NALA

ENVIRONMENTAL

CONSULTING FIRM

BAT MONITORING PROGRAMME – RIETRUG WIND ENERGY FACILITY

DECEMBER 2022

Applicant	:	Rietrug Wind Farm (Pty) Ltd
Title	:	BAT MONITORING PROGRAMME
Authors/EAP	:	Nala Environmental (Pty) Ltd Arlene Singh (SACNASP) Norman Chetsanga (SACNASP) Justin Jacobs
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BAT MONITORING REQUIREMENTS

The bat monitoring programme should at all times adhere to the relevant South African Bat Assessment Association best practise guidelines, in effect at the time that the monitoring is undertaken (http://www.sabaa.org.za/pages/3_currentguidelines.html). The sections below outline the recommended monitoring protocol, however, these can and should be revised as needed to comply with updates to the best practise guidelines as/when these occur.

The operational WEF will be regularly monitored for bat activity and bat mortality as follows:

- Acoustic monitoring will be done at one or two randomly chosen towers at each site during the periods of migration and mid-summer.
- The acoustic monitoring will be accompanied by monitoring for bat fatalities at one or two randomly chosen towers at each facility by walking two concentric spiral transects 7m apart with the larger spiral starting at 50m from the tower.

APPENDIX 1 – MINIMUM REQUIREMENTS FOR OPERATION BAT MONITORING SUMMARY (as per the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities, 2nd Editions, June 2020).

- A minimum of two years of operational monitoring is required (acoustic monitoring and carcass searches).
- Monitoring must be conducted again in year five, and every five years thereafter.
- Acoustic monitoring as per the pre-construction monitoring programme, if acceptable, or according to MacEwan *et al.* (2020b, or subsequent editions). At least one ultrasonic microphone should be installed within rotor sweep height.
- The search interval must be twice a week initially to be updated using carcass removal rates by scavengers for the specific study area.
- All turbines must be searched according to the search interval for the first year. This can be reduced or adjusted in subsequent years based on the findings of the first year.
- The search plot must cover a radius around the turbine of at least half the distance from the maximum blade tip height to the ground. For example, if turbines blades extend 120 m from the tip to the ground (i.e. the top of the rotor swept zone), the search plot should extend 60m in all directions.
- Transects within each plot should be spaced a maximum of 6 m apart yielding a search width of 3 m on either side of the transect line. This should be decreased in areas with low visibility.
- Field bias assessments should be conducted as often as possible, but a minimum of once per season is required, including at the start of the monitoring programme to set baselines.
- A minimum of 10 carcasses per visibility (and size) class should be used per season for each searcher or search team for the searcher efficiency trials.
- For each carcass removal trial, a minimum of 10 carcasses, evenly distributed across the visibility (and size) classes, should be used. No more than three carcasses should be placed at any particular search plot at any given time. The trial carcasses should be monitored every day until they have been completely removed or decomposed.
- GenEst (Simonis *et al.* 2018) or subsequent versions must be used to estimate bat fatality.
- If fatality minimisation strategies are implemented, the effectiveness of the strategies must be thoroughly tested by extending the initial monitoring period by an additional two years. Records of bat fatality and fatality estimates must be kept in a central

database that can be accessed by various stakeholders to facilitate greater understanding of bat wind energy impacts including cumulative impacts.

- One or more fatalities during a 12 month period of any frugivorous bats, conservation important or rare/ range-restricted bats listed in Table 3 should trigger mitigation."

Due to the difficulty in determining actual bat population sizes (Lentini *et al*. 2015; Arnett *et al.* 2016), based on data available, literature reviews and based on expert elicitation, a method of determining site specific bat fatality threshold levels that trigger mitigation measures has been proposed. When empirical data is lacking for focal species, data from similar species or structured elicitation of expert opinion can be used for conservation decision-making (Burgman *et al.* 2011; Drescher *et al.* 2013; Martin *et al.* 2012). Such expert elicitation has been used for a variety of conservation problems (Donlan *et al.* 2010; Martin et al. 2005; Runge *et al.* 2011; Smith *et al.* 2007). Deciding whether conservation measures are necessary to prevent or mitigate impacts from wind energy development on populations of bats requires use of expert judgments and/or use of data from similar taxa to quantify reasonable scenarios of population growth and losses (Frick *et al.* 2017).

The proposed threshold calculation method is the area of impact and ecoregion specific and that bat activity indices (bat passes per recording hour) are used as an indication of the bat occupancy level of an area, as this is information easily available. The below explanations and results were derived in conjunction with Workbook. Special Notes:

- Whilst these guidelines were developed for the impacts of wind energy facilities on bats, because they are area and ecoregion based, they can be applied to any development that may result in bat fatalities.
- Owing to the importance of these guidelines, the South African Bat Assessment Association (SABAA) will strive to review and update them every 18 months or as pertinent information becomes available.
- Any deviations from using the threshold determination method in these guidelines must be acknowledged and motivated clearly. Such deviation should be ecologically justified. Financial or capacity constraints are not acceptable reasons for deviating from the recommended threshold calculations.

Which Bats Does the Threshold Apply to?

To all insectivorous bat species not included in Table 3 below. The threshold applies to individual species killed annually per 10 ha and is based on values adjusted for biases such as searcher efficiency and carcass persistence. One or more fatalities during a 12 month period of any frugivorous bats, conservation important or rare/ range restricted bats as listed In Table 3 should trigger mitigation.

Table 3: List of Bats where 1 Fatality per Annum should Trigger Mitigation (South African Bat Fatality Threshold Guidelines, Edition 2. October 2018)

Species Name	Common Name
Cistugo lesueuri	Lesueur's Hairy Bat
Cistugo seabrae	Angolan Hairy Bat
Cloeotis percivali	Short-eared Trident Bat
Eidolon helvum	African Straw-colored Fruit Bat
Epomophorus wahlbergi	Wahlberg's Epauletted Fruit Bat
Kerivoula argentata	Damara Woolly Bat
Laephotis namibensis	Namib Long-eared Bat

Laephotis wintoni	De Winton's Long-eared Bat
Miniopterus fraterculus	Lesser Long-fingered Bat
Miniopterus inflatus	Greater long-fingered bat
Neoromicia rendalli	Rendall's serotine
Nycteris woodi	Wood's Slit-faced Bat
Otomops martiensseni	Large-eared free-tailed Bat
Rhinolophus blasii	Peak-saddle Horseshoe Bat
Rhinolophus capensis	Cape Horseshoe Bat
Rhinolophus cohenae	Cohen's Horseshoe Bat
Rhinolophus denti	Dent's Horseshoe Bat
Rhinolophus smithersi	Smither's Horseshoe Bat
Rhinolophus swinnyi	Swinny's Horseshoe Bat
Rousettus aegyptiacus	Egyptian Fruit Bat
Scotoecus albofuscus	Thomas' House Bat
Scotophilus nigrita	Giant Yellow House Bat
Tadarida ventralis	Giant Free-tailed Bat
Taphozous perforatus	Egyptian Tomb Bat

EXAMPLE DATA SHEETS

Information for each Search Plot

Site: _____ Date:_____

Searcher(s):_____

Turbine No.	Search Start Time	Search End Time	Start Point/Direction	No. of Bat Carcasses Found	Notes (weather, turbine maintenance etc.)

Fatality Report Sheet

Site Name		Photo Number:	
Carcass ID No:		Searcher (s):	
Recovery Date:		Time Found:	
Turbine No:		Co-ordinaates:	

HABITAT INFORMATION (within a 3m radius around carcass)

Dominant Habitat Rocks ☐ Bare Ground ☐ Vegetation ☐ Other: _____

Visibility Class Easy ☐ Moderate ☐ Difficult ☐ Very Difficult ☐

Slope <25º ☐ 50º ☐ >75º ☐

Distance from turbine base_____

Other Notes_____

CARCASS INFORMATION

Live ☐ Dead ☐

If Live Euthanised ☐ Released ☐ Taken to Rehab Centre ☐

If Dead Used for Field Bias Trials ☐ Taken as Voucher ☐

Field ID_____ Species

Sex Male ☐Female ☐ Unknown ☐

Describe obvious injuries_____

Evidence of Scavenging Yes ☐ No ☐ Possible Scavengers_____

Carcass Condition Fresh ☐ Decomposing - early ☐ Decomposing - late ☐ Desiccated ☐

Infestation None ☐ Flies ☐ Maggots ☐ Ants ☐ Beetles ☐ Other:

Estimated Time of Death Previous Night ☐ 2-3 Days ☐ 4-7 Days ☐ 1-2 weeks ☐ >2 weeks ☐

Eyes Round/fluid filled ☐ Dehydrated ☐ Sunken ☐ Empty☐

Notes

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Procedure for Dealing with Live and Injured Bats

The level of treatment and care offered to injured bats depends on the training, skill and motivation of the personnel involved. Training in all the techniques discussed below can be obtained from an experienced wildlife veterinarian or from specialist bat rehabilitators. Handling injured bats should not be attempted by untrained personnel. If there is no training offered, and little motivation to care, injured bats are best humanely euthanised and the bodies lodged with a museum so that the injuries and death may be recorded. However bats are intelligent and can learn: grounded bats treated and returned to the wild may learn to avoid turbines and thus safeguard future generations. Bats (live or dead) may not be handled except with the correct permits from the responsible provincial authorities. Live bats should be handled with soft, close-fitting, bite-proof gloves (gardening or pigskin gloves) and with a soft flannel or fleece cloth. All personnel handling live or dead bats should be fully inoculated against rabies. Although canine rabies has never been found in a bat in Africa, African bats may carry one of two Lyssaviruses which might infect humans. Accidental bites and scratches should be washed well with soap and water and treated with an iodine-based ointment. A medical professional should be consulted as soon as possible after such injury. Live bats should not be handled by inexperienced or untrained people.

IT SHOULD BE IMPRESSED UPON ALL HANDLERS THAT BATS ARE INTELLIGENT AND SENTIENT MAMMALS AND HANDLING SHOULD BE ACCORDINGLY

Assessment of Injuries

Rehydration

Bats are best rehydrated with a subcutaneous injection of Lactated Ringer's solution. Many of the bats at highest risk of harm from wind turbines (e.g. Molossidae and Miniopteridae) do not drink free water and cannot be effectively rehydrated orally.

Shock

Shock can be treated with oral Rescue Remedy drops (available from chemists and supermarkets) or with Metacam® (Meloxicam) which is more effective but only available from veterinary professionals.

Feeding

Insect-eating bats can be fed mealworms (the best food for insect-eating bats but difficult to keep in field conditions), Whiskas® cat food (not a balanced diet and thus for short-term use only), and Nutrostim® (a high-calorie food supplement useful for Pipistrelles and Serotines). Fruit bats can be fed any soft, non-citrus fruit or Purity® Pear baby food.

Euthanasia

There is no simple way to euthanise bats in a field situation and the method used depends on the experience of the handler.

1. Halothane or Isoflurane are anaesthetics which are the method of choice for bat euthanasia. The bat is placed in a small container with the halothane and left until heartbeat has ceased. However halothane is a Schedule 5 drug, can only be obtained from a veterinarian, and evaporates unless correctly stored.

2. Cervical dislocation, stunning and decapitation should only be used by experienced handlers and as a last resort. Brain activity may persist for 13 seconds or more after decapitation and the skull may be damaged too badly for correct identification.

Classification and Assessment of Injuries with Recommended Option for Providing Care to Bats

Level of Injury	Descriptions	Care Needed
Level 1	No obvious injuries, no blood or broken bones visible. Dehydration, shock. Bruises where bat can fold and move wings. Holes in wing membranes where trailing edge is intact.	Field care. Treat for dehydration and shock. Release same day
Level 2	No broken long bones (might be small breaks in phalanges) or blood visible. Bruises where bat cannot fold or move wings. Bat unwilling to fly.	Field care. Treat for dehydration and shock
Level 3	Broken long bones, tears through trailing edge of wings. Concussion	Specialist care. Treat for dehydration and shock

Level 4	Broken skull or jaw, spinal injuries where bat cannot move hind legs. Blood in mouth and nose indicating barotrauma injury	Euthanise

Procedure for Dealing with Dead Bats

Dead bats which are not needed for field bias trials should always be lodged with a museum which can provide accurate species identification, cause of death, and long-term storage. Dead bats should be preserved with alcohol as formalin-preserved animals are harder to manipulate to determine the cause of death, and alcohol preservation is needed for genetic sampling. Dead bats can be frozen temporarily but need to be preserved in alcohol for transport and identification. Bats should be identified, measured, and weighed before being preserved. An identification label should be tied firmly to a leg. The following information must accompany all specimens:

- Date and time when carcass was located/found
- Collectors name and surname
- Locality in the following format: Province, District/Municipality, Town/Suburb, etc. (e.g. KwaZulu-Natal: uMkhanyakude District, Mtubatuba,Nkosi Mtuba Road)
- GPS locality3
- State of body (e.g. fresh, poor, badly decomposed)
- Any evidence of scavenging of the body (this may be important for noting bodily damage during autopsies)

The abdomen should be injected with 90 % ethanol to ensure that the internal organs are adequately preserved and can be sampled for genetic material at a later stage. The bat should then be placed in 70 % ethanol for at least three days to allow the tissues to be preserved. To prevent deterioration of the bodies during preservation the volume of alcohol should be more than three times the volume of the bodies.

Once preserved, the specimens can be drained of excess alcohol, wrapped in muslin cloth, and placed in appropriate packaging for transport. Carcasses should be packaged in strict accordance to UN3373 category B packing instructions - this includes leak-proof packaging, and triplicate layering. Packages should be clearly marked "UN3373 category B – biological material for research purposes". Transportation of carcass material should follow International Air Transport Association (IATA) packing instruction 650 (for UN3373 material), on passenger and cargo aircraft and Cargo Aircraft only. The above also applies to consignments shipped via road freight. For further information on the packing requirements for UN3373 category B, please visit https://apps.who.int/iris/bitstream/handle/10665/325884/WHO-WHE-CPI-2019.20-eng.pdf?ua=1.

These requirements are subject to change. Please visit the World Health Organisation website to ensure compliance with the most recent guidelines. A declaration needs to be fixed to the outside of the package stating that IATA regulations have been followed prior to shipping the package. In accordance with the Convention of Biological Diversity – Nagoya Protocol, copies of all permits (scientific/collecting, export, import) must accompany the package or be provided in electronic format to the relevant receiving organisation. Packages can be couriered to either:

Dr L. Richards

Durban Natural Science Museum (Research Section)

151 K.E.Masinga Rd (corner Wyatt Rd)

Durban, 4001

Dr T. Kearney

Ditsong National Museum of Natural History

432 Paul Kruger Street

Pretoria, 0002