

**Final Avian Re-Assessment and Part 2 Amendment for the
BRANDVALLEY WIND ENERGY DEVELOPMENT AREA, ROGGEVELD**



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1 SUMMARY

This study contains a re-appraisal of the impacts and mitigations suggested for the proposed Brandvalley Wind Energy Facility by Brandvalley Wind Energy Facility (Pty) Limited. It is also a part 2 amendment given that the number of turbines, their dimensions and their locations have been altered from that authorised. 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. We incorporate findings from November 2021 also. The primary aims are to determine if the receiving environment has changed, to summarise the avian impacts of the previous avian assessment report and determine if the impacts will change due to the modifications to the turbines.

The number of turbines will be decreased from 58 to 34 turbines, and the footprint has been reduced accordingly (Figure 1). The original pre-construction monitoring by African Insights (2016), for Brandvalley (the central farm in the Euronotus cluster) covered a total 20 days in the development site itself, across four seasons, in the period April 2015 to February 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 few birds at the time, but seven Priority species were recorded, of which three are *Endangered* species: Black Harrier *Circus maurus*, Martial Eagle *Polemaetus bellicosus*, Ludwig's Bustard *Neotis ludwigii*, and a *Vulnerable* Verreaux's Eagle *Aquila Verreauxii* pair. Raptors made up the remainder of the Priority species.

African Insights' report did not report Passage Rates or flight heights but recorded Priority bird flights and observation hours. We, thus, reconstructed Passage Rates to quantitatively compare their 2016 findings with our 2021 surveys. The activity of eagles in 2016 was relatively high with Verreaux's Eagle Passage Rate of 0.11 eagles per hour (~ 1 flight/day), while all Priority Species had a Passage Rate of 0.15 birds per hour. Despite the numerous eagle flights, no nest was located in 2016.

Our short surveys in May 2021 revealed an active Verreaux's Eagle nest (No. 7) that had been missed in the 2016 monitoring at the Snydersberg. The medium-high eagle Passage Rates in 2016 were focussed around the area where the nest was located by BBU in May 2020, but, despite this, no High-risk area was flagged there.

Given the discovery of the Verreaux's Eagle nest the guidelines for this species (Ralston Paton 2017) recommend a 3-km buffer around active eagle nests on site. However, African Insights made no recommendations regarding eagle nests as they found none. Birds & Bats Unlimited (BBU) recommends, in line with the present eagle guidelines, a 3-km buffer. Red Rocket have accounted for this by removing 8 turbines from the 3 km buffer, reducing potential impacts to the breeding eagles here.

Two inactive Black Harrier nests were discovered at a late stage (November 2021) to be active (Williams nest in the southern section of the WEF) or have a pair in attendance (Jenkins' nest, centrally placed). The recommended 3 km buffers overlap several proposed turbines in both areas and we recommend two forms of mitigation.

- If turbine positions can be dropped with the 41% reduction in turbines, then we would recommend that B28, B29, B30, B31, B32 be re-located to the east.
- These possible turbines would reduce impacts to both the Black Harriers and the Verreaux's Eagles that are known to forage down this ridge

BBU understands that this is a late recommendation and may not be possible. Thus an additional form of mitigation, for these turbines and any that kill more than one *Endangered* or *Vulnerable* species per year, would be either observer-lead Shut down on demand (SDOD) or the addition of automated SDOD of the problem turbines. This can be Bioseco, or DT-bird, or a suitable alternative.



The increase in hub height from 120m to 125 m and the increase in blade length is predicted to increase avian fatalities from the literature and our own modelling of South African fatality data. The increase, however, will account for an additional 3 birds/turbine/year and with the 41% reduction in turbine numbers there will be an overall reduction in the number of birds killed per year. Thus, the increase in turbine dimensions is more than compensated for by the reduced numbers of turbines.

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.

This avian assessment suggests that overall lower impacts are expected by the reduction in turbine numbers, but we caution that if some turbine positions could be dropped within the 3-km buffer of the newly active (Jenkins) Black Harrier nest then impacts for both the eagles and harriers can be further reduced.



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 Verreux'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** Kommas + Kommas (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: BRANDVALLEY 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		
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Postal code:	7975	Cell:	0827 800 133
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:

5 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

5 December 2021

Date

Signature of the Commissioner of Oaths

Date



3 TERMS of REFERENCE

The Terms of Reference 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 increased and the numbers decreased from 58 to 34 (41% reduction) thus the ToR includes:

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

Table 1: Authorised (approved) versus new specifications for the Brandvalley Wind Energy Facility (WEF), October 2021.

	NEW Specs for ALL WEFS	Approved for BV WEF
Turbine Generation Capacity	7 MW	Not specified (140MW – with 58 turbines)
Hub Height	125m	Up to 125m
Rotor Diameter	180m	Up to 160 m
Blade Length	90m	Up to 80 m
Max upper tip height	215m	Not specified

3.1 STUDY AREA

The proposed Brandvalley 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°C in summer to 0.9°C 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 Baboon, Klipspringer, Red Rock Hare, Mountain Rhebok and a raptor component reported on below.



3.2 BACKGROUND

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

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

This is especially 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:

- 58 turbines reduced to 34 turbines (41% reduction);
- Reduced footprint size with turbines re-located away from the Verreaux's Eagle nest.

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 58 turbines as defined earlier (African Insights 2016) is shown in Figure 1.

4 METHODS

- This report compares data from 2016 when monitoring 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 spent surveying the site from vantage points (VPs) on Brandvalley in 2016 was 288-hours from six VPs (African Insights 2016).
- We estimated Passage Rates from the number of flights depicted in Figures 8 and 9 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 the breeding season 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).



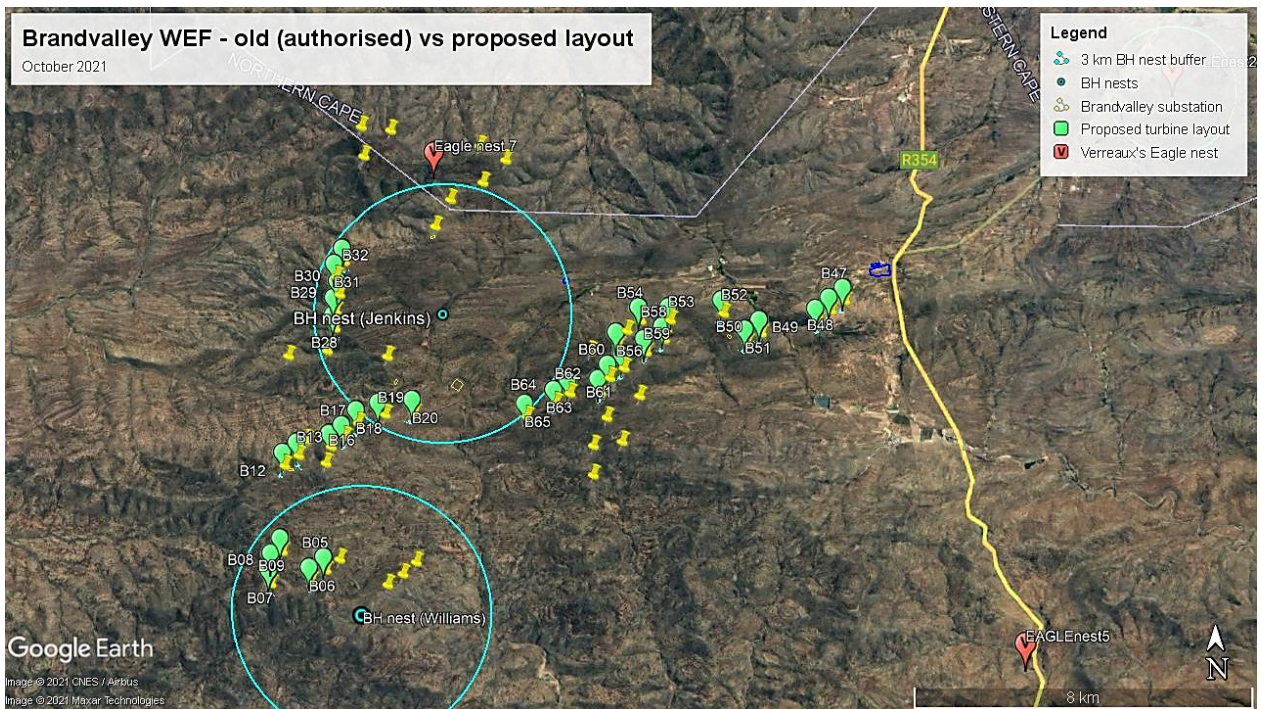


Figure 1: The 34 proposed turbine positions (green pins) vs the 58 authorised positions (yellow pins) in the Brandvalley wind farm in the Roggeveld mountains, October 2021 layout. Blue circles are the 3-km nest buffers for the newly active Black Harrier nests on site.

5 SUMMARY of FINDINGS of ORIGINAL EIA REPORT

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

- Four site visits, spanning all four seasons, were undertaken in 2015/2016.
- From six Vantage Points, 288-hours of observation were undertaken to record Priority species.
- Seven Priority species were recorded in that time (Table 1).
- Red Data Black Harrier, Martial Eagle, Verreaux's Eagle, and a Ludwig's Bustard were found on site.
- No Verreaux's Eagle nests were found but medium Passage Rates (0.11 eagles/hour) for the species were recorded in 2016.
- In the high use area in the north-west (Snydersberg), the Verreaux's Eagle Passage Rates were 27 flights in 96 hours (12-hours x 4 seasons x 2 VPs) or 0.28 eagles/hour. This is approximately three eagle flights/day.
- The Passage Rate for the remaining Priority species (Booted Eagle, Jackal Buzzard, Pale Chanting Goshawk, Steppe Buzzard, excluding the Rock Kestrel) was estimated at 0.15 birds/hour.



Table 1: Seven Priority Red Data species identified in the avian EIA report for Brandvalley 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
Black Harrier	Endangered	Moderate	High	low	High	Not reported
Ludwig's Bustard	Endangered	Low	Moderate	Low	Medium	Not reported
Martial Eagle	Endangered	Low	High	High	High	Not reported
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 Indication as to whether the population is a core, or marginal, one, relative to the main population.

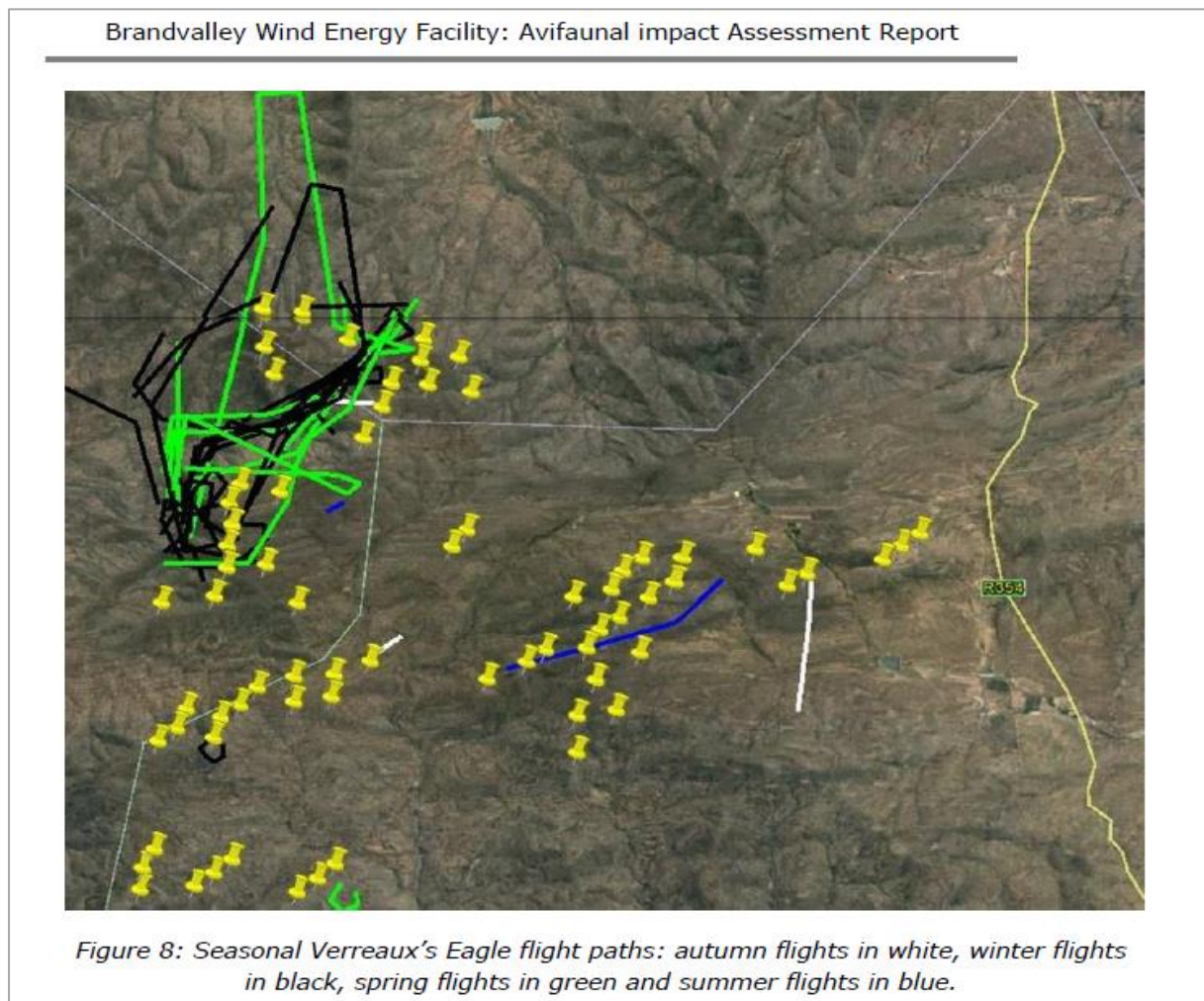


Figure 2: Screenshot from African Insights' Brandvalley Report (2016) of Verreaux's Eagle flights recorded in 2015/16 over 288-hours over four seasons. The Passage Rate for this species, estimated from 33 flights in 288-hours, is ~0.11 eagle flights/hour. Note that 82% of these (27/33) were associated with the area where the Verreaux's nest was found by Birds & Bats Unlimited (BBU) in 2021. The Passage Rates from the two VPs here comprising ~27 flights in 96 hours (12-h x 4 seasons x 2 VPs =) was ~0.28 eagles/hour.



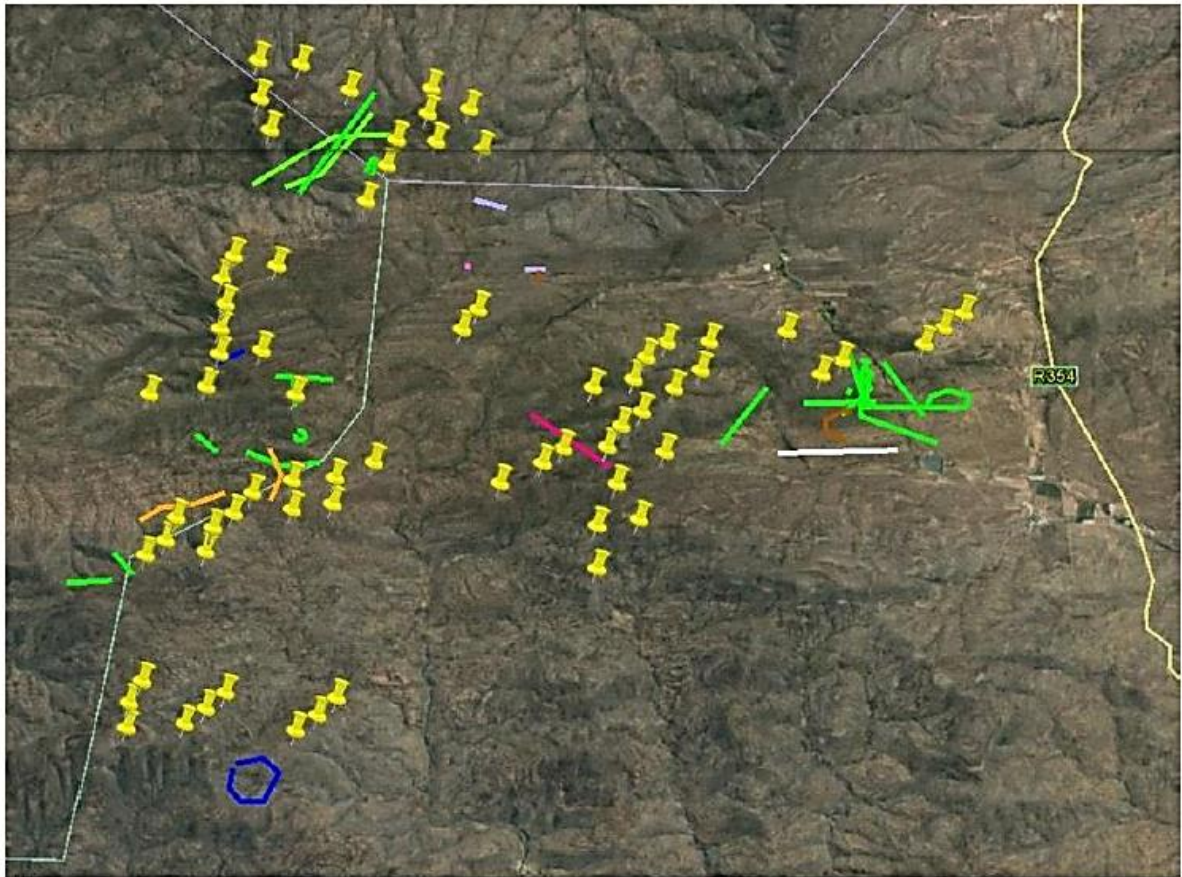


Figure 9: All season flight paths of raptors other than Verreaux's Eagles. Legend: Black Harrier – blue; Rock Kestrel – green; Booted Eagle – orange; Pale chanting Goshawk – grey; Martial Eagle – pink; Jackal Buzzard – brown; Steppe Buzzard – white.

Figure 3: Screenshot from African Insights' Brandvalley Report (2016) of all raptor flights (other than Verreaux's Eagles) recorded over four seasons in 2015/16 over 288-hours. The Passage Rates estimated for these seven species is approximately 57 flights in 288-hours, or 0.20 flights/hour. Excluding the Rock Kestrel (not a Priority species) the Passage Rate was 0.15 birds/hour.

6 RESULTS from the 2021 SITE VISIT

The six days Birds & Bats Unlimited spent in the Euronotus cluster (two days on the Brandvalley site itself) were devoted to surveying the wind farm area to record eagles in flight, and to check for possible nest sites.

6.1 VERREAUX'S EAGLES

The most important findings in our reassessment of the Brandvalley site in 2021 was the discovery of a previously unrecorded Verreaux's Eagle nest in the north-western corner of the wind farm (Figure 4 and Photo 1), and the discovery of two previously inactive Black Harrier nests

The eagle nest was first located in May 2020 when the area was surveyed as a Control site for an adjacent wind farm (Birds & Bats Unlimited 2020).

The nesting cliff supported a well-protected eagle nest and, in May 2021, during the first drone flight a roosting adult was found perched 100-m from this nest (Photo 1). This indicates that the site is active and not merely a historical site. Below (point 6.1.1) we compare the Passage Rates from 2021 and 2016 around this nest.

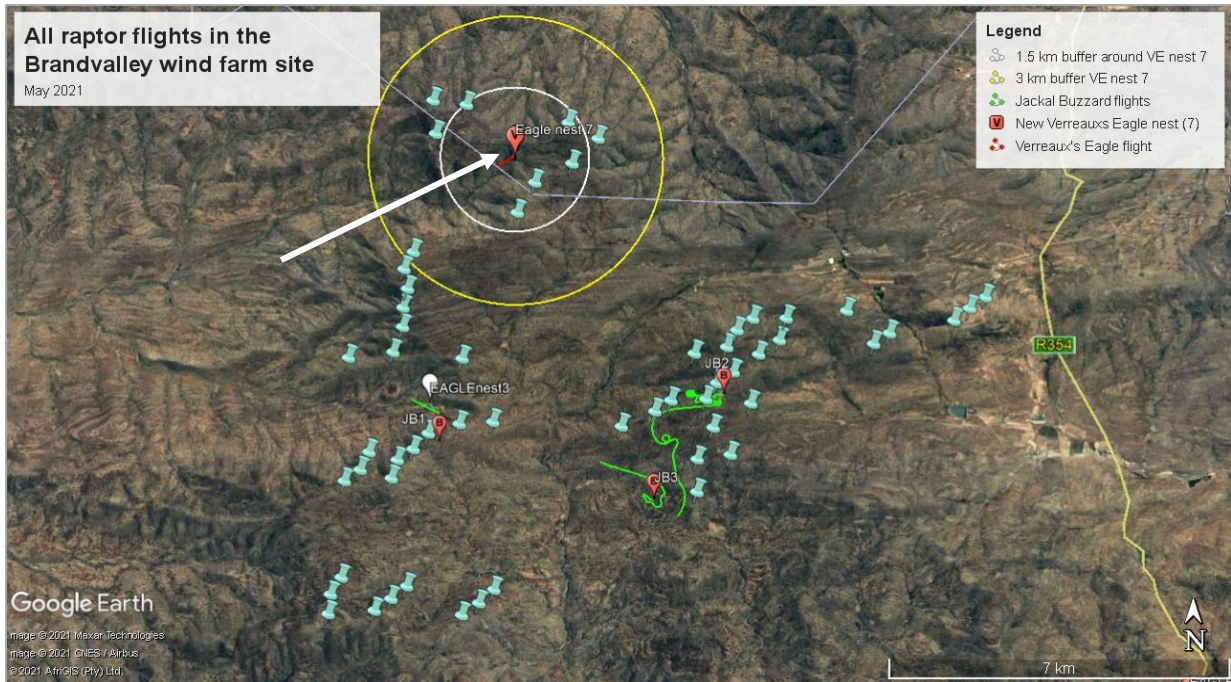


Figure 4: All raptor flights (= red and green lines) over the proposed Brandvalley wind farm (turbines = blue pins) recorded in May 2021 in 18.1-hours. Verreux's Eagles were one of two Priority species present (with Jackal Buzzard) and the Passage Rates here, based on four flights in 18.1-hours, was 0.22 birds/hour. This compared with Passage Rates in 2016 of 0.15 Priority birds/hour but from seven species. The over-looked eagle nest was present in the north-west corner (= New VE nest no. 7) at S32°56'0.23" E20°26'4.10" (white arrow). The orange circle represents a 3-km nest buffer; white = 1.5-km buffer.



Photo 1: The Verreaux’s Eagle nests (No. 7) discovered by BBU in the north-west corner of the Brandvalley site in May 2020. A roosting adult eagle was photographed in drone footage (inset) in May 2021, indicating that the nest site is active.

6.1.1 PASSAGE RATES COMPARED OVER THE PROPOSED STUDY SITE

In May 2021 we tallied up a total of 56 hours of observations throughout the three development sites in the Euronotus cluster. In the two days spent on the Brandvalley Wind Farm itself we used the same VPs used by African Insights but undertook fewer hours on site (18.1-hours) as this is a re-assessment of the findings, not a full EIA.

- We recorded only one Verreaux’s Eagle flight on Brandvalley in that time giving a Passage Rate of 0.06 eagles/hour for the site.
- This compares with 0.11 eagles/hour recorded by African Insights in 2015/16 on Brandvalley – a two-fold higher rate in 2016.
- The eagle Passage Rates in 2016 for the Snydersberg nest area alone (inset Figure 6) were much higher from the two Vantage points (African Insights 2016). We estimated 27 flights in 96-hours (2 VPs x 4 seasons x 12-hours) for a Passage Rate of 0.28 eagles/hour.
- For all Priority species on Brandvalley in 2021 the Passage Rate (0.22 birds/hour) was higher than that recorded in 2016 by African Insights (0.15 birds/hour).
- All 2021 flights are shown in Figure 4.

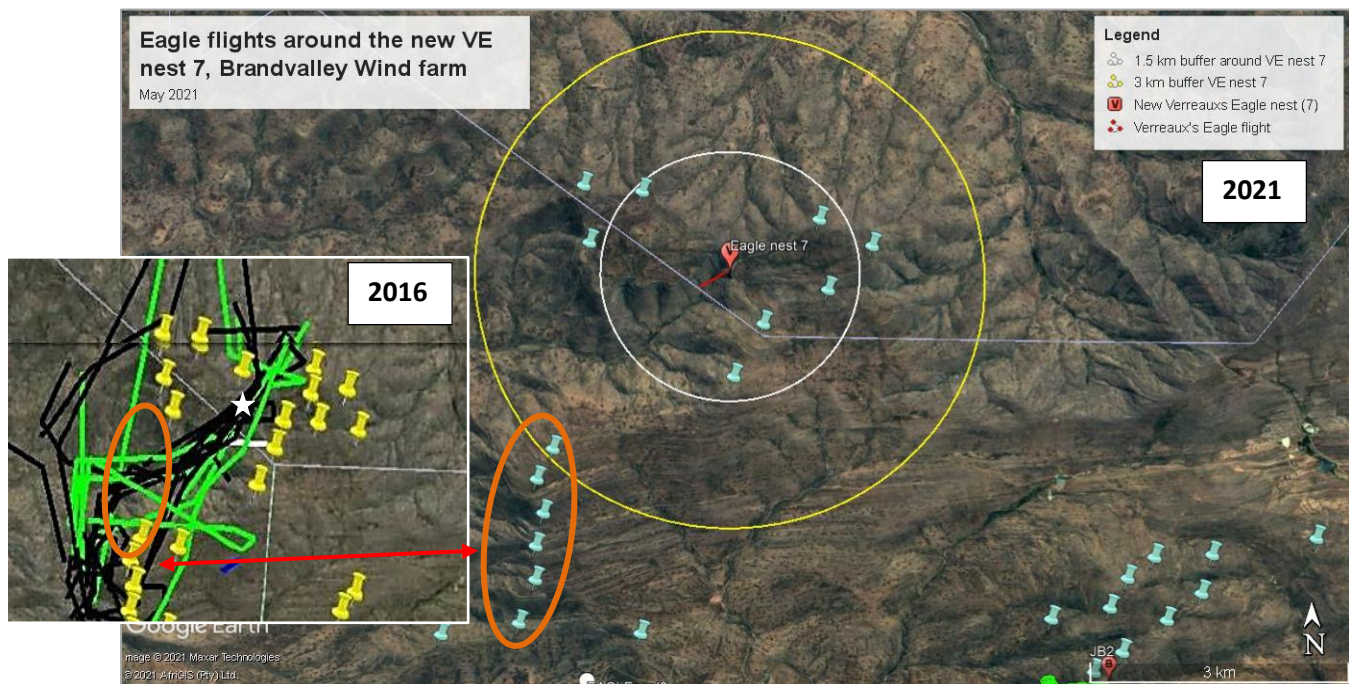


Figure 6: The new Verreaux’s Eagle nest (no. 7, red balloon) on the Brandvalley Wind Farm in relation to the authorised turbines (= blue pins) and two possible buffers. The yellow circle represents a 3-km nest buffer (recommended by Birds & Bats Unlimited) and the white circle a 1.5-km buffer. The larger buffer encompasses eight turbines. These have now been relocated away from this nest by Red Rocket, to decrease impacts to the eagles from the spinning turbines.

Inset: Verreaux’s Eagle flight lines recorded in 2016 (African Insights) in this area. Approximately 27 flights were recorded (giving a medium-high Passage Rate of 0.28 eagles/hour or about three eagle/day). The white star (inset) gives the approximate location of the new VE nest 7. Orange polygons highlight the six turbines that lie directly in the path of eagle flights (inset), and we recommend that these are relocated if at all possible.

Passage Rates around the newly discovered VE nest (no. 7) were very low in 2021, with only one short flight recorded. However, in 2016 numerous flights were recorded (Figure 6 inset) which we conservatively estimate at 27 (in 96-hours: African Insights 2016).

The previous specialists/authors were puzzled by the high number of flights in 2016, noting that the cliff faces here on the Snydersberg plateau appeared “too short, and of the wrong shape” to hold an eagle nest (page 15). Oddly, they did not designate this area as High-risk despite the large number of flights.



This number of eagle flights suggests that there is high risk to the eagles here, and the hierarchy of mitigations required are treated below.

6.2 BLACK HARRIERS

Two previously inactive Black Harriers nest sites were known in Brandvalley from African Insights' 2016 surveys – and in 2021, following good rains, both were active.

- In the southern sections of the WEF site, the “Williams” Black Harrier nest was found to contain a single egg in November 2021 (Photo 3).
- In November 2021 a Black Harrier pair were disturbed from the “Jenkins” Black Harrier nest in the central sections, but no nest was located. However, it is highly likely that this nest was also active given that the pair alarm-called at both the BBU observer and a pair of Pied Crows soaring overhead. Both are sure signs that they had an investment (eggs or chicks) to defend (RE Simmons pers obs.).



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

These nests pose a challenge for the Developers.

The Birdlife South Africa Black Harrier guidelines (Simmons et al. 2020) recommend a 3-5-km buffer around the nests and, within the 3-km “No-go” buffer, several turbines occur, particularly the centrally placed “Jenkins” Black Harrier nest (Figure 7).

For the “Williams” nest in the south, several turbines occur within 3-km, but the bird observed appeared to forage mainly to the east, away from the turbines in the west.



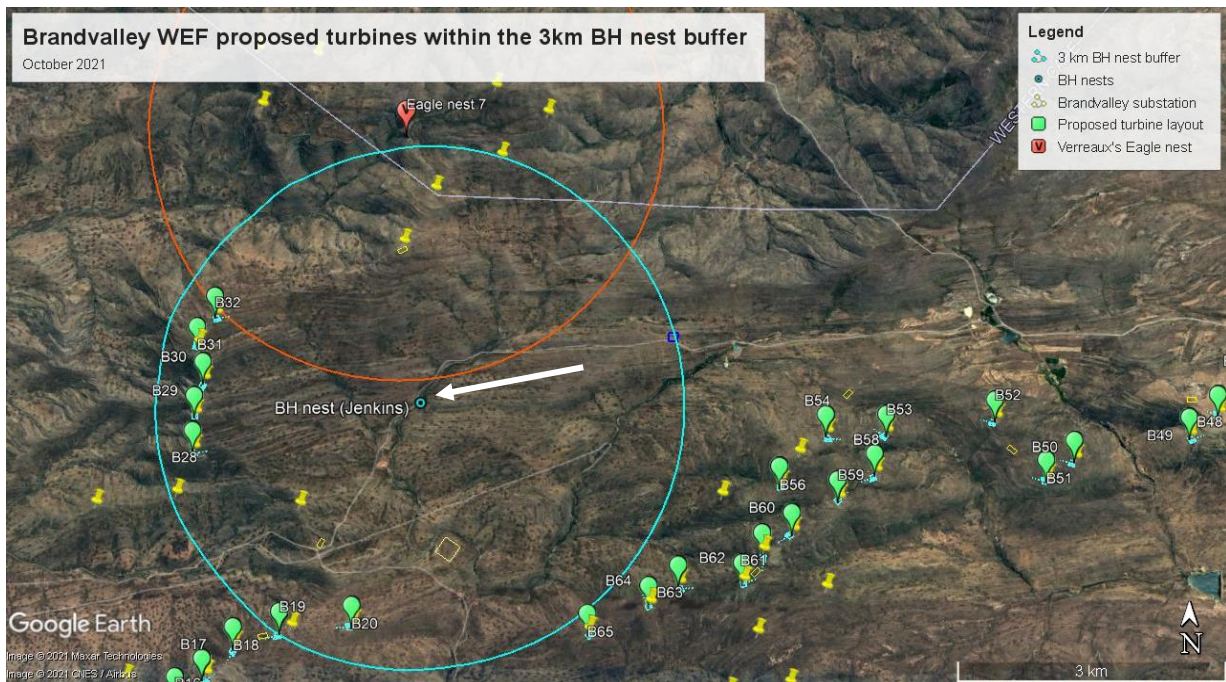


Figure 7: The new Black Harrier nest “BH nest (Jenkins)” (= blue dot, white arrow) within the Brandvalley Wind Farm in relation to the proposed turbines (= blue pins) and 3-km nest buffer (= blue circle) recommended by Birdlife South Africa’s Black Harrier guidelines. This buffer encompasses seven turbines, and we recommend that those to the west (B28, B29, B30, B31, B32) are relocated, if at all possible. The harriers here flew most often in a north-west direction in November 2021, towards these proposed turbines. This area is also used by the foraging Verreaux’s Eagles from the new nest to the north (see Figure 6), so it would benefit both Red Data species in the area if they could be re-located.

6.3 EFFECTS of INCREASES in TURBINE DIMENSIONS and REDUCTION in NUMBERS

The authorised and proposed turbines will change as follows

- A total of 58 (authorised) turbines will be reduced to a (proposed) 34 turbines (41% reduction).
- All authorised turbines had a hub height up to 125-m and that will remain the same (no increase).
- However, the remaining (authorised) 58 turbines are (proposed) to increase blade lengths from 80-m (proposed) to 90-m (13% increase).

Given that the reduction in the number of turbines (41%) is more than 3-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 graphics below indicate that:

- avian fatalities increase exponentially as hub height is increased (Figure 8a); but
- the exponential increase flattens out when South African data are added to the USA graph (Figure 8b).

By reading what is predicted at the 120-m and 125-m hub heights we can see (Figure 8b) that the expected fatalities differ by about three birds (16 VS 19).

The same cannot be done for blade length given that this metric has not been modelled by either Loss et al (2013) or by Ralston et al. (2017).



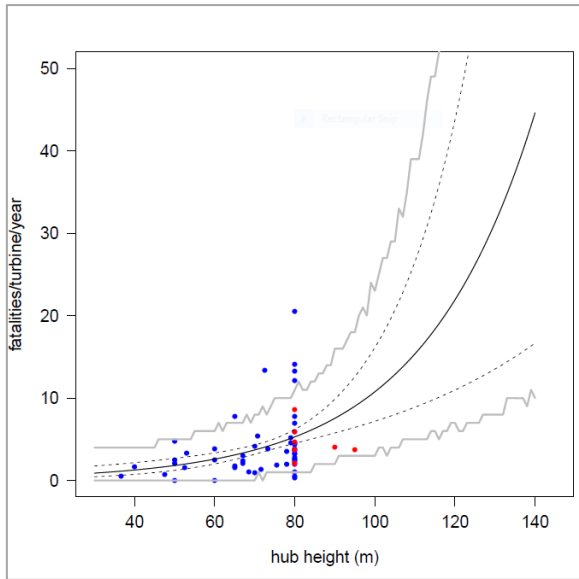


Figure 8a: Prediction intervals from bootstrapping analyses (jagged line) based on North American hub height/fatality data (Loss et al. 2013 = blue data points) to determine if South African data (= Red Data points) fall within 95% confidence intervals. All seven data points fall within the confidence intervals.

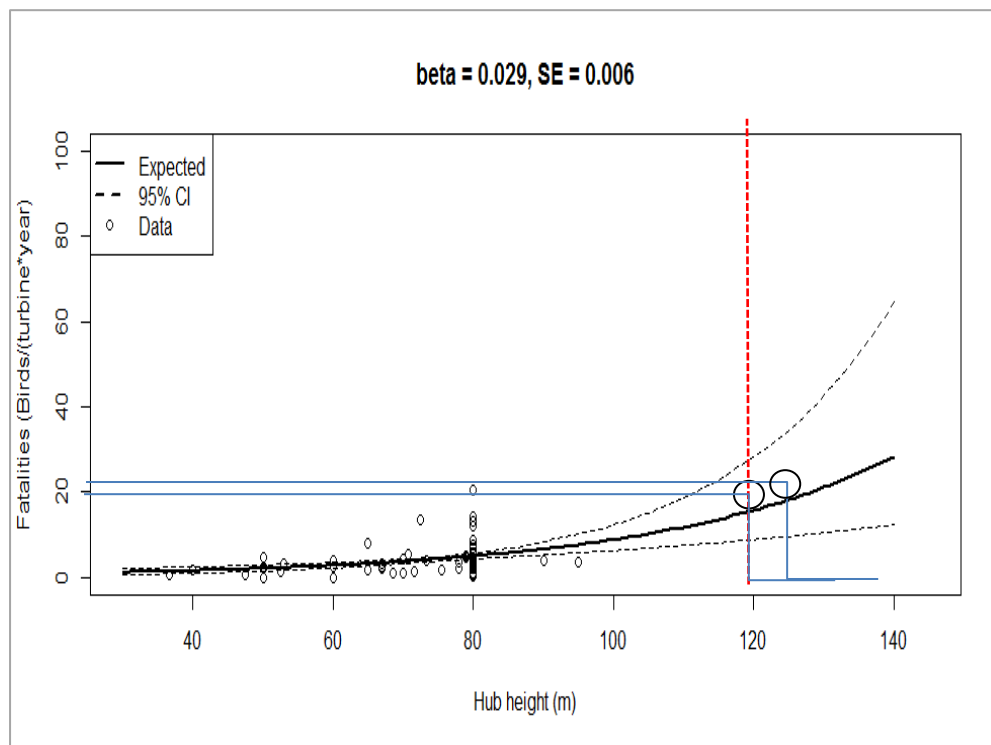


Figure 8b: Modelled data combining avian fatalities from the USA (Loss et al. 2013) and from South Africa (Ralston-Paton et al. 2017) and their relation to hub height. The South African data ($n = 7$ farms) include two with hub heights of 90-m and 95-m. The combined data and 95% confidence limits predict 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/year) according to this assessment. We were not able to model the fatalities due to an increase in blade length, but we assume they will be similar to that predicted here.

This means that, with a decrease in the number of turbines (from 58 to 34), the following fatalities are expected:

- 58 turbines of 120-m hub height are predicted to kill 58×16 birds = 928 fatalities (from Figure 8b).
- 34 turbines of 125-m hub height are predicted to kill 34×19 birds = 646 fatalities (from Figure 8b).

Thus, the fewer, larger, turbines are expected to kill 282 fewer birds and, therefore, the Significance of the predicted impacts will be lower. The above calculation is simplified using 58 turbines of 120-m hub height. The actual number of fatalities will be lower and, thus, even fewer fatalities are predicted for the proposed authorised turbines.



7 MITIGATIONS

The discoveries of the new Verreaux's Eagle nest (no. 7) as well as the newly active Black Harrier nests ("Jenkins" and "Williams") creates a challenge for the developers as Red Rocket (Pty) Limited – without any previous knowledge of Red Data species here – have already selected positions for turbines in this area.

- For the newly discovered **Verreaux's Eagle nest** Red Rocket have already relocated all (eight) turbines due to fall within the recommended 3-km buffer (Figure 6). This will substantially reduce the impact within this area.
- For the **Black Harrier nest**, seven turbines are planned for the area within the 3-km buffer created around the central Black Harrier nest (Figure 7) and given that the pair most often foraged to the north-west (November 2021 data) the turbines to the west may create impacts.
- Birds & Bats Unlimited recommends the five turbines here (B28, B29, B30, B31, B32) be repositioned away from the nest, if at all possible. We understand that this request comes very late, given the late breeding start of this Black Harrier nest.
- Since (58-34 =) 24 turbine positions are due to be dropped we request that these five turbines are included in those that are dropped, if at all possible.

We note that should Red Rocket be able to drop these five turbines it will simultaneously reduce the likelihood of Verreaux's Eagles impacting operational turbines here, as they appear to lie directly on the eagle flight lines captured in 2016 (inset in Figure 6). We have highlighted these turbines with a red arrow in Figure 6.

If these five turbines cannot be relocated, we recommend the following approach and mitigation hierarchy for this string of turbines:

- Erect them with striped-blade mitigation already installed (Appendix 1); *and*
- Automatic shut-down on demand or curtailment at certain times of day or seasons when flights are numerous.
- If these mitigations are not possible then the mitigation hierarchy suggests a suitable set-aside to help safeguard and replace the eagles that may be killed. This should be undertaken as a last resort given that the first mitigations are considered more effective.

We understand that these are difficult decisions to be made, given the late notice and discovery of the *Vulnerable* Verreaux's Eagle nest, and the active *Endangered* Black Harrier nest, but Red Rocket (Pty) Limited and Birds & Bats Unlimited must try to minimise the impacts to these vulnerable and highly collision-prone species.

8 CONCLUSIONS

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

Our May 2021 monitoring revealed that:

- Passage Rates of the Priority birds at 0.22 birds/hour were two-fold higher for all Priority birds in 2021 than 2016.
- However, Passage Rates for the Red Data Verreaux's Eagles were lower in 2021 (0.06 vs 0.11 birds/hour) than the relatively high Passage Rates recorded in 2016 (African Insights 2016).
- The discovery of a Verreaux's Eagle nest site (VE nest no. 7) on the Snydersberg (in May 2020), with an adult eagle in attendance in May 2021, throws up numerous challenges. We doubt this is a recently built nest area given the size of the structure.



- African Insights (2016) recorded high eagle activity in this nest area (~ 0.28 eagles/hour, or ~ 3 flights/day) but were unable to find any nests and, thus, failed to highlight it as a high-risk area. This was an oversight.

Birds & Bats Unlimited recommended a 3-km buffer around the Verreaux's Eagle nest (no. 7) based on existing recommendations in the Verreaux's Eagle guidelines (Ralston 2017). This requires that eight proposed turbines will need to be relocated to avoid fatalities in this area. This has been complied with by Red Rocket (Pty) Limited.

We, additionally, appeal to the Developer to either:

- (i) Consider re-locating the five turbines (B28-B32) as they lie within the 3-km buffer of the "Williams" Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.

If these mitigations cannot be enacted the mitigation hierarchy recommends:

- (i) Erecting the turbines with striped, red- or black-blade mitigation (painted before installation) to increase turbine visibility for the eagles (May et al. 2020, Appendix 1).
- (ii) The advantages of this mitigation are that:
 - (a) raptors and humans see striped blades more clearly than unmarked white blades;
 - (b) 'signal red' is already approved by the South African Civil Aviation for towers and other tall structures;
 - (c) blade manufacturers (such as Siemens and Vestas) already produce painted blades in Europe; and
 - (d) 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) In addition, automatic shut-down on demand be installed with systems such as DT-Bird and Bioseco.
- (iv) The last accepted way of mitigating is to select a set-aside area to compensate for the eagles lost, by providing a safe area for breeding eagles near the wind farm, that cannot later be developed.

Mitigations during the construction phase should include avoiding the construction of roads or powerlines 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 in August-September when small vulnerable nestlings are present (Simmons 2005). For the *Endangered* Black Harriers found breeding on site, construction should be avoided in August-September-October.

We suggest that the Brandvalley Wind Farm proceeds with caution given the likelihood of avian fatalities, and:

- (i) an additional 3-months of pre-construction monitoring be undertaken around the new eagle and harrier nests to determine their success or otherwise;
- (ii) all mitigations 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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10 APPENDIX 1:

Striped patterns on blades tested for conspicuousness by Mclsaac (2001) on raptors and human observers.

For both raptors and humans, **pattern No. 4** was perceived best of all. The white blade was amongst the *least* conspicuous of the spinning blades tested.

