ARCUS

An ERM Group Company

AVIFAUNAL SPECIALIST ASSESSMENT REPORT FOR THE PROPOSED MULILO NEWCASTLE WIND POWER FACILITY NEAR NEWCASTLE, KWAZULU-NATAL

For

Mulilo Newcastle Wind Power (Pty) Ltd

January 2023

Prepared By:

Arcus Consultancy Services South Africa (Pty) Limited

240 Main Road
1st Floor Great Westerford
Rondebosch
7700

T +27 (0) 21 412 1529 l **E** Ashlin.Bodasing@arcusconsulting.co.za
W www.arcusconsulting.co.za

Registered in South Africa No. 2015/416206/07

QUALITY MANAGEMENT SYSTEM

Issue/Revision	First Issue	Revision 1	Revision 2
Version Number	v1-2		
Date	24 January 2026		
Arcus Review and Approval	Ashlin Bodasing		
Signature			
ERM Review and Approval	Dieter Rodewald		
Signature			

TABLE OF CONTENTS

NON-TECHNICAL SUMMARY

- The preferred site covers an area largely comprising high-altitude grassland under varying degrees of grazing pressure, with patches of dense alien woody vegetation and smaller areas of natural thicket;
- Relatively low diversity and levels of flight activity were recorded across the preferred site for avifaunal species of conservation concern (SCCs);
- Of the 23 potential avifaunal SCCs considered most relevant to potential impacts associated with the proposed development during the desktop study, reconnaissance study and scoping report, only 11 were recorded across the preferred site during the 12-months of avifaunal pre-application monitoring programme;
- Notably no Cape Vulture, Black Harrier, Wattled Crane, Grey-crowned Crane flights were recorded across the preferred site;
- Similarly, no Botha's Lark, Rudd's Lark or Yellow-breasted Pipit were recorded during any of the surveys conducted for the pre-application monitoring programme, despite concerted effort to locate these species;
- The Site Ecological Importance was lower than predicted during the scoping phase due to lower-than-expected levels of SCC activity, diversity and abundance;
- Dense stands of alien woody vegetation across the site did not support species such as Bush Blackcap (and should be cleared);
- Of the resident species, Southern Bald Ibis were regularly recorded throughout the pre-application monitoring programme with a colony located near the western site boundary;
- Flight paths recorded during Vantage Point monitoring identified Southern Bald Ibis movement corridors, with flight records often consisting of multiple individuals in flocks commuting to foraging areas;
- Amur Falcon flight record numbers were relatively low but also comprised multiple individuals in flocks;
- Jackal Buzzard records accounted for the majority of the flight records with activity across the site;
- Transect and incidental records identified preferred foraging areas for Southern Bald Ibis;
- While no flights of Cape Vulture were recorded, this species was recorded incidentally near the existing 400 kV Pegasus-Tutuka Overhead Power Line beyond the north-eastern site boundary, and 22 individuals were recorded soaring in the same location during a walk transect. This species may therefore, at least on occasion, utilise a small farm dam positioned beyond the site boundary below that transmission line for bathing and drinking;
- No nests of Verreaux's Eagle or Martial Eagle were located near the site and flight activity levels for these species was low, indicating that the proposed development area does not represent an active territory and the species may only utilise the area infrequently;
- The proposed development site is topographically elevated compared to the surrounding areas and is a source of water for downstream environments such as wetland habitats important for Wattled Crane and Grey Crowned Crane;
- Potential impacts associated with the proposed development are relatively easy to mitigate effectively, minimising risk to avifaunal SCCs and downstream environments; and
- The proposed development is acceptable from an avifaunal perspective following the implementation of mitigation measures and is unlikely to reduce the long-term persistence or viability of avifaunal SCC populations in the area.

Government Notice No. 320 in Government Gazette No. 43110 of 20 March 2020	Section of Report
Avifaunal Specialist Assessment Report	
The SACNASP registration number of the avifaunal specialist preparing the assessment and their curriculum vitae;	Appendix G, H
A signed statement of independence by the specialist;	Appendix F
A description of the study area including a map of all the aspects identified in the duration, dates and seasons of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2
The outcome of the reconnaissance study and the resultant site-specific pre-application avifaunal monitoring;	Appendix A
A description of the methodology used to undertake the site specific preapplication avifaunal monitoring program inclusive of the equipment used;	Section 2
A map showing the Global Positioning System (GPS) coordinates for each of the monitoring points for both the preferred site as well as the control site;	Figure 3
The monitoring intervals for both sites;	Section 2
Where relevant, a map showing the areas to be avoided;	Figure 8
Fatality prediction for target species and general species on the preferred site;	Section 4
A map showing the existing renewable energy facilities within a 10 km radius of the proposed development;	Figure 1
Where relevant, the outcomes of the cumulative impact assessment;	Section 4
A discussion based on the pre-application monitoring of the expected impact of the proposed development on avifaunal species;	Section 5
A substantiated statement from the avifauna specialist, indicating the acceptability or not of the proposed development and a recommendation on the approval, or not, of the proposed development;	Section 5
Any conditions to which this statement is subjected;	Section 5
A detailed post construction monitoring programme;	Section 6
The outcomes of the post-construction monitoring, including data and specialist's reports, must be uploaded onto the national bird monitoring database, to be accessed at https://www.environment.gov.za/birddatabase, once operational;	Not Operational
Where required, proposed mitigation measures or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and	Section 4
A description of the assumptions made and any uncertainties or gaps in knowledge or data.	Section 3
Avifaunal Specialist Assessment	
Discussion on bird abundance and movement within the site;	Section 3
Discussion on presence of target or threatened species and their occurrence on the site at heights which could pose risks to collision;	Section 3
Assessment of risk of identified target species to collision including the expected fatality rates of the target species based on a suitable model commonly used for risk determination, per species and for the site;	Section 4
Identification and mapping where relevant, of any migratory or preferential bird routes or corridors;	Figure 8
Where relevant, discussion on the risk of displacement;	Section 4
Where relevant, areas identified within the site as having a very high sensitivity for bird collision or displacement and in which the development of turbines should be avoided. These areas are to be mapped;	Figure 8
In areas where existing operational wind energy generation facilities have been identified within a 30 km radius, a cumulative impact assessment must be undertaken which includes:	Section 4
The fatality rates for target species at the wind energy generation facilities within a 10 km radius;	N/A

Government Notice No. 320 in Government Gazette No. 43110 of 20 March 2020	Section of Report
The possible additional fatalities from the proposed wind energy generation facility for target species as well as general avifaunal species; and	Section 4
A discussion on the possible cumulative impact of the proposed facility on regional populations of target species;	Section 4
Where no existing operating wind energy generation facilities occur within the 10 km radius, the specialist must include a discussion on possible cumulative impacts on target species from the proposed facility; and	Sections 4, 5
A plan for post construction monitoring (on both the preferred site as well as the control site) and reporting, which must include:	Section 6
Timeframes and intervals for monitoring;	Section 6
Number of turbines to be monitored, including any specific area for monitoring;	Section 6
Methodology for searcher efficiency and scavenger removal;	Section 6
Method for monitoring, i.e. transects or radial as well as extent of monitoring area;	Section 6
Results of monitoring compared against expected fatality rates per target species as well as general species;	Section 6
Reporting requirements, including organisations for submission of reports;	Section 6
Years and intervals for monitoring to occur; and	Section 6
All methods used to estimate bird numbers and movements during reconnaissance and pre-application monitoring, which should be applied in exactly the same order to ensure the comparability of these two data sets.	Sections 3, 6

GLOSSARY OF TERMS AND ABBREVIATIONS

BLSA: BirdLife South Africa
CAR: Coordinated Avifaunal Road-count
CBA: Critical Biodiversity Area
CR: Critically Endangered
CWAC: Coordinated Waterbird Counts
DD: Data Deficient
DT: Drive Transect
EN: Endangered
ESA: Ecological Support Area
EWT: Endangered Wildlife Trust
GPS: Global Positioning System
IBA: Important Bird Area
MTS: Main Transmission Substation
MW: Megawatt
NT: Near Threatened
OHPL: Over-head Power Line
RSH: Rotor Swept Height
PAAMP: Pre-Application Avifaunal Monitoring Plan
PV: Photovoltaic
WTG: Wind Turbine Generator
SABAP2: South African Bird Atlas Project 2
SCC: Species of Conservation Concern
SEF: Solar Energy Facility
SEI: Site Ecological Importance
Threatened: CR, EN and VU species
VP: Vantage Point
VU: Vulnerable
WEF: Wind Energy Facility
kV: Kilovolt
WT: Walk Transect

Priority species: all species occurring on the Birdlife South Africa (BLSA) and Endangered Wildlife Trust (EWT) Avian Sensitivity Map priority species list[1]. 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 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)[2].

Endemic or Near-endemic: Endemic or near endemic (i.e., ~70 % or more of population in RSA) to South Africa 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)[3]. 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;
- Drive Transects (DT): All raptors; all large (non-passerine) priority species;
- Walked Transects (WT): All birds; and
- Incidental Observations: All raptors; all large (non-passerine) priority species.

[1] 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 BLSA.

[2] Taylor, M.R., Peacock, F., and Wanless, R.M., 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Updated in 2020 by BLSA.

1 INTRODUCTION

1.1 Background

The proposed Mulilo Newcastle Wind Power ('MNWP') Wind Energy Facility Complex ('WEF') will be located near Newcastle, KwaZulu-Natal. The applicant, Mulilo Newcastle Wind Power (Pty) Ltd, intends to develop, construct and operate an up-to 400 megawatts ('MW') WEF, (the Newcastle WEF Complex), located approximately 15 kilometres northwest of the town of Newcastle in the Kwazulu-Natal Province (Figure 1). The study area is situated in the Newcastle Local Municipality, which forms part of the Amajuba District Municipality ('ADM') and will have an anticipated lifespan of 20 – 25 years. Arcus Consultancy Services South Africa (Pty) Ltd (an ERM Group Company) ('Arcus') was appointed to conduct the pre-construction avifaunal monitoring for the project, the results of which have informed this impact assessment process required for environmental authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998, as amended) ('NEMA') and associated EIA regulations of 2014 as amended (EIA regulations).

1.2 Project Description

The proposed Newcastle WEF Complex comprises:

- MNWP 1 WEF (up to 200 MW and up to 45 turbines) (Scoping and Environmental Impact Assessment process);
- MNWP 2 WEF (up to 200 MW and up to 35 turbines) (Scoping and Environmental Impact Assessment process);
- MNWP grid connection infrastructure and associated powerlines (Basic Assessment process); and
- MNWP 2 grid connection infrastructure and associated powerlines (Basic Assessment process).

A total of four (4) applications will be submitted to Department of Forestry, Fisheries and the Environment ('DFFE') for Environmental Authorization ('EA') for the Mulilo Newcastle WEF Complex. This report is compiled to be included into the draft Environmental Impact Assessment report for:

- MNWP 1 WEF (up to 200 MW and up to 45 turbines).

The MNWP 1 WEF will consist of up to forty-five (45) wind turbine generators (WTGs) with a maximum generating output of up to two hundred (200) MW. The proposed turbine footprints and associated facility infrastructure will cover an area of up to 85 ha after rehabilitation, depending on final layout design.

The MNWP WEF infrastructure will be located on six (6) land parcels with a total extent of 2 940 ha, although the actual infrastructure footprint will be substantially less than this.

Table 1: Specific Information Requirements from the Competent Authority (DFFE)

DESCRIPTION OF REQUIRED INFORMATION	DESCRIPTION			
General site information				
Description of all farm portions	**Farm ID**	**Farm Name**	**Farm Number**	**Area (ha)**
21-digit Surveyor General codes of all affected farm portions	N0HS00000000335000001	Geelhoutboom	1/3350	647

DESCRIPTION OF REQUIRED INFORMATION	DESCRIPTION			
General site information				
Description of all farm portions	**Farm ID**	**Farm Name**	**Farm Number**	**Area (ha)**
	N0HS00000000335000000	Geelhoutboom	RE/3350	567
	N0HS00000000944700000	Bernard	9447	465
	N0HS00000001630200000	Spitskop	16302	280
	N0HS00000000944800000	Byron	9448	392
	N0HS00000000943900000	Cliffdale	9439	587

Tables 2 to 5 summarize the key technical details for the MNWP 1 WEF project:

Table 2: Turbine specifications

Component	Specification
WEF Capacity	Up to 200 MW
Number of Turbines	Up to 45
Hub Height	Up to 140 m
Rotor Diameter	Up to 200 m
Blade length	Up to 100 m

Table 3: Facility component descriptions

Facility Component	Description
Crane platform and hardstand area	Crane platform and hardstand laydown for each turbine position.
Turbine Foundations	Reinforced Concrete Foundation. Depth: up to 3.5 m Diameter: up to 25 m per turbine Volume of concrete: up to 800 m³ per turbine.
IPP Substation	33 kV to 132 kV collector substation to receive, convert and step-up electricity from the WEF to the 132 kV grid suitable supply. The substations maximum height will be a Lightning Mast up to 25 m high. The facility will house control rooms and grid control yards for both Eskom and the IPP. Additional infrastructure includes parking, up to 2.8 m high fencing, storm water channels and culverts, ablutions, water storage tanks, septic tank, and borehole.
Construction/office yard	This includes bunded fuel areas, oil storage areas, general stores (containers) and skips.
WTG component laydown area	Temporary laydown area.
On-site concrete batching plant	Temporary on-site concrete batching plant.
Primary Site Access Roads	Site access will, where possible, make use of existing farm roads that will be upgraded and maintained for the life of the WEF. The existing roads to be upgraded will be expanded to a width of up to 9 m. New roads will be constructed (in areas where there are no existing roads) with a width of up to 9 m to the IPP substation and laydown areas. V-drains will run on both sides of the road.

Facility Component	Description
Internal roads	Roads connecting the turbine positions will where possible make use of existing farm roads that will be upgraded and maintained for the life of the plant. The existing roads to be upgraded will be expanded to a width of up to 6 m. New roads will be constructed (in areas where there are no existing roads) with a width of up to 6 m and will connect all turbines. V-drains will run on both sides of the road.
33 kV reticulation	A combination of 33 kV overhead lines and 33 kV underground cable (where technically feasible) will be used, aligned along the road network connecting each WTG position to the IPP substation.
Operations and maintenance (O&M) buildings	Includes other infrastructure such as parking, up to 2.8 m high fencing, storm water channels and culverts, ablutions, water storage tanks, septic tank and borehole.
Met masts	Two met masts (Up to 140 m height).

Table 4: Facility component footprints

Facility Component	Construction footprint	Final footprint after rehabilitation
Crane platform and hardstand area	Up to 0.8 ha per turbine which equates to up to 36 ha.	Up to 0.8 ha per turbine which equates to up to 36 ha.
Turbine foundations	Up to 0.06 ha per turbine which equates to up to 2.7 ha (included in hardstand area).	Up to 0.06 ha per turbine which equates to up to 2.7 ha (included in hardstand area).
IPP substation	Up to 1 ha	Up to 1 ha
Construction/office yard	Up to 2 ha	0 ha
WTG component laydown area	Up to 4 ha	0 ha
On-site concrete batching plant	Up to 1 ha	0 ha
Temporary stockpiles	Up to 2 ha	0 ha
Primary site access road and reticulation	Total width of up to 15 m consisting of: • Up to 12 m wide area prepared for road and v-drain • Up to 3 m width for underground 33 kV reticulation. Overhead lines to be used where underground cables are not technically feasible. Total length up to 8 km which equates to 12 ha.	Total width of up to 12 m consisting of: • Up to 9 m wide road • Up to 1.5 m wide v-drain on either side of road Total length up to 8 km, which equates to 9.6 ha. 33 kV underground / overhead line reticulation and stockpile areas to be rehabilitated. Final footprint up to 0.25 ha to account for cable markers and/or overhead line foundations and stays along primary site access roads.

Facility Component	Construction footprint	Final footprint after rehabilitation
Internal roads and reticulation	Total width of up to 12 m consisting of: • Up to 9 m wide area prepared for road and v-drain. • Up to 3 m wide area for underground 33 kV reticulation. Overhead lines to be used where underground cables are not technically feasible. Total length up to 28 km which equates to 33.6 ha.	Total width of up to 9 m consisting of: • Up to 6 m wide road. • Up to 1.5 m wide v-drain on either side of road. Total length up to 28 km, which equates to 25.2 ha. 33 kV underground / overhead line reticulation and stockpile areas to be rehabilitated. Final footprint up to 1 ha to account for cable markers and/or overhead line foundations and stays along internal roads.
O&M buildings	Up to 0.5 ha	Up to 0.5 ha
Met masts	Up to 0.002 ha per met mast which equates to 0.004 ha.	Up to 0.002 ha per met mast which equates to 0.004 ha.
Total	**Up to approximately 105 ha**	**Up to approximately 85 ha**

1.3 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[3] and the Birds and Wind-Energy Best-Practice Guidelines[4] and the requirements prescribed therein. This report also takes into consideration the National Environment Management Act, 1998 (NEMA) (Act 107 0f 1998).

The aims of the study were to:

- Describe the study area and map avifaunal aspects identified during the site investigation;
- Describe and map (where relevant) the methodology used to undertake the site-specific pre-application avifauna monitoring programme;
- Present the outcomes of the site-specific pre-application avifaunal monitoring, including:
    - Bird abundance and movement within the preferred site;
    - Presence of target species and SCCs, their occurrence across the site and heights which could pose collision risks; and
    - Identification of preferential bird routes or corridors.
- Present an avifaunal sensitivity map of the preferred site indicating areas to be avoided;

[3] 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.

[4] 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.

- Assess, predict and discuss the expected impact and fatality risk for target and general avifaunal species of the proposed development on the preferred site;
- Provide recommended mitigation measures to reduce the potential impact on avifauna;
- Assess the cumulative impact of existing (or potential) renewable energy facilities within a 30 km radius of the preferred site;
- Provide a substantiated statement indicating the acceptability (or not) of the proposed development on the preferred site from an avifaunal perspective; and
- Provide details of the applicable post-construction monitoring programme.

1.4 Study Area Description

1.4.1 Regional Context

The proposed development site falls within the Grassland Biome in an area of transition between the Sub-Escarpment Grassland Bioregion to the east of the site, and the High-Altitude/Mesic Highveld Grassland Bioregion found towards the west of the site on the Great Escarpment plateau (Figure 1). The Grassland Biome supports the greatest human population densities and the highest levels of agricultural utilization on the subcontinent, thereby placing it under severe threat and pressure[5]. The result is that the Grassland Biome is highly transformed and fragmented, with much of its high priority biodiversity located within production landscapes.

The primary drivers of transformation by agriculture in the Grassland Biome include the dairy, wool, beef, maize, sorghum, wheat, and to a lesser extent, sunflower industries. A further 65% of the Grassland Biome is grazed for livestock and game. In terms of mining, South Africa is one of the world's top coal producing countries; an extensive coal belt is located within the Grassland Biome. Exacerbating the problem of habitat transformation within this biome is that large coal-fired power stations (occupying a large footprint) are located in close proximity to the coal-producing areas to minimize transport costs[6], further impacting overall grassland habitats.

1.4.2 Local Context

The vast majority of the proposed development site is located in Low Escarpment Moist Grassland, with small sections of Kwa-Zulu Natal Highland Thornveld towards the north. These vegetation types are classified as falling within the Sub-Escarpment Grassland Bioregion. Despite their position (on the top of the plateau), the intermediate altitude presents an area where there is a transition between mesic highveld and sub-escarpment grasslands. These grasslands are made up of long-lived grasses and forbs that are adapted to frequent above-ground disturbance mostly due to fire, after which they re-sprout using carbohydrates stored in underground storage organs. Of particular concern for these grasslands is expansion of various types of cultivation, heavy grazing, changes in other commercial land-use patterns (relating to mining, urban and peri-urban sprawl and sub-division of land), altered burn regimes, unsuitable grazing practices and encroachment by invasive alien species (Figure 2).

[5] Meter, E. & Edwards, T. 2002. A checklist of the plants of Mahwaqa Mountain, KwaZulu-Natal. Bothalia. 32. 10.4102/abc.v32i1.473.

[6] Carbutt, C. & Tau, M. & Stephens, A. & Escott, B. 2011. The conservation status of temperate grasslands in southern Africa. Grassroots. 11. 17-23.

Figure 2: Typical grassland dominated hills across the site showing the effects of fire, grazing and invasion by alien vegetation.

2 METHODS

2.1 Pre-Application Avifaunal Monitoring Programme

The resultant site-specific pre-application monitoring programme (Appendix A) included the identification of three suitable VPs across the preferred site (Figure 3) and a VP at a suitable control site (Appendix C). VPs were selected based on consideration of viewshed coverage and accessibility. Four monitoring trips and a dedicated nest survey were planned to coincide with relevant expected climatic conditions over a 12-month period to account for potential seasonal variation in the site utilisation by avifauna.

A team of two experienced bird observers conducted the first season of monitoring from 19 – 29 August 2021 to coincide with the end of the dry season. The dry season survey was however not completed, as an extended period of poor weather conditions reduced visibility below acceptable levels. The observers returned to site or a single day to complete the survey on 06 September 2021. The second season of monitoring was conducted from 03 – 11 December 2021 to coincide with the peak of the wet season. The third season of monitoring was from 18 – 28 February 2022 to coincide with the end of the wet season. The fourth season of monitoring was conducted from 04 – 13 May 2022 to coincide with the dry season. December 2021 and February 2022 monitoring was also timed to coincide with the potential peak of Black Harrier occurrence in the area. An additional dedicated nest survey was conducted during the period 26 – 28 April 2022 to coincide with the onset of the breeding season of Verreaux's Eagle. The Verreaux's Eagle nest survey was conducted through direct observation using a 60x Nikon spotting scope and included the searching of areas identified as likely to hold nest sites including cliffs, tall trees and transmission infrastructure. Habitat suitability maps for Verreaux's Eagle (obtained from BirdLife South Africa) were projected onto the project map to identify and determine potential nest locations, and these areas were directly observed within approximately 8 km from the project boundary (Figure 3).

VPs were monitored for an average of 67 hrs each across the project site and 56 hrs on the control site (Appendix C). Each VP was surveyed by a pair of observers operating covering a 360 degree viewshed with a radius of approximately 2 km. The flight paths of target species were recorded on a large-scale map along with data on the number/species of bird(s) and type of flight (e.g. soaring, foraging, commuting etc.), flight duration and flight height. Flight heights were recorded through five height bands: 1: 0 – 20 m; 2: 21 –

70 m; 3: 71 – 160 m; 4: 161 – 280 m and 5: >280 m. Height bands 2, 3 and 4 were considered to be within rotor-swept height (RSH).

The diversity and abundance of smaller birds was determined through the use of five walk transects of 500 m each. Two observers walked between the start and end points of the transects and recorded all birds seen or heard up to 150 m on either side of the transect. Beyond 150 m, only priority species were noted and were recorded as incidental sightings. Surveys were conducted at least once per season. While larks are notoriously difficult to identify in some instances, surveys conducted in December 2021 coincided with the expected peak of their more conspicuous aerial displays to maximise their detection likelihood.

To sample abundances of large terrestrial birds and raptors, two driven transect routes (5.5 km and 3.7 km) were conducted once each per survey within the project site, and one transect was conducted at the control site. Target species were recorded by driving slowly (±25 km/h) with all windows open, and stopping occasionally to listen and scan the surrounding environment. When a target species was located, a GPS co-ordinate was recorded, along with the distance and direction from the vehicle to the observed bird. Additional information, such as weather conditions and habitat type, were also noted.

All other incidental sightings of priority species on the WEF site, control site and within the broader area were recorded and geo-referenced, along with additional relevant information such as weather and habitat type.

2.2 Avifaunal Sensitivity

2.2.1 Habitats

Prior to the analysis of pre-application avifaunal monitoring data, the relevant avifaunal aspects of the preferred site and Site Ecological Importance (SEI) were determined for each avifaunal SCC. This is done through a combination of various attributes (e.g. conservation importance) and consideration of site-specific factors (e.g. land-use) in combination with the nature of the potential impacts associated with the proposed development. The primary output of this exercise was the development of a map identifying the relative SEI of broader preferred habitats of relevant species across the preferred site (presented in the Scoping Report). This was used in combination with pre-application monitoring data of species composition, abundance and site utilisation to determine avifaunal sensitivity.

2.2.2 Flight Activity

Observed flight sensitivity was determined by calculating a Grid Cell Sensitivity Score (GCSS), falling within either a Low, Medium, Medium-High or High classification for a 100 m x 100 m grid covering the preferred site. The GCSS was derived by analysing the following characteristics of all mapped priority species and raptors flight lines passing through each grid cell:

- Priority species score and the number of individuals associated with each flight line;
- Risk height factor, which considered if the flight was within RSH;
- The duration of the flight; and
- The length of the flight.

These factors were considered in the following equation to determine a Flight Section Sensitivity Score (FSSS), for each section of flight within a grid cell.

$$\mathbf{FSSS = PSS \times N \times (X/Y \times D) \times (P+1)}$$

Where:

- PSS is the Priority Species Score (Retief et al. 2011, updated 2014).
- N is the number of birds that are associated with the flight line.
- X is the length of the flight line section that is within a particular Grid Square.
- Y is the length of the whole flight line.
- D is the duration of the whole flight.
- P is the proportion of the flight line at Risk Height.

The GCSS is the sum of these flight sections within the grid cell, giving a sensitivity score specific to the cell.

The resultant GCSS scores were categorised as follows: Low (< 15 000); Medium (15 000 – 40 000); Medium – High (40 001 – 110 000); and High (> 110 000). Grid cells classified as Medium – High and High were considered to be preferential movement corridors in areas of elevated risk.

2.2.3 Avifaunal Sensitivity Mapping

The results of the avifaunal species diversity, abundance and activity recorded during the pre-application monitoring programme were used together with the initial SEI determinations presented in the Scoping Report to inform site utilisation by SCCs and to map the avifaunal sensitivity across the site.

2.3 Impact Assessment Rating System

Significance ratings of the potential impacts were determined following the methods outlined in Appendix B. The impact assessment considers the results of the pre-application avifaunal monitoring programme in the context of the receiving environment, the conservation status of the species observed/expected, the susceptibility of species to the potential impacts and the species' utilisation of the proposed development site.

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 (detailed in Appendix A). Several of the monitoring survey trips were influenced by access issues resulting from bad weather rendering access tracks impassable. The survey hours and effort completed across the site was nevertheless considered sufficient to inform the assessment based on the species observed across the site. The accurate visual estimation of flight heights in the field is difficult, to address this limitation VPs were placed in view of the meteorological masts (of known height) where practical for reference, and observers were instructed to classify flight heights to the nearest RSH band where any uncertainty existed (e.g. birds observed flying at approximately 70 m). This may lead to an overestimate (rather than underestimate) of flight risk following the precautionary principle.

3.2 Avifaunal Baseline

3.2.1 Reconnaissance Study and Site Investigation

The results of the Reconnaissance Study were presented in the Scoping Report. A list of Threatened, Near-Threatened, Endemic/Near-endemic and Priority Species was consolidated from the results of the desktop study and initial site investigation as potential impact receptors of the proposed development. The resultant list identified 34 potential avifaunal SCCs in the area of potential relevance to the proposed development (Appendix

A). SEI was determined for 23 species considered most relevant to the potential impacts of the proposed development. A total of 11 avifaunal SCCs were recorded during the pre-application avifaunal monitoring programme (including incidental sightings in the broader area), namely Denham's Bustard, Blue Crane, Grey Crowned Crane, Wattled Crane, Crowned Eagle, Martial Eagle, Verreaux's Eagle, Black Harrier, Southern Bald Ibis, Secretarybird and Cape Vulture.

3.2.2 Vantage Point Surveys

The overall flight activity across the proposed development site was relatively low, with a total of 141 flight paths and 13 identified target species recorded after the completion of the pre-application avifaunal monitoring programme (Table 1). This comprised 40, 46, 33 and 22 flights recorded during surveys 1 to 4 respectively. The majority of the flight records were of Jackal Buzzard (44), Southern Bald Ibis (37) and Common Buzzard (13). Southern Bald Ibis flight records were often flocks of multiple individuals resulting in 153 birds recorded across the site (however, it must be noted that the same individuals may have been recorded on multiple separate occasions). Overall, a total of 351 birds were recorded during 141 flights (Table 1). The highest level of activity was recorded during Season 3, this was largely due to a peak of Amur Falcon activity during the February 2022 (Table 5).

Table 5: Target Species Flight Activity[7]

Species	Survey flights (birds)				Total
	1	2	3	4	
African Goshawk				1 (1)	**1 (1)**
African Harrier-hawk		2 (2)			**2 (2)**
Amur Falcon		1 (1)	8 (93)		**9 (94)**
Black-winged Kite		4 (4)	1 (1)		**5 (5)**
Common Buzzard		5 (5)	8 (9)		**13 (14)**
Crowned Eagle	1 (2)				**1 (2)**
Forest Buzzard		9 (9)			**9 (9)**
Jackal Buzzard	9 (10)	9 (10)	13 (17)	13 (14)	**44 (51)**
Martial Eagle	1 (1)			1 (1)	**2 (2)**
Rufous-breasted Sparrowhawk				1 (1)	**1 (1)**
Southern Bald Ibis	21 (61)	7 (16)	3 (49)	6 (27)	**37 (153)**
Tawny Eagle		1 (1)			**1 (1)**
Unidentified Buzzard		2 (2)			**2 (2)**
Unidentified Falcon	3 (3)	3 (3)			**6 (6)**
Unidentified Raptor	1 (1)	3 (3)			**4 (4)**
Verreaux's Eagle	4 (4)				**4 (4)**
Total	**40 (82)**	**46 (56)**	**33 (169)**	**22 (44)**	**141 (351)**

Flights of Jackal Buzzard were relatively widespread across the entire site (Figure 4). Southern Bald Ibis flights included movement from the valley to forage on the higher lying areas across the site, as well as movement traversing the site to and from the surrounding agricultural areas (Figure 5). Individual Verreaux's Eagle were only recorded on four occasions during Survey 1, and Martial Eagle was only recorded on two occasions (Figure 6), while Tawny Eagle and a pair of Crowned Eagle were recorded on single occasions each respectively (Figure 6). It is therefore likely that the area does not represent core territory

[7] Recorded across the proposed development site over four avifaunal monitoring surveys showing the number of flights recorded per species per survey and the number of individuals in parentheses.

for Verreaux's Eagle or Martial Eagle and is likely utilised only infrequently or by transient individuals.

Notably, no Black Harrier activity was recorded across the site during the monitoring period, nor were any flights recorded of several other important species such as Cape Vulture, Black Stork, Secretarybird, Blue Korhaan, flamingos or cranes.

The activity of target species across the site was relatively low in the specialist's experience, with average passage rates ranging from 1.2 birds/hour recorded at VP1 to 2.2 birds/hour recorded at VP3 (Table 6). At a finer spatio-temporal scale, a maximum average of 4.8 birds/hour was recorded at VP2 during Survey 3, elevated by the arrival of the migratory Amur Falcon to the area. At the species level, Southern Bald Ibis (non-migratory residents) averaged 0.7 birds/hour across the survey period, with the highest levels of activity recorded around VP3 (1.5 birds/hour, Appendix D). The majority of these flights were outside of RSH however, and while the activity of this species was minimal at VP2 (0.1 birds/hour), those flights were at higher-risk heights (Figure 7).

Table 6: Average Passage Rates (birds/hour) recorded at each VP

VP	Average Passage Rate (birds/hour)				Total
	1	2	3	4	
1	1.67	0.56	1.78	0.83	**1.21**
2	0.22	1.00	4.83	0.06	**1.53**
3	2.72	1.83	2.78	1.56	**2.22**
CVP	0.22	0.61	2.72	0.33	**0.97**

The overall proportion of risky flights for target species was also relatively low as indicated by GCSS analyses (Figure 7). Nevertheless, 13 of the 37 recorded flights of Southern Bald Ibis (35 %) and 26 of the 44 Jackal Buzzard flights (59 %) included portions at RSH. These analyses confirmed preferred foraging locations and movement corridors predicted during the scoping phase.

3.2.3 Transect Surveys

The highest species diversity and abundance was recorded along walk transect (WT) 1, which was positioned at lower elevation alongside a vegetated riverine area, resulting in 61 species recorded at 75 birds/km (Appendix D). WT2, also positioned at lower elevations but across grassland, recorded the second highest diversity and abundance at 30 species at 49.3 birds/km. The remaining walk transects were positioned in the grasslands along the top of the higher elevation areas and had relatively low levels of diversity and abundance, with a maximum of 25 species at 30 birds/km.

Notably no Rudd's Lark, Botha's Lark, Bush Blackcap or Yellow-breasted Pipit were recorded across the site during the pre-application monitoring programme (Appendix D). Concerted effort was made to locate these species by positioning walk transects in areas with predicted elevated habitat suitability indicated by the habitat suitability models of each species. Despite these efforts, and familiarity of the bird observers with these species, none were recorded across the proposed development site during the monitoring programme. The site represents marginal habitat for these species and it is therefore not particularly surprising that no individuals were recorded utilising the site. Similarly, only Amur Falcon, Common Buzzard, Jackal Buzzard, Southern Bald Ibis and Yellow-billed Kite were observed during drive transects (Appendix D), indicating that the proposed development site and immediate surrounds does not represent optimal habitat for other large terrestrial SCCs, such as cranes and korhaans (which were expected to occur in the area).

While no flights of Cape Vulture were recorded during the VP surveys, a single flight of 22 Cape Vulture were observed incidentally soaring in the distance beyond the site boundary during WT2 in Survey 4, and a Verreaux's Eagle was recorded along WT5 (Figure 6).

3.2.4 Incidental Records

A total of 98 incidental records of 377 birds were made during the pre-application monitoring programme, the majority of which were 32 records (250 birds) of Southern Bald Ibis. A single observation of Cape Vulture was recorded in a similar location to those recorded during WT2 and this species possibly utilises the pylons of the Pegasus-Tatuka 400 kV main transmission overhead power line on occasion to perch and/or drink and bathe at the small farm dam below (Figure 6).

3.3 Avifaunal Sensitivity

An avifaunal sensitivity map was produced for the project site based on observed avifaunal activity, habitat quality/functionality, and nature of the impacts associated with the proposed development (Figure 8). Areas around nesting and roosting locations for Grey Crowned Crane (2 500 m) and Southern Bald Ibis (1 500 m) were considered to be of Very-High Avifaunal Sensitivity, representing No-Go areas for WTGs (including blade encroachment). Cliffs and prominent topographic features were buffered by a 100 m and also considered to be of Very-High Avifaunal Sensitivity, representing No-Go areas for WTGs (including blade encroachment).

Aquatic features were considered to be of High Avifaunal Sensitivity due to the importance of maintaining existing flow/infiltration regimes in this ecosystem type to support down-stream aquatic environments that may be important for SCCs beyond the project boundary, such as Crowned Cranes and Wattled Cranes. To reduce or avoid impacts on sensitive habitats these areas are to be avoided wherever practical, and flow-control measures are to be implemented to reduce potential effects of erosion or sedimentation altering the hydrology of the area. Smaller drainage lines and tributaries were buffered by 32 m and wetlands were buffered by 100 m, with these areas representing No-Go areas for WTG bases.

From an avifaunal perspective, the relatively small total area of habitat destruction, resulting from permanent infrastructure associated with the proposed development, is unlikely to pose a significant impact on the long-term persistence or viability of avifaunal species in the area. Remaining areas were considered to be of Low Avifaunal Sensitivity, as the majority of the previously mapped forest areas were determined to be dense stands of invasive alien woody species in need of clearing. Areas of low avifaunal sensitivity are the preferred areas for development activities, as well as permanent and temporary structures such as site buildings and lay-down areas.

Despite the relatively low SCC passage rates recorded across the site, the probability of individual collisions of these species occurring nevertheless remains distinct. This being said, should collisions of these species occur, the levels would likely be low given the relatively low number of flight-paths of target species recorded across the site. Therefore, even prior to the implementation of mitigation measures, low incidence of collision fatalities would not likely result in population level impacts beyond the broader project area. The extent, magnitude and probability of this potential impact would be further reduced through the implementation of the mitigation hierarchy such as avoidance mitigation through informed infrastructure layouts (already implemented), additional mitigation measures (blade painting and shut down-on-demand) and adaptive management (if required).

Flight paths that represented an elevated risk or preferred movement corridors have been considered to be of Medium Avifaunal Sensitivity and avoided where possible during the iterative layout design (informed by the SEI determined in the Scoping Phase), however

WTG development in these areas is still permitted following the implementation of additional mitigation requirements such as shut down-on-demand and blade painting.

All WTGs in the proposed layout avoid areas identified to be of Very High Avifaunal Sensitivity (WTG No-Go) areas and the layout as presented is acceptable from an avifaunal perspective.

4 IMPACT ASSESSMENT

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 vegetation for development of infrastructure such as temporary laydown areas, site buildings, WTG bases and access roads;
  - 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
  - Direct Mortality – fatalities of avifauna due to WTG collision, collision or entrapment with perimeter fencing, collision with internal power lines, and electrocution from energised components.
- Decommissioning Phase:
  - As per construction phase.
- Cumulative Impact
  - Three facilities are being considered within 50 km of the MNWP WEF according to the DFFE Renewable Energy database (Q3 2022). In accordance with this database, all three facilities are listed to be solar energy facilities (SEFs), with no WEFs listed. However, the neighbouring wind energy facility, MNWP2, is presently the only known wind energy facility being planned in the area, and is currently being submitted for environmental authorisation; and
  - Habitat degradation through altered land-use practices, imbalanced burn regimes/grazing pressure and resultant erosion.

4.1 Impact Assessment Tables

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
Direct Habitat Destruction	Preferred	Direct habitat destruction associated with WEFs is generally low relative to the overall size of the project area. This impact is largely unavoidable, resulting in some birds being displaced from the project site. The habitats present in the proposed development site are not unique to the site and the agricultural/natural land-use matrix is similar throughout the broader area. The more natural or near-natural grasslands that remain in these areas are,	Negative	Direct	Slight	Study Area	Long Term	Definite	Reversible	Resource will not be lost	Easily achievable	Low Negative	Infrastructure to avoid Very High Sensitivity areas, linear infrastructure permitted; The footprint within High Sensitivity areas must be minimized and avoided wherever possible; Laydown and other temporary infrastructure to be placed within Low or Medium sensitivity areas, preferably previously transformed areas, wherever possible; Appropriate run-off and erosion control measures must be implemented where required; A site-specific environmental management programme (EMPr) must be developed and implemented. The EMPr must give appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat (e.g. no open fires outside of designated areas);	Low Negative

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
		however, under increasing pressure from various other impacts such as commercial crop production and rangeland grazing/burning mismanagement. The loss of habitat associated with clearing will not likely have a significant negative impact on the long-term viability or persistence of avifaunal species or populations in the area following the implementation of appropriate mitigation measures.											All contractors are to adhere to the EMPr and must apply good environmental practice during construction; All hazardous materials must be stored in the appropriate manner to prevent contamination of the site and downstream environments. Any accidental chemical, fuel and oil spills that occur at the site must be cleared as appropriate for the nature of the spill; Existing roads and farm tracks must be used where possible; The minimum footprint areas of infrastructure must be used wherever possible, including road widths and lengths; No off-road driving must be permitted in areas not identified for clearing; An Environmental Site Officer (ESO) must form part of the on-site team to ensure that the EMPr is implemented and enforced and an Environmental	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
													Control Officer (ECO) must be appointed to oversee the implementation activities and monitor compliance for the duration of the construction phase; and Following construction, rehabilitation of areas disturbed by temporary laydown areas and facilities must be undertaken.	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
Disturbance and Displacement	Preferred	Indirect loss of habitat from disturbance during the construction phase is temporary in nature and is expected to result largely from the presence of heavy machinery and increased activity of construction personnel. Disturbance resulting from grazing of livestock occur within the natural or near-natural areas and therefore it is expected that any species particularly sensitive to anthropogenic	Negative	Direct	Slight	Localised	Short Term	Possible	Reversible	Resource will not be lost	Easily achievable	Low Negative	A site specific EMPr must be developed and implemented. The EMPr must give appropriate and detailed description of how construction activities must be conducted; All contractors are to adhere to the EMPr and must apply good environmental practice during construction; The ECO must oversee activities and ensure that the site specific EMPr is implemented and enforced; Maximum use of existing access road and servitudes; Existing and novel access roads are to be suitably upgraded or constructed to prevent damage and erosion resulting from increased vehicular traffic	Low Negative

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
		disturbance are unlikely to occur within the proposed project area through displacement by existing impacts. The habitats present in vicinity of the proposed development are not unique to the site and are relatively widespread in the area so any displacement from the immediate vicinity that may occur will not likely incur a high energetic cost as suitable habitat is widely available nearby. The proximity of nearby suitable habitat makes it											and construction vehicles; No off-road driving in undesignated areas; Speed limits (50 km/h) must be strictly enforced on site to reduce unnecessary noise; Construction camps must be lit with as little light as practically possible, with the lights directed downwards where appropriate; The movement of construction personnel must be restricted to the construction areas on the project site; No dogs or cats other than those of the landowners must be allowed on site; The appointed ECO must be trained to identify the potential Red Data	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
		likely that species will return to areas that have not been physically altered by the proposed development once construction activity ceases. There are no confirmed active nest locations in proximity to the proposed development site where breeding success is likely to be negatively impacted upon through disturbance or displacement during the construction phase.											species, as well as the signs that indicate possible breeding by these species; The ECO must during audits/site visits make a concerted effort to look out for such breeding activities of SCCs (e.g. cranes, Secretarybird). Additional efforts must include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species; and If any avifaunal SCCs are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
													the situation and instruction on how to proceed.	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
Direct Mortality	Preferred	Fatalities of avifaunal species can occur through collision with vehicles as traffic in the area increases due to construction activity. Large-bodied and ground dwelling species (e.g. korhaans, cranes and bustards) are at increased risk, but this impact can be effectively mitigated against and the presence of these species across the site was low. Temporary fencing can result in collisions,	Negative	Direct	Slight	Localised	Short Term	Possible	Irreversible	Resource will not be lost	Easily achievable	Low Negative	Maximum use of existing access road and servitudes; No off-road driving in undesignated areas; Speed limits (50 km/h) must be strictly enforced on site to reduce probability of vehicle collisions; The movement of construction personnel must be restricted to the construction areas on the project site; No dogs or cats other than those of the landowners must be allowed on site; Any holes dug e.g. for foundations of pylons must not be left open for extended periods of time to prevent entrapment by ground dwelling avifauna or their young and only be dug when required and filled in soon thereafter;	Low Negative

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Construction Phase														
		entrapment or entanglement if not suitably installed. Similarly ground dwelling avifauna (particularly chicks) can fall into uncovered excavations and become entrapped.											Temporary fencing must be suitably constructed, e.g. if double layers of fencing are required for security purposes, they must be positioned at least 2 m apart to reduce the probability of entrapment by larger bodied species that may find themselves between the two fences; Roadkill must be reported to the ECO and removed as soon as possible.	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
Direct Habitat Destruction	Preferred	The grasslands present across the site are sensitive to imbalanced burn regimes and grazing pressures. Grasslands receive relatively high rainfall and habitats are sensitive to alterations of flow regimes and infiltration rates, with wetlands forming an important component for many avifaunal species in the area. Several potential risks to the long-term functioning and persistence of these environments	Negative	Direct	Slight	Municipal	Long Term	Possible	Reversible	Resource will not be lost	Easily achievable	Moderate Negative	Flow- and erosion control measures must be implemented where appropriate to reduce uncontrolled runoff from hard surfaces; Infrastructure must be designed in a manner that is compatible with the continuation of burn regimes implemented in the surrounding grasslands; No open fires are to be permitted outside of designated areas; and The operational EMPr must be developed and implemented and should include site specific measures for the effective management and treatment of any wastewater to be	Low Negative

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
		exist which, if unmitigated, could result in the long-term degradation or permanent loss of habitats. Fortunately, the potential risks are relatively easy to mitigate very effectively and are largely standard practice for these types of developments. In addition, downstream environments are largely degraded due to alien plant invasion. Increased runoff from hard surfaces during the operational phase (e.g. pylon bases,											produced by the project.	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
		roads etc.) has the potential to increase the risk of habitat destruction through erosion, which can alter flow regimes and water tables, drain wetland environments or increase sedimentation downstream. These potential impacts are also easy to mitigate through the appropriate use of flow and erosion control measures.												

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
Disturbance and Displacement	Preferred	Indirect loss of habitat from disturbance during the operational phase is associated with ongoing operational activity as well as more discrete periods of routine maintenance tasks. Similar to the construction phase, the avifauna in the area already experience levels of disturbance associated with agricultural activities and therefore species particularly sensitive to disturbance are	Negative	Direct	Slight	Localised	Long Term	Possible	Reversible	Resource will not be lost	Easily Achievable	Low Negative	A site specific operational EMPr must be developed and implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance; All contractors are to adhere to the EMPr and must apply good environmental practice during all operations; and Operational phase bird monitoring, in line with the latest available guidelines, must be implemented.	Low Negative

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
		unlikely to frequent the area.												

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
Direct Mortality – Collision with Infrastructure	Preferred	WEFs can cause bird fatalities through the collision of birds with moving turbine blades. The most effective mitigation for collision impacts currently available is wind farm placement, as well as specific turbine placement within a WEF to avoid elevated avifaunal SCC use areas[8]. Collisions with power lines are a well-documented threat to birds in southern Africa[9,10]. Heavy-bodied birds such as bustards,	Negative	Direct	Moderate	Regional	Long Term	Probable	Irreversible	Resource will not be lost	Difficult	Moderate Negative	WTGs must not be constructed within any designated Very High Sensitivity (WTG no-go) areas; Additional mitigation (as detailed below) must be implemented for WTGs placed within High and Medium sensitivity areas; Shut down-on-demand and Blade Painting (contingent on approval by the Civil Aviation Authority) or similar technology must be implemented for all WTGs that are positioned within or encroach on High and	Low Negative

[8] Murgatroyd, M, Bouten, W, Amar, A. A predictive model for improving placement of wind turbines to minimise collision risk potential for a large soaring raptor. J Appl Ecol. 2020; 00: 1– 12. https://doi.org/10.1111/1365-2664.13799.

[9] van Rooyen, C.S. 2004. The Management of Wildlife Interactions with over-headlines. In The fundamentals and practice of Over-head Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

[10] Shaw, J.M, Jenkins, A.R., Smallie, J.J & Ryan, P.G. 2010. Modelling power-line collision risk for the Blue Crane *Anthropoids paradiseus* in South Africa. Ibis 152: 590-599

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
		cranes and waterbirds, with limited manoeuvrability, are more susceptible to this impact[9].											Medium Sensitivity areas; Internal power lines must be buried wherever technically feasible; Appropriate (approved) Bird Flight Diverters (BFDs) must be affixed to the entire length of novel overhead power lines (in all sensitivity categories); If one or more avifaunal SCC carcasses are located and determined likely to have resulted from collisions with infrastructure in any sensitivity area over the lifespan of the facility, the fatality is to be appropriately recorded and reported to an avifaunal specialist to	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
													determine the most appropriate action; If double layers of fencing are required for security purposes, they should be positioned at least 2 m apart to reduce the probability of entrapment by larger bodied species that may find themselves between the two fences; Develop and implement a carcass search and bird activity monitoring programme in-line with the latest applicable guidelines; Regular reviews of operational phase monitoring data (activity and carcass) and results to be conducted by an avifaunal specialist;	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
													The above reviews should strive to identify sensitive locations including WTGs and areas of increased collisions that may require additional mitigation; An operational monitoring programme for any novel overhead power lines must be implemented to locate potential collision fatalities; and Any fatalities located must be reported to Birdlife South Africa (BLSA) and the Endangered Wildlife Trust (EWT).	

Potential issue	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	Type	Consequence	Extent	Duration	Probability	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE without Mitigation	Mitigation Measures	SIGNIFICANCE with Mitigation
Operational Phase														
Direct Mortality - Electrocution	Preferred	Electrocution refers to the scenario where a bird is perched or attempts to perch on energized structures and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components.	Negative	Direct	Slight	Localised	Long Term	Possible	Reversible	Resource will not be lost	Easily Achievable	Low Negative	Internal power lines should be buried wherever possible; All new overhead power line pylons must be of a design that minimizes electrocution risk. This can be achieved by using adequately insulated 'bird friendly' structures, with sufficient clearances between live components; and An operational monitoring programme for the overhead power line route must be implemented to locate potential collision fatalities.	Low Negative

Cumulative Impact														
Cumulative Impacts on avifaunal habitat, displacement and direct mortality	Preferred	The cumulative impact of the proposed development in the context of the land-use activities found in the broader local area (including MNWP2). The highest potential impacts prior to mitigation would relate to the effects on aquatic habitats (particularly during the operational phase), such as possible contamination and uncontrolled runoff from hard surfaces that may result in erosion and subsequently further degradation of downstream wetlands.	Negative	Direct	Slight	Municipal	Long Term	Possible	Reversible	Resource will not be lost	Easily Achievable	Low Negative	All appropriate mitigation measures listed above should be implemented; The project should collaborate with other developments (current and proposed) in the broader project area. Companies in the area should share lessons learnt, align strategies and agree coordinated approaches to responding to environmental issues; A data sharing agreement should be setup with other wind farm projects in the region to share operational monitoring data. Data should be shared with regulators and interested stakeholders to allow cumulative impacts to be documented and to inform adaptive operational management; and Implement an alien woody plant removal	Low Negative

Cumulative Impact													
												and eradication programme to restore currently degraded grassland and aquatic habitats.	

4.2 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.

From an avifaunal perspective, however, the proposed development presents an opportunity to afford some level of long-term protection for (and/or improvement of) the habitats present across the proposed development area from activities potentially less compatible with the persistence and rehabilitation of avifaunal habitats (e.g. wetlands) such as coal mining.

Furthermore, 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 (amongst others) 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 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.

5 DISCUSSION

Overall, the proposed development site has a lower avifaunal sensitivity than anticipated during the initial desktop study and scoping phase. No active Verreaux's Eagle or Martial Eagle territories were evident by the nest- or flight activity surveys, and smaller passerine species such as Botha's Lark, Rudd's Lark and Yellow-breasted Pipit were not observed across the site. The majority of the thicket/woodland areas are invaded by dense stands of alien woody vegetation, including the drainage lines and habitats could be improved through an alien eradication programme across the site. Similarly, the upgrade of roads to include appropriate flow control measures would reduce the existing levels of erosion and habitat degradation.

The mitigation of potential impacts is relatively easy to implement and likely to be highly effective at reducing the risk to habitats and avifauna. For example, the potential alteration of flow/infiltration regimes can be mitigated through avoidance of placing hard surfaces near sensitive aquatic features and use of appropriate flow control measures where required. The low overall SCC passage rates indicate that collisions can be mitigated through a combination of blade painting and shut down-on-demand. This requirement in areas of Medium Avifaunal Sensitivity is not considered a primary mitigation measure (as avoidance mitigation has been applied), but rather a complimentary measure likely to be effective to reduce the risk for both resident birds (e.g. Southern Bald Ibis and Jackal Buzzard), as well as any less frequent incursions by flocking species onto the site (e.g. Amur Falcon and Cape Vulture), should they occur.

Based on the desktop study, reconnaissance study and results of the pre-application avifaunal monitoring programme conducted for the MNWP 1 WEF and associated infrastructure (including cumulative impacts), it is the avifaunal specialist's informed opinion that the proposed development will not likely have a significant negative impact on the viability or persistence of avifaunal populations (particularly avifaunal SCCs) in the area should the mitigation and monitoring measures included in this report be implemented. The indicative positions of all 45 WTGs provided in the layout are acceptable.

The encroachment of woody alien invasive species across the site should be managed through an alien plant removal and eradication programme to restore local avifaunal grassland habitats and functionality.

It is the specialist's opinion that the proposed development can be approved from an avifaunal perspective.

6 POST-CONSTRUCTION MONITORING PROGRAMME

6.1 Avifaunal Abundance and Flight Activity Monitoring

As a minimum, survey protocols used in the pre-application monitoring should be repeated during the first two years of operation and should be combined with monitoring of fatalities. Requirements of the latest available guidelines should be included wherever necessary. The need for further monitoring of bird abundance and movements should be reviewed at the end this of period to determine if it is necessary to continue with some, or all, components of the monitoring.

Any observed changes in bird numbers and movements at a WEF could be linked to changes in the available habitat (e.g. agricultural expansion, mining, alien vegetation clearing as well as changes in weather conditions, rainfall, etc.). The avifaunal habitats available on both the development and reference sites should therefore be mapped at least once a year (at the same time every year).

6.2 Fatality Monitoring

In addition to avifaunal abundance, flight activity monitoring and habitat mapping, the post-construction monitoring programme must include fatality monitoring that incorporates carcass searches as well as scavenger removal (carcass persistence) and searcher efficiency trials.

The aims of fatality estimates are to:

- Estimate the number and rate of fatalities at a WEF;
- Describe the species composition of fatalities (as well as the age and sex where possible);
- Record and document the circumstances and site characteristics associated with avian fatalities at turbines and ancillary infrastructure of the WEF (this could aid in understanding the cause of fatalities, and hence possible mitigation measures); and
- Mitigate impacts by informing final operational planning and ongoing management.

There are normally three separate components to estimating fatalities:

- Regular searches for collision casualties;
- Experimental assessment of search efficiency and scavenging rates of bird carcasses on the site; and
- Estimating fatality rates based on these data.

6.3 Carcass Searching

The search schedule will ultimately be dependent on the number of WTGs developed and their location. No fewer than 30 % of the total number of WTGs constructed should be surveyed using intensive sampling methods. WTGs should be selected randomly, or through stratified random sampling where habitat variation is pronounced. The same turbines are searched at regular intervals and once the subset of turbines has been selected, these should be fixed for the rest of the monitoring period, unless there is good reason to change this.

As a minimum, the radius of the search area should be equal to 75 % of the turbine height (ground to vertical blade-tip). The size of the search area should remain the same throughout the study. The area around each turbine should be searched using transects located no more than 10 m apart; this width should be reduced where thick groundcover hampers visibility. Transects should be walked slowly, and the target area searched carefully and methodically for any sign of a bird-collision incident (carcasses, dismembered body parts, scattered feathers, injured birds).

It may be acceptable to search only a subset of the search area if the habitat is such that surveying the entire area is not possible, although such circumstances should be carefully documented. All guyed masts and sample sections of any new lengths of power line associated with the development should also be surveyed for collision and/or electrocution victims and included in the search schedule.

The search interval must be adjusted to ensure that WTG search intervals are shorter than scavenger removal rates.

All physical evidence associated with located carcasses should be photographed, referenced (including accurately geo-referenced using a GPS), checked for age and sex (where possible). Carcasses should be collected, bagged and carefully labelled (label inside and outside the bag(s) – if double-bagged, put one label inside the outer bag), and refrigerated or frozen to await further examination.

If an injured bird is recovered, it should be contained in a suitably sized cardboard box. The local conservation authority should be notified that the bird will be transported to the nearest veterinary clinic or wild-animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above).

Maintenance staff should be required to report bird mortalities through a formalised reporting system throughout the lifespan of the facility. This should be additional to post-construction monitoring and does not replace formal carcass searches. All information should be recorded as far as possible.

Where there are incidental carcass finds at turbines that are being formally monitored, the carcass should be left in place where they may be detected during formal searches.

Details of carcasses found incidentally must be included in post-construction monitoring reports. Where bird carcasses are found in years where there is no formal monitoring, carcasses should be labelled, bagged and frozen. Fatalities should be reported annually to BirdLife South Africa, EWT, the Department of Environmental Affairs/SANBI and any relevant species specialists (more often if significant incidents occur).

An avifaunal specialist is to be notified of any significant (e.g. avifaunal SCCs) carcasses located as soon as possible to consider the most appropriate course of action.

6.4 Searcher Efficiency and Scavenger Trials

Scavenger removal trials must occur prior to the spinning of any WTG to determine the appropriate, initial search interval.

Fresh carcasses of birds of similar size and colour to a variety of the priority species should be placed randomly at sites around the search area and the location of each carcass recorded. As far as possible, carcasses used in trials should mimic the species characteristics and state of carcasses from WTG collisions.

Care should be taken to avoid tainting carcasses with human scent and the total number of carcasses set out should not be less than 20, but not so plentiful as to saturate the food-supply for the local scavengers.

These sites should be checked daily for the first week to record any changes in the presence, location and condition of each carcass. After the first week, the search interval can be increased and searches should continue for up to a month.

Scavenge and decomposition rates should therefore be measured at least twice over a monitoring year, once in winter and once in summer. Scavenger removal rates may also differ according to ground-cover and proximity to modified habitats and agricultural activity

(e.g. from farm cats) and scavenger removal rate trials must be stratified to account for this.

To estimate the probability of an observer detecting a carcass, a sample of suitable bird carcasses should be obtained and distributed randomly around the search area. The number and location of the paced carcasses should be recorded, and these carcasses should be of similar size and colour to the priority species. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method. These trials should be done under the supervision of the avifaunal specialist during the scheduled carcass searches, without the knowledge of the field teams. Separate trials should be conducted for each individual searcher or search team. The location of all carcasses not detected by the survey team should be checked subsequently to discriminate between error due to search efficiency (those carcasses still in place which were missed) and scavenge rate (those immediately removed from the area).

Observed mortality rates need to be adjusted to account for searcher efficiency, scavenger removal and the probability that some carcasses may be outside the search area. It is recommended that the GenEst model is used when estimating fatality rates.

The need for further monitoring of fatalities should also be reviewed after the first two years, and then again on an annual basis. Carcass searches must always be repeated in the fifth year of operation, and again every five years thereafter.

6.5 Reporting

Quarterly monitoring reports should be completed for each site, presenting the results of the previous three months monitoring. Quarterly reports must include the details of carcasses found, including the species, date found, carcass condition (e.g. fresh, decomposed, feathers only), age class and sex (if possible), nearest turbine number, GPS location and proximity to relevant impact receptors (e.g. nests).

A post-construction monitoring report analysing the results of monitoring should be completed at the end of each year of monitoring. These reports must be submitted to the competent authority and relevant stakeholders

Post-construction monitoring reports must also be made available to environmental assessment practitioners, specialists and scientists for the purposes of environmental audits, environmental impacts assessments, cumulative impact assessments and scientific research.

The annual report is to investigate the following:

- Has the habitat available to birds in and around the facility changed?
- Has the abundance of birds and/or species composition changed?
- Have the distributions and/or movements of priority species changed?
- Where the answer is yes to any of the above four questions, what is the nature of the observed changes? (Compare these changes before (during) and after construction).
- What is the nature, and likely drivers, of any changes observed?
- What is the likely demographic and ecological significance of any observed changes in bird populations at the site (including consideration of the magnitude and direction of change) at both the local and broader population scale?
- What are the collision rates and the total number of bird fatalities at the facility? (Collision rates should be reported per MW (nameplate capacity) and per turbine for different size classes of birds. Data should be reported in both raw and corrected formats, and the GPS locations of carcasses must be included).
- What is the species and, as far as possible, age and sex composition of fatalities?
- What proportion of fatalities is likely to be due to collisions with wind turbines?

- Are there any factors (e.g. site characteristics and proximity to wind turbines) that may contribute to these fatalities?
- Is additional monitoring and/or mitigation necessary and if so, what needs to be done?

The outcomes of the post-construction monitoring, including data and specialist's reports, must be uploaded onto the national bird monitoring database, to be accessed at https://www.environment.gov.za/birddatabase, once operational.

APPENDIX A: RECONNAISSANCE STUDY AND PRE-APPLICATION AVIFAUNAL MONITORING PLAN

Reconnaissance Study

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[11] and the vegetation descriptions were obtained from Mucina & Rutherford (2006)[12];
- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) obtained from the Avian Demography Unit of the University of Cape Town[13];
- Co-ordinated Avifaunal Road Count (CAR) project[14];
- Co-ordinated Water-bird Count (CWAC) project[15];
- The Important Bird Areas of southern Africa (IBA) project[16];
- Output from the National Web-based Screening Tool[17] ('Screening Tool');
- Habitat suitability maps compiled by BirdLife South Africa;
- Information supplied by Mulilo obtained through consultation with BirdLife South Africa (e.g. Southern Bald Ibis records);
- Relevant publicly available documentation and literature (referenced where applicable);
- Publicly available satellite imagery; and
- The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland[18].

Site Visit

- Date: 2021-08-16 to 2021-08-18
- Duration: 3 days
- Season: Winter
- Season Relevance: This period coincides with the breeding of large raptors such as Verreaux's Eagle and facilitates the location of nesting sites. This period also coincides with expected burn regime and lower grass length to facilitate the location and identification of terrestrial bird species such as larks and pipits.

Results

Site Description

Regional Context

The proposed development site lies near the southern boundary of the Grasslands Important Bird Area (IBA SA020, Figure 1 inset). This large IBA is centred on the towns of Volksrust, Wakkerstroom and Memel. The southern boundary extends to Newcastle and Utrecht, the northern boundary to Amersfoort and the western boundary to about 10 km east of Vrede. The area comprises gentle rolling hills on the plateau. Globally threatened

[11] 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.

[12] 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.

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

[14] 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.

[15] 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.

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

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

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

species in the IBA are Southern Bald Ibis, Wattled Crane, Blue Crane, Martial Eagle, Grey Crowned Crane, Denham's Bustard, White-winged Flufftail, Rudd's Lark, Botha's Lark, Yellow-breasted Pipit, Pallid Harrier, Black Harrier, Blue Korhaan, Black-winged Pratincole, Maccoa Duck, Bush Blackcap, Chestnut-banded and Secretarybird. Regionally threatened species are African Marsh Harrier, Striped Flufftail, White-bellied Korhaan, African Grass Owl, Short-tailed Pipit, Black Stork, Greater Flamingo, Lanner Falcon and Orange Ground Thrush. Restricted-range and biome-restricted species include Swee Waxbill, Forest Canary, Grey Cuckooshrike, Buff-streaked Chat, Barratt's Warbler, Yellow-throated Woodland Warbler, Olive Bush-Shrike, Kurrichane Thrush and Southern Bald Ibis, which are common[19].

Of the terrestrial birds, the core populations of most threatened and endemic grassland species are centred on the IBA. Approximately 85 % of the global population of Rudd's Lark is thought to occur within the IBA. The IBA also holds substantial breeding colonies of Southern Bald Ibis and several breeding populations of Secretarybird, African Marsh Harrier, Grey Crowned Crane and African Grass Owl.

Local Context

The proposed development site is positioned approximately 35 km to the north-west of the Chelmsford Nature Reserve IBA (SA059) surrounding the Ntshingwayo Dam, a large, man-made impoundment on the Ngagane River. Globally threatened species found in this IBA are Southern Bald Ibis and Grey Crowned Crane. Regionally threatened species are African Marsh Harrier, White-bellied Korhaan and African Grass Owl.

Two vulture restaurants are located around this IBA, namely the Albany and Buffelshoek Vulture Restaurants[20], which are 36 km and 31 km to the south of the site boundary respectively (Figure 1). The restaurant on Buffelshoek was being maintained by uMsonti Private Nature Reserve[21] and while not currently be operating there are plans to re-establish it. These restaurants likely service Cape Vulture colonies located some 150 km to the south and the proposed development is therefore unlikely to present an obstacle to this species travelling to and from the restaurants if operational.

Screening Tool

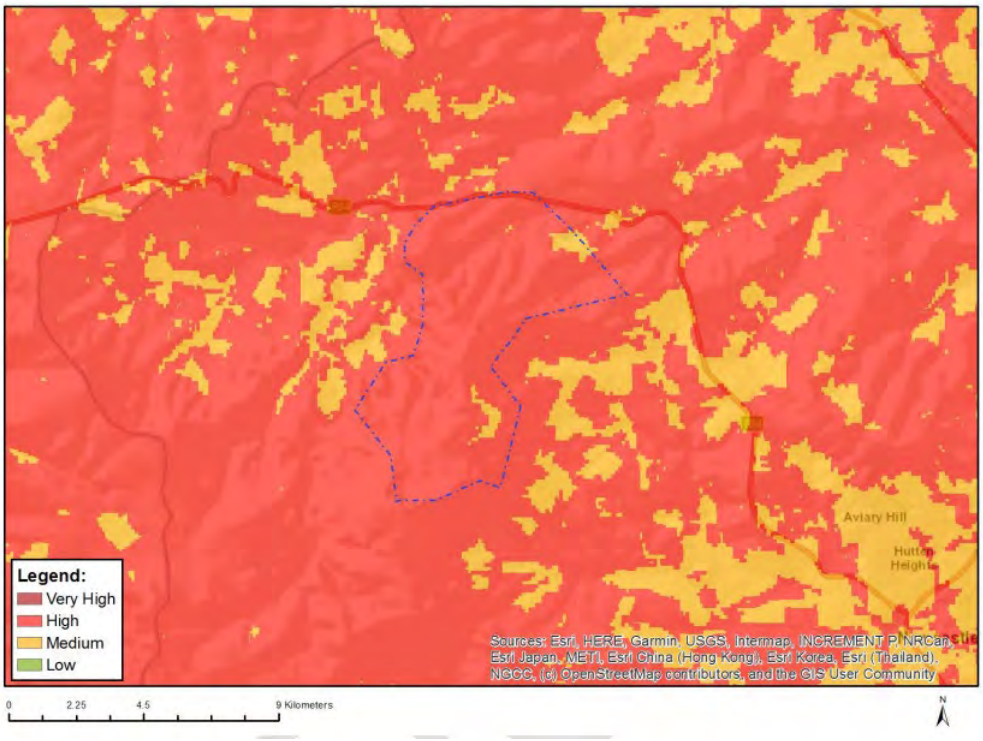
The output from the Screening Tool (as of 2022-06-03) indicated that the majority of the site was of high sensitivity due to the potential presence of several avifaunal species of conservation concern (SCCs, Figure PAAMP2), including White-bellied Bustard (listed as *Eupodotis senegalensis* in the output of the screening tool), Bush Blackcap (*Sylvia nigricapillus*), Grey Crowned Crane (*Balaerica regulorum*), Lanner Falcon (*Falco biarmicus*), Rudd's Lark (*Heteromirafra ruddi*), Secretarybird (*Sagittarius serpentarius*) and Southern Bald Ibis (*Geronticus calvus*). The remaining areas were classified as medium sensitivity due to the potential presence of African Marsh Harrier (*Circus ranivorus)*, Botha's Lark (*Spizocorys fringillaris)*, Black Stork (*Ciconia nigra)*, African Crowned Eagle (*Stephanoaetus coronatus)*, Denham's Bustard (*Neotis denhami)*, Wattled Crane (*Grus carunculata)*, Yellow-breasted Pipit (*Anthus chloris)* and African Grass Owl (*Tyto capensis)*.

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

[20] South African Civil Aviation Authority

[21] uMsonti Private Nature Reserve: Management Plan. Version 1.0. 2018. Endangered Wildlife Trust.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Eupodotis senegalensis
High	Aves-Sylvia nigricapillus
High	Aves-Balearica regulorum
High	Aves-Falco biarmicus
High	Aves-Heteromirafra ruddi
High	Aves-Sagittarius serpentarius
High	Aves-Geronticus calvus
Medium	Aves-Circus ranivorus
Medium	Aves-Sylvia nigricapillus
Medium	Aves-Spizocorys fringillaris
Medium	Aves-Ciconia nigra
Medium	Aves-Stephanoaetus coronatus
Medium	Aves-Neotis denhami
Medium	Aves-Balearica regulorum
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Grus carunculata
Medium	Aves-Anthus chloris
Medium	Aves-Tyto capensis
Medium	Insecta-Chrysoritis phosphor borealis
Medium	Mammalia-Chrysospalax villosus
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi
Medium	Invertebrate-Forest invertebrate
Medium	Invertebrate-Clonia lalandei

Figure PAAMP2: Output from the Screening Tool indicating that the site is of High Sensitivity due to the potential presence of various avifaunal species.

It must be noted that the avian species theme output produce by the screening tool indicates that the proposed development site is outside of avifaunal sensitivities and is of low avian sensitivity. The avian species theme however currently only provides avian sensitivities within Renewable Energy Development Zones (REDZ). Therefore, the animal species theme was used in this instance.

South African Bird Atlas Project 2 (SABAP2)

The Southern African Bird Atlas Project 2 (SABAP2) is part of an on-going study by the Animal Demography Unit, a research unit based at the University of Cape Town. SABAP2 data were examined for 11 pentads (which are approximately 8 km x 8 km squares) located within the study area (Figure 1, Appendix E). These are pentads: 2735_2940 (85 species, 11 cards), 2735_2945 (114 species, 6 cards), 2735_2950 (174 species, 17 cards), 2740_2940 (180 species, 39 cards), 2740_2945 (145 species, 6 cards), 2740_2950 (193 species, 37 cards). A total of 40 Priority Species were recorded during full protocol SABAP2 surveys, including 12 Species of Conservation Concern (SCCs), 20 species classified as *Endangered*, *Vulnerable* or *Near-Threatened*, and 9 endemic or near-endemic species.

Notable large terrestrial red listed species recorded in the applicable pentads included Wattled Crane, Southern Bald Ibis, Blue Crane, Grey Crowned Crane, Denham's Bustard, White-bellied Bustard, Greater and Lesser Flamingo, Black Stork, Secretarybird, Blue Korhaan and Black Stork. Large raptors commonly observed in and around the study area include Verreaux's Eagle, Lanner Falcon, African Marsh Harrier, Black Harrier, African Fish Eagle, Black-chested Snake Eagle, Jackal Buzzard and Common (Steppe) Buzzard. Several owls have been recorded in the study area, including Cape-Eagle Owl, Spotted Eagle Owl and Verreaux's Eagle Owl. It is also of note that Cape Vulture has been recorded by the SABAP2 in the region, albeit with a low reporting rate.

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.

CAR routes within 20 km from the proposed development area include KN01, KN03, KN04, KN06, FN28, FN30, FN27 (Figure 1). Grey Crowned Crane, Southern Bald Ibis, Secretarybird, Blue Crane, White Stork and Blue Korhaan have been recorded along some of these routes.

Co-ordinated 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.

Two CWAC sites (Seekoeivlei and Chelsmford Dam) are located near the proposed development area, approximately 21 km north-west and 30 km south-east from the site, respectively (Figure 1). Priority Species that have been recorded at these CWAC sites include Grey Crowned Crane, African Marsh Harrier, African Grass Owl, Greater Flamingo, Lesser Flamingo, Osprey and Marsh Owl.

Protected Areas

Seekoeivlei Nature Reserve is a Ramsar site located approximately 18 km from the proposed WEF. The vlei is the largest floodplain on the Highveld and supports large numbers of a rich diversity of resident and migratory waterbirds. Five Red Data bird species are partially or wholly dependent on the wetland, these being the Little Bittern, Yellow-billed Stork, all three of South Africa's crane species (including important numbers of Wattled Crane), White-winged Flufftail and African Grass Owl.

Expected Species

Based on the results from the desktop study, 51 Priority Species have been identified as potentially being present on the proposed development area. This includes 34 Species of Conservation Concern (SCCs, Table PAAMP1), including the *Critically Endangered* Wattled Crane, the *Endangered* Grey Crowned Crane, Martial Eagle, African Marsh Harrier and Cape Vulture, and the *Vulnerable* Southern Bald Ibis, Secretarybird, Verreaux's Eagle and African Crowned Eagle. In addition to these red-listed species, other Priority Species such as Blue Korhaan and Jackal Buzzard have been recorded in the area and likely occur in the broader impact zone in good numbers. The grasslands of the broader area could potentially be of significance to several owl species, including the *Vulnerable* African Grass Owl. The passerine species assemblage of the site may include threatened and restricted-range grassland specialists, such as the *Endangered* Botha's Lark and Rudd's Lark.

Table PAAMP1: Avifaunal Red List species potentially present in or around the proposed development site.

Common Name	Scientific Name	Regional Status	Global Status	Likelihood of occurrence in or near proposed WTG areas
Blackcap, Bush	*Sylvia nigricapillus*	Vulnerable A2bc	Vulnerable C2a(i)	High
Bustard, Denham's	*Neotis denhami*	Vulnerable A2bcd+3bcd+4bcd; C1	Near Threatened A2bcd+3bcd+4bcd	Medium
Bustard, White-bellied	*Eupodotis senegalensis*	Vulnerable A2c+3c+4c; C1	Least Concern	Medium
Crane, Blue	*Anthropoides paradiseus*	Near Threatened A2acde	Vulnerable A3cde+4cde	High
Crane, Grey Crowned	*Balearica regulorum*	Endangered A2acd+4acd	Endangered A2acd+4acd	High
Crane, Wattled	*Grus carunculata*	Critically Endangered C1+2a(ii)	Vulnerable A2acde+3cde+4acde	High
Duck, Maccoa	*Oxyura maccoa*	Near Threatened C1	Endangered A2acde	High
Eagle, Crowned	*Stephanoaetus coronatus*	Vulnerable C1; D1	Near Threatened A2cde+3cde+4cde	High
Eagle, Martial	*Polemaetus bellicosus*	Endangered A2cde; C1	Endangered A2acde+3cde+4acde	Medium
Eagle, Verreaux's	*Aquila verreauxii*	Vulnerable A2c; C1	Least Concern	Medium
Falcon, Lanner	*Falco biarmicus*	Vulnerable A2bc; C1	Least Concern	High
Flamingo, Greater	*Phoenicopterus roseus*	Near Threatened A2bd	Least Concern	Low
Flamingo, Lesser	*Phoeniconaias minor*	Near Threatened A2c+3c+4c	Near Threatened A2c+3c+4c	Low
Flufftail, Striped	*Sarothrura affinis*	Vulnerable A2c; C1+2a(i)	Least Concern	Low
Flufftail, White-winged	*Sarothrura ayresi*	Critically Endangered C2a(i)	Critically Endangered C2a(i)	Very Low
Harrier, African Marsh	*Circus ranivorus*	Endangered A2c+3c+4c; C1	Least Concern	High
Harrier, Black	*Circus maurus*	Endangered C1+2a(ii)	Endangered C2a(ii)	High
Harrier, Pallid	*Circus macrourus*	Near Threatened A2cde+3cde+4cde	Near Threatened A2cde+3cde+4cde	High
Ibis, Southern Bald	*Geronticus calvus*	Vulnerable C1+2a(ii)	Vulnerable C1+2a(ii)	High
Kingfisher, Half-collared	*Alcedo semitorquata*	Near Threatened A2c; B1b+2b(ii,iii,iv,v); C1	Least Concern	Medium
Korhaan, Blue	*Eupodotis caerulescens*	Least Concern	Near Threatened	Medium

Common Name	Scientific Name	Regional Status	Global Status	Likelihood of occurrence in or near proposed WTG areas
			A3c; C1	
Lark, Botha's	*Spizocorys fringillaris*	Endangered B2ab(ii,iii,iv,v); C1+2a(i)	Endangered A3c+4c	Medium
Lark, Rudd's	*Heteromirafra ruddi*	Endangered A2c+3c+4c; B2ab(i,ii,iii,iv,v); C1	Endangered A2bc+3bc+4bc	Medium
Owl, African Grass	*Tyto Capensis*	Vulnerable A2c; C1	Least Concern	Medium
Pipit, Mountain	*Anthus hoeschi*	Near Threatened C1+2a(ii)	Near Threatened C1+2a(ii)	High
Pipit, Short-tailed	*Anthus brachyurus*	Vulnerable B2ab; C1	Least Concern	Medium
Pipit, Yellow-breasted	*Anthus chloris*	Vulnerable A3c; C2a(i); D1	Vulnerable A3c; C2a(i); D1	Medium
Plover, Chestnut-banded	*Charadrius pallidus*	Near Threatened C1+2a(i)	Least Concern	Medium
Rock Thrush, Sentinel	*Monticola explorator*	Least Concern	Near Threatened A2bc+3bc+4bc	High
Secretarybird	*Sagittarius serpentarius*	Vulnerable A4acd; C1	Endangered A2acde+3cde+4acde	High
Stork, Black	*Ciconia nigra*	Vulnerable A2c; D1	Least Concern	Medium
Sugarbird, Gurney's	*Promerops gurneyi*	Least Concern	Near Threatened A2bc+3bc+4bc	High
Vulture, Cape	*Gyps coprotheres*	Endangered A2a	Vulnerable A2acde+3cde+4acde; C2a(ii)	Medium
Woodpecker, Ground	*Geocolaptes olivaceus*	Least Concern	Near Threatened A2bc+3bc+4bc	High

Pre-Application Avifaunal Monitoring Plan (PAAMP)

Survey Design

The initial survey design and methodology followed the Birds and Wind Energy Best-Practice Guidelines[22] and draft update[23]. While Cape Vulture and Verreaux's Eagle were not

[22] Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M., Smit-Robinson H.A. and Ralson, 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. Birdlife South Africa. Endangered Wildlife Trust.

[23] Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M., Smit-Robinson, H.A., Ralson-Paton, S. and Cervantes, F. 2021. 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. Birdlife South Africa. Endangered Wildlife Trust. DRAFT Fourth Edition.

listed by the Screening Tool, the utilisation of the site by these species is to be investigated through the increase in vantage point monitoring effort and recommendations of the Verreaux's Eagle Guidelines[24] and Cape Vulture & Wind Energy Best Practice Guidelines[25] where relevant as there is potential for these species to utilise the site on occasion.

Four monitoring trips and a dedicated nest survey are to coincide with relevant expected climatic conditions over a 12-month period to account for potential seasonal variation in the site utilisation by avifauna.

A team of two experienced bird observers are to conduct the first season of monitoring in August 2021 to coincide with the end of the dry season and peak wind speed of the westerly prevailing wind. The second season of monitoring is to be conducted in December 2021 to coincide with the peak of the wet season. The third season of monitoring is to be conducted in February 2022 to coincide with the end of the wet season and the easterly prevailing wind and the fourth season of monitoring is to be conducted in late May 2022 to coincide with the dry season. December and February monitoring is also timed to coincide with the potential peak of Black Harrier occurrence in the area. An additional and separate nest survey is to be conducted in late April 2022 to coincide with the onset of the breeding season of Verreaux's Eagle.

Vantage Point Surveys

Three Vantage Points (VPs) are to be surveyed across the WEF site (VP1, VP2 and VP3) at suitable areas of elevation to provide a good viewshed, and one on the control site (CVP1). Each site VP is to be surveyed for 18 hours (12 hours for the control site) during the first survey and re-evaluated thereafter depending on the observed levels of Verreaux's Eagle, Cape Vulture and Black Harrier activity. A minimum of 54 hours is therefore expected across site VPs. A pair of observers is to monitor a viewshed of 360 degrees with a radius of approximately 2 km. These viewsheds are to be the focus of observation, however if target species are noted beyond these (or if a species being recorded flies out of the viewshed but still visible), they are also to be recorded. For each flight of a target species the flight path is to be recorded on a large-scale map along with data on the number/species of bird(s) and type of flight, flight duration and flight height. Flight heights are to be recorded through five height bands: 1: 0 – 20 m; 2: 21 – 70 m; 3: 71 – 160 m; 4: 161 – 280 m and 5: >280 m.

Walk Transects

To sample abundances and species richness of small terrestrial species, five walked transects of 500 m each in length are to be established on the project site and one on the control site, positioned in areas identified to be of elevated habitat preference by available habitat modelling of e.g. Botha's Lark, Rudd's Lark and Yellow-breasted Pipit. Two observers are to walk between the start and end points of the transects whilst recording all birds seen or heard up to 150 m on either side of the transect. Beyond 150 m, only priority species are to be noted and recorded as incidental sightings. Surveys are to be conducted at least once per season.

Drive Transects

To sample abundances of large terrestrial birds and raptors, two driven transect routes are to be conducted within the project site (DT1 and DT2) and one transect conducted at the control site (CDT1). Driven transects are to be conducted at least once per survey. Target species are to be recorded by driving slowly (±25 km/h) with all windows open, and

[24] Ralston-Paton, S & Murgatroyd, M. 2021. Verreauxs' Eagle and Wind Farms: Guidelines for impact assessment, monitoring, and mitigation. Second Edition. BirdLife South Africa.

[25] Pfeiffer, M., & Ralston-Paton, S. 2018. Cape Vulture and Wind Farms Guidelines for impact assessment, monitoring and mitigation. BirdLife South Africa.

stopping occasionally to listen and scan the surrounding environment. When a target species is located, a GPS co-ordinate is to be recorded, along with the distance and direction from the vehicle to the observed bird. Additional information, such as weather conditions and habitat type, are also to be noted.

Incidental Observations

All other incidental sightings of priority species on the WEF site, control site and within the broader area are to be recorded and geo-referenced, along with additional relevant information such as weather and habitat type.

Nest Surveys

A nest survey is to be conducted during the second season of monitoring in December 2021 to locate evidence of breeding for wetland species such as cranes. This includes observations made from the vehicle when passing wetlands and dams. A second, dedicated Verreaux's Eagle nest survey is to be conducted through direct observation using a 60x Nikon spotting scope and include the searching of areas identified as likely to hold nest sites including cliffs, tall trees and transmission infrastructure. Habitat suitability maps for Verreaux's Eagle are to be projected onto the project map to identify and determine potential nest locations and these areas were directly observed within approximately 8 km from the project boundary.

APPENDIX B: IMPACT ASSESSMENT SCORING METHODOLOGY

CES has developed the following impact rating methodology which has been developed in line with the Terrestrial Biodiversity Protocol, as well as the content requirements of Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended). This scale takes into consideration the following variables:

- **Nature**: Negative or positive impact on the environment.
- **Type**: Direct, indirect and/or cumulative effect of impact on the environment.
- **Significance**: The criteria in Table 2.3 are used to determine the overall significance of an activity. The impact effect (which includes duration; extent; consequence and probability) and the reversibility/mitigation of the impact are then read off the significance matrix in order to determine the overall significance of the issue. The overall significance is either negative or positive and will be classified as low, moderate or high (Table 2.3).
- **Consequence:** The consequence scale is used in order to objectively evaluate how severe a number of negative impacts might be on the issue under consideration, or how beneficial a number of positive impacts might be on the issue under consideration.
- **Extent:** The spatial scale defines the physical extent of the impact.
- **Duration:** The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- **Probability:** The likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
- **Reversibility:** The degree to which an environment can be returned to its original/partially original state.
- **Irreplaceable loss:** The degree of irreplaceable loss which an impact may cause, e.g. loss of non-regenerative vegetation or removal of rocky habitat or destruction of wetland.
- **Mitigation potential:** The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 2.3 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 2.1: Impact rating criteria

CRITERIA	CATEGORIES	DESCRIPTION
Overall nature	**Negative**	Beneficial/positive impact.
	Positive	Detrimental/negative impact.
Type	**Direct**	Direct interaction of an activity with the environment.
	Indirect	Impacts on the environment that are not a direct result of the project or activity.
	Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
Duration	**Short term**	Less than 5 years.
	Medium term	Between 5-20 years.
	Long term	More than 20 years.
	Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.

CRITERIA	CATEGORIES		DESCRIPTION
Extent	**Localised**		Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
	Study area		The proposed site and its immediate environments.
	Municipal		Impacts affect the municipality, or any towns within the municipality.
	Regional		Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
	National		Impacts affect the entire country.
Consequence	**Slight**		Slight impacts or benefits on the affected system(s) or party(ies).
	Moderate		Moderate impacts or benefits on the affected system(s) or party(ies).
	Severe/Beneficial		Severe impacts or benefits on the affected system(s) or party(ies).
Probability	**Definite**		More than 90% sure of a particular fact. Should have substantial supportive data.
	Probable		Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
	Possible		Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
	Unsure		Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
Reversibility	**Reversible**		The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
	Irreversible		The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
Irreplaceable Loss	**Resource will not be lost**		The resource will not be lost/destroyed provided mitigation measures are implemented.
	Resource may be partly lost		The resource will be partially destroyed even though mitigation measures are implemented.
	Resource will be lost		The resource will be lost despite the implementation of mitigation measures.
Mitigation Potential	**Easily achievable**		The impact can be easily, effectively and cost effectively mitigated/reversed.
	Achievable		The impact can be effectively mitigated/reversed without much difficulty or cost.
	Difficult		The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
	Very Difficult		The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.
Impact Significance	**Low negative**	**Low positive**	Largely of HIGH mitigation potential, after considering the other criteria.
	Moderate negative	**Moderate positive**	Largely of MODERATE or partial mitigation potential after considering the other criteria.
	High negative	**High positive**	Largely of LOW mitigation potential after considering the other criteria.

APPENDIX C: SURVEY LOCATIONS

Table C1: Vantage Point (VP) Locations and hours surveyed during the 12-month monitoring programme.

VP	Latitude	Longitude	Survey Hours				Total
			1	2	3	4	
1	27°40'2.14"S	29°47'41.02"E	18	16	16	16	**66**
2	27°39'23.56"S	29°49'18.45"E	18	18	16	16	**68**
3	27°41'58.03"S	29°47'38.72"E	18	18	16	16	**68**
CVP1	27°36'21.87"S	29°44'6.03"E	12	12	16	16	**56**

Table C2: Walked Transect (WT) Locations.

WT No.	Start Coordinates		Finish Coordinates	
	Latitude	Longitude	Latitude	Longitude
1	27°38'26.97"S	29°48'56.74"E	27°38'22.77"S	29°49'13.27"E
2	27°38'58.66"S	29°49'37.21"E	27°38'48.87"S	29°49'51.81"E
3	27°40'42.57"S	29°47'56.74"E	27°40'58.58"S	29°47'56.83"E
4	27°41'24.04"S	29°48'3.06"E	27°41'37.72"S	29°48'12.47"E
5	27°42'5.68"S	29°47'37.80"E	27°42'20.78"S	29°47'37.67"E
CWT	27°36'17.04"S	29°44'24.19"E	27°36'21.33"S	29°44'6.79"E

Table C3: Driven Transect (DT) Locations.

DT No.	Start Coordinates		Finish Coordinates	
	Latitude	Longitude	Latitude	Longitude
1	27°41'57.51"S	29°47'38.99"E	27°40'2.16"S	29°47'41.03"E
2	27°38'7.23"S	29°49'0.60"E	27°39'31.97"S	29°48'11.06"E
CDT	27°36'21.42"S	29°44'6.13"E	27°38'19.04"S	29°46'40.34"E

APPENDIX D: SPECIES AND NUMBER OF INDIVIDUALS RECORDED DURING VANTAGE POINT SURVEYS, TRANSECTS AND INCIDENTALLY OVER THE FULL PRE-APPLICATION MONITORING PERIOD

Table D1: Average Passage Rates (birds/hour) of target species recorded across the proposed development site over four avifaunal monitoring surveys.

Species	VP1	VP2	VP3	Total
African Goshawk	0.01			**0.005**
African Harrier-Hawk	0.03			**0.009**
Amur Falcon	0.10	1.14	0.07	**0.435**
Black-winged Kite		0.06	0.01	**0.023**
Common Buzzard	0.06	0.10	0.04	**0.065**
Crowned Eagle		0.04		**0.014**
Forest Buzzard		0.03	0.10	**0.042**
Jackal Buzzard	0.38	0.03	0.36	**0.255**
Martial eagle	0.01		0.01	**0.009**
Rufous-breasted Sparrowhawk			0.01	**0.005**
Southern Bald Ibis	0.58	0.07	1.47	**0.708**
Tawny Eagle			0.01	**0.005**
Verreaux's Eagle			0.06	**0.019**

Table D2: Species and number of individuals recorded during walk transects over four monitoring surveys at the proposed project site.

Species	Transects					Total
	WT1	WT2	WT3	WT4	WT5	
African Hoopoe	1					1
African Olive Pigeon			1	1		2
African Palm Swift	1				2	3
African Pipit	7	2	1	2	1	13
African Stonechat	4				2	6
African Wattled Lapwing		2				2
Amur Falcon				1	5	6
Ant-eating Chat	3	1				4
Arrow-marked Babbler	3	1				4
Banded Martin	5	11			4	20
Barn Swallow	28	13			11	52
Black Cuckoo	1					1
Black Saw-wing	1					1
Black-crowned Tchagra	1					1

Species	Transects					Total
	WT1	WT2	WT3	WT4	WT5	
Black-headed Heron	2					2
Black-headed Oriole	2	3				5
Black-rumped Buttonquail	1					1
Black-throated Canary	1					1
Bokmakierie	1	2	2	1		6
Brown-crowned Tchagra	1					1
Brown-hooded Kingfisher		1				1
Buffy Pipit	1	3	5	4	1	14
Cape Batis	2			1		3
Cape Canary			1			1
Cape Crow	2	3	1	3	3	12
Cape Longclaw	1	5	7	2	8	23
Cape Robin-Chat	2		1	2		5
Cape Vulture		22				22
Cape Wagtail	1	2				3
Cape Weaver	1					1
Cape White-eye	5					5
Cloud Cisticola	1		4	4	1	10
Common Buzzard		3				3
Common House Martin					1	1
Crowned Lapwing	5					5
Dark-capped Bulbul	11	3		6		20
Diederik Cuckoo	2					2
Drakensberg Prinia	2	2				4
Egyptian Goose	3					3
Eurasian Hobby				1		1
Fan-tailed Widowbird		2				2
Fiscal Flycatcher	1					1
Forest Buzzard					1	1
Fork-tailed Drongo	2					2
Greater Striped Swallow	4					4
Green Wood Hoopoe	2					2
Hadada Ibis		1	4	3		8
Hamerkop	2					2
Harlequin Quail		1				1
Jackal Buzzard			1	1	1	3
Lazy Cisticola					2	2

Species	Transects					Total
	WT1	WT2	WT3	WT4	WT5	
Levaillant's Cisticola	1	12			1	14
Little Grebe	5					5
Long-tailed Widowbird	3	1				4
Malachite Kingfisher	2					2
Malachite Sunbird			3	1		4
Neddicky	2		1	4	1	8
Olive Thrush	1					1
Pied Crow	3					3
Pied Starling	4					4
Pin-tailed Whydah		3				3
Plain-backed Pipit			4	1		5
Quailfinch			2			2
Red-billed Quelea	17					17
Red-chested Cuckoo	2		3	3	1	9
Red-eyed Dove	1	2		1		4
Red-knobbed Coot	2					2
Red-winged Francolin			2			2
Red-winged Starling	6		3		1	10
Reed Cormorant	1					1
Ring-necked Dove	19	19	5	4		47
Rufous-naped Lark	5	4				9
South African Cliff Swallow	6					6
Southern Bald Ibis			28		3	31
Southern Boubou	3		1	3		7
Southern Fiscal		3	1	4	1	9
Southern Grey-headed Sparrow		1				1
Southern Masked Weaver	3					3
Speckled Pigeon	1				1	2
Swainson's Spurfowl	2	1				3
Verreaux's Eagle					1	1
Wailing Cisticola			2	1		3
White-rumped Swift	1				6	7
Wing-snapping Cisticola	7			2	7	16
Yellow-billed Duck	1					1
Zitting Cisticola	10	11		2	1	24
Total	**221**	**140**	**83**	**58**	**67**	**569**

Table D3: Walk Transect Results across the proposed development site over four avifaunal monitoring surveys showing the total observations with the total number of birds in parentheses, total species recorded and total number of birds per kilometre for each transect.

Transect	Total Observations (No. of Individual Birds)	Total Species Recorded	Birds/km
WT1 (n=6)	116 (225)	61	75
WT2 (n=6)	83 (148)	30	49.3
WT3 (n=6)	46 (90)	23	30
WT4 (n=6)	55 (65)	25	21.7
WT5 (n=6)	43 (72)	25	24

Table D4: Drive Transect Results across the proposed development site over four avifaunal monitoring surveys showing the total observations with the total number of birds in parentheses for each transect.

Species	DT1	DT2	Total
Amur Falcon	3 (6)		**3 (6)**
Common Buzzard	2 (2)	2 (2)	**4 (4)**
Jackal Buzzard	2 (2)		**2 (2)**
Southern Bald Ibis		1 (1)	**1 (1)**
Unidentified	1 (1)	2 (2)	**3 (3)**
Yellow-billed Kite	1 (1)		**1 (1)**
Total	**9 (12)**	**5 (5)**	**14 (17)**

Table D5: Incidental Observation of Target Bird Species on or near the proposed development site over four avifaunal monitoring surveys showing the total observations with the total number of birds in parentheses

Species	Regional Red Data Status	Priority Species Score	Total Observations (No. Individual Birds)
African Fish Eagle		290	1 (1)
African Harrier-Hawk		190	3 (3)
Amur Falcon		210	10 (56)
Black Harrier	EN	345	1 (1)
Black Sparrowhawk		170	1 (2)
Black-winged Kite		174	3 (4)
Blue Crane	NT	320	1 (4)
Cape Vulture	EN	405	1 (3)
Common Buzzard		210	14 (15)
Denham's Bustard	VU	300	1 (1)
Forest Buzzard		170	1 (1)

Species	Regional Red Data Status	Priority Species Score	Total Observations (No. Individual Birds)
Grey Crowned Crane	EN	314	1 (2)
Jackal Buzzard		250	10 (12)
Martial Eagle	EN	350	3 (3)
Secretarybird	VU	320	8 (9)
Southern Bald Ibis	VU	330	32 (250)
Spotted Eagle-Owl		170	1 (2)
Wattled Crane	CR	349	1 (2)
Unidentified Raptor			1 (1)
Unidentified Stork			1 (1)
Unidentified			3 (4)
Total	**9 (12)**	**5 (5)**	**98 (377)**

APPENDIX E: SABAP2 RECORDS FROM PENTADS IN AND AROUND THE PROJECT SITE

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Acacia Pied Barbet						27.8	14.3		4.7		2.4	20.7	6.8
African Black Duck					14.3	22.2	21.4		2.3	16.7	17.1	0.8	13.6
African Black Swift							7.1		55.8	16.7	7.3	2.5	1.7
African Cuckoo						5.6							
African Darter						5.6	7.1	11.1			4.9	0.8	1.7
African Dusky Flycatcher									2.3		4.9	1.7	1.7
African Firefinch						27.8					2.4	1.7	
African Fish Eagle			290				7.1	11.1	2.3				5.1
African Harrier-Hawk			190						7		7.3	29.8	1.7
African Hoopoe					28.6	44.4	7.1		9.3	66.7	36.6	66.9	16.9
African Jacana													6.8
African Marsh Harrier	EN, LC		300				7.1	11.1	2.3		4.9	0.8	
African Olive Pigeon									11.6	50			
African Palm Swift						16.7	14.3	11.1	2.3	16.7	36.6	58.7	27.1
African Paradise Flycatcher				27.3	42.9	33.3			4.7	16.7	17.1	24.8	3.4
African Pied Wagtail											2.4		
African Pipit				90.9	85.7	61.1	71.4	33.3	72.1	66.7	68.3	36.4	88.1
African Rail											2.4		
African Reed Warbler						5.6	7.1				7.3	2.5	5.1
African Sacred Ibis						11.1	21.4	22.2	16.3		51.2	13.2	81.4
African Snipe						16.7	7.1		14		12.2	4.1	
African Spoonbill						11.1	14.3		14		22	0.8	16.9
African Stonechat				90.9	85.7	66.7	85.7	66.7	72.1	66.7	80.5	51.2	49.2
African Wattled Lapwing				54.5	14.3	16.7	57.1	11.1	14	16.7	39	15.7	35.6
African Yellow Warbler						5.6					2.4	5	3.4
Alpine Swift									20.9	16.7	7.3	1.7	1.7
Amethyst Sunbird				9.1		33.3		11.1	2.3	33.3	14.6	47.9	1.7

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Amur Falcon			210	36.4	28.6	33.3	21.4	55.6	41.9	50	34.1	24.8	23.7
Ant-eating Chat				100	100	66.7	64.3	66.7	76.7	66.7	78	46.3	27.1
Arrow-marked Babbler						5.6					2.4	2.5	
Banded Martin				63.6	42.9	44.4	35.7	44.4	58.1	50	36.6	14.9	13.6
Barn Swallow				45.5	57.1	61.1	42.9	77.8	53.5	50	58.5	29.8	45.8
Barratt's Warbler									14				
Bar-throated Apalis						5.6			16.3	50	2.4		
Black (Southern Africa) Saw-wing						5.6				16.7	2.4		
Black Crake												1.7	5.1
Black Cuckoo					14.3	11.1			2.3	16.7		2.5	
Black Cuckooshrike						5.6							
Black Harrier	EN, EN	NE	345						4.7				
Black Heron							7.1				2.4		3.4
Black Sparrowhawk			170			11.1		11.1		33.3	14.6	15.7	11.9
Black Stork	VU, LC		330	9.1							2.4		
Black-backed Puffback						5.6							
Black-bellied Bustard			200		14.3	5.6						0.8	1.7
Black-chested Prinia									2.3				
Black-chested Snake Eagle			230								2.4		
Black-collared Barbet					57.1	77.8	14.3			33.3	39	86	16.9
Black-crowned Night Heron								11.1					1.7
Black-crowned Tchagra					28.6	16.7				16.7	4.9	3.3	
Black-headed Heron				36.4	28.6	22.2	35.7	44.4	20.9	83.3	56.1	9.9	66.1
Black-headed Oriole				9.1	28.6	55.6		33.3		50	41.5	50.4	11.9
Blacksmith Lapwing				18.2	14.3	22.2	71.4	66.7	39.5	16.7	85.4	41.3	98.3
Black-throated Canary				18.2	28.6	22.2	7.1	22.2	2.3	16.7	7.3	24.8	32.2
Black-winged Kite			174		42.9	27.8	57.1	66.7	9.3		29.3	25.6	37.3
Black-winged Lapwing			174	18.2					14				
Black-winged Stilt												0.8	79.7
Blue Crane	NT, VU		320	36.4					53.5	16.7			1.7

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Blue Korhaan	LC, NT	SLS	270	9.1				22.2	7		17.1	2.5	13.6
Blue Swallow	CR, VU		264									0.8	
Blue Waxbill						16.7	7.1	11.1					
Blue-billed Teal								11.1					39
Bokmakierie				18.2	71.4	55.6	7.1	33.3	69.8	100	12.2	28.9	8.5
Botha's Lark	EN, EN	E	250						2.3				
Brimstone Canary					14.3				2.3		2.4	9.1	
Bronze Mannikin												3.3	
Brown-backed Honeybird												1.7	
Brown-hooded Kingfisher					42.9	55.6	7.1	11.1	2.3		7.3	39.7	15.3
Brown-throated Martin				27.3	14.3	27.8	42.9	22.2		33.3	34.1	10.7	50.8
Brubru					14.3	61.1	7.1				9.8	14.9	1.7
Budgerigar												0.8	
Buff-spotted Flufftail												0.8	
Buff-streaked Chat			185		14.3	11.1			9.3	33.3			
Buffy Pipit				9.1		5.6			2.3				1.7
Bush Blackcap	VU, VU	SLS							11.6	33.3			
Cape Batis									11.6	16.7		0.8	
Cape Bunting					14.3				39.5	16.7			
Cape Canary				27.3	57.1	27.8	7.1	11.1	67.4	33.3	14.6	8.3	5.1
Cape Crow				100	85.7	50	35.7	22.2	72.1	100	78	10.7	8.5
Cape Eagle-Owl			250						2.3				
Cape Grassbird					28.6	44.4	7.1	11.1	18.6	33.3	22	10.7	8.5
Cape Longclaw				90.9	71.4	44.4	71.4	44.4	81.4	100	80.5	32.2	79.7
Cape Robin-Chat				54.5	28.6	55.6	21.4	33.3	55.8	50	58.5	88.4	27.1
Cape Rock Thrush									11.6	16.7	2.4		
Cape Shoveler									2.3				62.7
Cape Sparrow				63.6	57.1	50	50	44.4	11.6	50	65.9	86.8	62.7
Cape Starling				27.3	14.3	38.9	35.7	33.3		83.3	61	58.7	23.7
Cape Teal							7.1						76.3

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Cape Turtle Dove				81.8	100	94.4	78.6	77.8	58.1	83.3	75.6	90.1	55.9
Cape Vulture	EN, VU		405						2.3				
Cape Wagtail				36.4	71.4	94.4	64.3	66.7	39.5	66.7	78	86	72.9
Cape Weaver				9.1	42.9	22.2	21.4	33.3	14	16.7	19.5	57.9	25.4
Cape White-eye					14.3	55.6	7.1		34.9	83.3	34.1	78.5	27.1
Capped Wheatear									2.3				
Cardinal Woodpecker					14.3	11.1				16.7	4.9	4.1	
Chestnut-banded Plover	NT, LC		230										8.5
Chinspot Batis					14.3	44.4	7.1	11.1			4.9	19	6.8
Chorister Robin-Chat									2.3	16.7		1.7	
Cinnamon-breasted Bunting						11.1	7.1	11.1	14			0.8	
Cloud Cisticola				9.1	28.6	16.7		44.4	7	33.3	19.5	9.1	15.3
Common Buzzard			210	27.3	42.9	33.3	14.3	22.2	18.6	50	19.5	7.4	8.5
Common Greenshank													20.3
Common House Martin									2.3			0.8	3.4
Common Moorhen						16.7	7.1	11.1	2.3		14.6	14.9	16.9
Common Myna				9.1	14.3	11.1	28.6	11.1		16.7	61	87.6	83.1
Common Ostrich					28.6	16.7	7.1	22.2			51.2	0.8	
Common Quail				45.5	14.3	5.6		11.1	39.5	16.7	12.2	1.7	1.7
Common Ringed Plover													16.9
Common Sandpiper						5.6					2.4		13.6
Common Scimitarbill						22.2							
Common Swift									11.6		2.4	1.7	
Common Waxbill				27.3	85.7	66.7	64.3	44.4	30.2	83.3	39	49.6	45.8
Common Whitethroat												0.8	
Crested Barbet					42.9	61.1	7.1	11.1	2.3	16.7	26.8	57	10.2
Croaking Cisticola						5.6						1.7	
Crowned Lapwing				72.7	42.9	33.3	64.3	33.3	30.2	16.7	80.5	62	79.7
Curlew Sandpiper	LC, NT												23.7
Dark-capped Bulbul				27.3	100	88.9	64.3	44.4	37.2	66.7	82.9	79.3	33.9

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Denham's Bustard	VU, NT		300	18.2		5.6					2.4		
Desert Cisticola												0.8	
Diederik Cuckoo				27.3	57.1	55.6	14.3	44.4	7	16.7	39	24	11.9
Domestic Goose								11.1			4.9		
Drakensberg Prinia						27.8			30.2	33.3	4.9		
Dusky Indigobird											2.4		
Eastern Clapper Lark					28.6			11.1			2.4	0.8	
Eastern Long-billed Lark					14.3			11.1	7	16.7		1.7	
Egyptian Goose				36.4	85.7	66.7	78.6	66.7	25.6	50	73.2	36.4	86.4
European Bee-eater												1.7	
Fairy Flycatcher												1.7	
Familiar Chat					14.3	22.2	14.3		27.9	33.3	17.1	63.6	11.9
Fan-tailed Widowbird				18.2	71.4	38.9	28.6	66.7	4.7	33.3	51.2	22.3	49.2
Fiery-necked Nightjar					14.3	5.6			2.3	16.7	12.2	5	
Fiscal Flycatcher					42.9	33.3	7.1	11.1	2.3	16.7	7.3	26.4	16.9
Forest Canary									4.7		2.4	1.7	
Fork-tailed Drongo				27.3	14.3	50	7.1	11.1	18.6	83.3	43.9	50.4	20.3
Fulvous Whistling Duck										16.7			15.3
Garden Warbler												0.8	
Giant Kingfisher						16.7	14.3			16.7	17.1	2.5	1.7
Glossy Ibis						5.6						0.8	55.9
Golden-breasted Bunting					28.6	22.2			14	16.7	4.9	1.7	
Golden-tailed Woodpecker					14.3	22.2			2.3	50	4.9		
Goliath Heron							7.1				2.4		5.1
Great Egret											4.9		1.7
Great Reed Warbler												0.8	
Greater Double-collared Sunbird					14.3	22.2			4.7	33.3	4.9	27.3	1.7
Greater Flamingo	NT, LC		290			11.1							84.7
Greater Honeyguide						5.6	14.3				9.8		3.4
Greater Kestrel			174						4.7				

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Greater Striped Swallow				27.3	42.9	61.1	28.6	66.7	67.4	66.7	43.9	47.1	37.3
Green Wood Hoopoe					14.3	33.3			2.3	16.7	29.3	47.9	8.5
Green-backed Camaroptera													1.7
Grey Crowned Crane	EN, EN		314			5.6			11.6	16.7	4.9	2.5	8.5
Grey Heron						16.7		11.1	9.3	50	17.1	7.4	71.2
Grey-headed Gull													8.5
Grey-winged Francolin			190	18.2					7	16.7			
Ground Woodpecker	LC, NT	SLS							25.6	33.3			
Groundscraper Thrush						5.6	14.3				12.2	24	
Gurney's Sugarbird	LC, NT	NE							9.3			0.8	
Hadada Ibis				72.7	57.1	77.8	64.3	77.8	60.5	100	90.2	97.5	89.8
Half-collared Kingfisher	NT, LC		170			5.6				33.3	2.4		
Hamerkop					28.6	27.8	7.1	11.1	4.7	50	17.1	22.3	18.6
Helmeted Guineafowl				45.5	100	61.1	85.7	66.7		66.7	65.9	62.8	45.8
Horus Swift				9.1					4.7	33.3	4.9	2.5	3.4
House Sparrow				9.1	42.9	77.8	28.6	22.2	2.3	50	41.5	82.6	62.7
Indian Peafowl						5.6							
Intermediate Egret						5.6		11.1					11.9
Jackal Buzzard			250	45.5	14.3	22.2	7.1	11.1	30.2	66.7	19.5	4.1	6.8
Karoo Thrush				9.1		5.6					14.6	81.8	6.8
Kittlitz's Plover							7.1						66.1
Klaas's Cuckoo						22.2			7			2.5	3.4
Knob-billed Duck								11.1					
Kurrichane Thrush					14.3	22.2				16.7	4.9	10.7	3.4
Lanner Falcon	VU, LC		300				7.1		23.3	16.7	9.8	5	5.1
Laughing Dove				9.1	42.9	50	50	55.6	7	66.7	65.9	92.6	81.4
Lazy Cisticola					14.3				4.7	33.3	9.8	9.1	3.4
Lemon Dove									2.3				
Lesser Flamingo	NT, NT		290								2.4		57.6
Lesser Grey Shrike						5.6	7.1				2.4	0.8	1.7

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Lesser Honeyguide					28.6	16.7	7.1		2.3			1.7	
Lesser Kestrel			214					11.1				1.7	
Lesser Striped Swallow											2.4	0.8	1.7
Lesser Swamp Warbler						5.6		22.2				26.4	6.8
Levaillant's Cisticola				45.5	28.6	44.4	42.9	33.3	51.2	33.3	48.8	33.1	54.2
Little Bee-eater							7.1						
Little Egret							7.1	11.1			7.3	1.7	5.1
Little Grebe					14.3	22.2	7.1	22.2	25.6	16.7	29.3	5	66.1
Little Rush Warbler						5.6	7.1	11.1	2.3		2.4	9.9	3.4
Little Stint													62.7
Little Swift						11.1	21.4	44.4	9.3	33.3	14.6	34.7	69.5
Long-billed Crombec					14.3	5.6							
Long-billed Pipit				9.1			7.1						
Long-tailed Widowbird				100	85.7	44.4	100	88.9	67.4	83.3	65.9	46.3	49.2
Maccoa Duck	NT, EN								2.3				13.6
Malachite Kingfisher						27.8	14.3			16.7	14.6	6.6	1.7
Malachite Sunbird						5.6			51.2	33.3	7.3	10.7	1.7
Mallard												2.5	
Marsh Sandpiper												0.8	11.9
Martial Eagle	EN, EN		350					11.1					
Melodious Lark			180									0.8	
Mocking Cliff Chat					42.9	33.3			4.7	66.7	24.4	20.7	1.7
Montagu's Harrier			210						2.3				
Mountain Pipit	NT, NT	SLS	230	9.1									
Mountain Wheatear					14.3	5.6		11.1	55.8	16.7	4.9	16.5	5.1
Namaqua Dove							7.1					4.1	3.4
Natal Spurfowl									4.7	16.7	2.4	0.8	
Neddicky					57.1	27.8	14.3	22.2	9.3	66.7	36.6	23.1	22
Nicholson's Pipit				9.1	14.3	11.1			32.6	66.7		1.7	3.4
Olive Bushshrike									2.3	16.7		0.8	

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Olive Thrush									4.7	16.7	7.3	25.6	5.1
Olive Woodpecker					14.3				2.3	16.7			
Orange-breasted Bushshrike												0.8	
Orange-breasted Waxbill						11.1	28.6				2.4	11.6	3.4
Pale-crowned Cisticola				36.4	14.3				7		4.9		5.1
Pennant-winged Nightjar													1.7
Pied Avocet													66.1
Pied Crow					42.9	11.1	42.9	33.3	2.3	16.7	51.2	17.4	30.5
Pied Kingfisher						11.1	21.4	11.1		50	26.8	0.8	1.7
Pied Starling				72.7	28.6	38.9	50	44.4	62.8	33.3	87.8	45.5	54.2
Pin-tailed Whydah				27.3	57.1	77.8	71.4	77.8	27.9	83.3	56.1	46.3	52.5
Plain-backed Pipit						5.6	7.1	11.1	2.3		4.9	1.7	6.8
Purple Heron								11.1	7		12.2	9.9	8.5
Quailfinch				27.3		5.6	7.1		32.6	16.7	22	11.6	1.7
Red-backed Shrike						5.6			2.3			1.7	8.5
Red-billed Quelea				9.1		55.6	64.3	77.8	2.3	33.3	39	62	61
Red-billed Teal						16.7		33.3	18.6		2.4	1.7	72.9
Red-capped Lark				54.5	14.3	16.7	28.6	11.1	51.2		43.9	13.2	72.9
Red-chested Cuckoo					71.4	27.8		11.1	7		9.8	12.4	1.7
Red-chested Flufftail									4.7			0.8	
Red-collared Widowbird					28.6	38.9	21.4	11.1	7	33.3	7.3	19	6.8
Red-eyed Dove				36.4	14.3	50	28.6	33.3	7	50	68.3	78.5	45.8
Red-faced Mousebird						5.6	7.1		2.3		7.3	33.1	3.4
Red-footed Falcon	NT, VU		174									5	
Red-headed Finch							14.3				4.9	64.5	6.8
Red-knobbed Coot				18.2	14.3	38.9	50	77.8	39.5	16.7	75.6	22.3	69.5
Red-throated Wryneck					42.9	22.2	28.6	11.1	2.3	33.3	19.5	42.1	6.8
Red-winged Francolin					14.3				2.3	16.7			
Red-winged Starling					100	27.8	28.6	33.3	53.5	83.3	41.5	68.6	33.9
Reed Cormorant				18.2	28.6	38.9	50	33.3	23.3	66.7	51.2	10.7	39

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Rock Dove						5.6	7.1				7.3	19	50.8
Rock Kestrel							7.1		23.3				
Rock Martin						5.6	7.1		53.5	16.7	4.9	4.1	3.4
Rudd's Lark	EN, EN	E	230						32.6	16.7			
Ruff													71.2
Rufous-breasted Sparrowhawk			170						9.3		2.4		
Rufous-naped Lark				9.1	85.7	50	42.9	55.6		83.3	58.5	27.3	47.5
Sabota Lark													1.7
Sand Martin											2.4	0.8	5.1
Secretarybird	VU, EN		320	18.2	28.6			11.1	9.3	33.3	7.3	2.5	3.4
Sentinel Rock Thrush	LC, NT	SLS							53.5	16.7			
Sombre Greenbul									2.3				
South African Cliff Swallow				27.3	14.3	16.7	50	33.3	27.9	50	41.5	25.6	71.2
South African Shelduck								11.1	11.6		12.2		35.6
Southern Bald Ibis	VU, VU	SLS	330	27.3	57.1	66.7	42.9		60.5	83.3	56.1	39.7	52.5
Southern Black Flycatcher											2.4	0.8	
Southern Black Tit						33.3							
Southern Boubou				9.1	28.6	38.9			41.9	66.7	12.2	11.6	3.4
Southern Double-collared Sunbird									2.3			5.8	
Southern Fiscal				72.7	100	77.8	71.4	77.8	44.2	100	92.7	85.1	79.7
Southern Grey-headed Sparrow				9.1	57.1	38.9	28.6	22.2	2.3	50	29.3	16.5	13.6
Southern Masked Weaver				63.6	71.4	94.4	85.7	88.9	18.6	83.3	80.5	92.6	74.6
Southern Pochard													30.5
Southern Red Bishop				63.6	42.9	66.7	71.4	77.8	18.6	66.7	73.2	66.1	69.5
Speckled Mousebird						44.4	7.1	11.1	2.3	50	41.5	80.2	20.3
Speckled Pigeon				9.1	28.6	77.8	57.1	55.6	44.2	100	70.7	81.8	66.1
Spectacled Weaver												1.7	
Spike-heeled Lark				18.2	14.3	5.6	14.3	22.2	20.9	16.7	17.1	16.5	18.6
Spotted Eagle-Owl			170							16.7	7.3	17.4	3.4
Spotted Flycatcher						16.7				16.7	2.4	4.1	

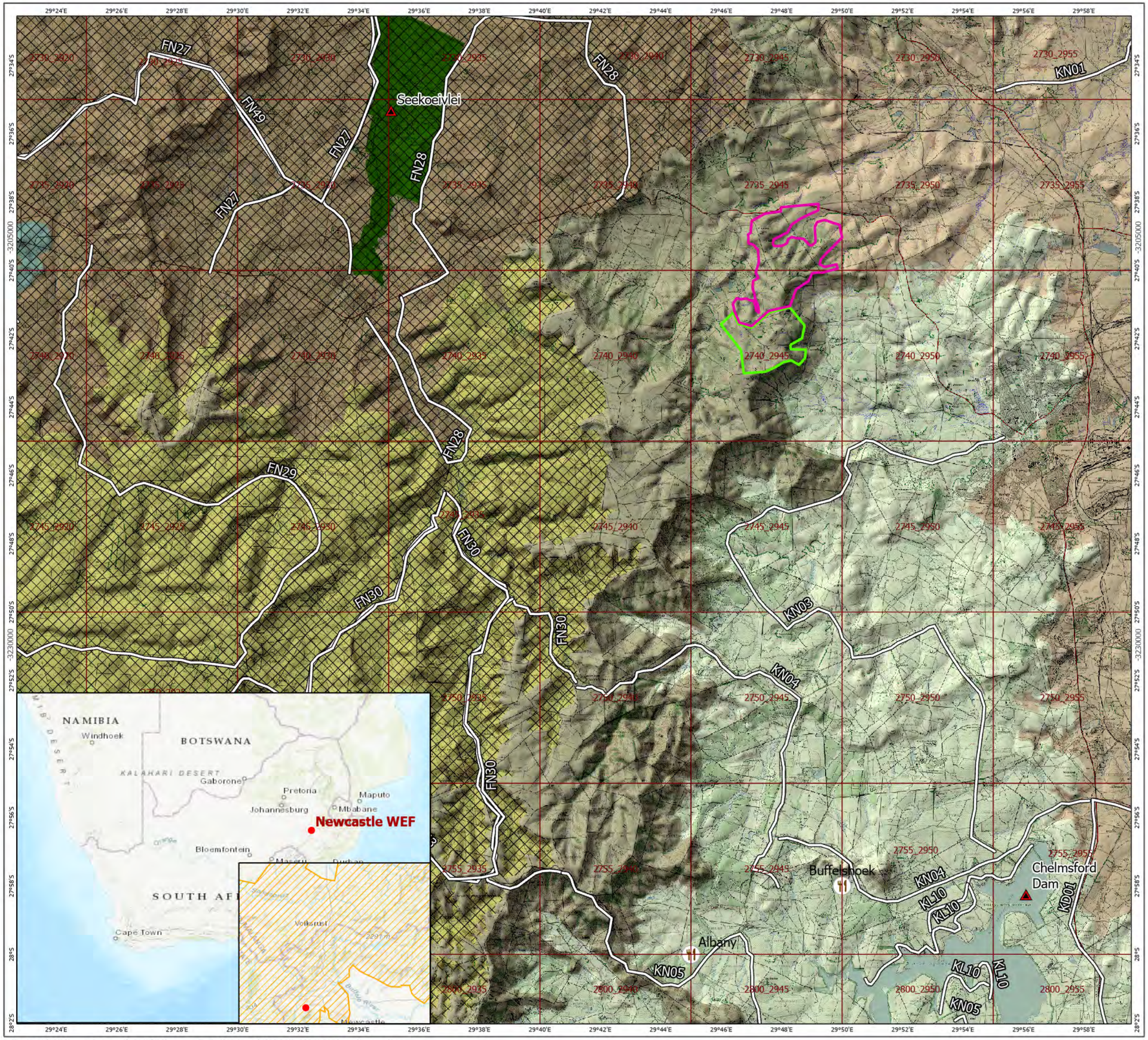
Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
Spotted Thick-knee						11.1	21.4	11.1			17.1	53.7	33.9
Spur-winged Goose				27.3	42.9	27.8	35.7	66.7	2.3	50	58.5	11.6	39
Squacco Heron								11.1					3.4
Streaky-headed Seedeater						27.8	21.4		7		2.4	13.2	
Swainson's Spurfowl				9.1	42.9	38.9	42.9	55.6	2.3	16.7	43.9	23.1	20.3
Tawny-flanked Prinia					28.6	33.3	7.1	11.1	2.3	50	22	15.7	16.9
Temminck's Courser					14.3				2.3				5.1
Thick-billed Weaver												11.6	
Three-banded Plover							14.3				24.4	2.5	67.8
Verreaux's Eagle	VU, LC		360						27.9				
Verreaux's Eagle-Owl			210		14.3								
Village Weaver						27.8	7.1				4.9	28.1	1.7
Violet-backed Starling					14.3	22.2			2.3		7.3	8.3	
Wailing Cisticola						5.6			58.1	16.7	2.4	0.8	
Wattled Crane	CR, VU		349						14				
Wattled Starling											2.4		5.1
Western Barn Owl											4.9	0.8	
Western Cattle Egret				27.3	42.9	55.6	92.9	66.7	9.3	83.3	63.4	49.6	83.1
Whiskered Tern									11.6		2.4		32.2
White Stork			220	18.2	14.3	11.1	7.1		7	50	12.2	3.3	13.6
White-backed Duck													1.7
White-bellied Bustard	VU, LC		270		14.3	11.1	35.7	22.2			19.5	5.8	3.4
White-bellied Sunbird						16.7	7.1				14.6	53.7	13.6
White-breasted Cormorant						5.6	14.3			16.7	7.3	1.7	25.4
White-browed Scrub Robin						22.2	7.1				2.4	0.8	
White-faced Whistling Duck						16.7	7.1				14.6	0.8	55.9
White-fronted Bee-eater						16.7							
White-necked Raven									7				
White-rumped Swift				18.2		16.7	35.7	44.4	18.6	33.3	26.8	26.4	30.5
White-throated Swallow				9.1	14.3	55.6	57.1	33.3	44.2	83.3	58.5	27.3	57.6

Species	Red Data Status	Endemic or Near-Endemic	Priority Score	Reporting Rate (%)									
				2735_2940	2735_2945	2735_2950	2735_2955	2735_3000	2740_2940	2740_2945	2740_2950	2740_2955	2740_3000
White-winged Tern						5.6	7.1			16.7	2.4		37.3
White-winged Widowbird						16.7					9.8	0.8	1.7
Willow Warbler									2.3			5	
Wing-snapping Cisticola				54.5	14.3	16.7		11.1	55.8	16.7	14.6	6.6	1.7
Wood Sandpiper												0.8	42.4
Yellow Bishop									25.6	16.7	2.4	1.7	
Yellow-billed Duck				63.6	28.6	38.9	35.7	55.6	25.6	16.7	53.7	11.6	67.8
Yellow-billed Kite									7			2.5	3.4
Yellow-breasted Pipit	VU, VU	E	245						51.2				
Yellow-crowned Bishop				27.3	14.3		14.3		9.3	33.3	24.4		5.1
Yellow-fronted Canary					14.3	38.9		22.2	2.3	16.7	39	27.3	10.2
Yellow-throated Bush Sparrow					14.3		7.1				4.9		
Zitting Cisticola				36.4	57.1	50	21.4	66.7	18.6	50	61	19	32.2

APPENDIX F: SPECIALIST DECLARATION

APPENDIX G: SPECIALIST CV

APPENDIX H: PROFESSIONAL REGISTRATION



ARCUS

- Mulilo Newcastle Wind Power
- Mulilo Newcastle Wind Power 2
- Ramsar Site, Wetland of International Importance
- Pentads
- Mesic Highveld Grassland Bioregion
- Amersfoort Highveld Clay Grassland
- Eastern Free State Sandy Grassland
- Frankfort Highveld Grassland
- KwaZulu-Natal Highland Thornveld
- Low Escarpment Moist Grassland
- Northern KwaZulu-Natal Moist Grassland
- Southern Mistbelt Forest
- CWAC Site
- CAR Route
- Vulture Restaurant

1:225,000 Scale @ A3

0 4.5 9 km

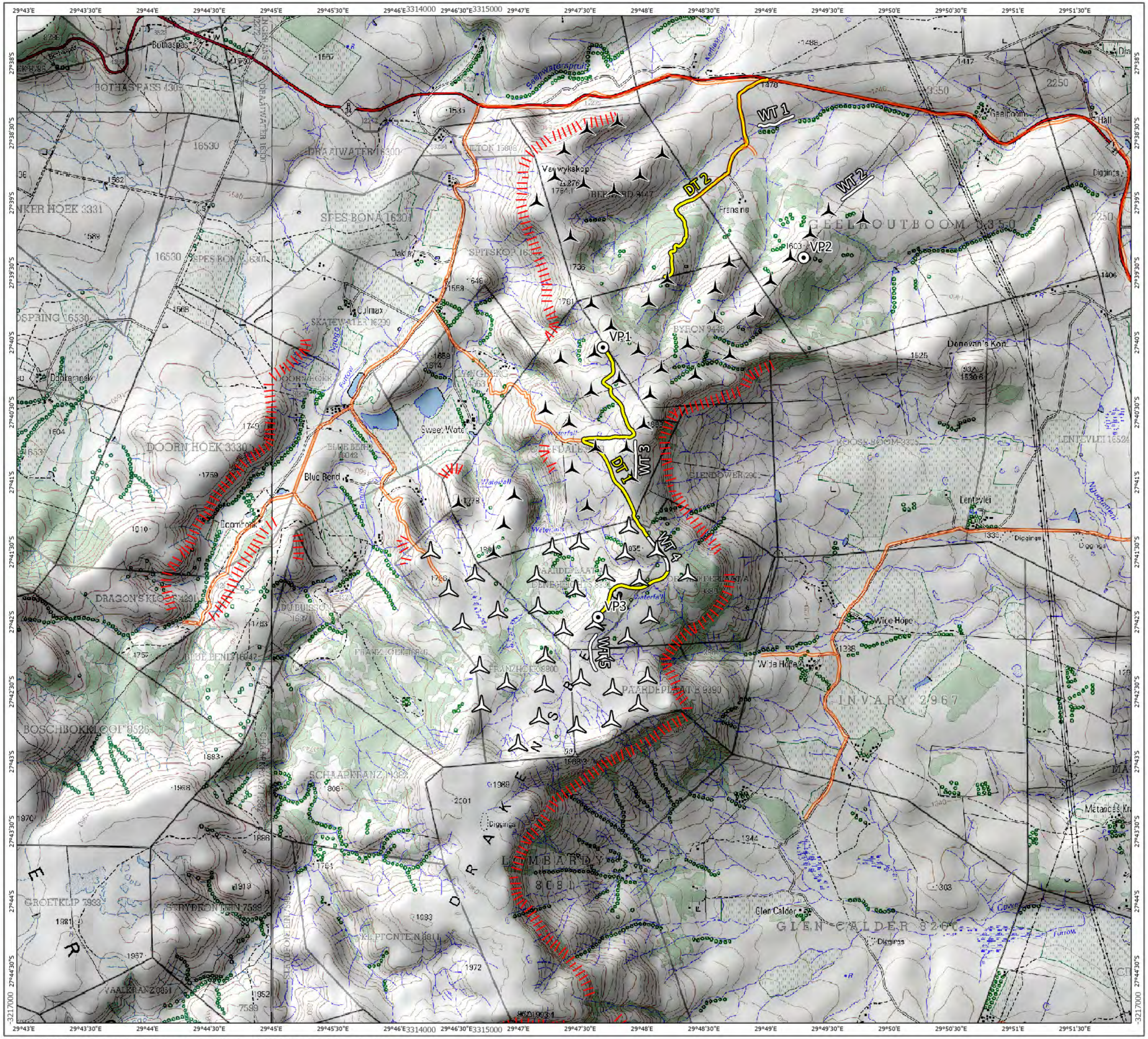
NORTH

Produced By: OD	Ref: 4323-EIA-0018
Checked By: AB	Date: 1/11/2023

Location and Vegetation
Figure 1

Mulilo Newcastle Wind Power Avifaunal Impact Assessment

G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-0018 Fig 1 Vegetation Location



ARCUS

- Cliffs Observed
- Nest Survey Route
- Vantage Point
- Walked Transect
- Driven Transect
- Mulilo Newcastle Wind Power WTG (Indicative)
- Mulilo Newcastle Wind Power 2 WTG (Indicative)

1:55,000 Scale @ A3

0 1 2 km

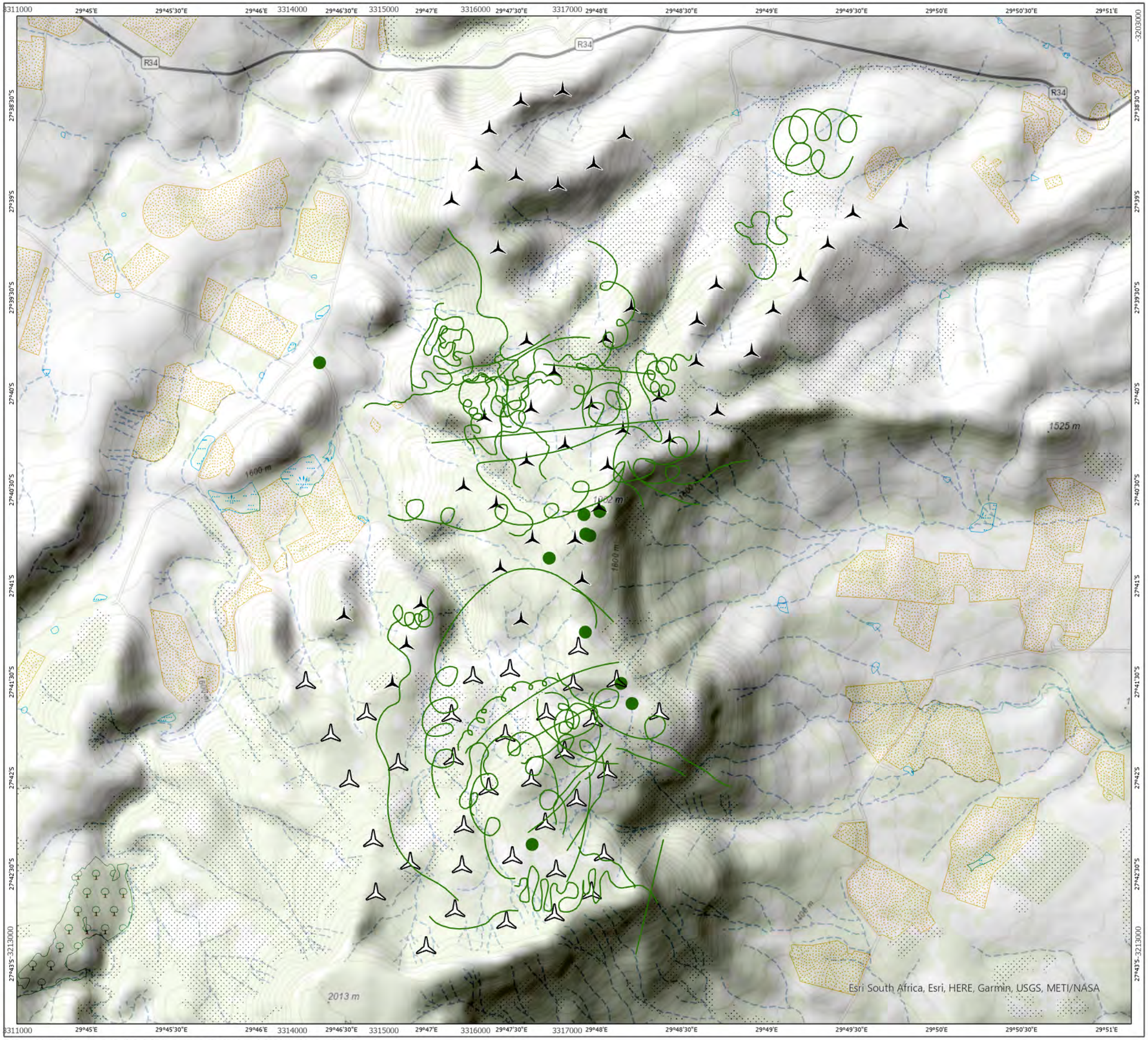
NORTH

Produced By: OD	Ref: 4323-EIA-0019
Checked By: AB	Date: 1/12/2023

Indicative Layout and Survey Locations

Figure 3

Mulilo Newcastle Wind Power Avifaunal Impact Assessment



ARCUS

- Jackal Buzzard Incidental
- Jackal Buzzard Flight Path
- MNWP2 WTG Location (Indicative)
- MNWP1 WTG Location (Indicative)
- Cultivated Land
- Forest and Woodlands
- Plantation
- Drainage Line
- Wetland / Dam

1:40,000 Scale @ A3

0 0.75 1.5 km

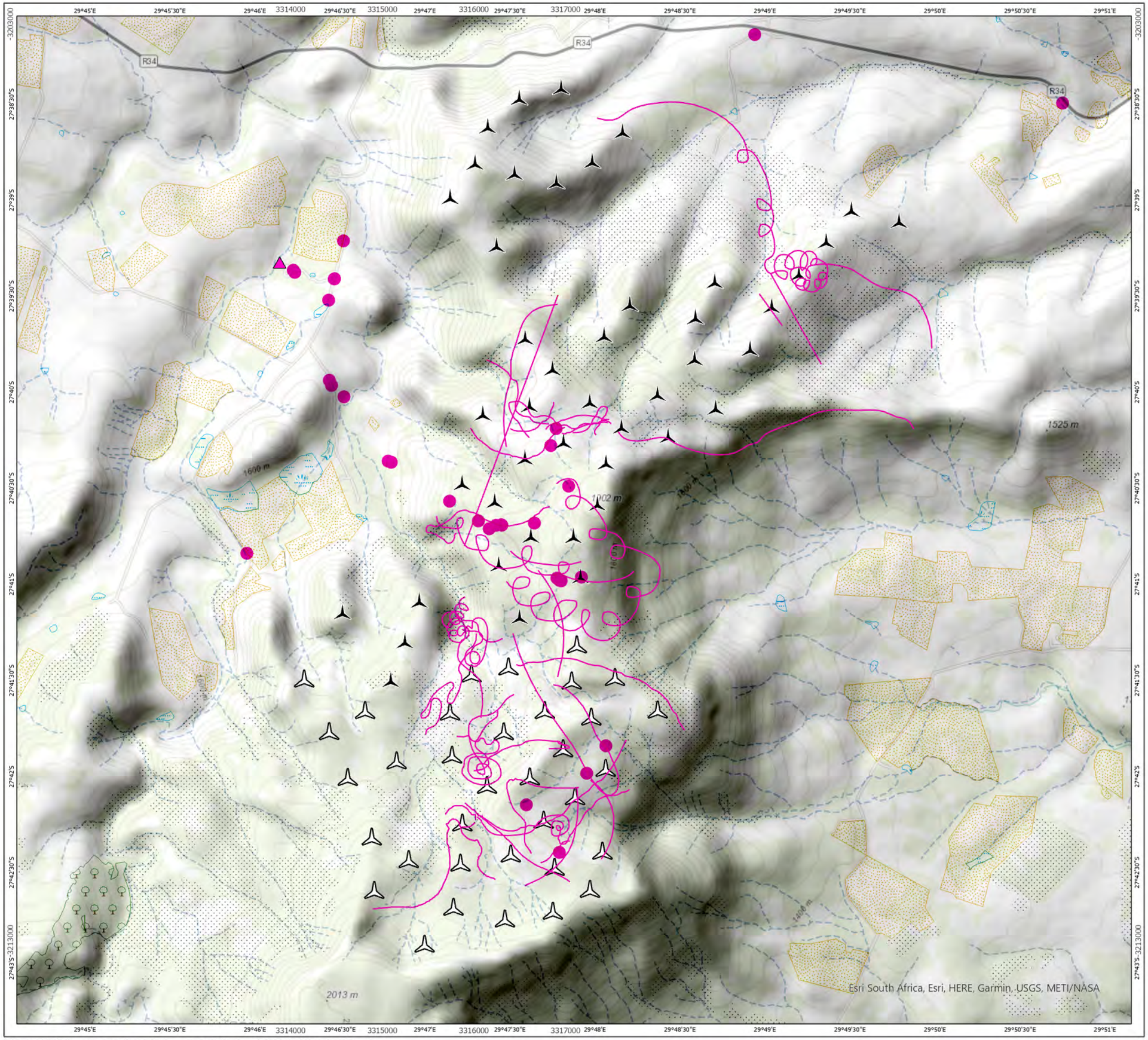
NORTH

Produced By: OD	Ref: 4323-EIA-0020
Checked By: AB	Date: 1/24/2023

Jackal Buzzard Records
Figure 4

Mulilo Newcastle Wind Power Avifaunal Impact Assessment

G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-002- Fig 4 JABU Records



ARCUS

- Southern Bald Ibis Incidental
- Southern Bald Ibis Flight Parth
- Southern Bald Ibis Colony
- MNWP1 WTG Position (Indicative)
- MNWP2 WTG Position (Indicative)
- Drainage Line
- Wetland / Dam
- Cultivated Land
- Forest and Woodlands
- Plantation

1:40,000 Scale @ A3

0 0.75 1.5 km

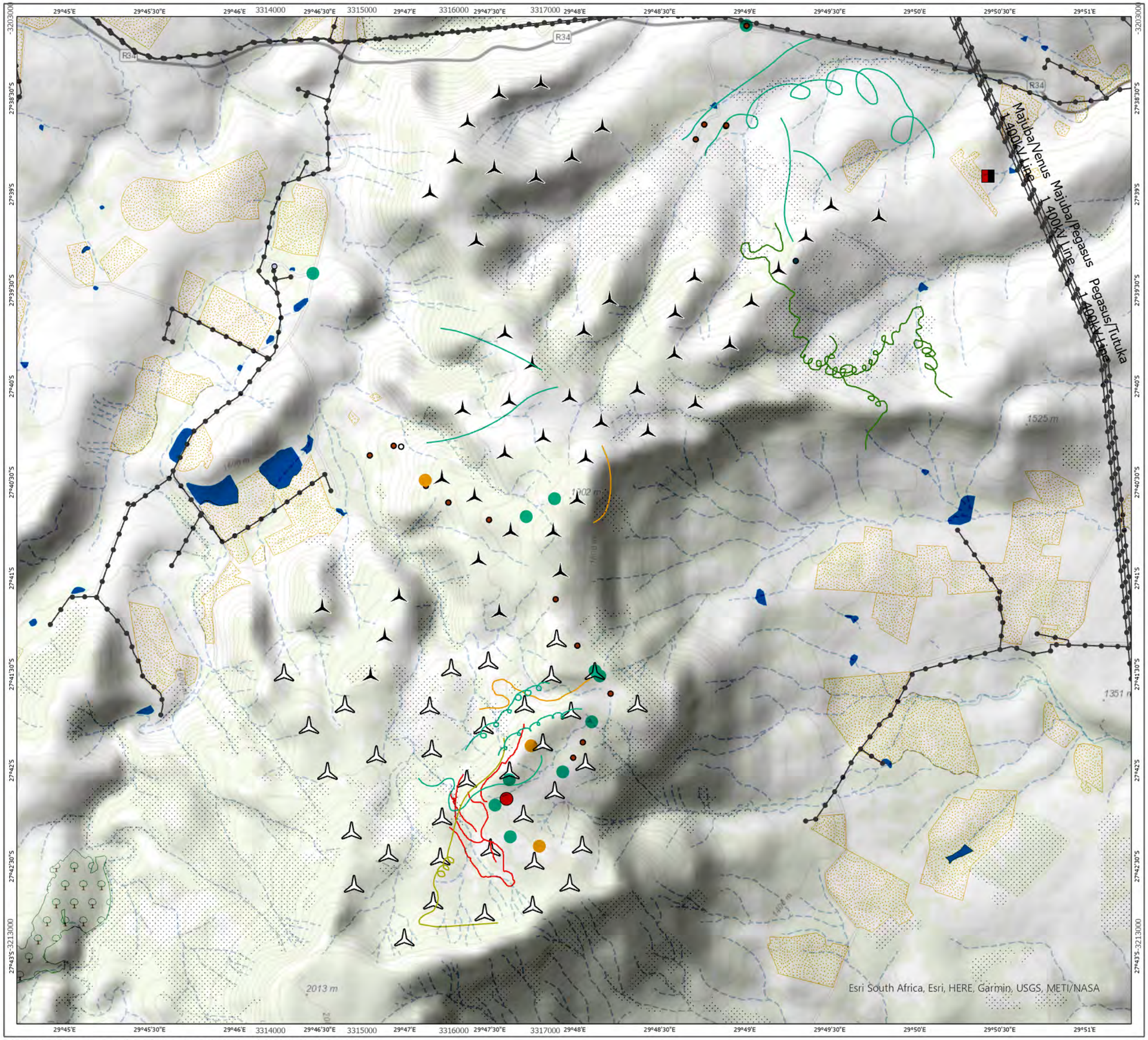
NORTH

Produced By: OD	Ref: 4323-EIA-0021
Checked By: AB	Date: 1/24/2023

Southern Bald Ibis Records
Figure 5

Mulilo Newcastle Wind Power Avifaunal Impact Assessment

G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-0021 Fig 5 SBI Records



ARCUS

- Mulilo Newcastle Wind Power - Turbine Layout - Dec2022
- Mulilo Newcastle Wind Power 2 - Turbine Layout - Dec2022
- Existing OHPL
- Drainage Line
- Cultivated Land
- Forest and Woodlands
- Plantation

Flight Paths

- Amur Falcon
- Tawny Eagle
- Crowned Eagle
- Martial Eagle
- Verreaux's Eagle

Incidental Records

- African Fish Eagle
- Amur Falcon
- Black Sparrowhawk
- Black-winged Kite
- Blue Crane
- Cape Vulture
- Common Buzzard
- Forest Buzzard
- Martial Eagle
- Verreaux's Eagle

1:40,000 Scale @ A3

0 0.75 1.5 km

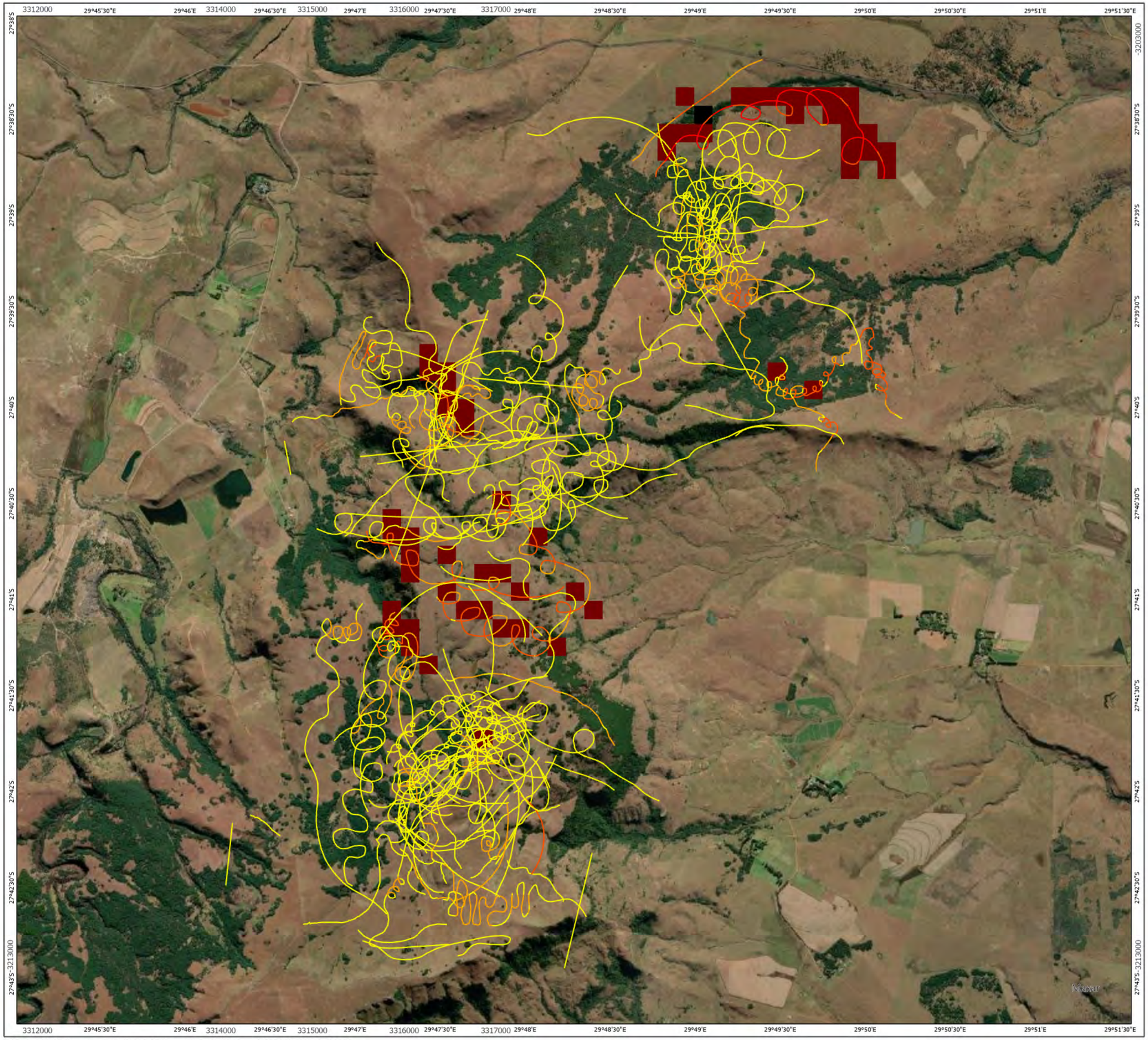
NORTH

Produced By: OD	Ref: 4323-EIA-0022
Checked By: AB	Date: 1/24/2023

Other Target Species Records
Figure 6

Mulilo Newcastle Wind Power
Avifaunal Impact Assessment

G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-0022 Fig 6 Eagle Records



G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-0023 Fig 7 GCSS

ARCUS

Flight Portion Risk

- Low
- Medium
- Medium - High
- High

Grid Cell Sensitivity Score

- Low
- Medium
- Medium - High
- High

1:40,000 Scale @ A3

0 0.75 1.5 km

NORTH

Produced By: AB	Ref: 4323-EIA-0023
Checked By: AB	Date: 1/24/2023

Flight Path Collision Risk Areas
Figure 7

Mulilo Newcastle Wind Power
Avifaunal Impact Assessment

G:\Projects\4323 Newcastle South WEF\4323 Newcastle South WEF3.aprx\4323-EIA-0024 Fig 8 Sensitivity

ARCUS

- MNWP1 WTG Position (Indicative)
- MNWP2 WTG Position (Indicative)
- Mulilo Newcastle Wind Power
- Mulilo Newcastle Wind Power 2

Avifaunal Sensitivity

- Very-high Sensitivity (WTG No-Go)
- High Sensitivity (WTG Base No-Go)
- Medium Sesitivity (WTG Permitted with Additional Mitigation)
- Low Sensitivity

1:40,000 Scale @ A3

0 0.75 1.5 km

NORTH

Produced By: OD	Ref: 4323-EIA-0024
Checked By: AB	Date: 1/24/2023

Avifaunal Sensitivity Map
Figure 8

Mulilo Newcastle Wind Power
Avifaunal Impact Assessment

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	14/12/16/3/3/2/2212
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

MULILO NEWCASTLE WIND POWER (PTY) LTD, WIND ENERGY FACILITY NEAR NEWCASTLE, KWAZUZU-NATAL PROVINCE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)		Percentage Procurement recognition	
Specialist name:	OWEN RHYS DAVIES			
Specialist Qualifications:	PhD ZOOLOGY (ORNITHOLOGY)			
Professional affiliation/registration:	SACNASP 117555			
Physical address:	1st FLOOR GREAT WESTERFORD 240 MAIN ROAD RONDEBOSCH, CPT			
Postal address:	AS ABOVE			
Postal code:	7700	Cell:	+27725580080	
Telephone:	+27 10 596 3403	Fax:		
E-mail:	OWEN.DAVIES@ERM.COM			

2. DECLARATION BY THE SPECIALIST

I, OWEN RHYS DAVIES, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

Name of Company:

2023-02-08

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, GWENRHYS DAVIES, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

Name of Company

2023-02-08

Date

7n1559-1
Sgt Sloman.

Signature of the Commissioner of Oaths

2023-02-08

Date

SUID-AFRIKAANSE POLISIEDIENS
DIST 3
STASIEBEVELVOERDER
2023 -02- 08
STATION COMMANDER
DIEPRIVIER K.P./C.P.
SOUTH AFRICAN POLICE SERVICE

DIEPRIVER
2023.02.08
7n1559-1
Sgt Sloman.

Nontombi Sloman.
104 main road
Diepriver
Sgt

CURRICULUM VITAE

Dr Owen Davies Pr. Sci. Nat. (Ecology)

Senior Ecologist – Avifaunal Specialist

Email:OwenD@arcusconsulting.co.za

Specialisms

- Avifaunal surveys
- Ecological surveys
- Field research
- Data analysis and assessment of ecological data

Summary of Experience

Owen is a Professional Natural Scientist registered with the South African Council for Natural Scientific Professions (SACNASP) and obtained his doctoral degree from the Percy FitzPatrick Institute of African Ornithology, a DST-NRF Centre of Excellence at the University of Cape Town. Owen has been involved in avifaunal monitoring activities for renewable energy projects since 2013. Extensive field research has given Owen experience in the techniques required for conducting biological surveys on a variety of taxa including observations, physical trapping and identification of small terrestrial birds, raptors, bats, small mammals, rodents, snakes, reptiles, scorpions and fish. He is also qualified to conduct observations and acoustic monitoring of marine mammals in the offshore environment. Data collection in a diversity of habitats and ecosystems, combined with formal training in field skills such as off-road driving, enables Owen to conduct ecological surveys across southern Africa. In addition, his skills in data analysis and scientific writing at the PhD level enable him to produce high quality assessments and reports.

Qualifications and Professional Interests

- **University of Cape Town, Percy FitzPatrick Institute of African Ornithology, 2010 to 2015**
  PhD Zoology
- **University of Cape Town, Percy FitzPatrick Institute of African Ornithology, 2008 to 2010**
  MSc Zoology (upgraded to PhD)
- **University of Cape Town, 2007**
  BSc Zoology (Hons)
- **University of Cape Town, 2003 to 2006**
  BSc Zoology
  BSc Botany

Professional History

2019 to present - Avifaunal Specialist, Ecologist, field team leader, Arcus Consultancy Services South Africa (Pty) Ltd, Cape Town
2015 to 2017 - Ecologist, Avifaunal Field Team Leader, Arcus Consultancy Services
2014 to 2015 - Bat monitoring field assistant, Arcus Consultancy Services
2013 to 2015 - Avifaunal observer, Arcus Consultancy Services
2009 to 2013 - Research Assistant (birds) to Dr J. Fuchs (Curator of Birds at the Muséum national d'Histoire naturelle, Paris), throughout South Africa
2007 to 2013 - Research Assistant (birds) to Prof T. M. Crowe (Percy FitzPatrick Institute of African Ornithology, Department of Zoology, University of Cape Town), throughout South Africa
2011 - Research Assistant (birds) to Dr I. Little, Endangered Wildlife Trust, Uganda
2010 - Research Assistant (bats) to Asst. Prof Hassan Salata, Department of Wildlife (South Sudan), Northern Cape
2010 to 2011 - Research Assistant (small mammals) to Dr B. Smit, University of Pretoria, Northern Cape
2010 - Research Assistant to Dr H. Smit-Robinson, Birdlife SA, Western and Northern Cape

CURRICULUM VITAE

Project Experience

- Confidential Transmission Infrastructure near Upington, Northern Cape Province (Avifaunal assessment)
- Confidential WEF near Volksrust, Mpumalanga Province (Avifaunal assessment, Ecological assessment)
- Confidential WEF near Newcastle, KwaZulu-Natal (Avifaunal Assessment)
- Confidential Solar Energy Facility near Touws River, Western Cape Province (Avifaunal assessment, Ecological assessment)
- Confidential Solar Energy Facility near De Aar, Northern Cape Province (Avifaunal assessment)
- Confidential Transmission Infrastructure near De Aar, Northern Cape Province (Avifaunal assessment, Ecological assessment)
- Confidential Transmission Infrastructure near Nelspoort, Western Cape Province (Avifaunal assessment);
- Confidential WEF near De Doorns, Western Cape Province (Avifaunal assessment, Ecological assessment)
- Confidential WEF near Nelspoort, Western Cape Province (Avifaunal assessment)
- Confidential Solar Energy Facility near Nelspoort, Western Cape Province (Avifaunal assessment)
- Confidential WEF near Beaufort West, Western Cape Province (Avifaunal monitoring, data analysis and reporting)
- Confidential WEF near Lutzville, Western Cape Province (Ecological assessment and reporting)
- Umsinde Emoyeni WEF (Avifaunal assessment, data analysis and reporting)
- Confidential WEF near Molteno, Northern Cape Province (Avifaunal monitoring data analysis and reporting)
- Confidential Battery Energy Storage System (BESS) near De Aar, Northern Cape Province (Avifaunal assessment, Ecological Assessment, site-walkthrough and reporting)
- Confidential Grid Connection near De Aar, Northern Cape Province (Avifaunal assessment, Ecological assessment, site-walkthrough, data analysis and reporting)
- Confidential WEF near Yzerfontein, Western Cape Province (Avifaunal assessment, Ecological assessment, site-walkthrough, data analysis and reporting)
- Confidential WEF near Kuruman, Northern Cape Province (Ecological Assessment and reporting)
- Confidential WEF near Pofadder, Northern Cape Province (Avifaunal assessment and reporting)
- Confidential WEF near Nelspoort, Western Cape Province (Avifaunal assessment and reporting)
- Metsimatala Solar (Field team leader, bird observations, data analysis and reporting in collaboration with specialists)
- Kolkies WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Karee WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Gouda WEF (Field team leader, bird observations – post construction)
- Hopefield WEF (Field team leader, bird observations, data analysis and reporting in collaboration with specialists – post construction)
- Spitzkop West WEF (Bird observations, bat mast commission)
- Pofadder WEF (Bat mast commission)
- Cookhouse WEF (Bat mast commission and decommission)
- Komsberg WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Bokpoort Solar (Avifaunal assessment, bird observations, data analysis and reporting)

Publications

FJELDSÅ, J., DINESEN, L., DAVIES, O.R., IRESTEDT, M., KRABBE, N.K., HANSEN, L.A. AND BOWIE, R.C. 2021. Description of two new Cisticola species endemic to the marshes of the Kilombero floodplain of southwestern Tanzania. Ibis. https://doi.org/10.1111/ibi.12971

JUNKER, K., SPICKETT, A., DAVIES, O.R., JANSEN, R., KRASNOV, B. R. 2021. Gastrointestinal nematodes in two galliform birds from South Africa: patterns associated with host sex and age. Parasitology Research. https://doi.org/10.1007/s00436-021-07254-0

DAVIES, O.R, JUNKER, K, JANSEN, R, CROWE, T.M. & BOOMKER, J. 2008. Age- and sex-based variation in helminth infection of Helmeted Guineafowl (*Numida meleagris*) with comments on Swainson's Spurfowl (*Pternistis swainsonii*) and Orange River Francolin (*Scleroptila levaillantoides*). South African Journal of Wildlife Research 38 (2): 163-170.

JUNKER, K., DAVIES, O.R., JANSEN, R., CROWE, T.M. & BOOMKER, J. 2008. Nematodes of Swainson's Spurfowl *Pternistis swainsonii* and Orange River Francolin *Scleroptila levaillantoides* from the Free State province, South Africa, with a description of *Tetrameres swainsonii*, sp. nov. (Nematoda: Tetrameridae). Journal of Helminthology 82: 365-371.

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Owen Rhys Davies

Registration Number: 117555

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective **19 July 2017** Expires **31 March 2023**

Chairperson

Chief Executive Officer

To verify this certificate scan this code