Final Avian Re-Assessment for turbines proposed for the RIETKLOOF WIND ENERGY DEVELOPMENT AREA, ROGGEVELD

Produced for:

CONTENTS

1 SUMMARY

This study contains a re-appraisal of the impacts and mitigation suggested for the proposed Rietkloof Wind Energy Facility by Rietkloof Wind Energy Facility (Pty) Limited. It is also a part 2 amendment given that the turbine numbers and dimensions have changed from that authorised (below). The avian component was previously surveyed in 2016 by African Insights (Williams 2016), and Birds & Bats Unlimited were asked to undertake a short re-assessment of the priority raptors in May 2021. The primary aim was to determine if the receiving environment has changed, if the eagle nests found in 2016 remain the same, to summarise the avian impacts of the previous avian assessment report, and to re-assess if the impacts have changed with the change in turbine numbers and dimensions.

The number of turbines has been decreased to 60 and then down to 34 (in November 2021) from the previously assessed 70 turbines and thus with a reduced overall footprint from 2016. Each turbine will general up to 7 MW, and all have a hub height of 125 m and a rotor diameter of 180 m (i.e., blade length of 90m). The original pre-construction monitoring by African Insights (2016), for Rietkloof (the southern-most farm in the Euronotus cluster) covered a total 20 days in the development site itself, across four seasons in the period April 2015 to January 2016. This was a period of intense drought and low avian activity.

The impact zone of the originally proposed facility lies in a small area in the Nama/Succulent Karoo biomes – in mountainous Roggeveld terrain. The area held very few birds at the time, but four priority species were recorded, a Verreaux's Eagle *Aquila Verreauxii* pair with a nest, Booted Eagle *Aquila pennatus,* Jackal Buzzard *Buteo rufofuscus* and Karoo Korhaans *Eupodotis vigorsii*.

African Insights' report did not report Passage Rates or flight heights but recorded priority bird flights and observation hours. We could, thus, reconstruct Passage Rates to quantitatively compare their 2016 findings with our 2021 surveys. The low activity in 2016 was reflected in the low Verreaux's Eagle Passage Rate of 0.08 eagles per hour, and all Priority Species of 0.11 birds per hour. An active Verreaux's Eagle nest was recorded from the R354 tar road in 2016 and a 1.5-km buffer was recommended around this nest and designated a No-Go area.

Our surveys in May 2021 revealed more species than recorded previously and a Passage Rate fourfold higher (at 0.32 eagles per hour) than in 2016. We also located a second Verreaux's Eagle nest site in the south-western corner of the Rietkloof site at S33.084875° E 20.441221° on a large south-facing cliff. The two nests were attended by an adult in May 2021.

Additional priority birds seen (over and above the four species recorded by African Insights) were Ludwig's Bustard *Neotis ludwigii* and Greater Flamingo *Phoenicopterus roseus*. All are Red Data species. The passage rate of all these priority species throughout the Euronotus cluster was low at 0.25 priority birds per hour, but still double that of 2016.

Given the discovery of the Verreaux's Eagle nest the guidelines for this species (Ralston Paton 2017) recommend a 3-km buffer around both eagle nests on site. However, African Insights' surveys and recommendations were made prior to the first Verreaux's Eagle guidelines in 2016, and the Environmental Authorisation, based on recommendations by Africa Insights, allows a 1.5-km buffer.

Given the risk involved to the eagles BBU recommended that the turbines within 3 km of this nest be relocated. Red Rocket have not only undertaken this but have moved all 11 turbines away from this new Verreaux's Eagle nest, such that the nearest turbine is now 5.6 km east. This will substantially reduce the risk to the eagles.

The increase in hub height from 120-m to 125-m increases the risk of collision to three birds per turbine per year for the nine turbines to which it is applied. This is countered by a reduction in the overall number of turbines (from 60 to 34). Thus, there is a *decrease* in the Significance of the impacts from the authorised layout to the newly proposed Amendment.

An additional form of mitigation, for any turbines across the farm that kill more than one highly threatened Red Data species per year, would be the addition of automated shut-down on demand of the problem turbines. This can be achieved by the installation of Bioseco, DT-bird, or a suitable alternative.

Operational-phase monitoring is essential to determine the actual impacts on birds and will inform the required mitigation measures and thresholds. This plan must allow for:

(i) changes to be implemented within a maximum timeframe of two months;
(ii) the Wind Farm must agree to follow the mitigation measures that may result from the operational monitoring and Adaptive Management Plan; and
(iii) in accordance with the Adaptive Management Plan, appropriate mitigation measures are implemented, such as curtailment during specific environmental conditions, or during high-risk periods.

Given the high occurrence of eagles in the proposed development area, and their proximity to the proposed turbines, a further six months of monitoring is recommended to, more precisely, determine flight paths and perch areas.

These data can be integrated into the micro-siting of the 11 turbines closest to the newly discovered Verreaux's Eagle nest.

1.1 Qualifications of Specialist Consultants

Dr Rob Simmons, Director of Birds & Bats Unlimited is an ecologist, ornithologist, and environmental consultant, with three decades research experience in North America, Africa, Europe and Asia. He is a Permanent Resident in South Africa. Currently a Research Associate of the FitzPatrick Institute's Centre of Excellence, University of Cape Town. Formerly employed in Namibia's Ministry of Environment & Tourism as the state ornithologist, specialising in wetland, avian and montane biodiversity. Schooled in London (Honours: Astrophysics), Canada (MSc: Biology) and South Africa (PhD: Zoology).

SURVEY EXPERIENCE:

- **Sandwich Harbour avifauna** - A 30-year project assessing fluctuations in wetland avifauna relative to Walvis Bay and revealing long term declines in palearctic migrant shorebirds - published *Conservation Biology* (2015)
- **Arid species diversity across a steep rainfall gradient -** a 3-year project at 5 sites across a 270 km gradient, in the wet and dry seasons, assessing avian richness and functional diversity in 3 habitats in Namibia. Dry rivers found to be critical refugia as biodiversity declined with increasing aridity. Published *Ecosystems* (2015).
- **Population monitoring of Namibian endemics**–Determined densities and overall population numbers of all 16 Namibian endemic birds with Edinburgh University, published *Biological Conservation* Robertson et al (1996);
- **Damara Tern status** –Stratified random survey of the 1470-km Namibian coast, to determine the global population of this tern. Published *Ibis* 1998. Angolan breeding colonies published *Af J Mar Sci, Ostrich*
- **Black Harrier status** – 18-year study of *Endangered* Black Harriers in South Africa, followed by satellite tags to determine ecology and migration with FitzPatrick students. *PlosOne* Garcia-Heras et al. (2019).

Research on new avian mitigation measures for the wind and power industry:

- **testing use of vulture restaurants** to draw vultures away from wind farms in Lesotho.
- proposing and **testing coloured-blade mitigation** to reduce raptor fatalities in SA.
- **Implementing staggered pylons on parallel lines** as first effective mitigation for high bustard deaths.

Environmental Impact Assessments (renewable energy, power lines, mining, airports)

- birds impacted by a proposed Haib **copper mine** near the Orange River (1994);
- siting of proposed Lüderitz **wind farm** prior to formal assessments for NamPower (1997);
- impact of **water abstraction** from Karst System wetland birds Tsumeb (2003) (J Hughes);
- impact of **uranium mine** at Valencia, Khan River, Namibia (Aug 2007, Feb 2008)
- Impact on birds by a proposed **airport** in Caledon, Western Cape (2009)
- **Biodiversity surveys** in Namib Desert, Angola, (SANBI–Angola joint surveys- Dr B. Huntley)
- **Wind farm** assessments on the west coast at Kleinsee and Koingnaas (Savannah – 2011)
- EIA report on avian impacts at Namaqualand + Kareebosch **wind farms** (Mulilo –2015, 2017)
- Pre-construction avian impacts at the Witteberg (Karoo) **wind farm** site – (Anchor Environmental 2011-2012) and Verreaux's Eagles (G7/Building Energy 2014-2015, 2019);
- Pre-construction avian impacts at Happy Valley (E Cape) **wind farm** (EDP Renewables 2014)
- Pre-construction avian monitoring Karoshoek CSP-trough **CSP-tower** Solar Park (Upington) (Savannah Environmental for Emvelo Eco Projects, 2015-2016)
- Pre-construction avian impacts at a Tankwa Karoo **wind farm** (Genesis Eco-Energy 2016-17)
- Pre-construction avian impacts at **Juno WEF,** Strandfontein (AMDA Pty Ltd, 2016-2017)
- Specialist studies of Red Data raptors at Jeffreys Bay **wind farm** (Globeleq, 2016-2019)
- Pre-construction avian impacts: Namas+Zonnequa **wind farms**, Kleinsee (Atlantic Energy + Genesis 2016/17);
- Pre-construction avian impacts and mitigation test at Lesotho **wind farm**, IFC compliant (eGEN+AGR 2017-18);
- Walvis Bay **waterfront development** impacts on Walvis Bay lagoon avifauna (ECC) 2017
- Avian-**power line** EIA study of 450 km-long, 400 kV line (Lithon-Nampower 2017-2018);
- Pre-construction avian impacts of Kappa 1 and 2 and 3 **wind farms** in Tankwa (Eco-Genesis 2018-2020);
- Pre-construction avian impacts of Nama Karoo **wind farms** Komas + Komas (Enertrag) 2019;
- Avian impacts along Kruisvallei **Hydro-project power line** Free State and IFC compliance(Building Energy 2019)
- Amendments to avian impact (hub heights) Kareebosch (Nama-Karoo) **wind farm** site (Mulilo 2019) and the Namas and Zonnequa **wind farms** (Enertrag) 2019
- Specialist studies of Black Harriers at **Elands Bay** wind farm and aquaculture site (Planet Capital 2019/20)
- Pre-construction avian impacts at Kotulo-Tsatsi **solar and wind farm** (Savannah 2021)
- Avian impact assessment at the Euronotus and Roggeveld **wind farm** cluster **(x4)** Karoo (Red Rocket 2021)

Consultancy work at: http://www.birds-and-bats-unlimited.com

Papers and academic background at: www.fitzpatrick.uct.ac.za/fitz/staff/research/simmons

2 SPECIALIST DECLARATION

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:	
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

EA AMENDMENT: RIETKLOOF WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE - AVIAN SPECIALIST REPORT – 2021

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

Specialist Details

Specialist Company Name:	Birds & Bats Unlimited			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Dr Robert E Simmons			
Specialist Qualifications:	PhD (Wits), MSc (Acadian Univ, Canada), BSc Hons (London)			
Professional affiliation/registration:	Birdlife South Africa, Honourary Research Associate University of Cape Town			
Physical address:	8 Sunhill Estate, Trigg Road, Capri, Cape Town			
Postal address:	As above			
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Telephone:	As above	Fax:		
E-mail:	Rob.Simmons@uct.ac.za			

2.1 DECLARATION of INDEPENDENCE by the SPECIALIST

I, _Dr Rob Simmons_____, 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

Birds & Bats Unlimited

Name of Company:

1 December 2021

Date

2.2 UNDERTAKING UNDER OATH/AFFIRMATION

I, ____Dr Rob Simmons____, 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

Birds & Bats Unlimited

Name of Company

1 December 2021

Date

Signature of the Commissioner of Oaths

Date

3 TERMS of REFERENCE

The Terms of Reference (ToR) for the avian impact amendment assessment are: to compile an addendum to the 2016 specialist' avian reports addressing the following:

- Re-survey the study site to determine if the receiving environment has changed.
- Survey the priority species to determine if they occur with the same frequency as before.
- Survey the site to assess if any changes to the breeding species have occurred since 2016.
- The implications of the proposed amendments in terms of the potential impact(s).
- A detailed description of measures to ensure avoidance, management and mitigation of impacts associated with the proposed changes.
- The re-assessment must take into account and address public comments.
- The re-assessment must consider the findings of the 12-month pre-construction monitoring.

Subsequently the turbine dimensions were amended, and the numbers decreased from 70 turbines, to 60, to 32 (a 51% reduction) thus the ToR includes:

- A part 2 Amendment to assess the change in impacts due to increased hub height (now 125 m for 9 turbines originally of 120 mm hub height) and blade lengths increased as in Table 1 below.

Table 1: Authorised (approved) VS New specifications for the Rietkloof Wind Energy Facility (WEF), October 2021.

	New Specification for Rietkloof WEF (October 2021	**Approved for Rietkloof WEF**
Turbine Generation Capacity	7 MW	Not specified (up to 183MW – with 60 turbines)
Hub Height	125-m	9 turbines – up to 120-m 51 turbines – up to 125-m
Rotor Diameter	180-m	9 turbines – up to 140-m, 51 turbines – up to 160-m
Blade Length	90-m	9 turbines – up to 70-m 51 turbines – up to 80-m
Max upper tip height	215-m	9 turbines – 190-m 51 turbines – 205-m

3.1 STUDY AREA

The proposed Rietkloof wind farm lies in the Roggeveldberg a north-south lying mountain range rising to about 1500-m asl.

The habitat in the study area is described as *Central Mountain Shale Renosterveld* (Mucina & Rutherford 2006, p178). The vegetation comprises components of both the Nama and Succulent Karoo biomes, but mainly with Karoo bushes. The habitat is described *as Least Threatened*, with none conserved in formal protected areas.

This region just north of Matjiesfontein lies in the winter rainfall region but with summer rains also evident. Mean Annual Rainfall varies between 180- and 410-mm with a mean of 290-mm/year. Temperatures vary from a mean of 29.9℃ in summer to 0.9℃ in winter. Winds sweep across the open and undulating landscape, reducing temperatures to low levels. Frost days are common.

Land use is mainly low-level sheep farming, with large and small farm reservoirs attracting wetland birds (African Insights 2016). Indigenous wildlife comprises Klipspringer, Red Rock Hare, Mountain Rhebok and a raptor component reported on below.

3.2 BACKGROUND

The following report is a revision, re-assessment, and a part 2 amendment of the avian impacts EIA Report (African Insights 2016) for the proposed Rietkloof wind energy facility. This is required to re-examine possible impacts arising from:

(i) proposed reductions in the number of wind turbines; and
(ii) proposed increase in turbine dimensions over the authorised turbines (see Table 1)
(iii) possible changes in the receiving environment.

The latter is important given the intense drought apparent in 2016 (African Insights 2016) and the slow return to typical rainfall in 2021.

Specifically, the proposed amendments to the authorised wind farm include the following:

- 70 turbines reduced to 60 turbines and then 34 (a 43% reduction over the Authorised number)
- A reduction in footprint size due to the decrease in number of turbines.

Given the drought conditions in 2016 we may expect an increase in species diversity and possibly breeding by the larger priority species on site in 2021. Thus, one of our main priorities was to check all areas for the breeding of Verreaux's Eagles that are known to occur here (African Insights 2016).

The overall generation capacity has not changed. The layout, of the 34 turbines as defined earlier (African Insights 2016) is shown in Figure 1.

4 METHODS

- This report compares data from 2016 when a years was undertaken (April 2015, August 2015, October 2015, February 2016) with avian surveys covering all seasons in 12 months (African Insights 2016).
- The total number of hours from vantage points (VPs) on Rietkloof in 2016 was 384-hours from eight VPs (African Insights 2016).
- We estimated Passage Rates from the number of flights depicted in Figures 9 and 10 of the African Insights report (2016) and reproduced below (Figures 2 and 3).
- In 2021 Birds & Bats Unlimited undertook a site visit in May and spent 18.8-hours observing from eight VPs (as close as possible to those used by African Insights).
- May is the start of breeding for Verreaux's Eagles (Simmons 2005), thus, the visit was timed to coincide with territorial flights of the main priority species recorded here.
- We define 'Priority Species' as the top 100 most collision-prone species for wind farms (Ralston Paton et al. 2017).

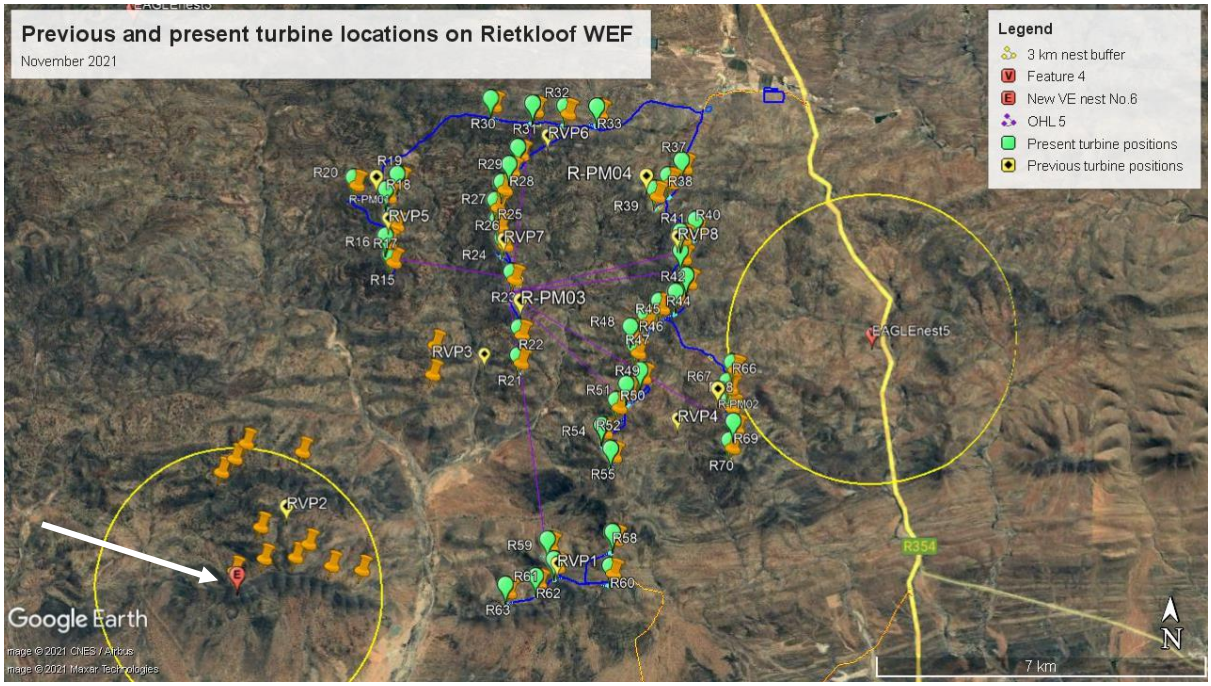


Figure 1: Previous (= orange pins) and newly located (= green pins) turbine positions in the Rietkloof wind farm in the Roggeveld mountains, October 2021 layout. The turbines have been moved away from the south-west corner near the Verreaux's Eagle nest (= red balloon, arrowed) by the client to reduce collision risk to the eagles.

5 SUMMARY of FINDINGS of ORIGINAL EIA REPORT

The main findings of the original avian assessment for Rietkloof (African Insights 2016) can be summarised as follows:

- Four site visits, spanning all four seasons, were undertaken in 2015/2016.
- From eight Vantage Points, 384-hours of observation were undertaken to record priority species on Rietkloof.
- Five raptor species were recorded in that time (Table 1).
- The Verreaux's Eagle was the only Red Data species recorded.
- One active Verreaux's Eagle nest was recorded from the R354 in the east of the site.
- The Passage Rate for the Verreaux's can be estimated at 0.08 eagle flights/hour in 2016.
- The Passage Rate for the remaining Priority species (Booted Eagle, Jackal Buzzard, Pale Chanting Goshawk, excluding the Rock Kestrel) was estimated at 0.04 birds/hour.

Table 1: Four priority raptor species (and the Rock Kestrel) identified in the avian EIA report for Rietkloof in 2015/2016 (African Insights 2016).

Common name	Conservation status	Relative importance of local population[1]	Susceptibility to collision	Susceptibility to electrocution	Susceptibility to disturbance	Likelihood of occurrence
Verreaux's Eagle	Vulnerable	Moderate	High	Low	Medium	Not reported
Pale Chanting Goshawk	Least Concern	Low	Low	Low	Low	Not reported
Booted Eagle	Least Concern	Medium	High	Low	Low	Not reported
Jackal Buzzard	Least Concern	Low?	Very high	High	Moderate	Not reported
Rock Kestrel	Least Concern	Low?	High	Moderate	Moderate	

[1] **An indication whether the population is a core, or marginal, one, relative to the main population.**

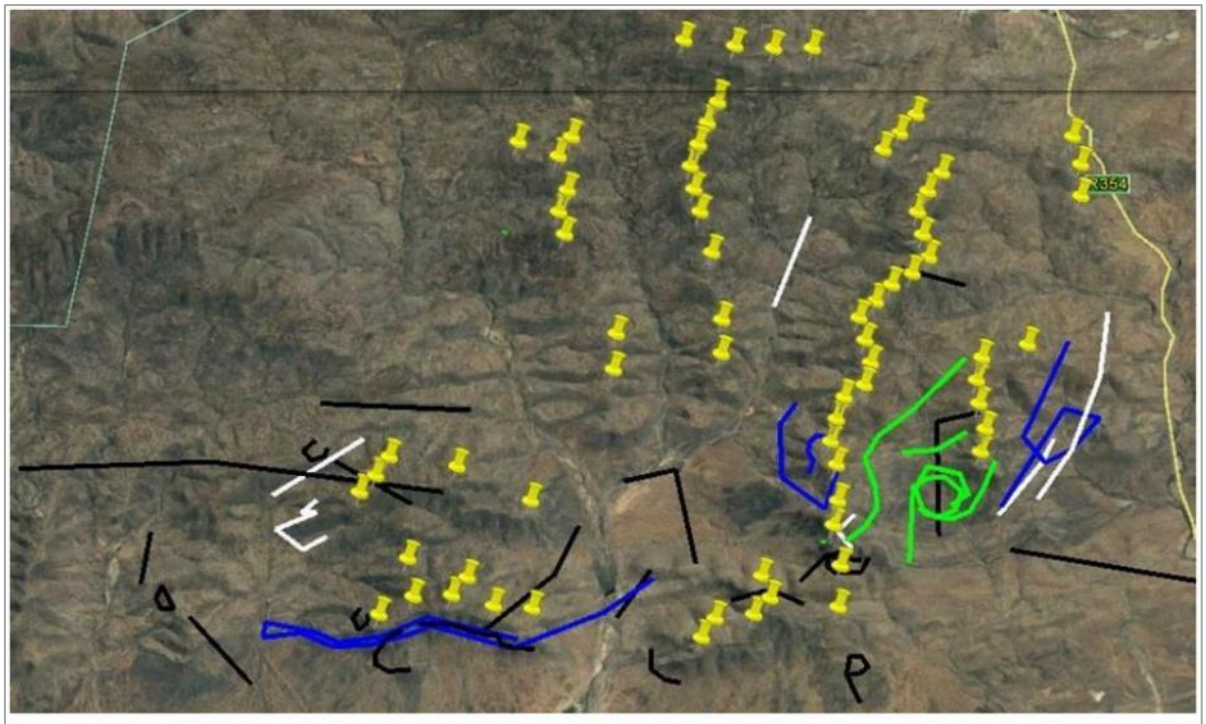


Figure 9: **Verreaux's Eagle seasonal flight paths: autumn: white; winter: black; spring: green; and summer: blue.**

Figure 2: A screenshot from African Insights' report (2016) of the Verreaux's Eagle flights recorded in 2015/16 over 384-hours over four seasons. The Passage Rate for this species, estimated from 30 flights in 384-hours, is ~0.08 eagle flights/hour.

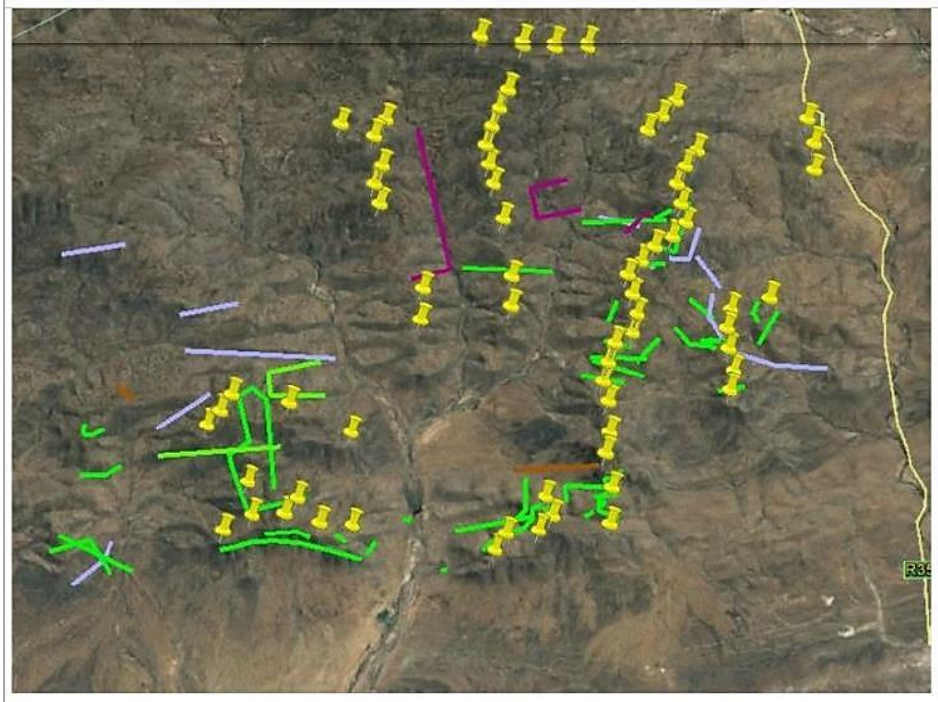


Figure 10: Flight paths across the four seasons of raptors, other than Verreaux's Eagles. Rock Kestrel in green; Pale Chanting Goshawk - grey; Booted Eagle- purple; Jackal Buzzard- brown.

Figure 3: A screenshot from African Insights' report (2016) of all raptor flights (other than Verreaux's Eagles) recorded in 2015/16 over 384-hours over four seasons. The Passage Rates estimated for these four species is approximately 46 flights in 384-hours, or 0.12 flights/hour. Excluding the Rock Kestrel (not a Priority Species) the Passage Rate was 0.04 birds/hour.

6 RESULTS from the 2021 SITE VISIT

Six days spent in the Euronotus cluster, and two days on Rietkloof itself, were devoted to surveying the wind farm to record eagles in flight, and to check all possible nest sites.

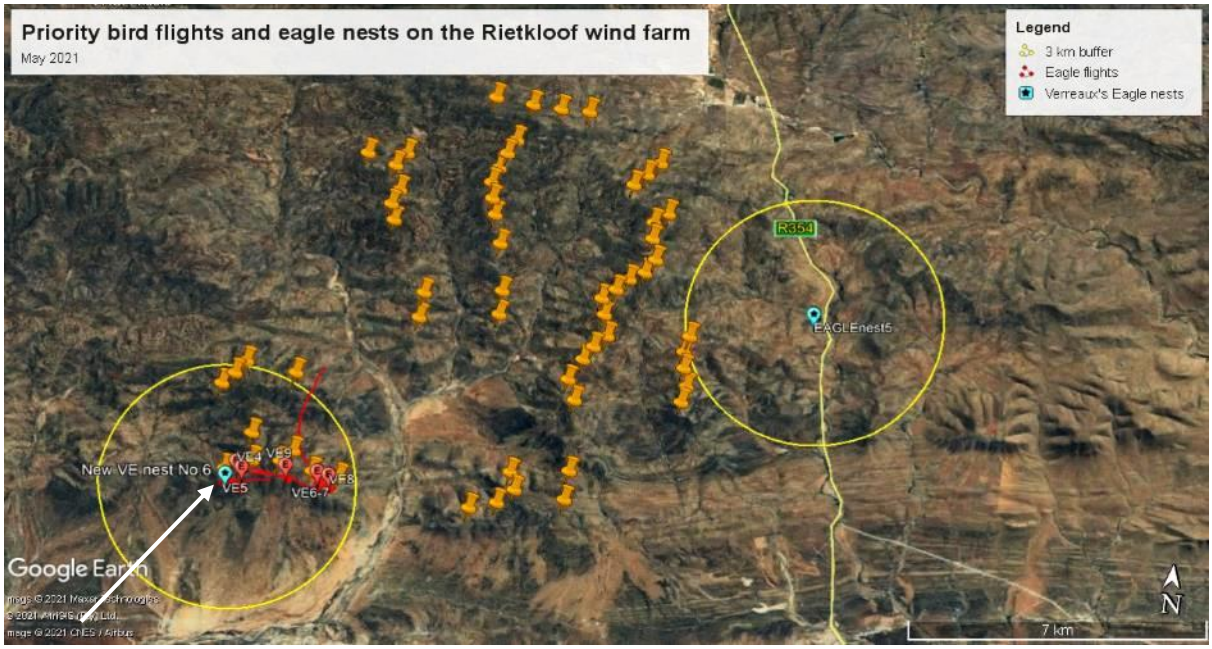
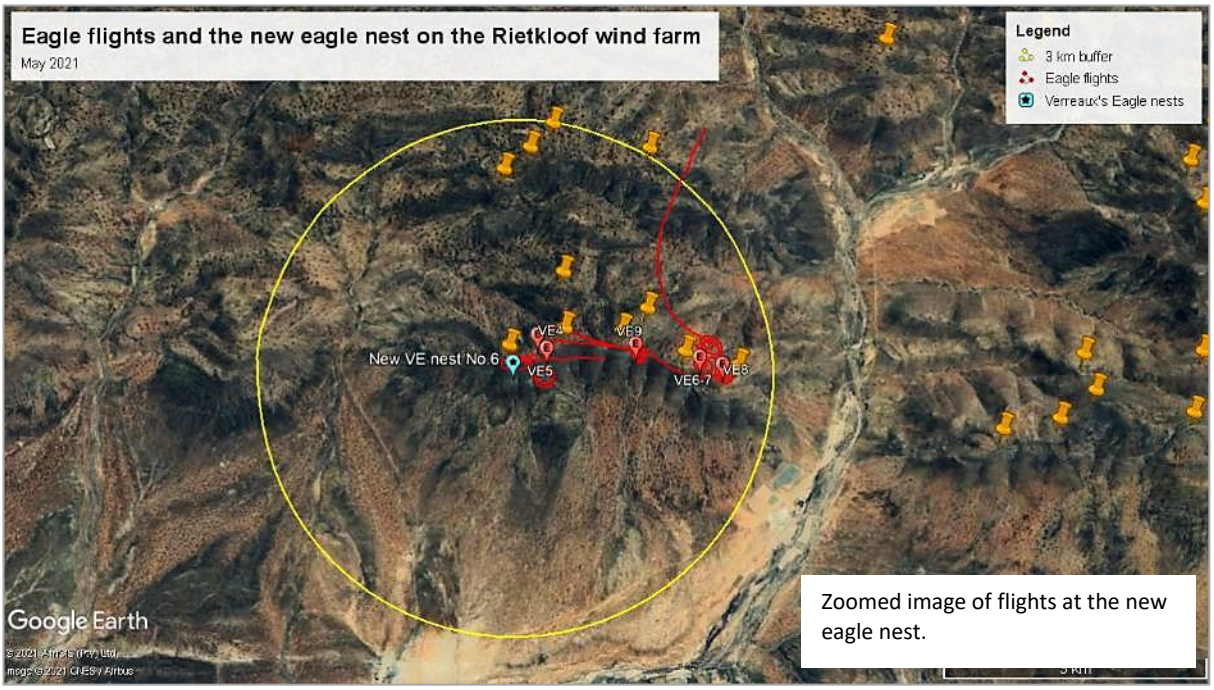


Figure 4: All raptor flights (= red lines, zoomed below) over the proposed southern Rietkloof wind farm (turbines = orange pins) recorded in May 2021 in 18.8-hours. Verreaux's Eagles were the only priority species present and the Passage Rates here, based on six flights in 18.8-hours, was 0.32 eagles/hour. As important, an over-looked eagle nest was present in the south-west corner (= New VE nest no. 6) at S 33° 05'5.55" E 20°26'28.40" (arrowed). Yellow circles represent a 3-km buffer around the nests.

- The most important finding in our reassessment of the Rietkloof site in 2021 was the discovery of a previously unrecorded **Verreaux's Eagle nest** site in the south-western corner of the wind farm (Figure 4, and Photo 1). The nesting cliff supported two eagle nests (Photo 1) and during the first drone flight an adult bird was disturbed from the nest cliff. This indicates that the site is active and not merely a historical site.



The second (right hand) nest showed whitewash behind the nest (Photo 1) indicating use within the last year. This nest was not reported by African Insights (2016).

Photo 1: Both new Verreaux's Eagle nests (No. 6) in the south-west corner of the Rietkloof site taken from drone footage of the cliff face. An adult eagle was disturbed from its perch just to the left of this image, indicating that the nest sites are active.

Photo 2: The Verreaux's Eagle nest No. 5 visible from the R354 in the south-east section of the Rietkloof site taken from the tar road in May 2021. The nest is circled (left) and the female is circled to the right. This nest was first reported by African Insights (2016).

- A second important discovery was the recent confirmation (November 2021) of the Black Harrier nest suspected by African Insights (2013), confirmed by F le Roex on 18 November 2021 (Photo 3). The nest is located on the Brandvalley site, but the recommended 3-5 km buffer of this nest just overlaps the Rietkloof WEF. The nearest turbine (R20) on Rietkloof is 4.9-km away, marginally inside the recommended 5-km buffer of the Birdlife South Africa Black Harrier guidelines. Given the marginal nature of this distance we do not believe this turbine offers much risk to the breeding birds here.

Photo 3: The Black Harrier nest located in July 2021 was found to be active on 18 November 2021 as shown above, with a single egg and a pair of birds in attendance. In July the nest had had no eggs, so this is a newly active nest.

In the Northern section of the wind farm, where three turbines occur in the revised layout for the WEF, multiple flights of Black Harriers were recorded in July 2021 (Figure 5).

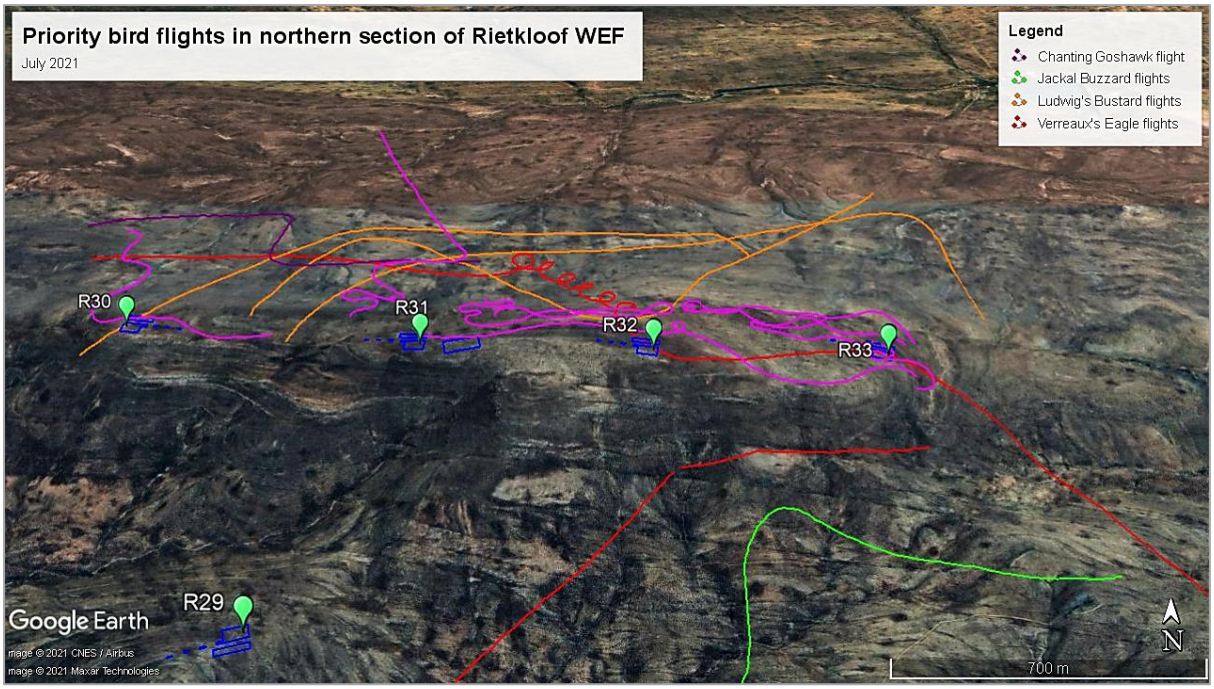


Figure 5: The presence of multiple Black Harrier flights (= purple lines) recorded in July 2021 in the northern section of the Rietkloof wind farm relative to the revised turbine layout for November 2021. BBU recommends that if Red Rocket are in a position to drop certain turbine positions (due to fewer turbines being required), then some or all of these turbines (R30, R31, R32, R33) are considered. More harrier flights were recorded here in November 2021 but are not shown here.

6.1 PASSAGE RATES OVER THE PROPOSED STUDY SITE COMPARED

We completed a total of 56 hours of observations throughout the three development sites in the Euronotus cluster in April 2021. In the Rietkloof wind farm itself we used the same VPs used by African Insights but undertook fewer hours on site (18.8-hours) as this is a re-assessment of the findings, not a full EIA.

- We recorded six eagle flights on Rietkloof in that time giving a Passage Rate of 0.32 eagle/hour for the site.
- This compares with 0.08 eagles/hour recorded in 2015/16 on Rietkloof, a four-fold higher rate in 2021.
- For all Priority species on Rietkloof the Passage Rate was identical (0.32 birds/hour) since all priority birds were Verreaux's Eagles.
- This compares with 0.11 birds/h recorded in 2015/16 on Rietkloof, a three-fold higher rate in 2021 for the priority birds.
- All 2021 flights are shown in Figures 4 and 5.

6.2 EFFECTS of CHANGES and REDUCTIONS in TURBINE POSITIONS

The authorised and proposed turbines will change as follows:

- A total of 60 (authorised) turbines will be reduced to a (proposed) 34 turbines (43% reduction).
- Nine (authorised) turbines had a hub height of 120-m and these are (proposed) to increase to 125-m.
- The remaining 51 (authorised) turbines are (proposed) to remain at 125-m hub height.
- Their (authorised) blade length of 80-m is (proposed) to increase to 90-m (13% increase).

Given that the reduction in numbers of turbines (43%) is more than three-fold higher than the increase in blade length (13%), we do not expect any increase in avian fatalities. Taller turbines and longer blades are generally associated with greater avian fatalities (Loss et al. 2013, Thaxter et al. 2020). To quantify this, we asked UCT statisticians (Drs Birgit Erni and Francisco Cervantes Peralta) to model the increase, using a combination of published data (kindly provide by Dr Scott Loss) and the limited South African data of fatalities from hub heights above 80-m (Ralston Paton et al. 2017).

The two graphs below indicate that (i) avian fatalities increase exponentially as hub height is increased (Figure 1a); but (ii) the exponential increase flattens out when South African data are added to the graph (Figure 1b).

By reading what is predicted at the authorised (120-m) and proposed (125-m) hub heights, we can see (Figure 1b) that the expected fatalities differ by about three birds (16 vs 19).

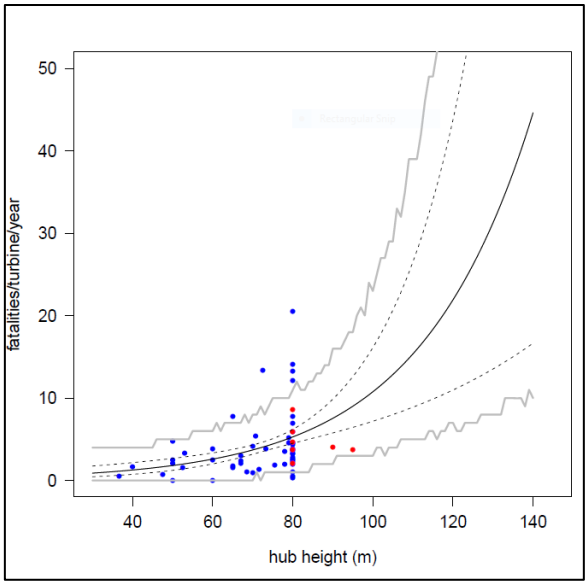


Figure 1a: Prediction intervals from bootstrapping analyses (jagged line) based on North American hub height/fatality data (Loss et al. 2013 = blue data points) to determine if South African data (= red data points) fall within 95% confidence intervals. All 7 data points fall within the confidence intervals.

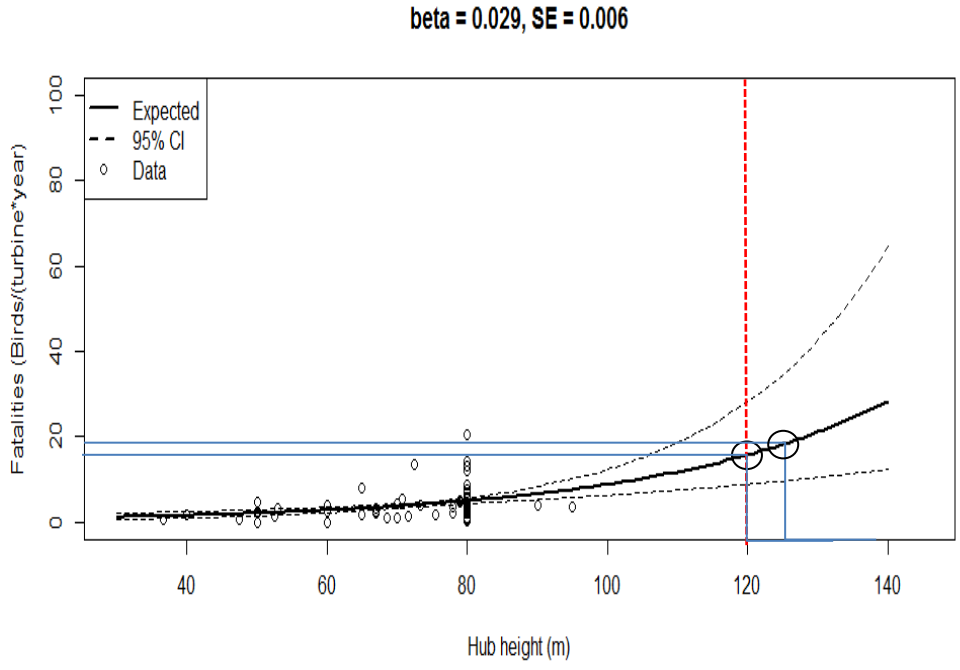


Figure 1b: Modelled data combining avian fatalities from the USA (Loss et al. 2013) and from South Africa (Ralston-Paton et al. 2017) and their relation to hub height. The South African data (n = 7 farms) include two with hub heights of 90 m and 95 m. The combined data and 95% confidence limits predict that 16 birds (95% CI = 9, 28) will be killed on average per year for 120 m-high turbines and about 19 birds on average for 125 m-high turbines. Thus, the increase in fatalities is marginal (3 birds/ turbine/y) according to this assessment. We were not able to model the fatalities due to blade length increase, but we assume they will be similar to that predicted here.

This means that with a decrease in the number of turbines from 60 to 34 the following fatalities are expected

- 60 turbines of 120-m hub height are predicated to kill 60 x 16 birds = 960 fatalities (from Figure 1b).
- 34 turbines of 125-m hub height are predicated to kill 34 x 19 birds = 661 fatalities (from Figure 1b)

Thus, the fewer, larger, turbines are expected to kill fewer birds and, thus, the significance of the predicted impacts will be lower. The above calculation is simplified using 60 turbines of 120-m hub height. The actual number of larger turbines is only nine, and, thus, even fewer fatalities are predicted for the *proposed* VS the *authorised* turbines.

A further reduction in the significance of the impacts is expected from the following action by Red Rocket (Pty) Ltd.

In mid-November 2021, following discussions with the client, eleven turbines were relocated away from the newly discovered Verreaux's Eagle nest in the south-west corner of the Rietkloof site. The number of turbines were also reduced from the original 60, to 34. The changes are, thus, highly advantageous in reducing the possible threats to the breeding eagles and the nearest turbines to the eagle nest are now 5.6-km away. As such this is beyond what the new Verreaux's Eagle guidelines (Ralston Paton and Murgatroyd in prep.) recommend *(5.2-km) and, thus, unlikely to impact Verreaux's Eagles here.*

As this report is revised in line with the new layout (November 2021) confirmation has been received that Black Harriers are breeding 4.9-km to the west of the Rietkloof WEF (on the Brandvalley WEF) and, thus, marginally within the 3-5-km buffer recommended for this *Endangered* species. We don't expect this to have a major impact on this species given that only one short harrier flight has been recorded near the closest turbine (R20) in July and (the current) November 2021 site visits.

Most flights of Black Harriers were recorded on the northern-most ridge (Figure 5). This area is, thus, designated of *High* sensitivity even though no harrier nests are known here.

7 MITIGATIONS

The discovery of the new Verreaux's Eagle nest in the southwest sector, and the newly active Black Harrier nest on the adjacent Brandvalley WEF (within 5-km of the Rietkloof site), presents a challenge for the developers as Red Rocket (Pty) Ltd have already selected positions for turbines in this area, without any previous knowledge of Red Data species nests here.

Eleven turbines are planned for this south-western area (Figure 6) and some will be affected by whichever buffer is created around the nest. We have shown both the 1.5- and 3.0-km buffers in our Figure 6 below. However, in discussions with **Red Rocket they have agreed to drop all eleven turbines from this south-west section** and thereby reduce, considerably, the risk to the Verreaux's Eagles.

Birds & Bats Unlimited is grateful that the developer is willing to undertake this to reduce the risk to the eagles.

These positions are shown in Figure 6 for clarity.

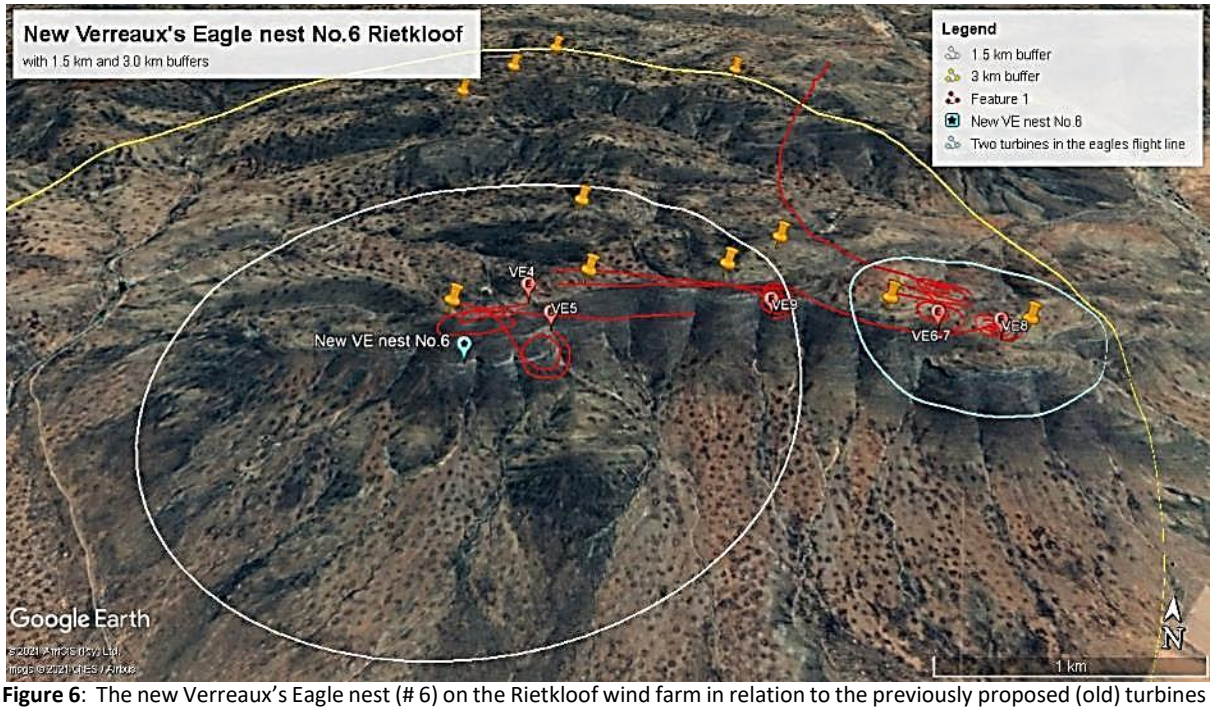


Figure 6: The new Verreaux's Eagle nest (# 6) on the Rietkloof wind farm in relation to the previously proposed (old) turbines (=orange pins) and two possible buffers. All of these turbines have now been removed (dropped) from this area by the developer: this will substantially reduce the risk to the Verreaux's Eagles in this wind farm.

The second area of concern is the ridge in the northern section of the WEF (Figure 7). This area showed unusually high activity of Black Harrier flights even though no nest is known nearby.

We recommend, the following:

- if the client has the opportunity to drop turbines from the authorised layout (because of the reduction from 60 to 34 turbines) that they do so from this northern ridge, that is: the four turbines R30, R31, R32, R33.
- If this compromises the energy yield of the wind farm, then these four turbines can remain, but they should be mitigated with striped-blade mitigation and/or automated shut down on demand (SDOD), or observer-lead SDOD.

These mitigations should reduce the risk to Black Harriers flying through this area.

8 CONCLUSIONS

The presence of four to five Priority and Red Data bird species in the Rietkloof Wind Farm area (particularly Verreaux's Eagles and Black Harriers) requires careful siting of the proposed turbines.

Our 2021 monitoring revealed that:

- Passage Rates of the Priority birds at 0.32 birds/hour were three-fold higher for all Priority birds and four-fold higher (0.32 vs 0.08 birds/hour) for the Red Data Verreaux's Eagles, than Passage Rates recorded in 2016 (African Insights 2016). This is probably related to the drought conditions present in 2016.
- We also discovered a second Verreaux's Eagle nest site (VE nest No. 6) in the south-west corner of the Rietkloof site, with two nest structures and an adult eagle in attendance in May 2021. We doubt this is a recently started nest area given the size of the structures and number of nests here.
- The previously recorded nest (2016) in the south-east corner, visible from the R354 was also active in 2021.

The 2016 African Insights' monitoring recommended a 1.5-km buffer around the Verreaux's Eagle nest and the Environmental Authorisation reflected that. This is at odds with the Verreaux's Eagle guidelines (Ralston 2017) that a year later recommending 3.0-km nest buffers.

Eleven proposed turbines fall within the recommended 3.0-km buffers, and four proposed turbines fall within the Authorised 1.5-km buffers.

On recommending a 3.0-km buffer around this newly discovered eagle nest Red Rocket have removed (November 2021) all 11 turbines that occur within these buffers. In doing so they have not only complied with the new Verreaux's Eagle guidelines but have significantly reduced the likely impact of these turbines on the foraging eagles.

During our November 2021 monitoring we verified an active Black Harrier nest to the west of the Rietkloof WEF but outside the recommended buffers of 3- to 5-km for this species. As such this nest is not at risk. However, the high flight activity of Black Harriers along the northern-most ridge of the WEF is cause for concern from turbines R30, 31, 32, 33 and if these turbine positions can be dropped as part of the reduction in turbine numbers, this too, will go a long way towards reducing impacts to this *Endangered* species.

To mitigate further any impacts to Priority birds and, specifically,

the harriers and eagles, we recommend:

(i) Erecting the turbines with striped-blade mitigation (painted before installation) to increase turbine visibility for the eagles (May et al. 2020).

(ii) The advantages of this mitigation are that:
   (a) raptors see well in colour.
   (b) Two broad stripes across the blade are the most visible pattern to both raptors (kestrels and buzzards) and humans (McIsaac 2001).
   (c) 'Signal red' is already approved by South African Civil Aviation for towers and other tall structures.
   (d) Blade manufacturers, such as Siemens and Vestas, already produce painted blades in Europe; and
   (e) this mitigation has no running costs.
   www.engineeringnews.co.za/article/opinion-black-blade-mitigation-a-new-and-exciting-mitigation-for-wind-turbines-to-reduce-impacts-to-birds-of-prey-2020-10-09/

(iii) Should painted blades be ineffective, additional mitigations should include automatic shut-down on demand with systems such as DT-Bird and Bioseco.

If post-construction monitoring indicates that one or more highly threatened Red Data raptors are killed at one turbine then an adaptive management plan must be initiated within two months to reduce the fatalities. We recommend, then, an automated shut down-on-demand system for each problem turbine.

Mitigations during construction phase should include avoiding road or powerline construction within 500-m of active nests of Red Data species during the early breeding season. For Verreaux's Eagles this is May-July and again during August-September when small vulnerable nestlings are present (Simmons 2005). Since *Endangered* Black Harriers have been found breeding, construction should be avoided in August-September.

We suggest that the Rietkloof wind farm proceeds with caution given the likelihood of avian fatalities, and:

(i) an additional 6-months pre-construction monitoring be undertaken as prescribed by the DFFE;
(ii) all mitigation detailed above be implemented; and
(iii) construction-phase and post-construction phase monitoring be undertaken for a minimum of 24 months to inform the possible, and actual, impacts to the avian community.

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APPENDIX 1:

Striped patterns tested for conspicuousness by McIsaac (2001) on raptors and people. For both groups, pattern No. 4 was perceived best of all, while the white blade (No. 1) was amongst the least conspicuous of the spinning blades tested.

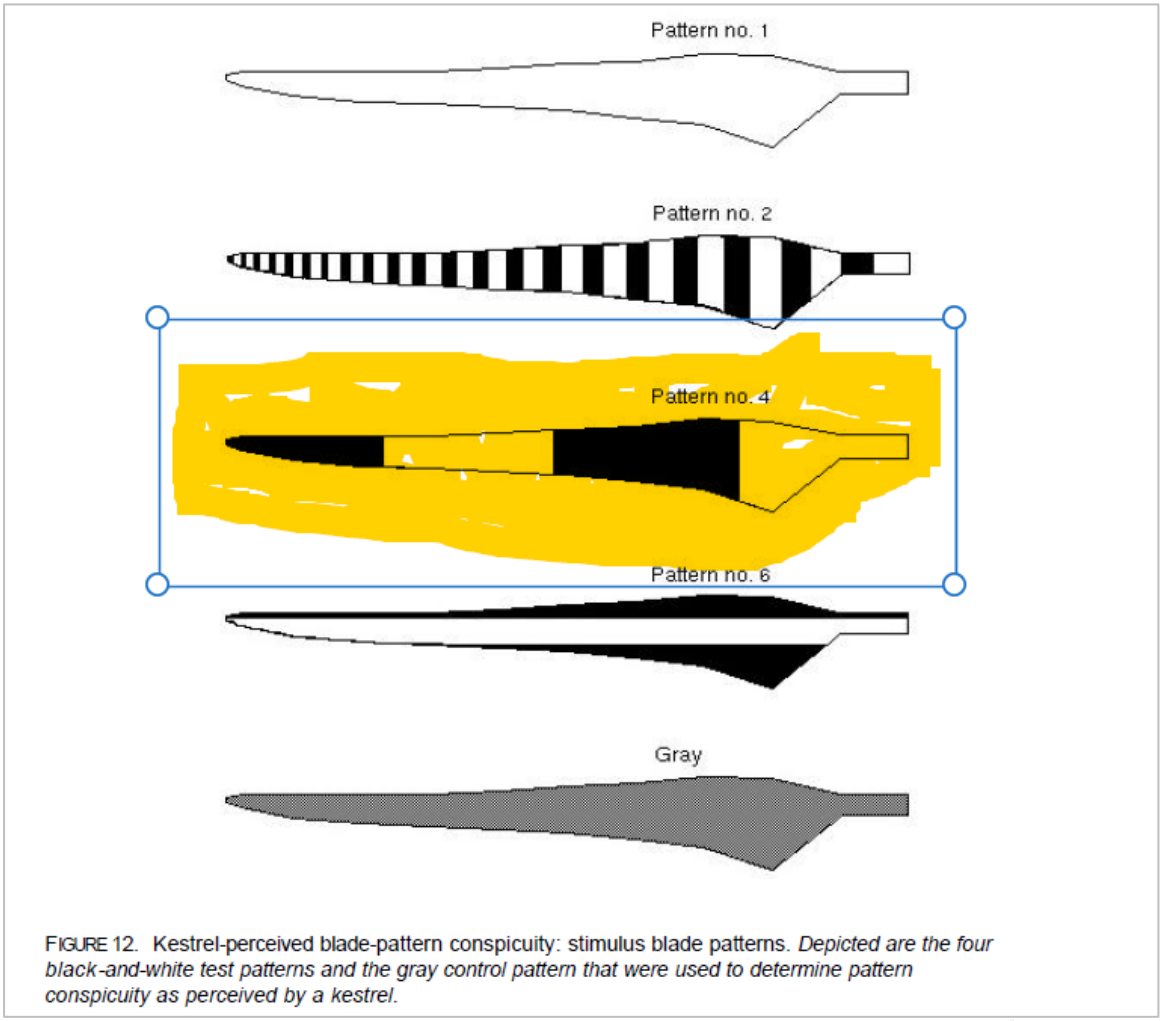

FIGURE 12. Kestrel-perceived blade-pattern conspicuity: stimulus blade patterns. *Depicted are the four black-and-white test patterns and the gray control pattern that were used to determine pattern conspicuity as perceived by a kestrel.*