

Priority Bird Monitoring and Management Programme for the Euronotus Wind Farm Cluster



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Prepared for



Prepared by:



1 INTRODUCTION

The Euronotus cluster of wind farms, proposed for the rugged Roggeveld mountains north of Matjiesfontein, straddles the Northern and Western Capes, and comprise three, separate, wind farm developments by Red Rocket (Pty) Ltd. These are (from north to south):

- (i) Kareebosch wind farm (60 turbines)
- (ii) Brandvalley wind farm (34 turbines)
- (iii) Rietkloof wind farm (34 turbines)

Red Rocket have proposed and gained Environmental Authorisations (EA) for all three wind farms. This highland area is relatively sensitive in that it holds breeding pairs of two highly collision-prone species, namely:

- **Verreaux's Eagle** *Aquila verreauxii*, a *Vulnerable* Red Data species in South Africa.
- **Black Harrier** *Circus maurus*, an *Endangered* Red Data species globally.

The original 60 turbines of 160-m hub height (HH) proposed by the developer may be reduced to 33 turbines each as they may produce up to 7MW each (from 2.5MW to 5.5MW) in the final layout.

The avian pre-construction sensitivity was first determined for each farm in 2016 (African Insights 2016a,b,c) and re-evaluated by Birds and Bats Unlimited (BBU) in a May 2021 site visit (Birds & Bats Unlimited 2021a,b,c). Due to the sensitivity of the Rietkloof WEF alone, two more avian surveys over six months are planned (July 2021: Birds & Bats Unlimited 2021d) and a final survey in November 2021. The other two WEFs (Brandvalley and Karreebosch) do not warrant these extra visits.

A total of four active Verreaux's Eagle (VE) nests were located in the Euronotus cluster, two of them were newly discovered by BBU in 2020 and 2021:

- **VE nest 1** – 1.5-km south of Kareebosch WEF, and 1.3-km north of the Roggeveld WEF.
- **VE nest 5** – 3.0-km west of Rietkloof WEF.
- **VE nest 6 [new]** – 280-m south of Rietkloof WEF.
- **VE nest 7 [new]** – in northern part of Brandvalley WEF.

A total of two inactive Black Harrier nests were located in this area, both of them suspected in previous site visits (African Insights 2016):

- **BH nest 1** (Jenkins nest) – inactive in northern part of Brandvalley WEF.
- **BH nest 2** (Williams nest) – pair present 4.9-km west of the Rietkloof WEF.

This document lays out a Management Plan for the monitoring of, and mitigation for (where necessary), the Verreaux's Eagles in the Euronotus cluster of wind farms to reduce impacts.

1.1 CONSULTANT'S DECLARATION of INDEPENDENCE

Dr Rob Simmons and Marlei Martins of Birds & Bats Unlimited are independent consultants to Red Rocket (Pty) Ltd. They have no business, financial, personal, or other interest in the activity, application, or appeal in respect of which they were appointed, other than fair remuneration for work performed in connection with the activity, application, or appeal. There are no circumstances that compromise the objectivity of these specialists performing such work.

1.2 QUALIFICATIONS of SPECIALIST CONSULTANTS

Dr Rob Simmons, of Birds & Bats Unlimited Environmental Consultants (<http://www.birds-and-bats-unlimited.com/>) was approached to undertake the specialist avifaunal management plan to determine possible impacts and appropriate mitigations at the Euronotus Cluster of renewable energy facilities, Western Cape. Dr Simmons is an ecologist and ornithologist, with 30 years' experience in avian research and impact assessment work. He has published over 110 peer-reviewed papers and two books, (see <http://www.fitzpatrick.uct.ac.za/fitz/staff/research/simmons> for details).

He was the State Ornithologist for Namibia's Ministry of Environment for 14-years and has undertaken more than 50 avian impact assessments in Angola, Namibia, South Africa, and Lesotho. He also undertakes long-term research from the FitzPatrick Institute, UCT, on threatened species (raptors, flamingos, and terns) and the impacts of domestic cats on wildlife. He supervises PhD students studying the ecology of threatened raptors (harriers and vultures) and statistical approaches to recording avian impacts at wind farms.

Marlei Martins, co-director of Birds & Bats Unlimited, has 10 years' consultancy experience in avian wind and solar farm impacts as well as environmental issues, and has been employed by several consultancy companies throughout South Africa because of her expertise in these fields. She has published papers on her observations including a new species of raptor to South Africa (<http://www.birds-and-bats-unlimited.com/>).

1.3 TERMS of REFERENCE

The Terms of Reference for the Verreaux's Eagle and Black Harrier Management Plan for the Euronotus cluster of wind farms are to:

- Compile a monitoring and management plan for the breeding Verreaux's Eagles and Black Harriers within the Euronotus WEF site.
- This is designed such that any adverse impacts on the harriers and eagles in terms of (i) displacement or (ii) deaths from the turbines or related infrastructure can be detected timeously.
- Any impacts can be mitigated in an adaptive management strategy within a few weeks of occurring.

2 STUDY AREA and OBJECTIVES

The Euronotus cluster of wind energy facilities (WEFs) lie 30-km north of Matjiesfontein in the Roggeveldberg; a north-south lying mountain range rising to about 1 500-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.

An Environmental Management Plan must satisfy the following aims (SANBI 2020):

- Outline mitigation measures and environmental specifications which must be implemented for the planning, construction, rehabilitation, and operation phases of the projects to minimise the extent of environmental impacts.
- To manage environmental impacts associated with the wind energy facilities.
- To ensure that the construction, operational, and decommissioning phases do not result in undue, or reasonably avoidable adverse, environmental impacts and ensure that any potential environmental benefits are enhanced.
- To identify roles and responsibilities for the implementation of the measures.
- To propose mechanisms for monitoring compliance and preventing long-term or permanent environmental degradation.
- To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the EIA process.

2.1 SUMMARY of VERREAUX'S EAGLE NESTS in the EURONOTUS CLUSTER

From surveys in 2013-2016, (African Insights) followed by a re-appraisal in 2020 and 2021 by Birds & Bats Unlimited (BBU) covering all three wind farms (Kareebosch, Brandvalley and Rietkloof) we were able to locate and monitor **four Verreaux's Eagle nest sites** on cliff faces and **two (one active and one inactive) Black Harrier nests** in wetter areas in the otherwise arid Karoo veld.

All the nest locations are shown in Figure 1 in relation to the proposed turbine layout. All flight activity were given in previous reports and will not be repeated here. Nest numbers are based on original numbers given by African Insights and are not continuous.

❖ *VE nest No 1 (Kareebosch WEF)*

This nest was discovered by African Insights in their original surveys and lies at the edge of the Roggeveld wind farm (not part of the Euronotus cluster) and the southern end of the Kareebosch WEF. This is not known to have been active in either 2013, or during our monitoring surveys, possibly due to drought conditions present from 2013-2016.



Photo 1: Verreaux's Eagle nest No 1 lies at the south end of the Kareebosch WEF and has never been recorded as active (breeding started) but was attended by a pair of eagles in 2020/2021. This nest was located at S32.867250° E20.503600° and a smaller, alternate, nest occurs within 100-m of it.

VE nest No 5 (Rietkloof WEF)

This Verreaux's Eagle nest was discovered by African Insights (2013) and is visible on a cliff face from the R354 tar road. It lies 3-km east of the Rietkloof wind farm on the farm Hartjieskraal. The nest has always been attended by a pair of eagles, but no nestling was evident in 2021.



Photo 2: VE nest No 5 visible from the R354 tar road and occurring on the farm Hartjieskraal, 3-km east of the Rietkloof WEF. This nest area comprises three alternate nests, all found on different portions of the same cliff S33.036550° E20.582367°. Two of the three nests are shown below.



❖ **VE nest No 6 (Rietkloof WEF)**

This Verreaux's Eagle nest was discovered by BBU in July 2021 and comprises three alternate nests on a steep cliff face at S33.084949° E20.441105° in the furthest south-west corner of the Rietkloof WEF.

This nest is one of the most problematic discoveries as it lies within a few hundred metres of proposed turbines.

Drone footage of the cliff face in July 2021 revealed a perched adult but no eagles sitting on eggs at any of the three nest structures. High aerial activity was recorded here in July 2021 and additional mitigations are required for the proposed turbines that lie a few hundred metres from this new nest.



Photo 3: VE nest No. 6 comprises three different structures on the same steep cliff at S33.084875° E20.441221° a few hundred metres south of the Rietkloof WEF.

The circled nest left, shows whitewash (faeces) on the rock face behind it indicating that it may have been used in the previous breeding season.

The second nest, below, is difficult to see, and shows no whitewash.



❖ **VE nest No 7 (Rietkloof WEF)**

This nest was discovered in May 2020 when the area was used as a Control site for the Roggeveld WEF by BBU in our assessment. It lies within the northern section of Brandvalley wind farm. No breeding activity has been recorded here despite birds roosting within 100-m of the nest in 2021 (bottom photo).



Photo 4: Nest No 7 – arrow shows the undiscovered nest neatly tucked into the rock face and easily overlooked. It was discovered in May 2020 by BBU.

This nest is located at S 32.933397° E20.434472° and no other alternate nests were present. The adult (left) was only revealed by drone flight below the cliff in July 2021.

These four eagle nests require close attention and monitoring, and the protocol for that is laid out below.

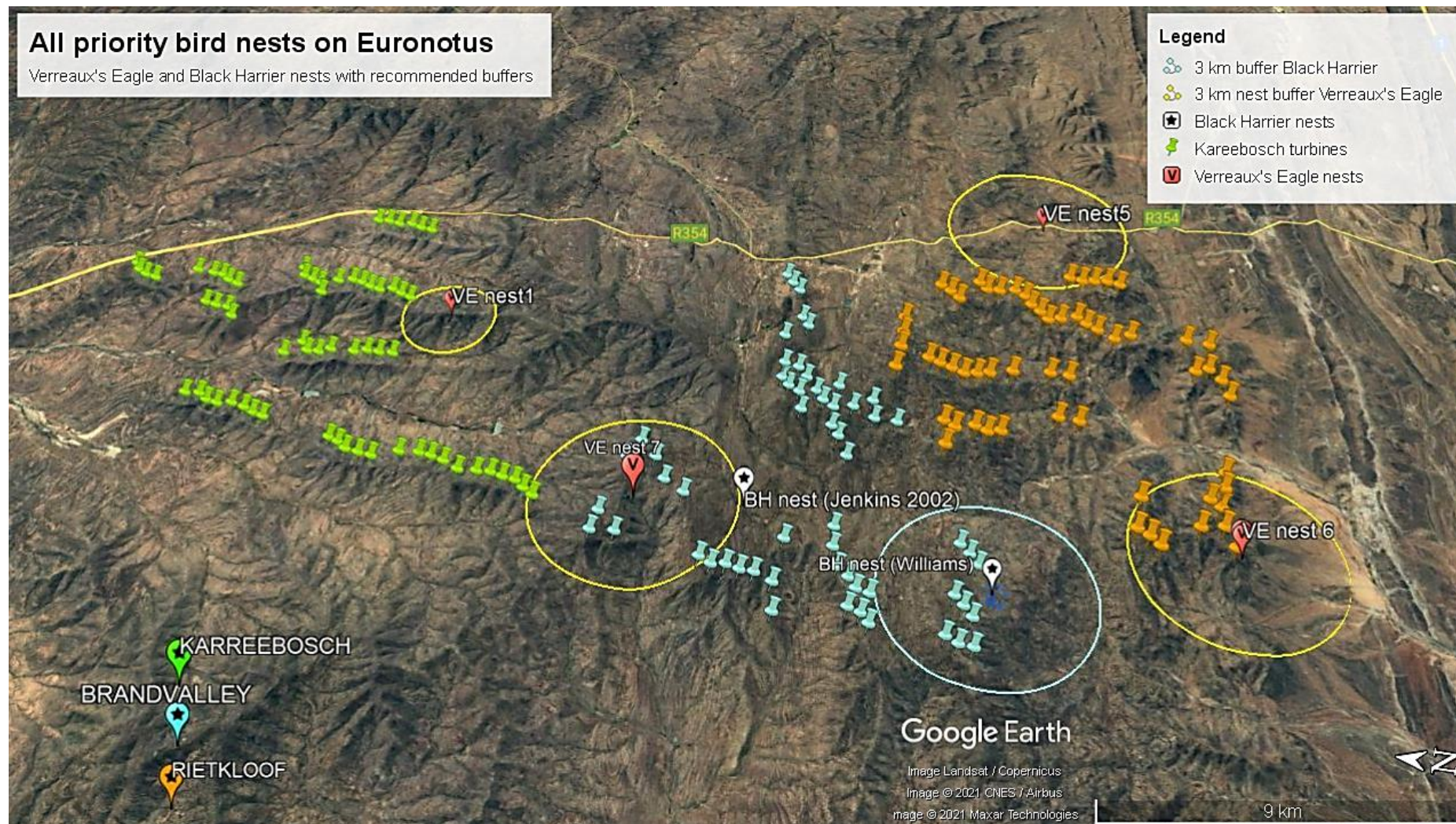


Figure 1: All (4) Verreaux's Eagle (= red balloons) and (2) Black Harrier nests (= white balloons) in the Euronotus cluster, with their recommended Birdlife buffers of 3-km. The authorised turbine design may be less than the 60 turbines (= green, blue, and orange pins), shown here and may be reduced to 33 for each wind farm. No buffer is shown for the BH (Jenkins 2002) nest as no activity has been recorded at this nest in 2020 or 2021.

2.2 SUMMARY of BLACK HARRIER NESTS in the EURONOTUS CLUSTER

As *Endangered* Red Data species highly susceptible to collision with turbines, Black Harriers also require special attention (Simmons et al. 2020). Two nest sites are known within the Brandvalley wind farm.

❖ *BH nest No 1 (Williams nest – Brandvalley WEF)*

This Black Harrier nest area was discovered in 2016 during surveys by African Insights (2016). It is located on the southern border of the Brandvalley WEF.

The nest was re-visited by BBU in both July and August 2021. A Black Harrier pair were recorded in July, and a new nest, with no eggs, was found in August (Photo 5). This nest requires monitoring as laid out below.



Photos 5 a+b: Black Harrier Nest No 1. The nest on Brandvalley was suspected by African Insight in 2013 but remained undiscovered.

In July 2021 a Black Harrier pair were recorded at S33.024364° E20.416442° in juncus vegetation within Karoo scrub.

The nest (left) was found complete, but without eggs, in August 2021 by BBU.

It is possible that it was depredated by a terrestrial predator as the male remained in the area. The outcome remains unknown, and the area will be monitored again in our November 2021 surveys in case the pair decide to breed again.



Photos 6 and 7: Black Harrier nest No 2 – this second nest site on Brandvalley was found by Avisense in 2010 during initial field work but was not investigated by African Insights (2013). No birds were recorded here when we visited in May 2020 and July 2021. It appears ideal habitat however, with juncus vegetation (below) in a drainage line within Karoo scrub. This nest area must be surveyed according to recommendations in Birdlife’s Black Harrier guidelines (Simmons et al. 2020).



3 MONITORING PROGRAMME

Given that, by April 2021, 22 Verreaux's Eagles (VE) fatalities had been recorded at all South African wind farms (S Ralston-Paton and M Murgatroyd unpubl data), the monitoring (and mitigation of impacts) at wind farms for this *Vulnerable* species is of the highest priority.

Equally important is the monitoring of globally *Endangered* Black Harriers because of their susceptibility to wind farms (Simmons et al. 2020) and due to its very small global population of just over 1000 individuals, the population is highly sensitivity to additive fatalities from wind farm (Cervantes Peralta et al. in press).

In the Euronotus cluster of wind farms in the Roggeveld environment, four active Verreaux's Eagle nests are present as described above and their positions relative to the WEF shown in Figure 1. From previous experience with eagle nests and monitoring programmes across South Africa we recommend the optimal timing of visits to the VE nests as per 3.1 below.

All observations must be undertaken by qualified ornithologists familiar with raptors and, eagles in particular.

3.1 TIMING of SITE VISITS

- **Winter** – egg-laying (May-June) three full field days must be spent observing all possible nests at the start of eagle breeding, to determine nest activity and collect some adult flight data. Nests must not be visited or approached closer than 150-m.
- **Spring** – small young (September-October) three full days must be spent observing the young on the nests and visiting other eagle sites to determine activity/success of these nests.
- **Summer** – (November-December) three full days to record the first flights of fledged youngsters at active and successful nest.
- **Late Summer** – (January-February) three full days to record extended juvenile flights to determine if they venture near any turbines.

For each site visit, an Interim Report must follow which details:

- (i) the activity **status of the nest** (active/inactive) and stage (eggs, nestling, success/failure);
- (ii) the **flight paths** of adult eagles (and juveniles when they are airborne);
- (iii) special attention must be made for **flights near spinning turbines** (avoidance behaviour, attraction to, or impact by the blades); and
- (iv) report any **deaths** detailing time, turbine number, behaviour, identity of the adult or juvenile, resident or floater. These must be accompanied by photographs of the carcass *in situ*, with GPS point clearly marked.

As per the BARESG guidelines a **carcass monitoring programme** should be simultaneously instituted to systematically record all avian deaths (not just eagles) over 12-24 months. This must follow guidelines laid out in the Wind Farm guidelines (Jenkins et al. 2015).

We understand that Luke Strugnell (Ecological Logistics) is undertaking these surveys for the Roggeveld wind farm, and we are happy to liaise with him over protocols, timing, and avian collision-victim identifications.

4 MANAGEMENT and MITIGATION PROGRAMME

4.1 LAND-OWNER MANAGEMENT

The Management and Mitigation Programme must be adaptive, with a fast response time, if it is found that eagles (or other Red Data species) are being killed. This applies to both the wind farm *and* the landowner's management practices.

If the latter is not included then it renders redundant all observations, data capture, identification of risk areas, discussions with the developer, and the subsequent efforts by Red Rocket to reduce impacts by micro-siting turbines or reducing numbers of turbines.

Thus, site and nest inspections must detail any suspected interference. That is, the sudden loss of an adult/adults, and/or the disappearance of the nest, or its contents, must be reported immediately.

Given the importance of safe-guarding all nests we suggest that the **Lease Agreement** – and the Environmental Authorisation – must have a clause to formalise the non-interference of adult eagles (i.e., shooting, poisoning, persecution, etc) and the nests, and/or their contents. The landowner must be made fully aware of this clause, and there must be consequences if it is broken.

To ensure compliance we further suggest that the Contractual Agreement with the landowner is put on hold, and they do not receive remuneration for a period to be determined by the developer if the evidence is overwhelming that eagle interference, or death, has occurred.

Given that such evidence is hard to prove we suggest that, as part of the management programme, trail cameras (camera-traps) are mounted at the Verreaux's nests, or nearby, to ensure that if interference occurs, it is captured on camera.

For our part, to reduce disturbance during surveys, we plan to use a small light-weight drone (DJI Mavic-mini drone) to check nests. This has been employed successfully at some Witberg eagle nests and has not disturbed the breeding eagles there unnecessarily.

4.2 WIND-FARM MANAGEMENT

The main goal of the wind farm Management Plan is to proactively seek solutions as soon as:

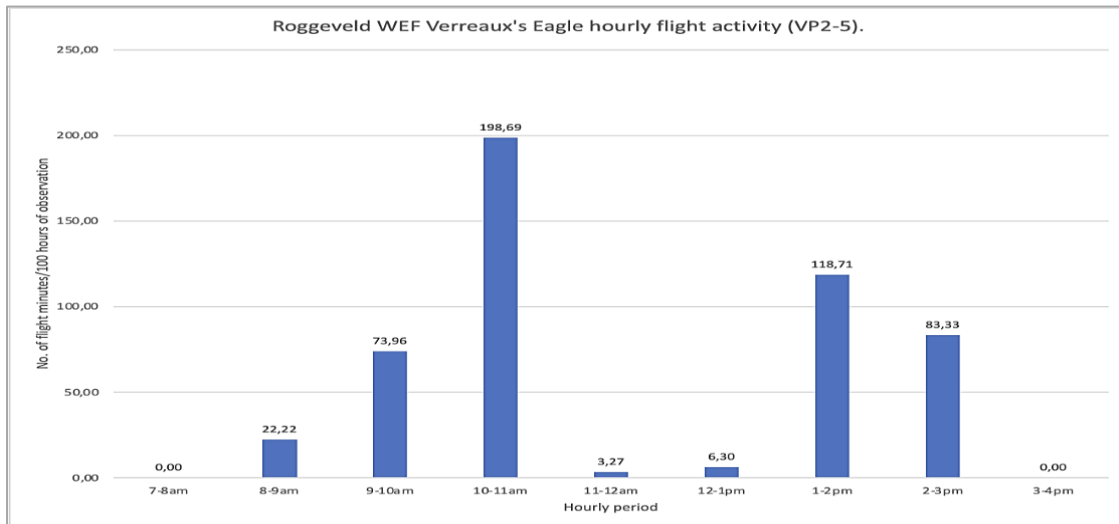
- (i) short term issues occur – such as eagle fatalities, due to impacts with turbines; or
- (ii) long-term issues are detected – such as the displacement of eagles or other species over several years.

To this end we suggest:

- Regular and systematic carcass searching must be implemented across the full site as laid out in the Best Practise guidelines (Jenkins et al. 2015).
Given that over **20 Verreaux's Eagles** and eight **Black Harriers** have been killed by South African wind farms to April 2021 (S Ralston Paton in litt) and this Euronotus site has four Verreaux's Eagle nests, and possibly two Black Harrier nests, it is important that live-bird surveys and carcass-searching should be undertaken for at least 24 months.
- Given the relatively small number of turbines (34 on Rietkloof and Brandvalley given the revised layout) we suggest that all turbines are surveyed by carcass-searching teams on a 2-weekly basis, year-round.

The tiers of mitigation to avoid large raptor impacts are:

- (i) the shutting down of certain turbines at certain times of day to avoid the most frequent flight times and flight areas of the Verreaux's Eagles (Figure2). This is designed to be used if the turbines are operational prior to other forms of mitigation being enacted
- (ii) an observer-lead Shut down on Demand (SDOD) team on site.
- (iii) BBU had recommended coloured (black or red) blade mitigation as the second-tier mitigation of choice. This may be possible for the Euronotus Cluster given that blades have not been manufactured.
- (iv) The last mitigation recommended is the use of shut-down on demand technology (e.g., DT-Bird and Bioseco). This technology analyses the form and flight path of birds heading towards operational turbines and shuts down the turbine if the species is identified as a *Threatened* or collision-prone species.



WINTER (May-Jun-Jul)														
Hours	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	20:00-6:00
Operation and Risk	Night	Dawn											Dusk	Night

SPRING, SUMMER, AUTUMN (Aug-Sep-Oct-Nov-Dec-Jan-Feb-Mar-Apr)														
Hours	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	20:00-6:00
Operation and Risk	Dawn													Night

Figure 2: A summary of the hours when turbines can be operational (green), and should not be operational (red), based on seasonal and hourly flight times of Verreaux's Eagles in the Roggeveld WEF during the construction phase (top bar graph) and in Beaufort West (Davies 1994). This represents the first tier of mitigation prior to observer-lead SDOD on site.

4.3 PROGRAMME in case of EAGLE or HARRIER FATALITIES

Given the multiple tiers of mitigation to be put in place arising from our records and analysis of the behaviour of the eagles and the harriers, fatalities are not expected. However, experience has shown that even WEFs with no record of eagles passing through the farm during pre-construction surveys, can experience fatalities (Ralston Paton and Murgatroyd in prep).

Thus, the adaptive response recommended for Red Rocket (Pty) Ltd is to:

- (i) Investigate, over 12 months, which turbines are responsible for more than one eagle or harrier death.
- (ii) Investigate weather conditions at the times of the deaths.
- (iii) Investigate the time and seasons when most eagle and harrier deaths occur. This has been found to peak in August, from the 22 deaths recorded by Ralston Paton and Murgatroyd (in prep) and in October-November from the 6 Black Harrier deaths recorded at Jeffreys Bay WEF (Simmons et al. 2020).
- (iv) If patterns emerge from a statistical assessment of the factors involved, then additional mitigation measures are recommended – in the form of shut-down-on-demand (SDOD). This method shuts down individual problem turbines at specified times of day, in specified seasons when and weather conditions.

As an example:

- if turbine WTG(n) is found to have caused the deaths of two Verreaux's Eagles over a 12-month period at the Witberg WEF, and
- most other deaths at other turbines within the Witberg WEF (and other WEFs in South Africa) have occurred between 10:00 and 13:00,
- mainly in the month of August,
- during windy and misty conditions, then

we recommend that WTG(n) is shut down temporarily from 10:00 to 13:00 on any August day in which misty but windy conditions prevail.

At all other times the turbine can function as normal.

We recommend that Red Rocket (Pty) Ltd, in conjunction with Birdlife South Africa (and their fatality data), jointly employ a statistician to analyse all Verreaux's Eagle and Black Harrier deaths, the conditions under which fatalities occurred, and look for significant patterns in terms of weather, topography, time of day, and season.

These analyses can assist in reducing VE and BH impacts at other WEFs by automatically shutting down when all these conditions occur.

5 CONCLUSIONS

Eagles and Black Harriers can be affected in several ways by the construction, operation, or de-commissioning of wind farms by:

- (i) direct mortality; or
- (ii) displacement by disturbance caused by the wind farm; or
- (iii) changes in habitat, or displacement from hunting grounds in the wind farm.

One effect we expect to see is a reduction in the frequency of breeding or the success of breeding if the wind farm has direct (fatality) or indirect (displacement) effects (Walker et al. 2005, Wilson et al. 2017, Watson et al. 2018).

Thus, the carcass monitoring programme, in conjunction with the Verreaux's Eagle and Black Harrier nest monitoring, is important to determine if deaths coincide with reductions in productivity or nest use.

Here we have given an adaptive management plan to monitor the eagle and harrier nests and the breeding outcomes, at the same time as assessing any fatalities.

Should deaths occur (which are not expected given the multiple tiers of mitigation) then we recommend that statistical analyses of biotic and abiotic factors be undertaken – of all fatalities of Verreaux's Eagles and Black Harriers from all wind farms around South Africa – to determine if patterns occur that will assist mitigation by temporarily shutting down problem turbines at such times.

Given that landowner attitudes towards eagles are often negative in a Karoo setting, the landowner must also understand that persecution of the eagles will have consequences. Remote nest monitoring through trail camera installations will assist in reducing the likelihood of this and surveying the eagle and harrier nests with small drones will also assist in reducing stress from the nest monitoring work.

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Dr RE Simmons / M Martins
Birds & Bats Unlimited
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birds-and-bats-unlimited.com