	3050_2325	3050_2330	3050_2335	3055_2325	3055_2330
Acacia Pied Barbet	0	14.3	78.6	100	0	0	100	100	100	100	75	0	100	0	50
African Black Swift	0	0	14.3	0	0	0	0	0	0	0	0	0	14.3	0	0
African Fish Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
African Harrier-Hawk	0	0	0	0	0	0	50	0	0	0	25	0	0	0	0
African Hoopoe	0	71.4	0	0	0	0	0	0	0	33.3	0	0	0	0	0
African Palm Swift	0	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0
African Paradise Flycatcher	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
African Pipit	0	14.3	14.3	100	50	0	50	50	100	100	50	100	28.6	100	0
African Red-eyed Bulbul	0	57.1	78.6	100	0	100	75	0	100	66.7	50	0	71.4	0	0
African Reed Warbler	0	0	0	0	0	0	0	0	0	0	0	0	71.4	0	0
African Rock Pipit	0	0	0	0	0	0	12.5	0	0	0	0	0	28.6	0	50
African Sacred Ibis	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
African Spoonbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
African Stonechat	0	0	0	0	0	0	12.5	0	0	0	25	0	0	0	0
Alpine Swift	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0	0
Ant-eating Chat	100	28.6	50	100	100	100	50	50	100	100	75	100	71.4	100	50
Barn Swallow	33.3	14.3	35.7	50	100	100	50	100	50	66.7	50	100	71.4	100	0
Black-chested Prinia	100	28.6	21.4	100	50	100	25	50	50	66.7	75	100	85.7	100	50
Black-collared Barbet	0	0	0	0	0	0	0	0	0	0	0	0	57.1	0	0
Black-eared Sparrow-Lark	0	0	28.6	0	50	0	0	0	0	0	0	0	0	0	100
Black-headed Canary	0	0	0	0	0	0	12.5	0	50	0	25	100	42.9	0	0
Black-headed Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blacksmith Lapwing	0	28.6	14.3	0	0	0	50	0	0	100	100	0	57.1	0	0
Black-throated Canary	0	0	64.3	0	0	0	62.5	0	50	100	75	100	57.1	0	50
Black-winged Kite	0	28.6	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-winged Stilt	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Blue Crane	0	0	7.1	50	100	0	25	0	100	100	50	0	57.1	100	50
Bokmakierie	33.3	28.6	71.4	50	100	100	75	0	100	100	25	0	28.6	0	100
Booted Eagle	0	14.3	0	0	0	0	0	0	0	33.3	0	0	14.3	0	0
Brown-hooded Kingfisher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown-throated Martin	0	14.3	0	0	0	0	0	0	0	0	25	0	0	0	0
Cape Bunting	0	0	7.1	50	50	0	25	50	50	0	0	0	14.3	0	50
Cape Canary	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0
Cape Crow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Penduline Tit	33.3	14.3	7.1	0	0	0	0	50	50	0	25	0	0	0	100

Species	3035_2325	3035_2330	3040_2325	3040_2335	3040_2340	3045_2320	3045_2325	3045_2330	3045_2335	3045_2340	3050_2325	3050_2330	3050_2335	3055_2325	3055_2330
Cape Robin-Chat	0	42.9	50	50	0	100	100	0	0	33.3	75	0	100	0	0
Cape Sparrow	100	85.7	100	100	50	100	87.5	50	100	33.3	75	100	85.7	100	50
Cape Teal	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Cape Turtle Dove	66.7	57.1	100	50	0	100	100	50	100	100	75	100	57.1	0	0
Cape Wagtail	0	71.4	57.1	100	0	0	75	0	50	100	50	0	85.7	0	0
Cape Weaver	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0	0
Cape White-eye	0	14.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Capped Wheatear	0	14.3	14.3	50	50	100	37.5	100	100	100	50	100	28.6	100	0
Chat Flycatcher	0	28.6	21.4	100	100	100	25	50	50	100	75	100	14.3	0	0
Chestnut-vented Warbler	0	0	21.4	0	0	100	37.5	0	50	33.3	25	0	57.1	100	0
Cinnamon-breasted Bunting	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	50
Cinnamon-breasted Warbler	0	0	0	0	0	0	0	0	50	0	0	0	14.3	0	0
Common Buzzard	0	14.3	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Common Greenshank	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Common Quail	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0
Common Swift	0	0	7.1	0	0	0	0	0	0	33.3	0	0	0	0	0
Common Waxbill	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Crowned Lapwing	0	14.3	14.3	0	0	100	37.5	100	0	0	50	100	42.9	100	0
Desert Cisticola	33.3	0	28.6	50	0	0	37.5	50	100	33.3	25	0	42.9	100	0
Diederik Cuckoo	0	0	7.1	0	0	0	12.5	0	0	0	0	0	0	0	0
Domestic Duck	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Double-banded Courser	0	14.3	0	0	0	0	0	0	0	0	25	100	0	0	0
Dusky Sunbird	0	0	0	50	0	0	25	50	50	0	0	0	0	0	0
Eastern Clapper Lark	66.7	14.3	42.9	0	50	100	50	100	50	33.3	75	100	14.3	100	100
Egyptian Goose	0	0	35.7	0	0	100	50	0	50	0	25	100	42.9	0	0
European Bee-eater	0	0	0	0	0	0	0	0	0	0	25	0	14.3	0	50
Fairy Flycatcher	0	0	21.4	0	50	100	62.5	50	50	33.3	0	0	71.4	0	0
Familiar Chat	100	42.9	64.3	0	50	100	50	50	50	66.7	50	0	85.7	0	50
Fawn-coloured Lark	66.7	0	14.3	0	0	0	0	0	0	0	25	0	42.9	0	0
Fiscal Flycatcher	0	28.6	28.6	50	0	100	87.5	50	50	33.3	75	0	85.7	0	0
Gabar Goshawk	0	0	7.1	0	0	0	25	0	0	0	25	0	0	0	0
Greater Kestrel	33.3	0	7.1	0	0	100	12.5	50	50	0	50	100	0	100	0
Greater Striped Swallow	0	14.3	21.4	50	0	0	50	0	50	66.7	25	0	71.4	0	0
Green Wood Hoopoe	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Grey Heron	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0
Grey Tit	0	0	0	0	0	0	0	100	0	33.3	25	0	14.3	0	0
Grey-backed Cisticola	66.7	28.6	42.9	50	50	0	75	50	50	66.7	25	0	28.6	100	100
Grey-backed Sparrow-Lark	0	0	28.6	0	50	100	25	100	0	0	50	100	0	0	0

Species	3035_2325	3035_2330	3040_2325	3040_2335	3040_2340	3045_2320	3045_2325	3045_2330	3045_2335	3045_2340	3050_2325	3050_2330	3050_2335	3055_2325	3055_2330
Grey-winged Francolin	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0
Hadada Ibis	0	0	57.1	50	0	0	87.5	0	50	100	50	100	85.7	0	0
Helmeted Guineafowl	0	0	28.6	50	0	100	87.5	0	50	0	0	0	28.6	0	0
House Sparrow	100	100	35.7	50	0	100	50	0	0	0	50	0	100	0	0
Jackal Buzzard	0	0	0	50	0	0	12.5	0	50	66.7	0	0	28.6	0	0
Kalahari Scrub Robin	0	0	7.1	0	0	0	12.5	50	50	0	0	0	57.1	0	0
Karoo Chat	0	14.3	7.1	100	0	0	0	0	50	0	0	0	0	0	0
Karoo Korhaan	0	14.3	14.3	0	50	100	25	50	50	0	50	100	57.1	0	50
Karoo Lark	0	0	21.4	0	0	0	0	0	0	0	0	0	0	0	0
Karoo Long-billed Lark	0	0	0	50	50	0	0	50	50	66.7	0	0	42.9	0	0
Karoo Prinia	0	0	28.6	0	0	0	62.5	50	0	0	0	0	0	100	50
Karoo Scrub Robin	33.3	14.3	64.3	100	100	100	87.5	100	100	66.7	100	100	57.1	100	100
Karoo Thrush	0	71.4	92.9	0	0	0	75	0	0	33.3	0	0	57.1	0	0
Kittlitz's Plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kori Bustard	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Lanner Falcon	0	0	14.3	0	0	0	0	0	0	66.7	25	100	28.6	0	0
Large-billed Lark	0	14.3	14.3	100	100	100	50	100	100	100	50	100	28.6	100	50
Lark-like Bunting	66.7	28.6	42.9	50	100	100	50	100	100	66.7	75	100	85.7	100	100
Laughing Dove	0	71.4	92.9	50	0	100	87.5	0	50	66.7	100	0	100	0	50
Layard's Warbler	0	0	0	0	0	0	37.5	50	50	0	0	0	28.6	100	0
Lesser Grey Shrike	0	0	0	0	0	0	12.5	0	0	66.7	0	0	28.6	0	0
Lesser Honeyguide	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0
Lesser Kestrel	0	28.6	7.1	0	0	0	25	0	0	0	0	0	0	0	0
Lesser Swamp Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Levaillant's Cisticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Swift	100	100	85.7	0	0	0	75	0	50	0	75	0	100	0	50
Long-billed Crombec	0	0	28.6	50	0	0	37.5	0	50	0	50	0	71.4	0	0
Ludwig's Bustard	0	0	7.1	0	0	0	50	50	0	0	50	100	14.3	100	50
Malachite Kingfisher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malachite Sunbird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mountain Wheatear	0	14.3	7.1	50	50	0	62.5	100	50	0	0	0	14.3	0	0
Namaqua Dove	0	14.3	35.7	0	50	0	75	0	0	0	25	100	28.6	100	50
Namaqua Sandgrouse	33.3	0	35.7	0	0	0	12.5	0	0	33.3	25	0	0	100	100
Neddicky	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Northern Black Korhaan	100	42.9	64.3	100	100	100	75	100	100	100	100	100	85.7	100	100
Orange River White-eye	0	0	0	50	0	0	0	0	0	33.3	0	0	42.9	0	0
Pale Chanting Goshawk	100	28.6	71.4	100	50	100	75	50	100	66.7	100	100	71.4	100	100

Species	3035_2325	3035_2330	3040_2325	3040_2335	3040_2340	3045_2320	3045_2325	3045_2330	3045_2335	3045_2340	3050_2325	3050_2330	3050_2335	3055_2325	3055_2330
Pale-winged Starling	0	42.9	7.1	0	0	0	25	0	0	66.7	0	0	85.7	0	0
Pearl-breasted Swallow	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0
Pied Avocet	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Pied Crow	100	100	92.9	50	50	100	75	50	100	66.7	50	100	42.9	100	100
Pied Starling	33.3	42.9	57.1	0	0	100	87.5	0	0	100	0	0	57.1	0	0
Pink-billed Lark	0	0	7.1	0	0	0	37.5	50	0	0	25	100	14.3	100	50
Pin-tailed Whydah	0	0	14.3	0	0	0	0	0	0	0	0	0	57.1	0	0
Plain-backed Pipit	0	0	0	0	0	0	12.5	50	0	0	0	0	0	0	0
Pririt Batis	0	0	14.3	0	0	0	25	50	50	0	0	0	42.9	0	50
Quailfinch	33.3	0	14.3	0	0	0	25	0	50	0	25	0	14.3	0	0
Red-billed Firefinch	0	0	0	0	0	0	25	0	50	66.7	0	0	0	0	0
Red-billed Quelea	0	14.3	28.6	0	0	100	25	100	0	0	25	100	42.9	100	0
Red-billed Teal	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Red-capped Lark	0	0	21.4	0	0	0	25	50	50	0	50	100	0	100	0
Red-eyed Dove	0	85.7	57.1	0	0	0	75	0	0	0	0	0	0	0	0
Red-faced Mousebird	0	28.6	28.6	100	0	0	12.5	0	50	33.3	0	100	28.6	0	0
Red-headed Finch	33.3	28.6	21.4	0	0	0	37.5	0	50	100	25	100	71.4	100	50
Red-knobbed Coot	0	0	0	0	0	0	0	0	0	0	50	0	100	0	0
Red-winged Starling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed Cormorant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock Dove	0	57.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock Kestrel	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0
Rock Martin	33.3	28.6	71.4	100	0	100	50	0	50	33.3	75	0	85.7	0	0
Ruff	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Rufous-cheeked Nightjar	0	14.3	21.4	0	0	0	0	0	0	0	0	0	0	0	0
Rufous-eared Warbler	100	28.6	42.9	100	100	100	75	100	100	100	100	100	71.4	100	100
Sabota Lark	33.3	28.6	35.7	50	100	100	50	100	50	66.7	75	100	71.4	100	0
Scaly-feathered Weaver	33.3	28.6	0	50	50	0	37.5	50	100	100	0	0	57.1	0	0
Secretarybird	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Short-toed Rock Thrush	0	0	0	50	0	0	12.5	0	0	0	0	0	0	0	0
Sickle-winged Chat	0	0	0	0	0	100	25	50	50	33.3	0	0	14.3	100	0
South African Cliff Swallow	66.7	28.6	7.1	0	0	0	12.5	0	0	0	25	0	0	0	0
South African Shelduck	0	0	21.4	0	0	0	25	0	50	0	50	0	14.3	100	0
Southern Fiscal	0	14.3	71.4	100	50	100	37.5	100	50	33.3	50	0	71.4	0	0
Southern Double-collared Sunbird	0	0	0	0	0	0	0	0	0	0	0	0	28.6	0	0
Southern Grey-headed Sparrow	33.3	0	21.4	0	0	0	75	0	50	33.3	50	0	71.4	0	0
Southern Masked Weaver	33.3	71.4	78.6	100	50	100	62.5	0	50	33.3	100	100	85.7	0	0

Species	3035_2325	3035_2330	3040_2325	3040_2335	3040_2340	3045_2320	3045_2325	3045_2330	3045_2335	3045_2340	3050_2325	3050_2330	3050_2335	3055_2325	3055_2330
Southern Red Bishop	0	0	7.1	0	0	0	12.5	50	0	0	0	0	14.3	0	0
Speckled Pigeon	33.3	100	57.1	100	0	100	87.5	0	50	100	25	100	85.7	0	0
Spike-heeled Lark	33.3	14.3	28.6	100	100	100	25	100	100	66.7	100	100	57.1	100	50
Spotted Eagle-Owl	0	0	7.1	0	0	0	12.5	0	0	0	25	0	100	0	0
Spotted Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spotted Thick-knee	0	0	42.9	0	0	100	0	0	0	0	0	0	14.3	0	0
Spur-winged Goose	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
Swallow-tailed Bee-eater	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0
Temminck's Courser	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0
Three-banded Plover	0	0	0	0	0	0	25	0	0	0	0	0	71.4	100	0
Tractrac Chat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verreaux's Eagle-Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wattled Starling	0	0	0	0	0	0	12.5	0	0	33.3	50	0	71.4	0	0
Western Barn Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western Cattle Egret	0	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0
White Stork	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White-backed Mousebird	0	71.4	64.3	50	0	0	62.5	50	0	33.3	0	0	71.4	0	0
White-browed Sparrow-Weaver	0	14.3	64.3	0	0	100	25	0	0	33.3	100	0	100	0	0
White-necked Raven	0	0	0	0	0	0	37.5	0	100	33.3	0	0	57.1	0	0
White-rumped Swift	33.3	0	28.6	0	0	0	0	0	50	33.3	0	0	42.9	0	50
White-throated Canary	66.7	0	50	100	100	0	87.5	100	100	66.7	50	100	71.4	100	100
White-throated Swallow	0	0	14.3	0	0	0	12.5	0	0	33.3	75	0	14.3	0	50
Willow Warbler	0	0	0	0	0	0	0	0	0	0	0	0	28.6	0	0
Yellow Canary	0	0	21.4	0	0	0	0	0	0	0	0	0	0	0	0
Yellow-bellied Eremomela	66.7	14.3	28.6	0	0	100	25	50	100	66.7	50	100	85.7	100	50
Yellow-billed Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
Acacia Pied Barbet	100	0	75	100	100	0	50	100	0	50	100	0	100	71.4	0
African Black Swift	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
African Fish Eagle	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
African Harrier-Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	28.6	0
African Hoopoe	100	0	50	0	0	0	0	50	0	0	0	0	0	0	33.3
African Palm Swift	0	0	0	33.3	33.3	0	0	0	0	0	0	0	0	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
African Paradise Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
African Pipit	100	100	100	0	33.3	0	100	0	100	0	0	100	100	14.3	33.3
African Red-eyed Bulbul	100	0	0	100	66.7	0	0	100	0	25	0	0	0	57.1	33.3
African Reed Warbler	0	0	0	0	0	0	0	25	0	0	0	0	0	14.3	33.3
African Rock Pipit	100	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
African Sacred Ibis	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
African Spoonbill	0	0	25	33.3	0	0	0	0	0	0	0	0	0	0	0
African Stonechat	0	100	0	0	0	0	0	50	0	0	0	0	0	57.1	66.7
Alpine Swift	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ant-eating Chat	100	100	25	33.3	66.7	100	100	25	100	75	0	0	0	71.4	66.7
Barn Swallow	100	100	100	33.3	66.7	0	50	100	100	75	0	0	0	57.1	66.7
Black-chested Prinia	100	100	0	33.3	66.7	0	0	50	0	0	0	0	0	28.6	33.3
Black-collared Barbet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-eared Sparrow-Lark	0	0	0	33.3	33.3	0	0	0	0	25	0	0	0	0	33.3
Black-headed Canary	0	100	0	0	0	0	0	25	0	0	0	0	0	28.6	0
Black-headed Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Blacksmith Lapwing	0	0	50	66.7	33.3	100	0	50	0	0	0	0	0	28.6	0
Black-throated Canary	0	0	50	0	0	0	0	100	0	0	0	0	0	0	0
Black-winged Kite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-winged Stilt	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Blue Crane	100	100	75	100	100	100	100	0	100	75	0	0	100	42.9	33.3
Bokmakierie	100	100	25	100	33.3	0	0	75	0	25	100	0	0	57.1	100
Booted Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3
Brown-hooded Kingfisher	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Brown-throated Martin	0	0	0	0	0	0	0	0	0	25	0	0	0	14.3	33.3
Cape Bunting	100	0	0	66.7	33.3	0	0	0	0	50	0	0	0	14.3	66.7
Cape Canary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape Crow	0	100	0	0	0	0	0	0	0	25	0	0	0	0	0
Cape Penduline Tit	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
Cape Robin-Chat	100	0	0	100	0	0	0	100	0	25	0	0	0	28.6	33.3
Cape Sparrow	100	100	100	100	66.7	100	50	100	100	75	100	100	100	100	100
Cape Teal	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Cape Turtle Dove	100	50	50	66.7	66.7	100	50	100	0	25	0	0	0	71.4	100
Cape Wagtail	0	100	100	100	33.3	0	50	100	100	50	0	0	0	42.9	100
Cape Weaver	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cape White-eye	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Capped Wheatear	100	100	50	0	0	0	100	50	100	0	100	100	100	14.3	0
Chat Flycatcher	0	100	50	0	33.3	0	0	50	100	0	100	0	100	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
Chestnut-vented Warbler	100	0	0	66.7	0	0	0	75	0	0	0	0	0	0	0
Cinnamon-breasted Bunting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cinnamon-breasted Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Buzzard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Greenshank	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Common Quail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Swift	0	0	0	33.3	0	0	0	0	0	0	0	0	0	14.3	0
Common Waxbill	0	0	0	0	0	0	0	50	0	0	0	0	0	14.3	66.7
Crowned Lapwing	0	0	75	0	0	0	0	25	100	0	0	0	0	0	0
Desert Cisticola	100	100	25	0	0	0	0	0	0	0	0	100	0	14.3	0
Diederik Cuckoo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Double-banded Courser	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0
Dusky Sunbird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3
Eastern Clapper Lark	100	0	75	66.7	66.7	100	100	0	100	75	0	0	0	57.1	100
Egyptian Goose	100	0	100	33.3	66.7	100	0	50	0	50	0	0	100	42.9	0
European Bee-eater	0	0	25	0	33.3	100	0	0	0	50	0	0	0	42.9	66.7
Fairy Flycatcher	100	50	0	33.3	0	0	0	75	0	75	0	0	0	0	33.3
Familiar Chat	100	100	0	66.7	33.3	100	0	75	100	25	100	100	100	57.1	33.3
Fawn-coloured Lark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fiscal Flycatcher	100	0	100	0	33.3	0	0	75	0	25	0	0	0	28.6	0
Gabar Goshawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greater Kestrel	0	100	75	0	0	0	100	0	100	25	100	0	0	14.3	0
Greater Striped Swallow	0	100	75	0	66.7	100	50	50	100	50	100	100	100	57.1	33.3
Green Wood Hoopoe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Heron	0	0	0	33.3	0	0	0	0	0	0	0	0	0	14.3	33.3
Grey Tit	100	0	0	0	0	0	0	0	0	50	0	0	0	0	33.3
Grey-backed Cisticola	0	0	0	0	0	0	0	25	0	0	0	0	0	42.9	100
Grey-backed Sparrow-Lark	0	100	25	33.3	66.7	0	50	0	0	50	0	0	0	14.3	33.3
Grey-winged Francolin	0	0	0	33.3	0	0	0	25	0	0	0	0	0	0	0
Hadada Ibis	0	0	75	100	66.7	100	0	25	0	25	0	0	100	57.1	66.7
Helmeted Guineafowl	100	0	25	0	33.3	0	0	75	0	0	0	0	0	28.6	33.3
House Sparrow	0	0	25	0	33.3	100	0	25	0	25	0	0	0	28.6	66.7
Jackal Buzzard	100	100	0	0	33.3	0	0	0	100	0	0	0	0	28.6	66.7
Kalahari Scrub Robin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Karoo Chat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Karoo Korhaan	100	100	100	66.7	66.7	0	0	25	100	75	0	100	100	28.6	66.7
Karoo Lark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
Karoo Long-billed Lark	100	0	25	0	0	0	0	50	0	50	0	0	0	14.3	0
Karoo Prinia	100	0	0	0	33.3	0	0	50	0	25	0	100	0	42.9	66.7
Karoo Scrub Robin	100	100	75	33.3	100	100	50	100	100	100	100	100	100	71.4	100
Karoo Thrush	0	0	25	0	33.3	0	0	75	0	0	0	0	0	14.3	0
Kittlitz's Plover	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Kori Bustard	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0
Lanner Falcon	0	100	50	0	0	0	0	0	0	0	100	0	100	14.3	0
Large-billed Lark	100	100	75	0	66.7	0	100	0	100	50	100	100	100	0	33.3
Lark-like Bunting	100	100	100	100	100	100	100	50	100	100	100	0	0	71.4	100
Laughing Dove	0	0	50	100	0	100	50	75	0	0	0	0	0	28.6	66.7
Layard's Warbler	100	0	0	0	0	0	0	50	0	0	0	0	0	0	0
Lesser Grey Shrike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Honeyguide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Kestrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Swamp Warbler	0	0	0	0	0	0	0	25	0	0	0	0	0	0	66.7
Levaillant's Cisticola	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
Little Grebe	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Little Swift	0	0	0	100	0	100	0	50	0	25	0	0	0	14.3	100
Long-billed Crombec	0	0	0	33.3	0	0	0	25	0	0	0	0	0	0	0
Ludwig's Bustard	0	0	25	0	0	0	50	0	100	25	0	0	0	28.6	33.3
Malachite Kingfisher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3
Malachite Sunbird	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Mountain Wheatear	100	0	100	100	66.7	0	0	75	0	25	0	0	0	14.3	100
Namaqua Dove	0	100	0	66.7	33.3	0	100	25	0	25	0	0	0	57.1	66.7
Namaqua Sandgrouse	0	100	25	66.7	66.7	0	0	50	0	75	0	0	0	42.9	66.7
Neddicky	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Black Korhaan	100	100	50	100	33.3	0	50	50	100	25	0	0	100	42.9	66.7
Orange River White-eye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pale Chanting Goshawk	100	100	50	33.3	66.7	0	50	25	100	25	100	100	0	57.1	0
Pale-winged Starling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pearl-breasted Swallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pied Avocet	0	0	25	33.3	0	0	0	0	0	0	0	0	0	0	0
Pied Crow	100	100	100	100	66.7	100	100	100	100	100	100	100	100	85.7	100
Pied Starling	0	100	50	33.3	33.3	100	50	75	100	25	0	100	100	71.4	100
Pink-billed Lark	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0
Pin-tailed Whydah	0	0	0	0	0	0	0	25	0	0	0	0	0	14.3	0
Plain-backed Pipit	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0
Pririt Batis	100	0	0	0	33.3	0	0	25	0	0	0	0	0	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
Quailfinch	0	50	0	0	0	0	0	25	0	0	0	0	0	0	33.3
Red-billed Firefinch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-billed Quelea	100	100	25	0	33.3	0	100	25	0	25	0	0	0	14.3	0
Red-billed Teal	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Red-capped Lark	0	0	0	0	33.3	100	100	0	100	0	0	0	0	0	0
Red-eyed Dove	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	33.3
Red-faced Mousebird	100	0	0	0	0	0	0	50	0	0	0	0	0	0	0
Red-headed Finch	0	100	75	0	0	0	0	25	0	0	0	0	100	14.3	0
Red-knobbed Coot	0	0	0	33.3	33.3	0	0	0	0	0	0	0	0	28.6	0
Red-winged Starling	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0
Reed Cormorant	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Rock Dove	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
Rock Kestrel	0	0	0	0	0	0	100	75	0	0	0	0	0	14.3	33.3
Rock Martin	0	100	75	0	33.3	0	0	50	0	0	0	0	100	57.1	33.3
Ruff	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rufous-cheeked Nightjar	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
Rufous-eared Warbler	100	100	75	66.7	100	100	100	75	100	100	100	0	100	71.4	100
Sabota Lark	100	100	25	0	66.7	0	50	75	100	25	100	100	100	57.1	0
Scaly-feathered Weaver	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Secretarybird	0	0	25	0	0	0	0	0	0	0	0	0	0	14.3	0
Short-toed Rock Thrush	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sickle-winged Chat	100	0	25	0	0	0	0	25	100	0	100	0	100	0	0
South African Cliff Swallow	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
South African Shelduck	0	50	0	33.3	0	0	0	0	0	0	0	0	0	0	0
Southern Fiscal	0	100	75	100	33.3	0	0	25	100	25	0	100	100	42.9	33.3
Southern Double-collared Sunbird	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Grey-headed Sparrow	0	0	75	0	66.7	0	50	50	0	0	0	100	0	0	0
Southern Masked Weaver	0	100	100	100	100	100	50	100	100	25	100	100	0	100	100
Southern Red Bishop	0	0	25	0	0	0	0	100	100	25	0	0	0	14.3	33.3
Speckled Pigeon	0	100	75	66.7	66.7	100	0	75	100	50	0	0	100	85.7	66.7
Spike-heeled Lark	100	100	100	33.3	66.7	100	50	75	100	50	100	100	100	28.6	66.7
Spotted Eagle-Owl	0	0	0	0	33.3	0	0	25	0	0	0	0	0	28.6	0
Spotted Flycatcher	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
Spotted Thick-knee	0	0	0	33.3	0	0	0	0	0	50	0	0	0	14.3	0
Spur-winged Goose	0	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0
Swallow-tailed Bee-eater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temminck's Courser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	3055_2340	3100_2320	3100_2325	3100_2330	3100_2335	3100_2340	3100_2345	3105_2320	3105_2325	3105_2330	3105_2335	3105_2340	3105_2345	3110_2330	3110_2335
Three-banded Plover	0	100	25	33.3	0	100	0	25	0	50	0	0	0	28.6	100
Tractrac Chat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.3
Verreaux's Eagle-Owl	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0
Wattled Starling	0	0	75	0	0	0	0	50	0	0	0	0	0	0	0
Western Barn Owl	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Western Cattle Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Stork	0	0	0	33.3	0	0	0	0	0	0	0	0	0	0	0
White-backed Mousebird	100	0	25	66.7	33.3	0	0	75	0	25	0	0	0	14.3	0
White-browed Sparrow-Weaver	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
White-necked Raven	100	0	0	33.3	33.3	0	0	25	0	0	0	0	0	0	0
White-rumped Swift	100	0	25	33.3	66.7	100	100	50	0	25	0	0	100	14.3	33.3
White-throated Canary	100	100	0	66.7	33.3	0	50	75	100	50	0	0	100	85.7	100
White-throated Swallow	0	100	75	33.3	33.3	0	0	25	100	50	0	0	100	42.9	66.7
Willow Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Canary	0	0	0	0	0	0	0	0	0	0	0	0	0	14.3	0
Yellow-bellied Eremomela	100	0	0	0	33.3	0	100	25	0	0	0	100	0	14.3	33.3
Yellow-billed Duck	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0

APPENDIX B: PRE-APPLICATION AVIFAUNAL MONITORING PLAN (PAAMP)

RECONNAISSANCE STUDY AND PRE-APPLICATION MONITORING PLAN FOR THE PROPOSED CLUSTER OF SIX WIND ENERGY FACILITIES NEAR BRITSTOWN, NORTHEN CAPE PROVINCE

For

Soyuz 1 (Pty) Ltd, Soyuz 2 (Pty) Ltd, Soyuz 3 (Pty) Ltd, Soyuz 4 (Pty) Ltd, Soyuz 5 (Pty) Ltd and Soyuz 6 (Pty) Ltd

June 2021

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1 INTRODUCTION

Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') was appointed by Soyuz 1 (Pty) Ltd, Soyuz 2 (Pty) Ltd, Soyuz 3 (Pty) Ltd, Soyuz 4 (Pty) Ltd, Soyuz 5 (Pty) Ltd and Soyuz 6 (Pty) Ltd to conduct the specialist avifaunal study for the proposed cluster of 6 x 140 MW wind energy facilities (WEFs) located approximately 22 km to the south of Britstown in the Northern Cape Province of South Africa.

The National Gazette, No. 43110 of 20 March, 2020: "*National Environmental Management Act (107/1998) 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 Act, when applying for Environmental Authorisation*" provides the criteria for the specialist assessment and minimum report content requirements for impacts on avifaunal species associated with the development of onshore wind energy generation facilities, where the electricity output is 20 MW or more, which require environmental authorisation and provide the terms of reference outlined below.

These regulations prescribe that an Avifauna Specialist Assessment is to be undertaken for all sensitivity ratings provided by the national web-based environmental screening tool[1], as the present level of knowledge on bird behaviour and species population precludes confident predictions on the sustainability of priority or threatened species nationally.

The process for undertaking the Avifaunal Impact Assessment comprises three phases:

- A reconnaissance study;
- The preparation of a pre -application avifaunal monitoring plan; and
- The undertaking of an avifaunal impact assessment and the preparation of a report.

2 TERMS OF REFERENCE

The terms of reference were as follows:

Reconnaissance Study

- A desktop study of relevant information as well as a 2 to 4-day on-site inspection;
- The occurrence of target species is to be identified, including seasonality of occurrence and migratory patterns of the species;
- Define the study area (avifaunal impact zone); and
- Production of a site specific Pre-Application Avifaunal Monitoring Plan.

Pre-Application Avifaunal Monitoring Plan

- The study area and its characteristics to be mapped including the extent, habitat, special features including topographical and water features, quarries, drainage lines, known breeding sites, existing uses of land, existing infrastructure such as power lines and roads, and existing operational wind energy facilities within 30km of the site;
- Target avifaunal species that are likely to occur on the preferred site and for which monitoring is required;
- Pre-application monitoring requirements for both the site as well as the control site including:
    - the monitoring intervals including the number and duration of monitoring events which must be based on the latest version of the BirdLife South Africa (BLSA) Bird and Wind-Energy Best-Practice Guidelines[2] or a motivation provided for the deviation[3];

[1] https://screening.environment.gov.za/screeningtool

[2] Birds and Wind-Energy Best-Practice Guidelines. Third Edition, 2015 (Jenkins et al. 2015)

[3] BirdLife SA, 2017. Verreauxs' Eagle and Wind Farms-Guidelines for impact assessment, monitoring and mitigation.

- the location of monitoring points and aspects to be monitored (for example, bird abundance and flight activity, presence of target species, proportion of flying time each target species spends at turbine rotor height, preferred flight paths, risk of identified target species to collision, areas for specific monitoring if any, etc.); and
- equipment to be used and monitoring methodology for the abundance or activity monitoring and for direct observation or vantage point surveys and numbers of observers to be used.

3 METHODOLOGY

3.1 Desktop Study

The following data sources were consulted:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) obtained from the Avian Demography Unit of the University of Cape Town[4];
- Co-ordinated Avifaunal Road Count (CAR) project[5];
- Co-ordinated Water-bird Count (CWAC) project[6];
- The Important Bird Areas of southern Africa (IBA) project[7];
- Publicly available satellite imagery;
- The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland[8]; and
- Verreaux's Eagle Risk Assessment (VERA) modelling.

3.2 Site Visit

A reconnaissance site visit was conducted over eight days between 12 – 20 July 2021, during which time the area was traversed by vehicle and on foot with the primary aim of obtaining familiarity with the expected target species in the area, the habitat availability and levels of modification, access and vantage point suitability.

4 RESULTS

4.1 Desktop Study

4.1.1 South African Bird Atlas Project 2 (SABAP2)

SABAP2 data were examined for 32 pentads (which are approximately 8 km x 8 km squares) in and around the study area (Figure 1). A total of 145 species were recorded during full protocol SABAP2 surveys in the following pentads: 3035_2325 (36 species, 3 cards), 3035_2330 (64 species, 7 cards), 3040_2325 (106 species, 14 card40_2330 (0 species, 0 cards), 3040_2335 (48 species, 2 cards), 3040_2340 (33 species, 2 cards), 3045_2320 (43 species, 1 card), 3045_2325 (101 species, 8 cards), 3045_2330 (50 species, 2 cards), 3045_2335 (69 species, 2 cards), 3045_2340 (66 species, 3 cards), 3050_2325 (78 species, 4 cards), 3050_2330 (0 species, 0 cards), 3050_2335 (98 species, 7 cards), 3055_2325 (38 species, 1 card), 3055_2330 (38 species, 2 cards), 2055_2335 (48 species, 1 card), 3055_2340 (51 species, 1 card), 3100_2320 (46 species, 2 cards), 3100_2325 (46 species, 4 cards), 3100_2330 (65 species, 3 cards), 3100_2335 (60 species, 3 cards), 3100_2340 (25 species, 1 card), 3100_2345 (37 species, 2 cards), 3105_2320 (80 species, 4 cards),

[4] http://sabap2.birdmap.africa/ Accessed 18 June 2021.

[5] Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. Big birds on farms: Mazda CAR Report 1993-2001. Avian Demography Unit: Cape Town.

[6] Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. Coordinated waterbird Counts in South Africa, 1992-1997. Avian Demography Unit, Cape Town.

[7] Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.

[8] Taylor, M.R., Peacock, F., and Wanless, R.M. 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.

3105_2325 (34 species, 1 card), 3105_2335 (19 species, 1 card), 3105_2340 (19 species, 1 card), 3105_2345 (29 species, 1 card), 3110_2330 (82 species, 7 cards), and 3110_2335 (65 species, 3 cards).

This includes 19 Priority Species (Table 1), 8 species classified as *Endangered, Near Threatened* or *Vulnerable* and 17 endemic or near-endemic species. Due to the relatively few full protocol surveys conducted in some of the pentads (indicated by the number of cards submitted) this list cannot be considered to be complete.

Table 1: Priority species listed in the 32 pentads in and around the project site by SABAP2.

Species	Scientific Name	Red Data Status	Endemic or Near-endemic	Priority Score
Bustard, Kori	*Ardeotis kori*	NT, NT		260
Bustard, Ludwig's	*Neotis ludwigii*	EN, EN		320
Buzzard, Jackal	*Buteo rufofuscus*		X	250
Courser, Double-banded	*Rhinoptilus africanus*	NT, LC		204
Crane, Blue	*Anthropoides paradiseus*	NT, VU		320
Eagle, African Fish	*Haliaeetus vocifer*			290
Eagle, Booted	*Aquila pennatus*			230
Falcon, Lanner	*Falco biarmicus*	VU, LC		300
Francolin, Grey-winged	*Scleroptila africanus*		X	190
Hawk, African Harrier-	*Polyboroides typus*			190
Kestrel, Greater	*Falco rupicoloides*			174
Kestrel, Lesser	*Falco naumanni*			214
Korhaan, Karoo	*Eupodotis vigorsii*	NT, LC		240
Korhaan, Northern Black	*Afrotis afraoides*			180
Owl, Spotted Eagle-	*Bubo africanus*			170
Owl, Verreaux's Eagle-	*Bubo lacteus*			210
Pipit, African Rock	*Anthus crenatus*	NT, LC	X	200
Secretarybird	*Sagittarius serpentarius*	VU, EN		320
Stork, White	*Ciconia ciconia*			220

4.1.2 Co-ordinated Avifaunal Roadcounts Project (CAR)

CAR counts comprise a census of birds (focussed on large terrestrial species) performed twice annually (in winter and summer) by volunteer birdwatchers. The purpose is to provide population data for use in science, especially conservation biology, by determining findings about the natural habitats and the birds that use them. There are 10 CAR routes (NK033,

NK201, NK202, NK203, NK321, NK322, NK323, NK451, NK452, and NK453) that run through the proposed development area. Blue Crane, Karoo Korhaan, Northern-black Korhaan, Ludwig's Bustard, and Secretarybird have been recorded along some of these routes.

4.1.3 Coordinated Waterbird Counts Project (CWAC)

CWAC consist of a programme of mid-summer and mid-winter censuses at a large number of South African wetlands. The counts are conducted by citizen scientists at more than 400 wetlands around the country and provide a useful source of information on wetland bird species in South Africa. Four CWAC sites (Nuwejaarsfontein Farm Dam, Nuwejaarsfontein House Dam, De Aar Sewage Works and Wortelfontein Dam) are located near the proposed development area, between 22 and 31 km in an easterly direction.

Nuwejaarsfontein Farm Dam and Nuwejaarsfontein House Dam are only 4 km apart, approximately 22 km and 23 km east from the proposed development area respectively. Good numbers of South African Shelduck, Little Grebe, Cape Teal, Red-knobbed Coot, Egyptian Goose, and Cape Shoveler have been recorded at Nuwejaarsfontein Farm Dam. Pied Avocet, Cape Wagtail, Common Greenshank, Blacksmith Lapwing, Black-winged Stilt, and Spur-winged Goose were recorded in moderate numbers. Other species such as Black-necked Grebe, Little Stint, Three-banded Plover, Southern Pochard, African Spoonbill, Red-billed Teal, Reed Cormorant, Grey Heron, African Sacred Ibis, and Kittlitz's Plover were also recorded. Waterbirds recorded at the Nuwejaarsfontein House Dam include good numbers of Pied Avocet, South African Shelduck, Spur-winged Goose, and Egyptian Goose, as well as moderate numbers of Greater Flamingo (Priority Species), White-breasted Cormorant, Hadeda Ibis, Yellow-billed Duck, and Cape Teal. Other species such as African Spoonbill, Little Grebe, Southern Pochard, African Darter, Great Crested Grebe, and Blacksmith Lapwing were also recorded.

De Aar Sewage Works is adjacent to De Aar, approximately 29 km in a north-easterly direction from the proposed development area, and good numbers of Cape Teal, Blacksmith Lapwing, Black-winged Stilt, Ruffs, Yellow-billed Duck, Spur-winged Goose, Red-knobbed Coot, Hadeda and African Sacred Ibis, and Cape Wagtail have been recorded here. Moderate numbers of Little Grebe, Little Stint, Three-banded Plover, Grey Heron, Wood Sandpiper, and South African Shelduck were also recorded, including the Greater Flamingo (Priority Species). Other species include Reed Cormorant, Black-headed Heron, Marsh Sandpiper, Egyptian Goose, Common Greenshank, Brown-throated Martin, and Common Sandpiper.

Wortelfontein Dam is located approximately 31 km in a south-easterly direction from the closest point to the proposed development. Three Priority Species have been recorded here namely Black Stork, African Fish Eagle, and Maccoa Duck (classified as *Vulnerable*). High numbers of Egyptian Goose, Yellow-billed Duck, Red-knobbed Coot, South African Shelduck, Pied Avocet, White-breasted Cormorant, Greater Flamingo, Cape Wagtail, Blacksmith Lapwing, and Little Grebe have also been recorded. African Spoonbill, Black-winged Stilt, Spur-winged Goose, African Black Duck Grey Heron, Hadeda Ibis and Marsh Sandpiper have been recorded in moderate numbers. Other species recorded here include Southern Pochard, Hamerkop, Reed Cormorant, African Sacred Ibis, Kittlitz's Plover, Little Egret, Common Greenshank, Black-headed Heron, Goliath Heron, and Three-banded Plover.

4.1.4 Important Bird Areas

The IBA Programme is an important conservation initiative by both BirdLife International and BLSA. The IBA Programme identifies and works to conserve various sites that are vitally important for the long-term survival of bird species that: are globally threatened; have a

restricted range; are restricted to specific biomes/vegetation types; or sites that have significant populations. The proposed development area is located adjacent the Platberg–Karoo Conservancy IBA, with its closest point less than 2 km away. This large conservancy covers the De Aar, Philipstown and Hanover districts, including suburbia.

A total of 289 bird species have been recorded so far in this conservancy, despite it being poorly atlassed for SABAP2. This conservancy is extremely important for the conservation of large terrestrial birds and raptors since it holds vitally important populations of several globally threatened species, biome-restricted species and other important arid-zone birds. Globally threatened bird species include Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, Martial Eagle, Blue Korhaan, Black Harrier and Denham's Bustard. Regionally threatened species include Black Stork, Lanner Falcon, Tawny Eagle, Karoo Korhaan and Verreauxs' Eagle. Biome-restricted species include Karoo Lark, Karoo Long-billed Lark, Karoo Chat, Tractrac Chat, Sickle-winged Chat, Namaqua Warbler, Layard's Tit-Babbler, Pale-winged Starling, and Black-headed Canary. Congregatory species such as Amur Falcon and Lesser Kestrel also occur here, with almost 10% of the global population of Lesser Kestrels roosting in this conservancy during summer. The IBA is also seasonally important for White Stork during insect outbreaks.

4.1.5 VERA modelling

The Verreaux's Eagle Risk Assessment Tool (VERA) was developed by Dr Murgatroyd through the Percy FitzPatrick Institute of African Ornithology, DST-NRF Centre of Excellence, at the University of Cape Town, which uses predictive modelling to obtain a relative collision risk map of the area to ensure that WEF's can be placed in locations that will minimise risk to flying eagles. The tool utilises nest location data and models incorporating topographical and meteorological information of the area to predict site-specific collision risk with WEF's.

To minimize the potential impacts of the proposed development on Verreaux's Eagle, the developer employed the latest available VERA model to predict the territory use of breeding Verreaux's Eagles on and around the project site to inform the proposed layout. All known Verreaux's eagle nest locations up to 12 km from the development boundaries have been identified to predict collision risk around the proposed development area.

4.2 Reconnaissance Site Visit

The project is spread across the gently sloping flats and plains of the Eastern Upper Karoo and Northern Upper Karoo vegetation types with interspersed hills of Upper Karoo Hardeveld in the Nama Karoo ecoregion. The development area is comprised mostly of Eastern Upper Karoo in the south and Northern Upper Karoo in the north. The Northern Upper Karoo vegetation type consists of a complex mix of microphyllous shrubs, 'white' grasses, dwarf shrubs and low trees. The shrubland plains habitat is the most widespread habitat type throughout the region. This habitat does, however, likely support most of the red-listed avian species within the study area, such as large terrestrial birds and raptors. The flatter areas are likely utilised by species such as Karoo Korhaan, Ludwig's Bustard and Kori Bustard. The cliffs along the eastern boundary appear to be suitable habitat for Verreaux's Eagle. The relatively flat terrain offers good viewshed coverage from the vantage points, despite there being few opportunities to gain an elevated position larger birds can be observed well beyond 2 000 m, especially when in-flight.

4.3 Target Avifaunal Species

Based on the above the following target species have been identified as potentially being present on the proposed development area and should be considered during the monitoring and/or impact assessment process: Ludwig's Bustard *(Endangered)*, Martial Eagle

(Endangered), Black Harrier *(Endangered)*, Karoo Korhaan *(Near-threatened)*, African Rock Pipit *(Near-threatened)*, Kori Bustard *(Near-threatened)*, Blue Crane *(Near-threatened)*, Verreauxs' Eagle *(Vulnerable)*, Black Stork *(Vulnerable)*, Secretarybird *(Vulnerable)*, African Fish Eagle, Jackal Buzzard, Cape Eagle-Owl, Booted Eagle, Lesser Kestrel, Common (Steppe) Buzzard, Amur Falcon, Pale Chanting Goshawk, Grey-winged Francolin, African Harrier-Hawk, Black-shouldered Kite, Greater Kestrel, Rufous-breasted Sparrowhawk and Spotted Eagle-Owl.

5 MONITORING PROGRAMME

The proposed project area of interest provided covered a huge area within the project boundary. Indicative WTG locations were provided in addition to the proposed project boundary. These positions were already informed by existing avifaunal data including an initial model-based risk categorisation based on the output of the Verreaux's Eagle Risk Assessment (VERA) tool implemented on Verreaux's Eagle nest locations. The Vantage Point (VP) positions were therefore designed to include coverage of a minimum of 75% of the indicative WTG positions provided within viewsheds of approximately 2 000m as well as additional VPs positioned to provide greater overall coverage of areas identified by the VERA tool to be of elevated risk to Verreaux's Eagle and areas suspected to be utilised by species such as Secretarybird, bustards and korhaans. The optimum strategy was determined to include monitoring of the whole WEF cluster concurrently to maximise the length of time that observers would spend across the site per monitoring survey, increasing the likelihood of recording less frequent events in the area (e.g. an influx of bustards or storks following weather systems), even if incidentally.

It is therefore recommended that 35 VPs be positioned across the proposed project area (Figure 1). As large portions of the proposed project site are located on flat terrain comprising typical karroid scrubland, away from cliffs, and rocky outcrops, most of the area is unlikely to represent potentially important Verreaux's Eagle habitat and therefore the 'standard' guidelines[2] are considered appropriate for these areas. These guidelines recommend 12 hours of monitoring per VP per season (48 hours per VP over a 12-month period). For VPs positioned in areas that are likely to include Verreaux's Eagle habitat or territories, the Verreaux's Eagle guidelines[3] are considered appropriate. These guidelines recommend additional survey effort to be conducted including 18 hours of monitoring per VP per season (72 hours per VP over a 12-month period where areas associated with high/risky flight activity are avoided). Given the overall length of the surveys required to monitor this number of VPs, it is recommended that four surveys be conducted over the 12-month period to include potential seasonal variation in site utilisation by avifauna.

These considerations result in 30 VPs across the proposed project site requiring 12 hours of monitoring per survey and 5 VPs requiring 18 hours of monitoring per survey, totalling 48 hours per VP and 72 hours per VP respectively depending on the predicted level of Verreaux's Eagle flight activity in those areas. Three control VPs are to be surveyed for 12 hours each per survey.

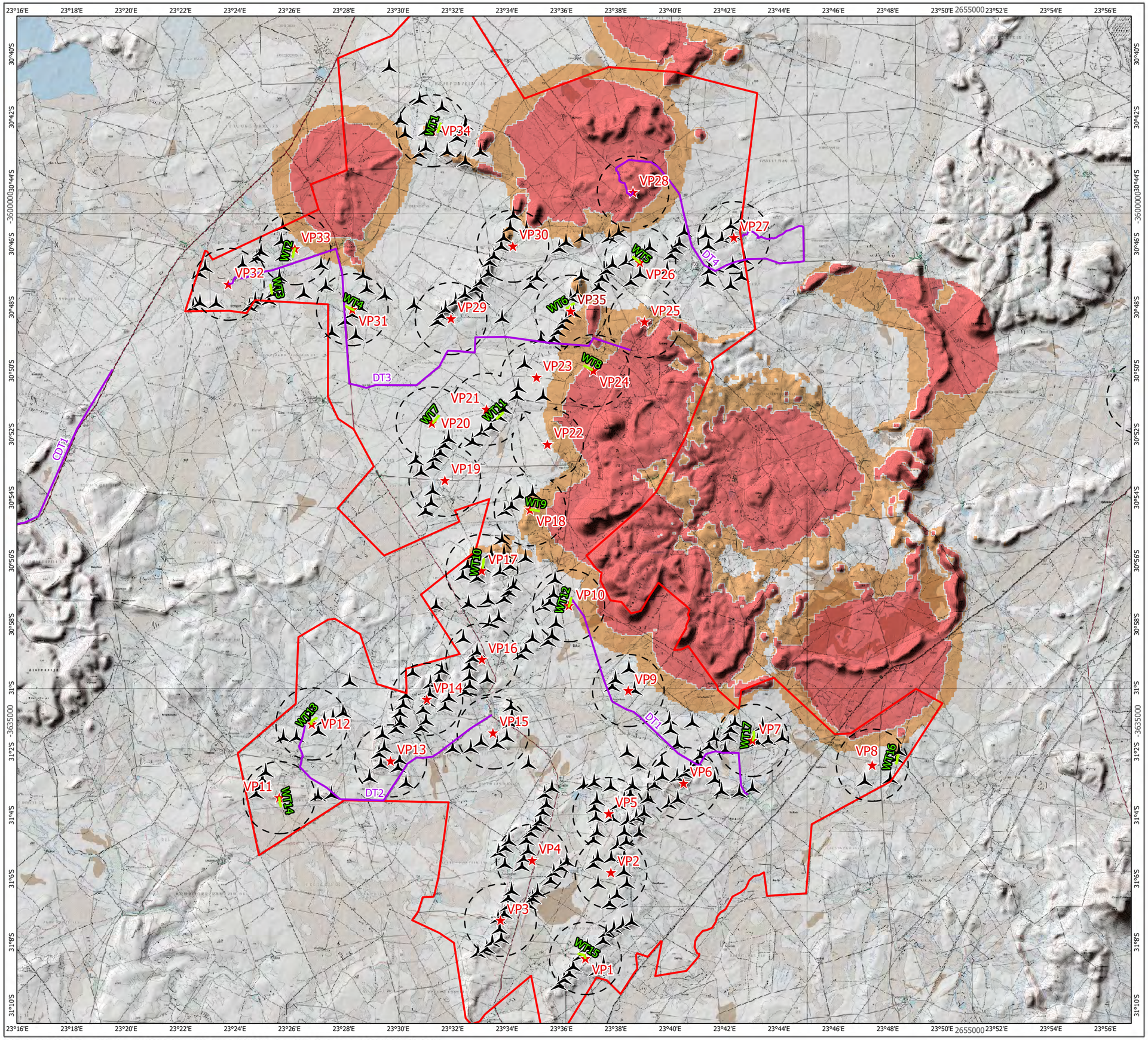
VPs are to be conducted in pairs of bird observers recording bird flight activity, abundance, flight paths, flight height, species, age and sex where possible as well as other relevant information such as date and time and weather characteristics. VPs should be monitored in sessions of a maximum of four hours per session to reduce fatigue as travel time across the project site can be long given the availability and condition of the roads. Each VP should be monitored over more than a single day per survey, i.e. the same VP should not be monitored for more than a single session per day by a pair of observers. Observer pairs are to monitor 360 degrees over an approximate radius of 2 km surrounding the VP.

Seventeen walk transects of 500 m in length are to be conducted across the project site (and three on a suitable control site) twice each per survey to record the abundance of

smaller species, species, number, age and sex as well as relevant time, weather and location data are to be recorded for all species observed or heard within 150 m perpendicular to the transect with target species to be recorded (with GPS positions) beyond 150 m if encountered. Four drive transects are to be conducted on and around the project site where vehicles are to be driven slowly (<25 km/h) along predetermined routes stopping approximately every 250 m to scan the landscape, any target species located must be recorded with their GPS position, age and sex where possible.

Incidental records are to be made of target species when they are located outside of other monitoring activities including the species, GPS position, number, age and sex where possible.

It is estimated that six observers operating in three pairs could conduct monitoring surveys over approximately 25 days, given that this is a long time to be in the field it is recommended that teams be rotated where practical so that some observers do a portion of the field surveys and are replaced by fresh observers to complete the remaining scope of works after about two weeks.



ARCUS

- Proposed Project Boundary
- Indicative WTG Position
- Vantage Point
- Approximate Viewshed
- Walk Transect
- Drive Transect

VERA Model

- High Sensitivity
- Medium Sensitivity

1:250,000 Scale @ A3

0 5 10 km

NORTH

Produced By: OD	Ref: 4331-PAAMP-0001
Checked By: AB	Date: 6/15/2022

Survey Locations
Figure 1

Britstown WEF Cluster
Pre-application Avifaunal Monitoring Plan

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