Bat Impact Assessment for the proposed development of the Latrodex Wind Energy Facility near Haga Haga, Eastern Cape Province, South Africa

BAT IMPACT ASSESSMENT: LATRODEX WIND ENERGY FACILITY

FINAL DRAFT

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CES ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

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EXECUTIVE SUMMARY

Latrodex (Pty) Ltd Wind Energy Facility has appointed Stephanie Dippenaar Consulting to undertake the required bat monitoring processes for the proposed construction of the Latrodex Wind Energy Facility (WEF) and associated grid connection infrastructure near Haga Haga in the Eastern Cape Province of South Africa.

The proposed Latrodex WEF consists of five (5) wind turbines. The hub height of the proposed turbines will be between 80 m and 125 m, with a maximum blade diameter of 90 m and the lowest point of the turbine sweep will be between 35 m and 80 m, depending on the final hub height and blade diameter.

The methodology and approach for this bat monitoring is mainly guided by the relevant South African bat monitoring guidelines (Sowler, *et al*., 2017) concerned with bat monitoring and wind energy development. The monitoring systems at the proposed Latrodex WEF consisted of a Wildlife Acoustics SM3BAT full spectrum bat detector with two microphones, one at 10 m and one 80 m. Bat monitoring included five field visits to investigate the site, do roost surveys, install and remove instruments, download data and perform transects.

The area has an oceanic humid subtropical climate with moderate, warm temperature typical of the South African coastline. Although most rain occurs in summer, the area receives rainfall throughout the year. The Latrodex WEF falls within the Tropical and Subtropical Moist Broadleaf Forests classified by SANBI (2012) as Albany Coastal Belt. The vegetation, with various flowering and fruit baring plant species, lends itself to high bat activity. Fruit bats as well as insectivores' bats could roost in the dense vegetation and insect occurrence associated with the vegetation cover, attracts insectivorous bats. Field visits confirmed signs of bat presence at the human dwellings and bat droppings indicate that bats could use these areas as roosts.

Of the two fruit bat species and twenty-three insectivores' bat species which have distribution maps overlaying the proposed development area, seven have a Near Threatened and two have an Endangered conservation status in South Africa, while three of these have a global conservation status of being Near Threatened. Two of the Near Threatened bat species *Miniopterus fraterculus* (Lesser long-fingered bat) and *Rhinolophus capensis* (Cape horseshoe bat), as well as two Least Concern bat species *Eptesicus hottentotus* (the Long-tailed serotine) and *Sauromys petrophilus* (Roberts's flat-headed bat) are endemic to Southern Africa (Monadjem, 2010).

According to the likelihood of fatality risk, as indicated by the pre-construction guidelines (MacEwan, *et al*, 2020), twelve of the species, namely *Epomophorus wahlbergi* (Wahlberg's epauletted fruit bat), *Rousettus aegyptiacus* (Egyptian rousette), *Taphozous mauritianus* (Mauritian tomb bat), *Miniopterus fraterculus* (Lesser long-fingered bat), *Miniopterus natalensis* (Natal long-fingered bat), *Chaerephon pumilus* (Little free-tailed bat), *Mops condylurus* (Angolan free-tailed bat), *Otomops martiensenni* (Large-eared giant mastiff bat), *Sauromys petrophilus* (Roberts's flat-headed bat), *Tadarida aegyptiaca* (Egyptian free-tailed bat), *Neoromicia capensis* (Cape serotine bat) and *Neoromicia nana* (Banana bat) have a high risk of fatality due to its foraging habitat at high altitudes. Three more species, *Myotis tricolor* (Temminck's Myotis bat), *Pipistrellus hesperidus* (Dusky pipistrelle) and *Scotophilus dinganii* (Yellow-bellied house bat) have a medium to high risk of fatality while *E. hottentotus* has a medium fatality risk.

The proposed Latrodex WEF has a rich species diversity. Calls similar to 14 of the 25 species with distribution maps overlaying the proposed development site were recorded by the static recorders. 45% of the calls at the proposed Latrodex WEF represent *Neoromicia capensis*, which is the dominant species on site. *N. capensis* is a high-risk species, that forage in the vicinity of the turbine blades, so that the risk of collision and barotrauma is high. 60% of the activity recorded within the sweep of the turbine blades at the 80 m sampling point (A) is from the Molossidae family, with 40% of these related to the high flying *Tadarida aegyptiaca*. 4% of the activity recorded indicates the presence of the red data *Miniopterus natalensis* of the Miniopteridae family. Higher activity was recorded at the lower monitoring system (B), if compared to the system at high altitude (A), indicating the bat activity decreases with altitude at the terrain.

Apart from the period between from June to July 2020, bat activity is high. All species' activity declines in the winter months. Increased activity is then portrayed from the end of winter, through three seasons, until the end of autumn. According to the data from the monitoring period, in general, bats show an increase in activity towards the end of summer and an increase in autumn. Then a decrease in activity is displayed as winter approaches with a second increase during spring or summer (for some species), when warmer temperatures set in.

Although higher activity was recorded at the lower monitoring system (B), both monitoring systems display similar trends in nightly hourly activity.

According to the 2017 SABAA bat monitoring guidelines (Sowler, *et al*., 2017) the terrain was categorised under Kwazula-Cape-Coastal Forest mosaic vegetation, but a more refined, and more applicable classification is evident in the 2020 SABAA bat guidelines (MacEwan, *et al*., 2020), that classifies the Latrodex terrain as Albany Thicket vegetation. Although the 2017 guideline is applicable to this report for EIA purposes, if the precautionary principle of environmental impact assessment is applied, and the more refined vegetation zone is used, this site is classified as medium to high risk. Due to the presence of fruit bats, which are problematic to monitor within the impact assessment methodology and period, the author of this document would classify the wind energy development as high risk for bats.

Linear regression of bat activity and weather conditions show that as wind speed increases, bat activity decreases. Furthermore, as temperature increases, bat activity increases. This is confirmed and refined by cumulative distribution functions as well as cumulative distribution function (CDF) heat maps. The data from the Met high sampling system (A) informs the mitigation regime, with most bat activity at Met High recorded below 10m/s windspeed and temperature above 16 ^{o}C.

High activity was recorded during all transects and the majority of calls were similar to *N.capensis. E. hottentotus, S. petrophilus, N. nana* and the Near Threatened *M. natalensis* were also recorded on the transects, confirming these species on site.

The bat sensitivity map indicates a general high biophysical bat sensitivity area. Due to the small footprint of only five turbines, the proposed wind turbines will have a lesser effect in comparison with the larger wind farms in the vicinity. Note that natural habitat surrounds the wind farm, containing numerous bat conducive features.

South African legislation requires a year pre-construction bat monitoring, but the environmental conditions vary from year to year. These changes usually result in changes in the bat situation not accounted for in this report. Operational monitoring will provide further clarity on the bat monitoring situation as well as refinement of the mitigation protocol.

Recommended mitigation measures for operational bat monitoring, as per Section 10, include the following **and should be incorporated in the EMPR:**

- Two years operational bat monitoring as per the relevant SABAA operational bat monitoring guidelines.
- Shifting turbines at least 500 m away from the human dwellings.
- Feathering of turbines below cut-in speed.
- The operational bat specialist will recommend Bat deterrent options.
- Curtailment as indicated in the table below:

CURTAILMENT FOR ALL TURBINES			
Months	**Time periods**	**Temperature (°C)**	**Wind speed (m/s)**
September to May	One hour after sunset up to one hour before sunrise	Above 16 °C	Turbines to be feathered up to 9 m/s

The outcome of the monitoring process predicts the potential Negative impact on the site as Moderate pre-mitigation with seven overall impacts rating Moderate and five rating High. The High rating impacts occur during the Operational phase as well as Cumulative impacts. The nature or the Negative impacts that rate High during the Operational phase as well as the Cumulative impact have severe consequences that include the mortality of resident and migrating bats due to direct collision or barotrauma, loss of bats of conservation value and habitat loss. Should the applicant adhere to the proposed mitigation measures, the potential impact on bats from the proposed Latrodex WEF post-mitigation is predicted to be Negative and remains of Moderate significance with both operational and cumulative impacts to be Negative and rating as Moderate impacts on the environment. These impacts include those mentioned above as well as the Negative Moderate impacts on Bat populations.

Impacts	**PRE-MITIGATION**			**POST-MITIGATION**		
Rating	**LOW**	**MODERATE**	**HIGH**	**LOW**	**MODERATE**	**HIGH**
Construction	**1**	**2**	**0**	**3**	**0**	**0**
Operational	**1**	**3**	**2**	**3**	**3**	**0**
Cumulative	**0**	**2**	**3**	**1**	**3**	**1**
Decommissioning	**1**	**0**	**0**	**1**	**0**	**0**
TOTAL	**3**	**7**	**5**	**8**	**6**	**1**

Considering the findings of the one-year pre-construction monitoring undertaken at the proposed Latrodex WEF site, the bat specialist is of the opinion that no fatal flaws exist, but that the site is sensitive to bats and the developer should proceed with caution. **The bat specialist recommends the granting of Environmental Authorisation with compliance to precautionary mitigation principles.**

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A and p.9
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix C
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5 and Section 6.3.1 – 6.3.2
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5 and Section 7
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 3 and Section 5
g) an identification of any areas to be avoided, including buffers;	Section 9
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 9
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 6 and Section 11
k) any mitigation measures for inclusion in the EMPr;	Section 10 and Section 11
l) any conditions for inclusion in the environmental authorisation;	Section 15

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 14
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8, Section 11 and Executive Summary
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 9
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 5.1.5. Not in the EIA public participation phase yet
q) any other information requested by the competent authority.	Appendix B
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n.a.

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FIGURES

TABLES

GLOSSARY OF TERMS

DEFINITIONS	
Bat monitoring systems	Ultrasonic recorders used to record bat calls
SM4BAT	Wildlife Acoustics' full spectrum ultrasonic bat monitoring recorder
Threshold	Bat activity threshold as provided by SABAA

ABBREVIATIONS

BA	Basic Assessment
CA	Competent Authority
CDF	Cumulative Distribution Function
CV	Curriculum Vitae
DEFF	Department of Environment, Forestry and Fisheries
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GNR	Government Notice Regulation
Ha	Hectares
IPP	Independent Power Producer
kV	Kilovolt
MW	Megawatt
NEMA	National Environmental Management Act (No. 107 of 1998)
O&M	Operation and Maintenance
REFs	Renewable Energy Facilities
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SABAA	South African Bat Assessment Association
WEF	Wind Energy Facility

SECTION 1: INTRODUCTION

Latrodex (Pty) Ltd Wind Energy Facility has appointed Stephanie Dippenaar Consulting to undertake the required Basic Assessment Process for the proposed construction of the Latrodex Wind Energy Facility (WEF) and associated grid connection infrastructure near Haga Haga in the Eastern Cape Province of South Africa.

It is anticipated that the proposed Latrodex WEF will consist of five (5) wind turbines. The hub height of the proposed turbines will be between 80m and 125m, with a maximum blade diameter of 90m. Therefore, the lowest point of the turbine sweep will be between 35m and 80m, depending on the final hub height and blade diameter. The maximum total energy generation capacity will be up to approximately 10MW.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered as listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such activities. Specialist studies assess and verify the project under the most recent Gazetted specialist protocols.

1.1 Terms of Reference

Acoustic monitoring of the echolocation calls of bats determine the seasonal and diurnal activity patterns of bats at the proposed Wind Energy Facility. The monitoring process follows the *South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments – Pre-Construction* (Sowler, *et al*, 2017), as the relevant guidelines from the start of the project throughout the monitoring process. The report incorporates the 2020 bat guidelines where necessary and relevant. The report furthermore uses the following South African guideline documents in conjunction with the pre-construction guidelines:

- South African Bat Fatality Threshold Guidelines for Operational Wind Energy facilities (MacEwan, *et al.*, 2018);
- Mitigation Guidance for Bats at Wind Energy facilities in South Africa (Aronson, *et al.*, 2018);
- South African good practice guidelines for operational monitoring for Bats at Wind Energy Facilities (Aronson, *et al.*, 2014).
- South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments - Pre-construction (MacEwan *et al*., 2020);
- South African Bat Fatality Threshold Guidelines (MacEwan, *et al.,* 2020);
- Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson, *et al.*, 2020)

The following Terms of Reference is applicable to the monitoring exercise, as informed by the relevant pre-construction guidelines:

- Conduct a desktop study of available literature to establish which species occur in the area. This will include the surrounding area as well as information from other wind developments in the area, if accessible.
- Provide background regarding ecosystem services and the impact of a loss of bats on the broader environment.
- Determine local and global conservation status of all identified bat species.
- Conduct a first site visit, included in the total of four site visits, which will include the scoping phase, to do reconnaissance of the site and install the equipment.
- Do in total four sight visits on each site to conduct active surveys, one per season, and daytime investigations.
- These site visits will cover all the various biotopes occurring on site.
- Set up and verify monitoring equipment, download data throughout the monitoring year and analyse echolocation calls.
- Conduct two sessions of mist netting to include fruit bats which do not echolocate (due to the position of the turbines, mist netting were not deemed necessary).
- Conduct interviews with the landowner(s), and where possible, employees who stay permanently on site, as well as other relevant local people and/or NGOs, if relevant, regarding possible bat occurrence on the property and the surroundings.
- Provide input in the final layout of turbines.
- Draw up a sensitivity map indicating areas with higher bat sensitivity.
- Assess the cumulative impact of each facility, together with existing wind farms in the close vicinity of the development site.
- Recommend mitigation measures.

1.2 Assessment Methodology

A description of the methods of investigation of bats on the proposed wind farm development follows below.

1.2.1 Desktop investigation of the development area as well as the surrounding environment

The report performs a desktop study of the site itself, using information as provided by the representative of the development as well as information gathered through a literature review. Investigation notes details of conservation areas in the vicinity and other renewable energy developments, particularly wind farms for the discussion of cumulative effects.

1.2.2 Passive Acoustic Monitoring Systems

The monitoring systems consisted of a Wildlife Acoustics SM3BAT full spectrum bat detector with two microphones, one at 10 m and one 80 m. 12V, 7 Amp-h sealed lead acid batteries replenished by photovoltaic solar panels powered the system, see Table 1. Four SD memory cards, class 10 speed, with a capacity of 64 or 128 GB each were utilised within the detector to ensure substantial memory space with high quality recordings, even under conditions of multiple false environmental triggers.

Table 1: Summary of passive bat detectors deployed at the Latrodex Wind Energy Facility.

Detector and microphone	Location	Coordinates	Micro-phone height	Division ratio	High pass filter	Gain	Format	Trigger window	Approximate drop in calibration at microphone
SM3 at 80m	80m met mast	32⁰44’37,49” S, 28⁰16’04,79” E	SMM-U2	8	16kHz	12dB	FS, WAV@ 384kHz	1 sec	-12 dB dB (at ground level)
SM3 at 10m			SMM-U2	8	16kHz	12dB	FS, WAV@ 384kHz	1sec	-8 dB (at microphone)

Each detector was set to operate in continuous trigger mode from dusk each evening until dawn. Times were correlated with latitude and longitude and set to trigger half an hour before sunset. The trigger mode setting for the bat detectors, which record frequencies exceeding 16kHz and -18dB, was set to record for the duration of the sound and 1000 m/s after the sound ceased; this period is known as the trigger window.

Every two to three months during the monitoring period, downloaded data from the recorder was analysed to provide an approximation of the bat frequency and species diversity that visit and inhabit the site.

Seasonal field work sessions were conducted during the following months:

- February 2020;
- March 2020;
- June 2020;
- November 2020;
- June 2021.

1.2.3 Roost Surveys

Roost surveys were conducted when the bat specialist visited the site, and any known roosts were inspected. Areas where roosts could be situated were investigated, including clumps of trees where fruit bats could roost. It is not always possible to have access to all roosts as insectivorous bats sometimes roost in crevices or roofs with limited ceiling space. If day roosts were identified, bat counts are done during sunset and if deemed necessary, detectors are installed for short periods at point sources to monitor roosts. Note that although the site itself is small, bats could roost in the surrounding area and these areas were walked through. Within the period and limitations of the bat monitoring study, searching the wider environment for roosts is not possible.

1.2.4 Driven transects

As prescribed by the guidelines, seasonal transects comprising of at least one transects session per field visit for each season were performed. A SM4BAT full spectrum recorder with the microphone mounted on a pole was used for transects. Starting at sunset, the vehicle was driven at a speed between 10 to 20 km/h along a set route. Due to the small size of the wind farm, transects were done by driving along the road and back again during the same evening. Apart from recording bats during the transects, the vehicle is sometimes switched off and the specialist listens for any *Epomophorus wahlbergi* (Wahlberg’s epauletted fruit bat), mainly during middle to late summer and spring.

1.2.5 Data Analysis

Data are downloaded manually approximately once every two to three months. Acoustic files downloaded from the detectors are analysed for bat activity with respect to the number of bat passes and bat species. The latest version of Kaleidoscope Pro is used for analysing large quantities of data. Data analysed electronically are regularly tested by hand to compare accuracy. Data sets are from time to time converted to ZC files and verified by Analook software. In cases where there is uncertainty about a call, but it is clear that it is a bat calling, the call is classified as Unclear.

SECTION 2: ASSUMPTIONS AND LIMITATIONS

Although it is an internationally accepted way of presenting bat data, the use of bat monitoring detectors to measure for relative abundance of bat activity as 'low', 'medium' or 'high', has limitations. This element of subjectivity is due to the extent that the results are based on the specialist's experience in interpreting the data into a qualitative baseline assessment report. A 'cautious' approach should be considered concerning accepting bat numbers as absolute true data and hence recent guidelines regarding bat monitoring recommends a 'standardised' approach and includes statistical formulas and calculations. Examples of assumptions and limitations in monitoring methods are highlighted below.

- The knowledge of certain aspects of South African bats such as population size, spatial and temporal movement patterns (e.g., migration and flying heights) and how bats may be impacted upon by WEFs is limited, as their behaviour differs when comparing the same European or American bat species.
- Data is extrapolated from echolocation surveys of bat calls over large areas, whereas acoustic monitoring only samples small areas of space (Adams *et al*. 2012). Furthermore, the sound recording of the bat echolocation call could be influenced by the type and intensity of the call, the bat species, detector system used, the orientation of the signal relative to the microphone and other environmental conditions such as humidity.
- Automatic analyses of bat activity has limitations, but for the EIA purpose, it is a scientifically accepted method of analysing data.
- The accuracy of species identification is dependent on the quality of the calls used for proof of identity but can be influenced by variation in bat calls within species and between different species and overlapping of species call parameters.
- Due to a high species diversity, and many species not being able to be recognised by Kaleidoscope Pro software automatically, many calls have been analysed manually. A few calls of several bat species have been identified, and although they are all been considered when species diversity is discussed, the low numbers of some of these species are statistically insignificant during statistical analysis of bats and weather conditions.
- Bat detectors record bat activity, but the sensors cannot distinguish between a single bat passing multiple times, which could lead to double counting, or multiple bats of the same species passing the device once (Kunz *et al*. 2007). Comparative studies of bat activity from similar locations are used to verify baseline information. Due to an overlap of calls, it is not possible to provide an exact number of bats passing the recorder. Therefore, the number of bats passing is not an exact count but is as close as possible under the given circumstances and within the limitations of the survey technique applied.
- Bats do not echolocate in a uniform, monotonous way. For example, when they go on a feeding frenzy, it is challenging to identify a species from the sound of a call. Sometimes a species could also echolocate at a frequency somewhat higher or lower than the normal identifiable frequency. These calls could then be nearer to the range of another species. For this study, bat calls from unidentifiable species were recorded as 'unsure.' These calls were identified as a bat, but uncertainty exists as to the species identification.
- Transects only provide a snapshot in time and do not determine spatial distribution on the site, although areas of high activity or nights with high activity could be uncovered.
- It is not possible to search the wider neighbouring terrain for bat roosts within the limitations of the EIA investigation. However, the team conducting the field visit walked through the site

thoroughly and incorporated any roosts or indication of bat presence discovered in this process into the study.

- Legislation in South Africa requires a year of pre-construction bat monitoring. Erratic climate conditions which might vary from year to year, could result in a variation in the bat situation.

Ongoing research and new knowledge gained from current projects will continuously inform this field of scientific practice.

SECTION 3: TECHNICAL DESCRIPTION

3.1 Project Location

The proposed Latrodex WEF and associated infrastructure is located in the Eastern Cape at approximately 2 km north, as the crow flies, of Marshstrand and 3km northeast of Haga Haga, in the Great Kei municipality, with coordinates around 32˚ 33'33.99"S, 28˚16"04.99"E (Figure 1).

Figure 1: Location of the Latrodex WEF

Figure 2: The Latrodex WEF Terrain

3.2 Project description

The proposed development follows the South African National, regional and municipal proposition in the Integrated Resource Plan (IRP) 2010-2030 that 17 800MW of renewable energy capacity should be secured by 2030 (energy.gov.za). It is anticipated that the proposed Latrodex WEF will comprise five Vestas V90-1,8/2,0 MW wind.

3.2.1 Wind Farm Components

- Up to 5 wind turbines, each 3 MW, with a maximum export capacity of 15 MW. This will be subject to allowable limits in terms of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The final number of turbines and layout of the WEF will, however, be dependent on the outcome of the Specialist Studies conducted during the EIA process;
- Each wind turbine will have a hub height between 80 m and 125 m, with a maximum rotor diameter of 90 m. Therefore, the lowest point of the turbine sweep would be between 35 m and 80 m, depending on the hub height and rotor diameter.

3.3 Alternatives

3.3.1 Wind Energy Facility

No alternatives were provided, and therefore, apart from the No-go alternative, no alternatives have been investigated as part of the EIA.

3.3.2 No-go Alternative

The ‘no-go’ alternative is the option of not undertaking the proposed WEF and infrastructure projects. Hence, if the ‘no-go’ option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against to compare other alternatives and will be considered throughout the report.

SECTION 4: LEGAL REQUIREMENT AND GUIDELINES

Environmental law in the form of legislation, policies, regulations, and guidelines which outline and manage development practice to ensure informed decision making and sound risk management of current and future projects, i.e., the impact of the proposed development on the ambient bat environment:

- Constitution of the Republic of South Africa (Act No. 108 of 1996)
- National Environmental Management Act (NEMA, Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Convention on Biological Diversity (1993)
- The Equator Principles (2013)
- The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
- National Biodiversity Strategy and Action Plan (2005)
- Aviation Act (Act no 74 of 1962)

The report is compliant to relevant versions of the South African Bat Assessment Association (SABAA) guidelines informing wind energy developments as applicable throughout the monitoring process. These include the following:

- South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-Construction (Sowler, *et al.*, 2017).
- Mitigation Guidance for Bats at Wind Energy Facilities in South Africa (Aronson, *et al.*, 2018).
- South African Bat Fatality Threshold Guidelines (MacEwan, *et al.*, 2018).

SECTION 5: DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 Regional Vegetation and Climate

5.1.1 Climate

Although no historic data exist for Marshstrand or Haga Haga itself, the wind development site is situated in the same climate zone as East London and is therefore to a certain extent similar. Seasons are divided as follow:

- Summer: December, January, February
- Autumn: March, April, May
- Winter: June, July, August
- Spring: September, October, November

Marshstrand, situated next to the coast, has an oceanic climate (Köppen Cfb), bordering on a humid subtropical climate (Köppen Cfa) with the warm temperature and moderation typical of the South African coastline.

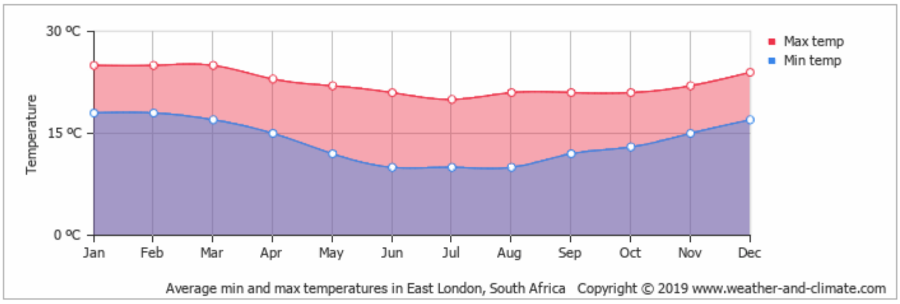


Figure 3: Average minimum and maximum temperatures of East London

Although most rainfall occurs in summer, the area receives rainfall during all months of the year. The average annual temperature is 25° C, with an average rainfall of 920 mm per year and an average humidity of 52%, see Figures 3 and 4.

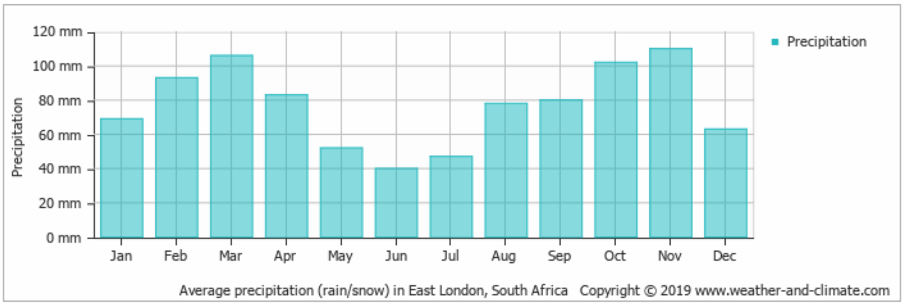


Figure 4: Average monthly precipitation

5.1.2 *Vegetation*

According to Olson (2001), as depicted in Figure 5, the proposed study area falls within the Tropical and Subtropical Moist Broadleaf Forests and classified by SANBI (2012) as Albany Coastal Belt, see Figures 5 and 6.

Figure 5: Ecoregion according to Olsen, *et al* (2001)

This vegetation belt is situated 15km to 30 km from the Indian Ocean coastline. The vegetation zone is situation on the gently to moderately undulating landscapes and dissected hilltop slopes close to the coast, dominated by short grasslands punctuated by scattered bush clumps of solitary *Acacia natalitia* trees (Hoare, *et al*., 2006). The seaboard region that contains this unit is a mosaic of a wide variety of structural vegetation types, ranging from grassland to forest. Hoare, *et al* (2006), believe that this current vegetation mosaic so typical of the Albany Coastal Belt is a creation of man and the original (pre-settlement) vegetation was mostly dominated by nonseasonal, dense thicket. The area of this unit was prime agricultural land which attracted early settlers who, presumably, cleared the dense thicket for pastures.

Figure 6: Vegetation zone according to SANBI 2012

The pure grasslands are limited to the Nanaga and Quarternary sands, whereas thornveld is prominent on the more finely textured soils derived from the Beaufort and Bokkeveld mudstone, granite and shale.

The area is characterised by various trees such as *Erythrina caffra*, *Euphorbia triangularis* and *Acacia natalitia*.

5.1.3 Landuse

Landuse of the study site and farmland in the area is used for grazing, and apart from game farm activities, it is the only current land use on and in close vicinity around the site. According to the Landuse map as portrayed by Figure 7, the Thicket/Dense Bush, Woodland/Open Bush and limited Grassland in the surrounding area, are all used for large stock farming and game farming.

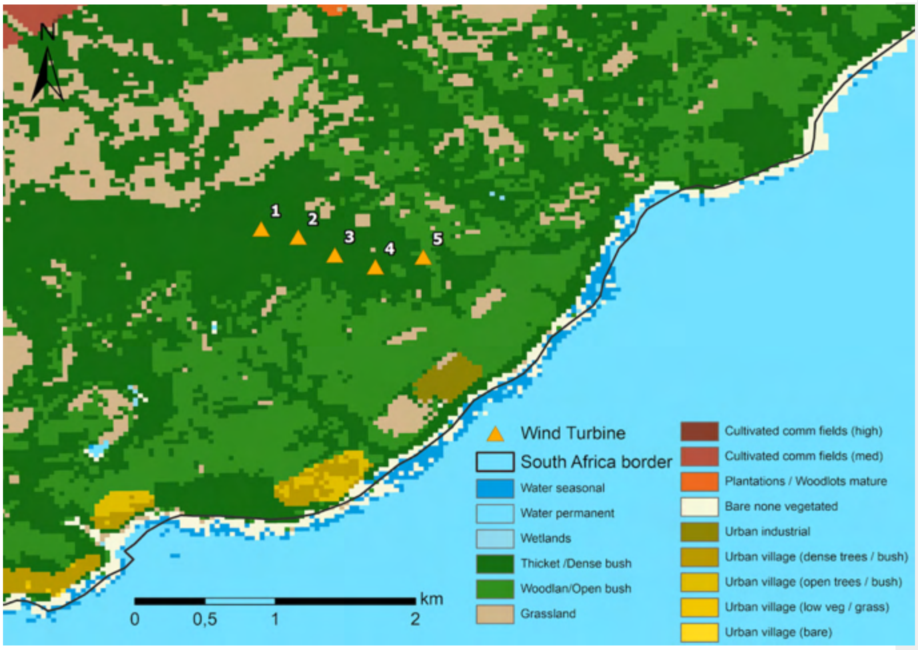


Figure 7: Landuse around the Latrodex WEF area

5.1.4 Protected Areas

Figure 8 indicates the South African protected areas. The wind energy facility is situated 1.3 km, as the crow flies, from the approximate centre (turbine no. 3) of the wind farm to the coast and the Amathole Marine Protected Area. From a bat perspective, the protected area in the sea should not have an influence on the bats. A thin strip of coastal public property falls within the East London Coast nature reserve, which is managed by the Eastern Cape Parks and Tourism Agency (ECPTA). This area of protected vegetation may provide a refuge to bats and there could be a daily migration of bats between this coastal area and foraging areas situated inland.

Marshstrand, situated 1,5 km from the turbines, and the buildings of Wild Coast Abalone, approximately 1 km from the turbines, might have an influence on the bat populations. Human dwellings have the potential to provide roosting space and the electrical lights often attract insects, which in turn attract insectivorous bats. The site is bordering a private conservancy towards the north east.

Figure 8: Registered Protected Areas in South Africa, situated close to Latrodex WEF

5.1.5 Interview with people staying on the property

Locals will often provide you with information concerning roosts and seasons when there is more bat activity on the properties. We value the local knowledge of people knowing the development area and staying on the land parcels. Therefore, we have at least one interview during the monitoring, either by visiting the people or through a telephonic interview. The occupants residing on the property at the time were interviewed in February 2020. They indicated that they encounter fruit bats during the warmer months, but that they have not seen them during the previous year. When the occupants were questioned about the peculiar call of the Wahlberg's epauletted fruit bat, they did not indicate that they have heard it. With all the night sounds of the rich biodiversity of the surrounding area, they might not have recognised the call as that of a bat. They also mentioned that they observe many insectivorous bats right through the year, but more frequently during warmer months.

5.2 Environmental Features conducive to bats at the LATRODEX WEF

Bats are dependent on suitable roosting sites provided, amongst other things, by human structures, vegetation, exfoliating rock, rocky outcrops, derelict mines, holes in the ground, such as derelict aardvark holes, and caves (Monadjem *et al*., 2010). The foraging utility of a site is further determined by water availability and the availability of food. Thus, the vegetation, geomorphology and geology of an area are important predictors of bat species diversity and activity levels. As discussed below, there are many bat conducive features at the proposed Latrodex WEF, as well as the surrounding area.

5.2.1 Vegetation

The vegetation is typical of Albany Coastal Belt zone, comprising of clumps of dense vegetation with grassland in between. This type of vegetation, with various flowering and fruit baring plant species, lends itself to high bat activity. The wild fruit trees, including palm tree species, could be a food source for fruit bat species. Fruit bats as well as insectivores' bats could roost in the dense vegetation and insect occurrence associated with the vegetation cover, could attract insectivorous bats, see Figures 9 and 10.

Figure 9: Some densely vegetated areas, where palm trees can also be seen, with ample roosting opportunities for fruit as well as insectivorous bats.

Figure 10: The development area, from the Met mast looking towards the east, with a clump of dense trees surrounding the farmhouse

Although no rocky areas occur on the site itself, the surrounding areas have valley floors with open rock formations along the valley sides.

5.2.2 Human dwellings

Some bat species prefer roosting in human dwellings and where roofs are not sealed off, buildings could provide roosting space for species such as *Neoromicia capensis* and *Tadarida aegyptiaca*. Both these species are at risk of a negative impact due to turning turbine blades and are often found in manmade structures.

Figure 11: Bat droppings occur at the buildings surrounding the farmhouse, indicating bat presence.

The farm dwellings were investigated during the summer and spring field visits. Although specific bat roosts were not discovered, signs of bat presence were found at many of the farm buildings, Figure 11. There was no bat emergence that could be depicted around sunset, so it is assumed that these might be either several small night roosts, or otherwise, due to numerous outside buildings and entrances, the bats might have emerged from an area where they could not be seen.

Figure 12 depicts lush gardens and large trees surrounding the farmhouse. The dense vegetation might attract bats for roosting and in particular fruit bats, which use trees for roosting and fruit bearing trees as a food source. Although it is not a regular occurrence, the occupant on the premises confirmed that they have seen fruit bats in the past, see Section 5.1.5. They indicated that there is a regular occurrence of insectivorous bats.

Figure 12: Lush gardens surrounding the farm dwellings

5.2.3 Livestock and open water sources

Open water bodies such as dams, water troughs for livestock and associated cement reservoirs provide permanent water sources for bats right through the year.

The area is utilised for livestock grazing, particularly cattle grazing. Livestock droppings attract insects, which, in turn, attract insectivorous bats.

5.3 Background to bats in the area

The extent to which bats may be affected by the proposed wind farm will depend on the extent to which the proposed development area is used as a foraging site or as a flight path by local bats.

5.3.1 Bat Species Diversity of the local Area

A summary of bat species distribution, their feeding behaviour, preferred roosting habitat, and conservation status are presented in Table 2. The bats mentioned in the underneath table have distribution ranges covering the Latrodex wind development and bats that had been confirmed up to now on the site are marked as such. The proposed wind farm falls within the distributional ranges of eight families and approximately 25 species, showing a possibility of high species diversity at the development site. Table 2 follows the most recent distribution maps of Monadjem *et al.* (2010).

Of the two fruit bat species and 23 insectivores bat species which have distribution maps overlaying the proposed development area, seven have a Near Threatened and two an Endangered conservation status in South Africa, while three of these have a global conservation status of being Near Threatened. Two of the Near Threatened bat species *Miniopterus fraterculus* (Lesser long-fingered bat) and *Rhinolophus capensis* (Cape horseshoe bat), as well as two Least Concern bat species *Eptesicus hottentotus* (the Long-tailed serotine) and *Sauromys petrophilus* (Roberts's flat-headed bat) are endemic to Southern Africa, and mainly due to agricultural activities, have limited suitable habitat left (Monadjem, 2010).

According to the likelihood of fatality risk, as indicated by the latest pre-construction guidelines (MacEwan, *et al*, 2020), twelve of the species, namely *Epomophorus wahlbergi* (Wahlberg's epauletted fruit bat), *Rousettus aegyptiacus* (Egyptian rousette), *Taphozous mauritianus* (Mauritian tomb bat), *Miniopterus fraterculus* (Lesser long-fingered bat), *Miniopterus natalensis* (Natal long-fingered bat), *Chaerephon pumilus* (Little free-tailed bat), *Mops condylurus* (Angolan free-tailed bat), *Otomops martiensenni* (Large-eared giant mastiff bat), *Sauromys petrophilus* (Roberts's flat-headed bat), *Tadarida aegyptiaca* (Egyptian free-tailed bat), *Neoromicia capensis* (Cape serotine bat) and *Neoromicia nana* (Banana bat) have a high risk of fatality due to foraging habitat at high altitudes. Three more species, *Myotis tricolor* (Temminck's Myotis bat), *Pipistrellus hesperidus* (Dusky pipistrelle) and *Scotophilus dinganii* (Yellow-bellied house bat) have a medium to high risk of fatality while *E. hottentotus* has a medium fatality risk.

Table 2: Potential bat species occurrence at the proposed Latrodex WEF (Monadjem, *et al*. 2010; IUCN, 2017).

Family	Species	Common Name	SA conservation status	Global conservation status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	c
PTEROPODIDAE	*Epomophorus wahlbergi*	Wahlberg's epauletted fruit bat	Least Concern	Least Concern	Roosts singly or in small groups in dense foliage of large, leafy trees	Open-air flying, clutter and clutter-edge foraging frugivorous	Not known to migrate but has been recorded to travel over 13 km between roosting and feeding sites in a single night	High	A o f s c b r o f
	Rousettus aegyptiacus	Egyptian rousette	Least Concern	Least Concern	Caves	Open-air flying, clutter and clutter-edge foraging frugivorous	Seasonal, at least 500 km	High	
HIPPOSIDERIDAE	*Hipposideros caffer*	Sundevall's leaf-nosed bat	Data Deficient	Least Concern	Roosts in a range of cavities: caves, sinkholes, mines and culverts	Clutter forager, insectivorous	Not known	Low	
EMBALLONURIDAE	*Taphozous mauritianus*	Mauritian tomb bat	Least Concern	Least Concern	Roosts with its belly on rock faces, tree trunks and walls	Open-air, insectivorous	Not known	High	
MINIOPTERIDAE	*Miniopterus fraterculus*	Lesser long-fingered bat	Near Threatened, Endemic	Least Concern	Caves	Clutter-edge, insectivorous	Suspected to migrate seasonally	High	

Family	Species	Common Name	SA conservation status	Global conservation status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed
	Miniopterus natalensis	Natal long-fingered bat	Near Threatened	Near Threatened	Caves	Clutter-edge, insectivorous	Seasonal, up to 150 km	High	✔
MOLOSSIDAE	*Chaerephon pumilus*	Little free-tailed bat	Least Concern	Least Concern	Roosts in small to extremely large groups in narrow cracks in rocks, trees and roofs	Open-air, insectivorous	Not known	High	✔
	Mops condylurus	Angolan free-tailed bat	Least Concern	Least Concern	Roosts in small to extremely large groups in narrow cracks in rocks, caves, trees and roofs	Open-air, insectivorous	Not known	High	
	Otomops martiensenni	Large-eared giant mastiff bat	Near Threatened	Near Threatened	Large groups in caves, roofs of houses	Open-air, insectivorous	Not known	High	✔
	Sauromys petrophilus	Roberts's flat-headed bat	Least Concern, Endemic	Least Concern	Roosts in small groups in narrow cracks and under exfoliating rock.	Open-air, insectivorous	Not known	High	✔
	Tadarida aegyptiaca	Egyptian free-tailed bat	Least Concern	Least Concern	Roofs of houses, caves, rock crevices, under exfoliating rocks, hollow trees	Open-air, insectivorous	Not known	High	✔

Family	Species	Common Name	SA conservation status	Global conservation status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed
NYCTERIDAE	*Nycteris thebaica*	Egyptian slit-faced bat	Least Concern	Least Concern	Cave, Aardvark burrows, road culverts, hollow trees. Known to make use of night roosts.	Clutter, insectivorous, Avoid open grassland, but might be found in drainage lines	Not known	Low	
RHINOLOPHIDAE	*Rhinolophus capensis*	Cape horseshoe bat	Near Threatened, Endemic	Near Threatened	Caves, old mines and hollows	Clutter, insectivorous	Not known	Low	
	Rhinolophus clivosus	Geoffroy's horseshoe bat	Near Threatened	Least Concern	Caves, old mines and hollows. Known to make use of night roosts.	Clutter, insectivorous	Not known	Low	
	Rhinolophus simulator	Bushveld horseshoe bat	Least Concern	Least Concern	Caves, old mines and hollows	Clutter, insectivorous	Not known	Low	
	Rhinolophus swinnyi	Swinny's horseshoe bat	Endangered	Near Threatened	Caves, old mines and hollows	Clutter, insectivorous	Not known	Low	
VESPERTILIONIDAE	*Eptesicus hottentotus*	Long-tailed serotine	Least Concern, Endemic	Least Concern	Caves, rock crevices, rocky outcrops	Clutter-edge, insectivorous	Not known	Medium	✔
	Hypsugo anchietae	Anchieta's pipistrelle	Near Threatened	Least Concern	Roosting habits are unknown	Clutter-edge, insectivorous	Not known	Low	
	Kerivoula argentata	Damara woolly bat	Endangered	Least Concern	Roosts in foliage, under the eaves of roofs and weavers' nests	Clutter, insectivorous	Not known	Low	

Family	Species	Common Name	SA conservation status	Global conservation status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed
	Kerivoula lanosa	Lesser woolly bat	Near Threatened	Least Concern	Roosting habits unknown, have been collected from weaver and sunbird nests	Clutter, insectivorous	Not known	Low	
	Myotis tricolor	Temminck's Mmyotis	Near Threatened	Least Concern	Roosts exclusively in caves	Clutter-edge, insectivorous	Migrates seasonally between winter and summer caves	Medium-High	✔
	Neoromicia capensis	Cape serotine	Least Concern	Least Concern	Roofs of houses, beneath bark of trees, base of aloes	Clutter-edge, insectivorous	Not known	High	✔
	Neoromicia nana	Banana bat	Least Concern	Least Concern	Roosts in furled leaves of *Strelitzia* and banana plants	Clutter-edge, insectivorous	Not known	High	✔
	Pipistrellus hesperidus	Dusky pipistrelle	Least Concern	Least Concern	Roosting habits are poorly known, has been collected from rock crevices and under loose bark of dead trees	Clutter-edge, insectivorous	Not known	Medium-High	✔
	Scotophilus dinganii	Yellow-bellied house bat	Least Concern	Least Concern	Roosts in holes in trees and roofs of houses	Clutter-edge, insectivorous	Not known	Medium-High	✔

Likelihood of fatality risk as indicated by the pre-construction guidelines (MacEwan, et al, 2020).

SECTION 6: SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

6.1 Bat Monitoring Results

Passive monitoring data for the period between 1 February 2020 and 25 June 2021 is included in this report. It is important to note that static recordings have limitations, as discussed in Section 2, but do provide a scientifically sound method of assessing the bat situation on site.

6.2 Bat species Diversity

Bats can be categorized by their preferred foraging altitudes and are adapted, mostly by the physiology of their wings, to forage in lower altitudes (clutter) amongst the bushes and trees, medium altitudes, and open air (high flying bats). The latter are usually the most susceptible to fatality by turbine blades. It should also be noted that even though some species forage at lower altitudes, they might change their flight behaviour during migration.

The proposed Latrodex WEF has a rich species diversity. Calls similar to 14 of the 25 species that have distribution maps overlaying the proposed development site were recorded by the static recorders, see Table 2 and Figure 13. 45% of the calls at the proposed Latrodex WEF represent *Neoromicia capensis,* which is the dominant species on site. *N. capensis* is a high-risk species, which forages in the vicinity of the turbine blades. As such, the risk of collision and barotrauma is high.

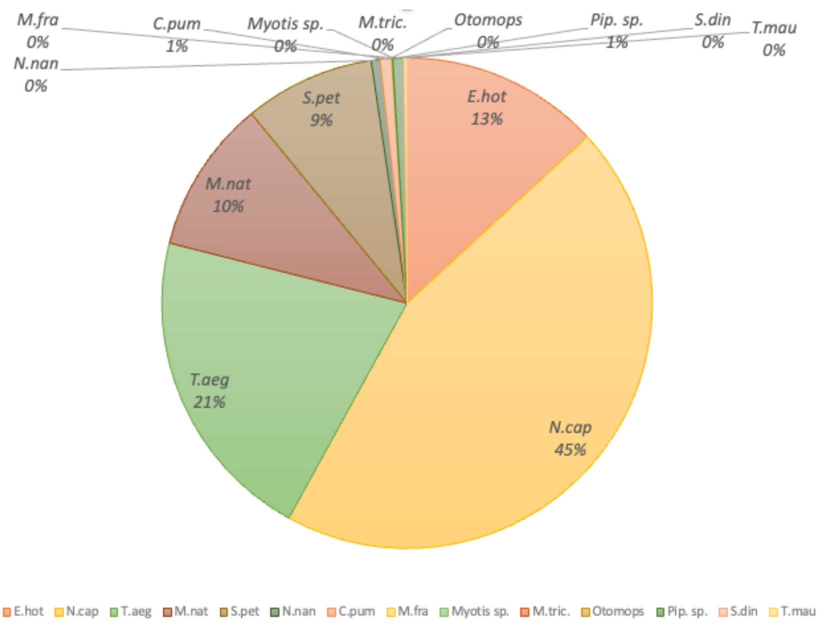


Figure 13: Bat species diversity at the Latrodex WEF from the combined data of both monitoring systems.

The bat species diversity recorded within the sweep of the turbine blades at Met high (A) and Met Low (B) is demonstrated in Figure 14. There occurs a predominant representation, more than 60%, of the Molossidae family, namely 40% of the activity related to *T.aegyptiaca*, 19% to the endemic *Sauromys petrophilus,* 1 % to *Chaerephon pumilus* and a statistically insignificant number of calls related to the Near Threatened *Otomops martiensenni* at Met high. The Vespertilionidae family represents 26% of the activity related to *Neoromicia capensis*, 10% activity to the endemic *Eptesicus hottentotus* and a statistically insignificant number of calls related to *Pipistrellus hesperidus,* Near Threatened *Myotis tricolor, Neoromicia nana* and *Scotophilus dinganii.* 4% of the activity recorded indicates the presence of the red data *Miniopterus natalensis,* Miniopteridae family.

The higher species diversity can be observed at the lower monitoring system, as well as a significant difference in the predominant species. This is particularly evident in the different representation of *T. aegyptiaca, N. capansis* and *M. natalensis.*

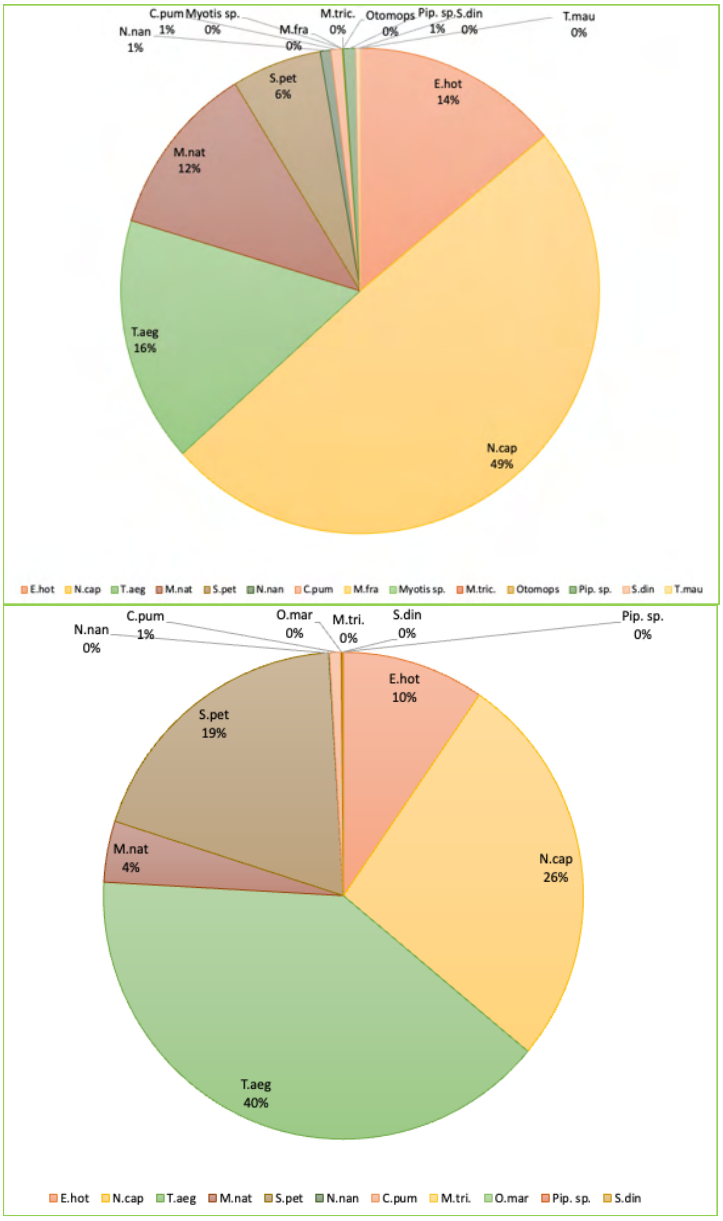


Figure 14: Bat species diversity at Met Low (A) above, and Met high (B) below.

6.3 Bat activity

6.3.1 Species distribution and activity per monitoring station

When observing Figure 15, the high activity of bats with calls like those of *Neoromicia capensis* can be seen where the monitoring Met Low station portrays 16333 bat passes of this species during the monitoring year. The Met High monitoring system has also recorded a total of 2116 calls of this high-risk species.

The expected higher activity at the lower monitoring system (B) can be clearly observed. Usually, bats are active at lower altitudes. This is especially evident in highly vegetated areas where more clutter and clutter edge species occur.

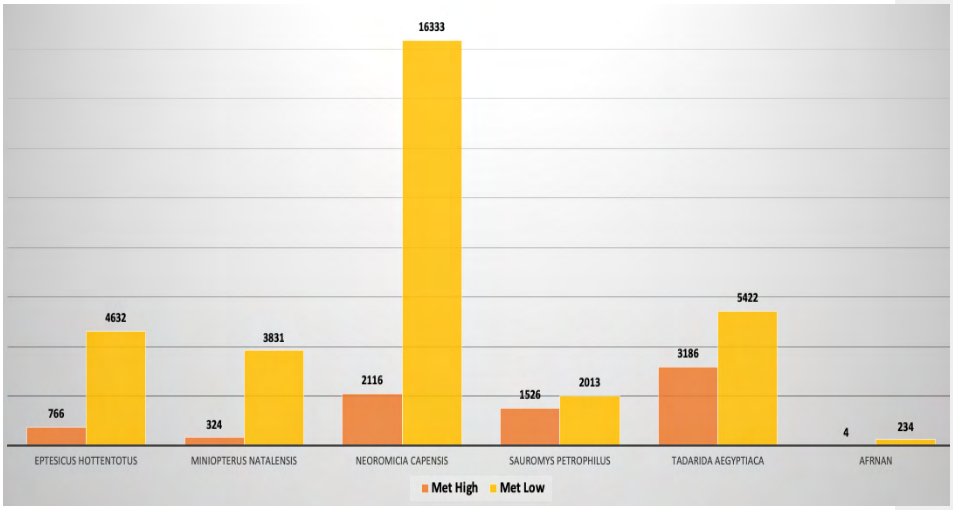


Figure 15: Main species activity per monitoring station.

6.3.2 Temporal distribution over the monitoring period

Figure 16 portrays total weekly bat passes of each species during the monitoring period. Apart from June to July 2020, bat activity is high. The green histogram depicts the activity of *Neoromicia capensis*, with a peak during September 2020, as well as several smaller peaks from August 2020 to April 2021. *Tadarida aegyptiaca* displays an increase in activity during autumn until the beginning of winter and during spring, with a peak in bat activity during early November 2020 and smaller peaks at the end of autumn. *Miniopterus natalensis* displays an increase in activity during autumn and spring. This is a migrating species and the peak in autumn could be a pocket of bats migrating over the site, which should be closely observed during operational monitoring. *Eptesicus hottentotus* displays an increase in activity at the beginning of spring, with a peak in bat activity around January and February in 2020 and 2021. *Sauromys petrophilus* shows an increase in bat activity from late spring until late autumn, with a peak in bat activity during middle December 2020.

All species activity declines towards the winter months. A general increase in activity is then portrayed from the end of winter, through three seasons, until the end of autumn. According to the data from the monitoring period, in general, bats show an increase in activity towards the end of summer and an increase in autumn. Then a decrease in activity is displayed as winter approaches with a second increase during spring or summer (for some species), when warmer temperatures set in.

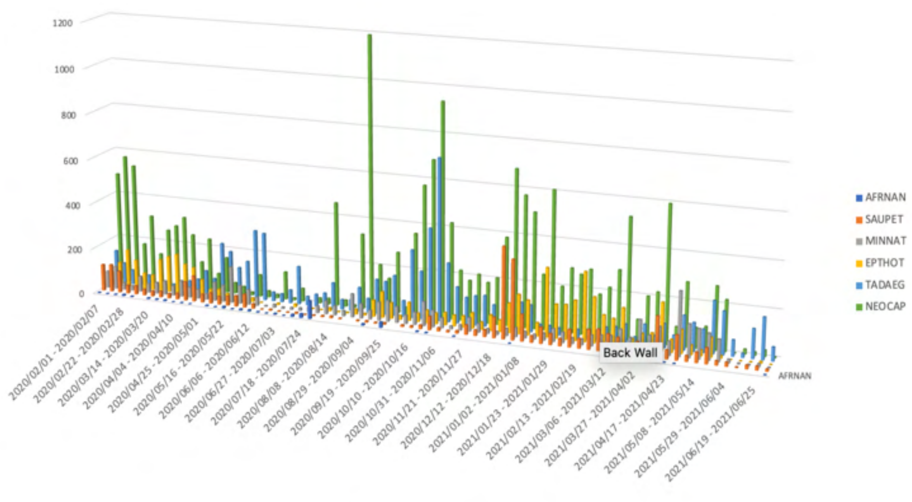


Figure 16: Temporal distribution of the six species with the highest activity

6.3.3 Monthly species activity

From Figure 17, which depicts monthly activity at the Latrodex WEF, one can clearly observe the high overall bat activity, with a peak in October 2020. As indicated in Figure 16, monthly activity is declining towards the winter months, with relative low activity during winter in comparison to other seasons. A clear increase in activity can be seen from July to October, as temperature rises. From middle spring a general trend of gradual decline can be observed towards July 2020.

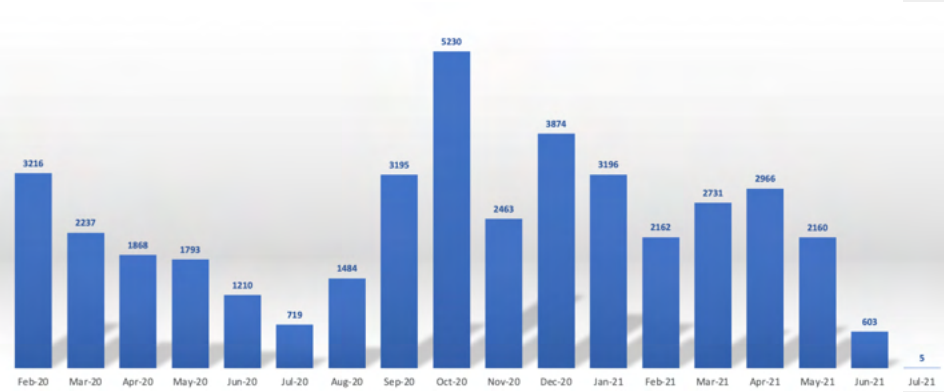


Figure 17: Monthly bat activity

6.3.4 Hourly bat activity distribution per night

This distribution of nightly activity is important when curtailment is recommended, as it indicates during which periods of the night bats are most active. Bats are usually more active the first few hours after sunset, as they emerge from their roosts to forage and to drink water. As sunrise approaches, they return to their roost and settle down for the day. One often experiences a slight increase in activity, presumably as bats return to their day roosts before sunrise.

Total nightly hourly combined bat passes for the monitoring period at each sampling point is portrayed in Figure 18, providing insight into the general distribution of bat activity from sunset to sunrise. Although higher activity was recorded at the lower monitoring system (B), both monitoring systems display similar trends in hourly activity.

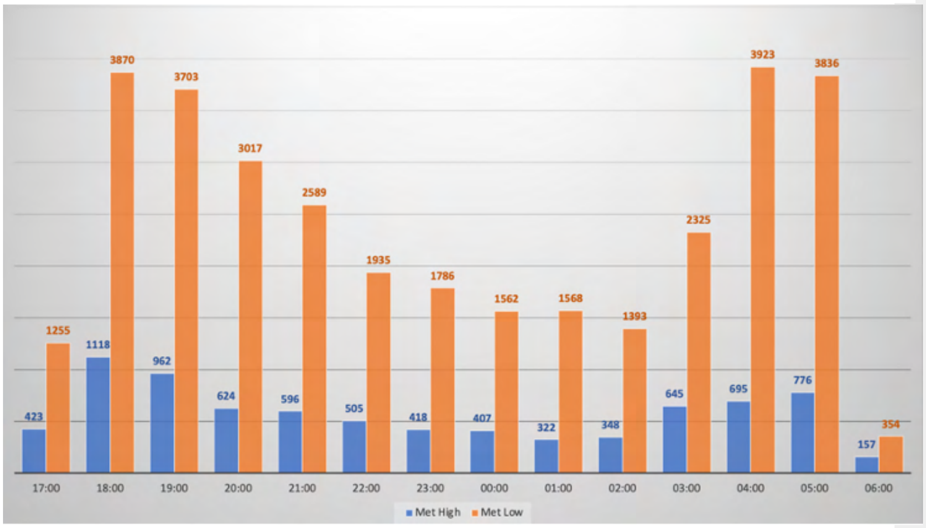


Figure 18: Hourly bat activity nightly distribution

6.3.5 Mean hourly bat passes and bat threshold

Threshold guidelines are calculated based on proportional bat occupancy per hectare for each of South Africa's terrestrial ecoregions to predict and assess impacts on bat fatalities as new WEFs are constructed. These ecoregions are identified by diverse biodiversity patterns determined by climate, vegetation, geology, and landforms (Dinerstein, *et al*. 2017 & Olson, *et al*., 2001). Threshold calculations add natural population dynamics and bat losses due to anthropogenic pressures to the sum to assess the number of bat fatalities that may lead to population decline.

Table 3 shows the combined mean hourly as well as median bat activity, for each sampling point, for the monitoring period. According to the 2017 SABAA bat monitoring guideline (Sowler, *et al*, 2017) the terrain was categorised under Kwazula-Cape-Coastal Forest mosaic vegetation, but a more refined, and more applicable classification is evident in the 2020 SABAA bat guideline (MacEwan, *et al*, 2020), where the Latrodex terrain is classified as Albany Thicket vegetation. According to the 2017 guideline, the site is classified as Low Risk, but if the 2020 bat guideline is applied, the site is considered Medium risk at rotor swept and High risk at ground level (10 m system B). If the precautionary principle of environmental impact assessment is applied, and the more refined vegetation zone is used, this site should be classified as medium to high risk. Due to the presence of fruit bats, which are problematic to monitor within the impact assessment methodology and time frame, as well as the attraction of the biophysical environment on site as well as surrounding the proposed WEF, the author of this paper would classify the wind energy development as high risk for bats.

Table 3: Mean and median of bat activity at the site, indicating the category of risk which is applicable to the Latrodex WEF sampling point.

MEAN bat activity per hour for the monitoring period		**2017 bat guidelines (Sowler, *et al*) threshold, classifying the site as KwaZulu-Cape-Coastal Forest mosaic vegetation (Olsen *et al*. 2001) with data from 60 m altitude**			
Combined mean activity	3,32	Low Risk	Medium Risk	High Risk	
Met High: 80 m (A)	1,29	0,0 – 14,60	14,61 – 19,84	>19,84	Only one threshold provided by guidelines at 60 m
Met Low: 10 m (B)	5,35				
MEDIAN hourly bat activity for the monitoring period		**2020 bat guidelines (MacEwan, *et al*) threshold, classifying the site as Albany Thicket vegetation, with thresholds and median of hourly bat activity at rotor sweep and near ground**			
Combined median of activity	6,11	Low Risk	Medium Risk	High Risk	
Met High : 80 m (A)	0,79	<0,24	0,24 – 1,52	>1,52	Rotor sweep
Met Low: 10 m (B)	4,78	<1,58	1,58 – 4,27	>4,27	Near ground

6.4 Weather conditions and bat activity

The information provided in this section describes the relationship between weather conditions and bat activity, in particular activity within the sweep of the turbine blades. Lower monitoring systems follow to a large extent the same pattern, but as weather monitors are close to the high microphone, and the high microphone is within the sweep of the turbine blades, it is believed that this system provides more accurate data to plot with the weather data. No humidity data was available; therefore, only temperature and wind were utilised for statistical analyses.

Weather conditions are plotted with bat activity at both systems below, to be able to compare the bat activity at different altitudes. This data, in particular the data from the high bat monitoring system, is used to compile a turbine curtailment schedule to be implemented from the onset of operation of the wind farm. Weather conditions, especially temperature and wind, have an influence on bat activity. Literature (Arnett, *et al*. 2008, Baerwald, *et al*.,2009, Kunz *et al*. 2007), as well as personal experience, indicate that bats tend to be more active at lower wind speeds and higher temperature. Therefore bats tend to be more active during warm, quiet nights; especially when there is an abundance of insect activity, in the case of insectivores bats, such as termites. Higher activity has also been reported during dark moon.

Weather data from the Met mast was utilized for the statistical analyses below, as this sampling system is situated in the area of collusion. The following weather data from the Met mast was used:

- Temperature data from the 80 m thermometer on the Met mast.
- Wind data from the 80 m anemometer situated on the Met mast.

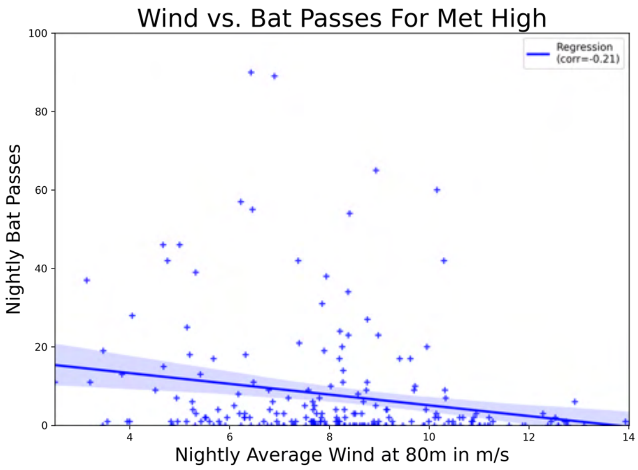
As there were no weather station at the lower altitude, the above weather data had to be extrapolated for the lower system.

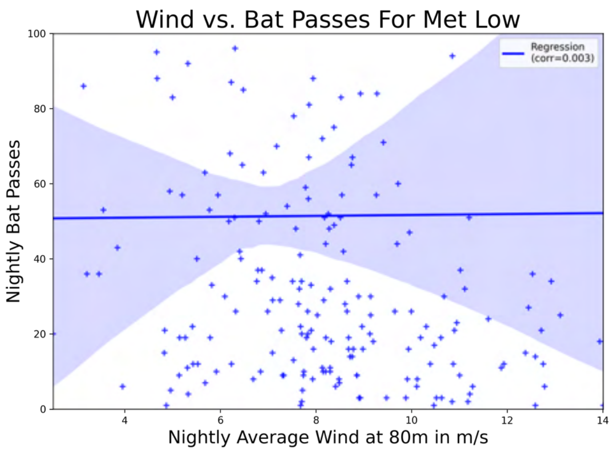
6.4.1 Linear Regression

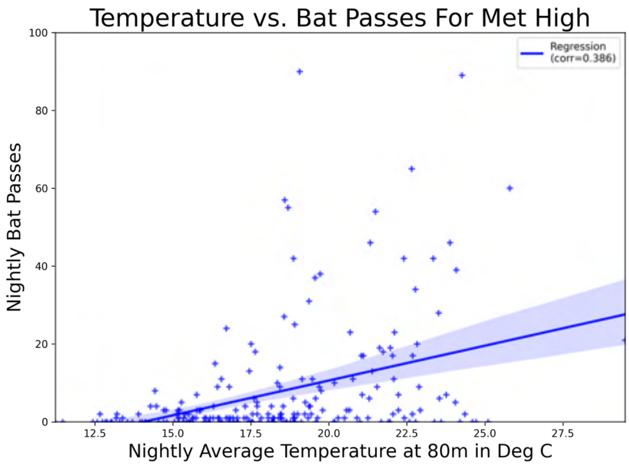
Linear regression between weather conditions and bat activity is provided below (Figure 19) and the results are summarized in Table 4. Since bats are not active during all variations of weather conditions, the linear regression results do not necessarily provide much insight into the bat situation at the WEF, especially with data from only one year. As soon as more data is available during the operational phase, linear regression analyses should be applied again.

Table 4: Summary of linear regression

	Correlation Coefficient	Explanation
Met High: Wind vs. bat activity	-0.21	A weak negative relationship between wind speed and bat passes. As wind speed increase there is a small decrease in bat activity.
Met Low: Wind vs. bat activity	0.003	No relationship between wind speed and bat passes. As wind speed increase/decrease the bat activity does not necessarily increase or decrease
Met High: Temperature vs. bat activity	0.386	A weak positive relationship between temperature and bat activity. As temperature increases there is an increase in the bat activity.
Met Low: Temperature vs. bat activity	0.198	A weak positive relationship between temperature and bat activity. As temperature increases there is an increase in the bat activity.


Wind vs. Bat Passes For Met High
Regression (corr=-0.21)
Nightly Bat Passes
Nightly Average Wind at 80m in m/s
0
20
40
60
80
100
4
6
8
10
12
14


Wind vs. Bat Passes For Met Low
Regression (corr=0.003)
Nightly Bat Passes
Nightly Average Wind at 80m in m/s
0
20
40
60
80
100
4
6
8
10
12
14



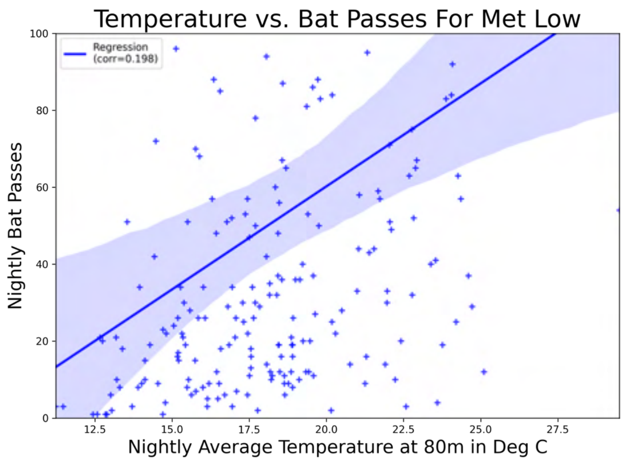


Figure 19: Linear regressions of wind speed and temperature as predictors of the distribution of bat activity

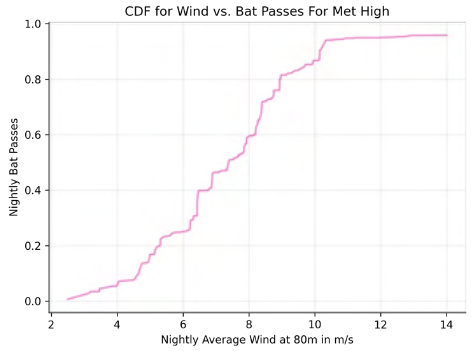
6.4.2 *Cumulative distribution functions*

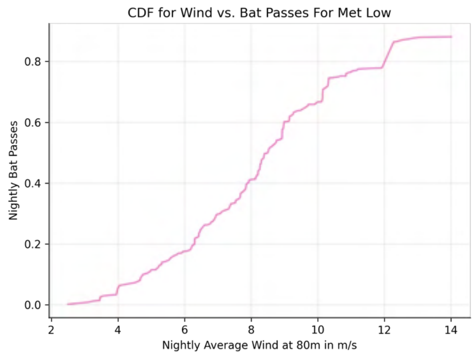
Figure 20 illustrates the cumulative distribution functions, where cumulative means an increased quantity by successive additions. Cumulative bat passes recorded are plotted with temperature and wind speed data.

If the cumulative percentage bat passes at the 80 m monitoring station (A) are plotted with temperature and wind speed, the following trends are observed:

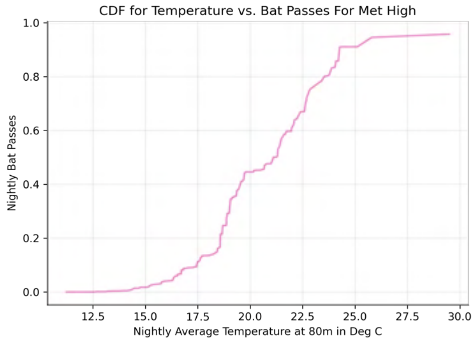
- Met High: Approximately 80% of the bat activity was recorded below 9m/s wind speed.
- Met Low: Approximately 80% of the bat activity was recorded below 12m/s wind speed.
- Met High: Approximately 85% of the bat activity was recorded above 17,5ºC.
- Met Low: Approximately 80% of the bat activity was recorded above 16ºC.

Wind





Temperature



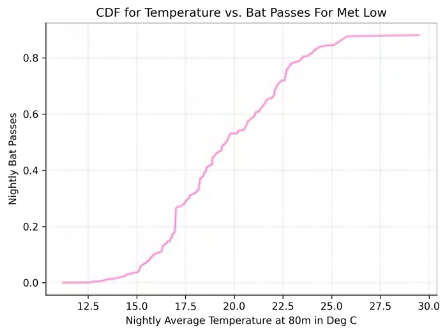
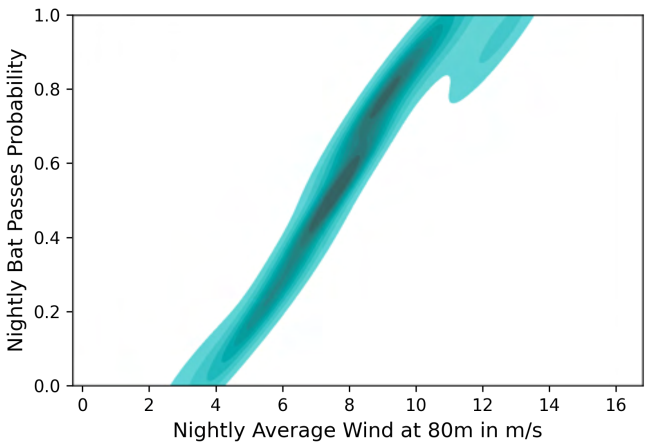


Figure 20: Cumulative distribution function of nightly bat passes with nightly average temperature and wind speed.

6.4.3 Cumulative Distribution Function (CDF) heat maps

CDF heatmaps provide a better visualization of the distribution of bat activity plotted with weather, Figures 21 and 22. Darker areas indicate a concentration of higher activity.

Wind and bat activity: Met High



Wind and bat activity: Met Low

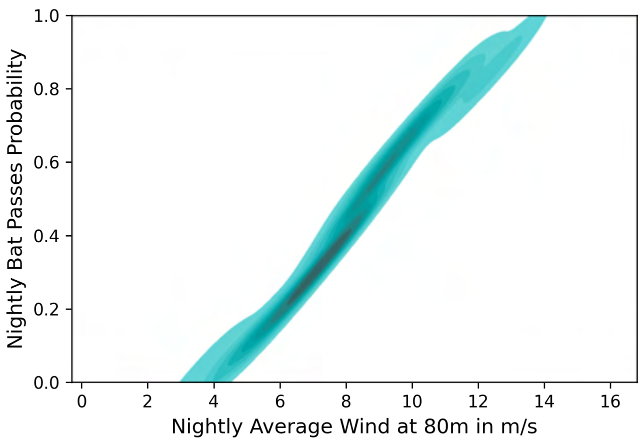
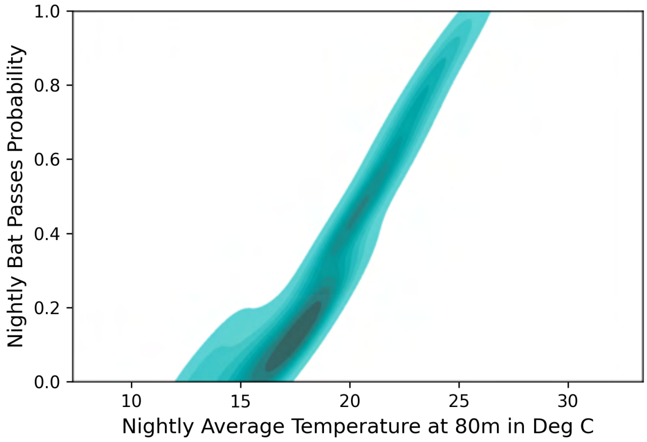


Figure 21: Cumulative distribution function heatmaps showing bat activity with wind speed

Temperature and bat activity: Met High



Temperature and bat activity: Met Low

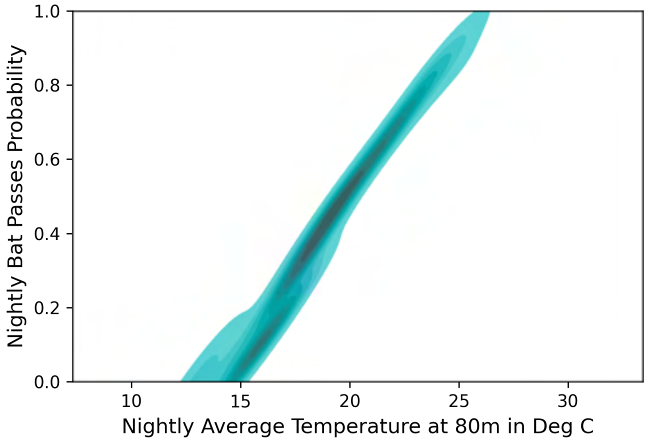


Figure 22: Cumulative distribution function heatmaps showing bat activity with wind speed and temperature.

The highest density of bat activity during wind speed and temperature ranges can be observed when CDF heatmaps are plotted. These could be used to confirm linear regression as well as cumulative distribution functions. From Figures 21 and 22 the following could be derived:

- High density of bat activity at Met High (A) below 10 m/s, with bats being active up to approximately 14 m/s.
- High density of bat activity at Met Low (B) below 10 m/s, with bats being active up to approximately 14 m/s.
- High density of bat activity at Met High (A) above 16ºC, with bats being more active from 12,5ºC and above.
- High density of bat activity at Met Low (B) above 14ºC, with bats being more active from 12,5ºC.

The data from the Met high is used to inform the mitigation regime with most of the bat activity at Met High recorded below 10m/s windspeed and temperature above 16 ºC.

SECTION 7: TRANSECTS

Transects do not confirm long term activity on site but provide a snapshot in time and do confirm bat diversity on site. The transects were conducted with a SM4BAT detector attached to a SMMU2 microphone mounted on a pole on the vehicle, see methodology in Section 1.2.4. Each season, starting at sunset, the vehicle was driven at a speed between 10 to 20 km/h along a set route.

A SM4 GPS was linked to the detector so that the route was recorded while driving. The detector was calibrated at the start of each transect session. Table 3 summarises the transect results, while Figure 23 shows the positions where the bats were recorded. Kaleidoscope Pro software was used to analyse calls, by looking at each call individually, while Myotisoft TransectPro was used to plot the data. Thirteen bat passes were recorded during the summer transect session, with 10 calls associated with *Neoromicia capensis*. One call was a bat, but the call was not very clear, and it is therefore classified as Unclear. During autumn 12 bats were recorded, with 7 calls associated with *Eptesicus hottentotus*, four calls of *N.capensis* and one call of *Miniopterus natalensis*. Eleven bats were recorded during the winter transects, with 10 calls similar to *N. capensis.* During spring, the transect route was driven four times, therefore more bats were recorded. Twenty-three bats were recorded during this transect, confirming the high activity recorded during the previous seasons transects. Due to a technical error on the GPS, we could not trace the positions of the bats, but the detector was in good working order, so we could confirm that all the bats were recorded.

High numbers of bats were recorded during all the transects; especially if one takes into consideration that the distance of the transects was so short. The data from the transects mirror to a large extent the species and activity from the stationary monitoring systems.

Table 5: Transect data for winter and spring

Date	Temperature	Wind	Precipitation	Results
Summer				
1 February 2020	Approximately 29 ºC	No wind	Clear skies	• 10 X *N. capensis* • 2 X *E. hottentotus* • 1 x Unclear
Autumn				
12 March 2020	Approximately 24 ºC	NE – 1 on Beaufort scale (2,8 to 1,39 m/s).	Heavy overcast and intermittent light rain	• 7 X *E. hottentotus* • 4 X *N. capensis* • 1 X *M. natalensis*
Winter				
3 June 2020	Approximately 19 ºC	NE – 1 on Beaufort scale (2,8 to 1,39 m/s).	Cloud cover 2/8	• 10 X *N. capensis* • 1 X *E. hottentotus*
Spring (transect route was driven four times)				
18 November 2020	Approximately 22,2 ºC (begin), dropping to 21,7 ºC	2,5 m/s (begin), and 3,5 m/s at the end	Light rain	• 10 X *N. capensis* • 7 X *T. aegyptiaca* • 2 X *E. hottentotus* • 3 X *S. petrophilus* • 1 X *N. nana*

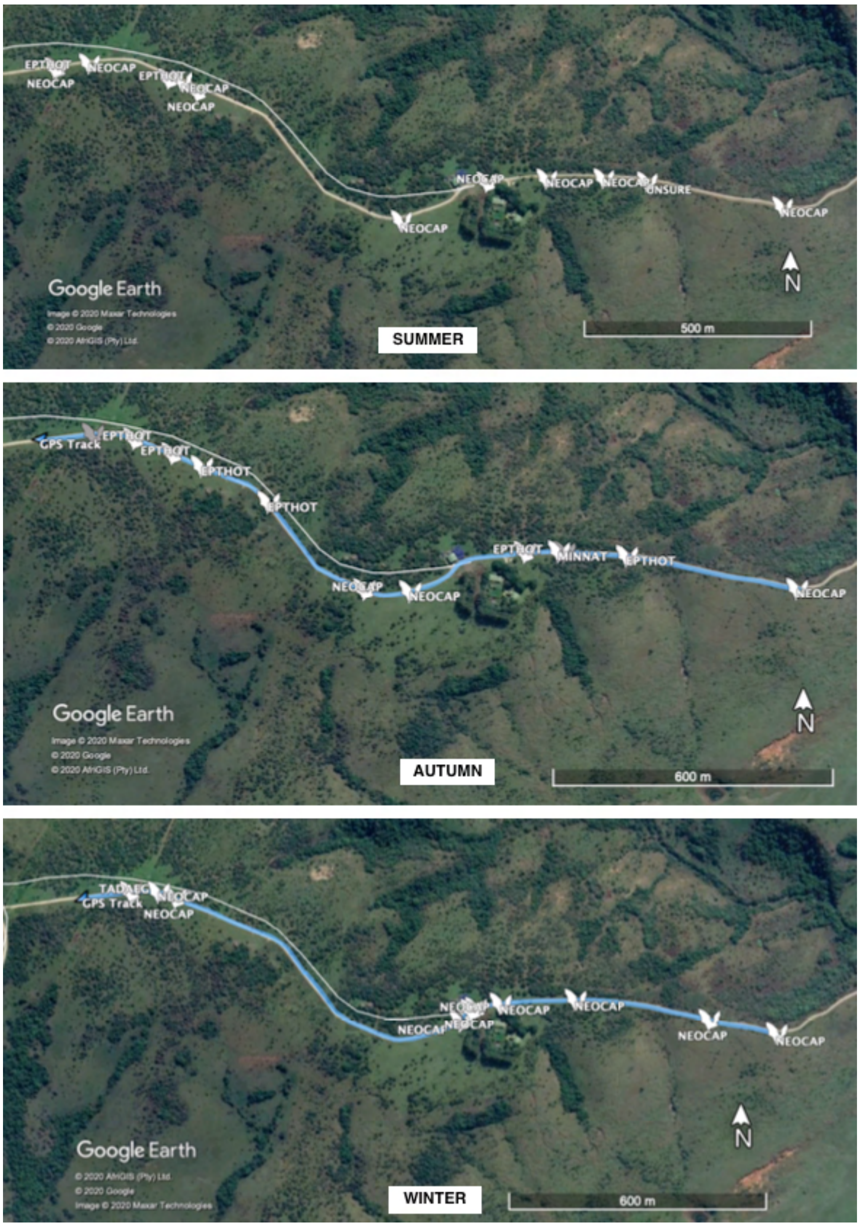


Figure 23: Transects conducted at the Latrodex WEF, showing bats recorded.

SECTION 8: CUMULATIVE IMPACTS

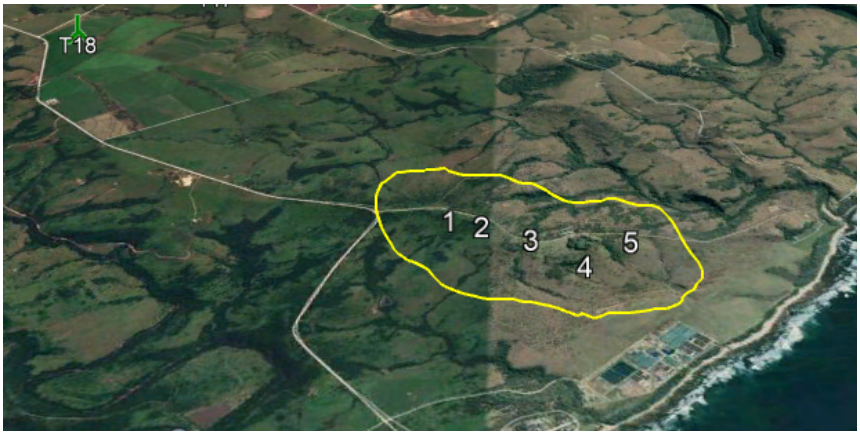


Figure 24: Area of interest of the proposed Latrodex WEF site showing the southern-most turbines of Haga Haga WEF in the north-west direction.

The relevant South African Bat Fatality Threshold Guidelines (MacEwan, *et al*. 2018) and South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments - Pre-construction (Sowler, *et al*. 2017) mention that early operational facilities in South Africa show a linear increase in bat fatalities as more turbines are monitored. Cumulative impacts will result from a combination of impacts of this project and similar related projects. The major concern is the potential indirect impact on broad scale ecological processes such as the disruptions of movement and migration pathways and broadscale fragmentation of habitat of locally active and migratory bats. Too many combined wind farms could create a large zone of development amplified across the area causing irreplaceable loss to bat populations. A decline in bat populations could potentially elevate insect numbers and subsequent pests and disease in the area.

The Latrodex WEF forms part of renewable energy development plans for the Eastern Cape, and specifically for the Amathole District Municipality and Great Key municipality, which covers an area of 1420 km^2. Cookhouse and Stormberg REDZ are in the Eastern Cape to the north and west of the Latrodex WEF, but neither the Latrodex WEF, nor the other WEFs within 30km radius, fall within these renewable energy development zones; However, the area displays suitable topography for high wind speed variability with strong winds from the south-west and south-east and is of strategic importance for renewable energy development to maximise the cumulative wind energy production (Janse van Vuuren & Vermeulen, 2019 and MacDonald, 2020). Furthermore, renewable energy is becoming a new important sector to the Great Key Municipality with 21,5 MW from nearby Chaba WEF producing enough electricity to supply 14 000 local households. The consequence of adding more wind farms supplying energy to local demands, will increase the cumulative effect on bats in the area (www.egis.gov.za and Great Kei Municipality final reviewed Integrated Development Plan 2020-2021).

SABAA, the Department of Forestry, Fisheries and the Environment (DFFE) and the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) require a regional combined cumulative impact assessment of predicted bat impact on other WEFs within 30 km radius of the proposed site (MacEwan, *et al*., 2018). Therefore, a radius of 30 km from the Latrodex WEF includes other WEFs that could add to the cumulative impact on bats in this assessment. The Haga Haga WEF is located 3 km from

Latrodex's Turbine 1. The Great Kei WEF is inside the 30 km radius and adjacent to the Chaba WEF. The latter is operational and situated just outside the 30 km radius, while the Great Kei WEF is awaiting approval of amendments.

Figure 2 presents the renewable energy facilities (approved or at proposal stage) within a 30 km radius of the Latrodex WEF and Table 1 provides a summary of renewable energy facilities within 30 km of the the Latrodex WEF site to assess the nature of the cumulative effect for bats.

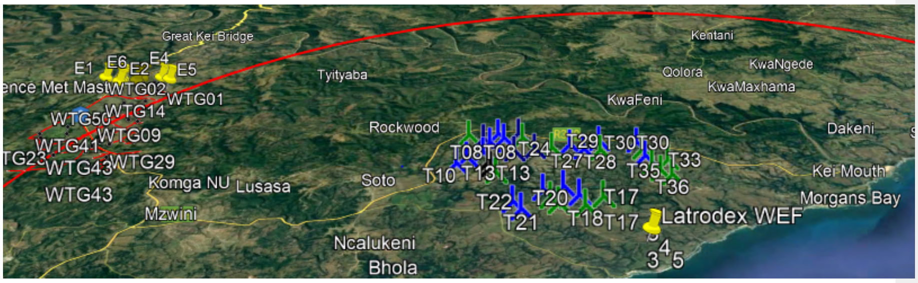


Figure 25: Renewable energy facilities (REF) within a 30 km radius of the Latrodex WEF

These include the proposed Haga Haga WEF with 36 turbines and 150 MW energy output, the 115MW Great Kei WEF with 35 turbines and the adjacent operational Chaba WEF with 7 turbines and 21,5 MW energy output just outside the 30km radius.

In areas with higher bat activity, bat fatality risk could be greater and due to their mobility, bats could originate from roosts off the site and have distributional ranges beyond the Latrodex WEF. Occurrence of 14 bat species were confirmed at the Latrodex WEF during specialist field visits. These include nine high risk species for wind development. Bat species diversity, activity levels and bat usage of the area for foraging and flight paths depends on climatic and bat conducive features on the WEF site such as roosts, food and water. Open air foragers with wing design and echolocation calls adapted to flying high above the vegetation, for example *T. aegyptiaca*, and migratory species, for example *M. natalensis*, that might fly over the proposed development site regardless of their foraging behaviour, will be at high risk from turbine mortality.

Peaks in activity of *Tadarida aegyptiaca* and *Neoromicia capensis* were detected in January, February, April and September 2014 and January and February 2015 on WEFs included in this assessment (Animalia, 2015). At the Latrodex WEF peaks in bat activity was detected from September 2020 to May 2021.

Table 9 below presents the individual project specifics as well as cumulative calculations for bats included in this impact assessment within 30 km radius of the Latrodex WEF to predict and assess the nature of cumulative impacts. The table includes features such as project size, fatality threshold figures, risk levels and Bat Indexes (annual average bat passes per hour per monitoring period) based on bat recordings and risk levels as indicated by the *South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction* (MacEwan, *et al*., 2018 and Sowler, *et al*., 2017).

Table 6: Summary of cumulative impact calculations for REFs within 30km radius of the Latrodex WEF

WEFs within 30km radius of Latrodex	Energy Ouput MW	Total Project Size (ha)	Average Bat passes/hour/ year	Bat fatality risk levels based on KZN-Cape Coastal Forest at 60m height	Risk Level	10 m Height specific and fatality risk in Albany Thicket ecoregion based on median bat passes >4.27	Risk Level	80 m Height specific and fatality risk in Albany Thicket ecoregion based on median bat passes 0.24-1.52	Risk Level
Proposed Latrodex WEF	10	200	3.3	0.0-14.60	Low	4.78	High	0.79	Medium
Operational Chaba WEF*	21.5	200	0.00	0.0-14.60	Unknown*	_	Unknown	_	Unknown*
Proposed Great Kei WEF**	115	8000	0.37	0.0-14.60	Low	_	Unknown	_	Unknown**
Proposed Haga Haga WEF***	150	9100	0.00	0.0-14-60	Unknown***	_	Unknown	_	Unknown***
Total for all WEFs	296.5	17500	3.67	0.0-14.60	Low	4.78	High	0.79	Medium

Little data from adjacent wind farms relevant to this table is available: *Average bat passes per hour per year data for Chaba is not available. Chaba WEF lies outside the 30km radius and adjacent to Great Kei WEF. Average bat passes per hour per year data for Haga Haga WEF *** is also not available, however the review of the report rates the risk level as Moderate and Low (Arcus, 2020 and Terramanzi Group, 2017). The risk levels according to the current 2017 and new 2020 Guidelines are explained in the paragraph below.

The known average bat passes per hour per monitoring year (bat index) for the Latrodex WEF is 3,3. The combined annual bat activity per hour for the WEFs (with available data*) within 30 km radius of the Latrodex WEF is 3,67 bats per hour. The total combined area is 17 500 ha and combined potential energy output up to approximately 300 MW.

This report complies with the 2017 Guidelines and accordingly, the Great Kei Municipality area falls within the KZN-Cape Coastal Forest Mosaic ecoregion that measures the mean bat activity at the Latrodex WEF and other WEFs in the region within a 30 km radius of the Latrodex WEF as a negative low impact. Also see Section 6.3.5 for a discussion of average bat activity and thresholds. However, the latest 2020 Guideline assumes that bat activity is positively correlated with bat fatality risk at turbines and that bat fatality is expected to be greater in ecoregions with higher bat activity. The 2020 Guideline furthermore assumes that bat fatality risk is expected to be greater at sites where bat activity is high for the relevant ecoregion. Median bat passes are considered at height specific and fatality risk per ecoregion. According to the 2020 Guideline, the the Latrodex WEF site falls under the Albany Thicket ecoregion and the fatality risk according to the median bat activity detected at 10 m Met system (B) rates High at 4.78 (>4.27). The median bat activity detected at 80 m Met system (A) rates Medium at 0.79 (0.24-1.52). Therefore, the likelihood exists that the fatality risk at the other WEFs within a 30 km radius of the Latrodex WEF and within the ecoregion would also rate High at low height (10 m) and Medium at 80m height (approximate rotor height) with the consequence that the negative cumulative impact would increase from Low to Medium and High. Although this is speculative, if the 2020 bat guidelines are applied, we suspect that all the wind farms might have portrayed a higher risk (MacEwan, *et al*., 2020 and Sowler, *et al*., 2017).

Specialist reports from a WEF considered in this assessment reviewed the likelihood of negative cumulative impacts on bats in the region as high, but reversible to moderate with mitigation if all wind farms will apply and adhere to appropriate mitigation. Another review rated the bat sensitivity to the negative impact medium/moderate due to habitat displacement and disturbance. A review after amendments rated bat sensitivity as Medium before and Low after mitigation. No fatal flaws were identified, and the final comment rated the potential for negative cumulative impacts as Low. However, where fatality rates may appear low, the cumulative impact of the same species in the same region of the same regional population of species should be monitored and Red Data species may not be able to sustain additional mortality (Arcus, 2020, Terramanzi Group, 2017 and Animalia, 2015).

Stephanie Dippenaar has completed three two-year post construction monitoring projects on wind farms in the Nama-Karoo. These wind farms have a combined output of 360 MW. The combined average general estimated true fatality of these three wind farms is approximately 232 bats per year, over a 20-year life span, the total estimated true fatality could amount to approximately 4 640 bats. Although this is only speculation and not a scientific way of calculating fatality over the lifespan of a wind farm, as the wind farms are situated in different areas and there are some variables, this does give one a slight indication of the fatality of bats over the lifespan of a wind farm and an idea of the severity of the cumulative impact over decades of wind energy generation. Bat diversity as well as bat activity at the proposed Latrodex WEF is much higher than Karoo environments, therefore it is expected that the relative cumulative mortality will also be significantly higher.

SABAA threshold calculations are area and ecoregion based and used for project specific and regional cumulative impact assessment to calculate the number of fatalities that may lead to population level declines for a given area. Application of collective mitigation and other conservation efforts in practice where site specific and regional thresholds are exceeded could reduce detrimental fatality impacts (MacEwan, *et al*., 2018). Recommending mitigation measures in the planning stages is advantageous as it is difficult to apply adaptive mitigation after commercial operation has commenced (Sowler, *et al*., 2017) and the developer has not planned for bat mitigation.

The Latrodex WEF management does not have control over other WEFs within the area, but the management of each renewable project should reduce the negative risk of bat population disturbance by adhering to effective mitigation measures such as using curtailment, installing ultrasonic acoustic deterrents and avoidance by placement of turbines in areas that are less sensitive to bats. Furthermore, post construction monitoring (operational monitoring and mitigation) is of crucial importance upon construction of all WEFs as per the relevant South African Bat Guidelines applicable at the time.

SECTION 9: SENSITIVITY MAP

Sensitivity are based on the South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction (Sowler, *et al*., 2017). Field visits of the bat conducive environments occurring at the development site as well as static and active monitoring data refine these zones. The minimum buffer recommendation prescribed by SABAA is a 200 m buffer around all potential key bat features. Two or more points of interest in close vicinity of each other link to form one sensitivity zone.

Figure 26 depicts the bat sensitivity of the wider environment. The vegetation and human dwelling in close vicinity to the five proposed turbine positions indicate a general high bat sensitivity area. It is recommended that a 200 m buffer zone is implemented around the farm dwellings due to the signs of bats in the buildings.

Due to the small footprint of only five turbines, the proposed wind turbines will have a lower effect in comparison with the larger wind farms in the vicinity. Regardless of the small footprint though, the development area as well as the surrounding environment contain numerous bat conducive features. These include perennial open water sources, riverine vegetation, large trees, including palm and wild banana trees, human dwellings with signs of bat roosts and high insect activity certain during times of the year; furthermore, fruit bats are also active in the area.

Powerlines, laydown areas and substations should avoid the riverine vegetation and vegetation thicket areas, rocky outcrops, or any potential bat roosts as far as possible. Roost searches should be conducted before the construction of these components commence as indicated in the EMPR.

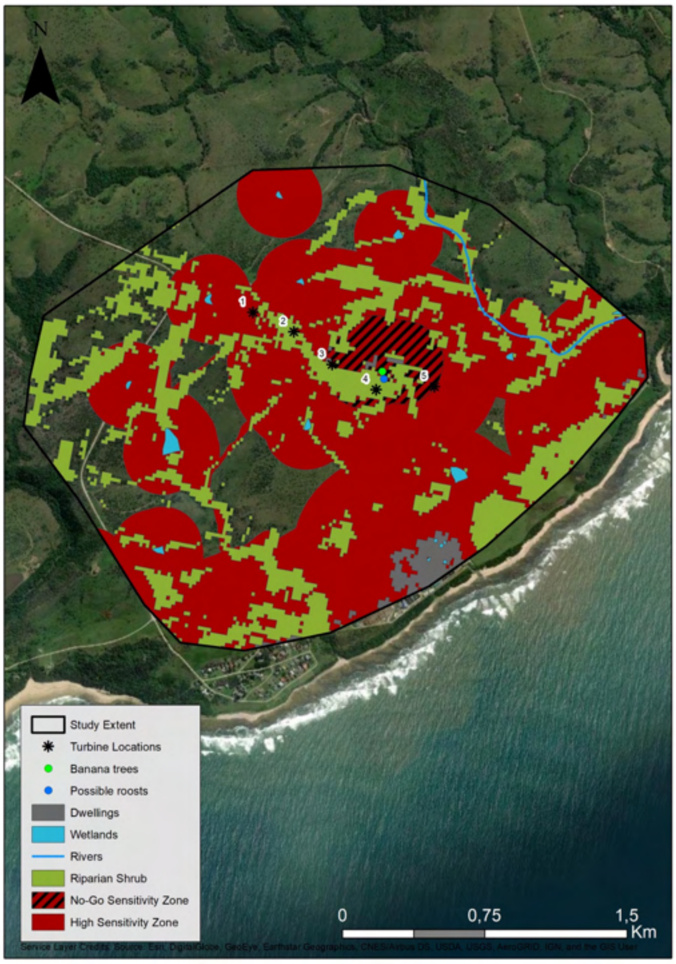


Figure 26: Latrodex proposed WEF broader bat sensitivity map

SECTION 10: MITIGATION RECOMMENDATIONS

10.1 Operational bat monitoring

Two years of operational bat monitoring as prescribed by the most recent SABAA operational bat monitoring guideline, is a pre-requisite of the SABAA preconstruction guidelines (Sowler, *et al*, 2017). Operational monitoring should start when turbines start to turn, so it is important that a bat specialist is appointed before the start of operation.

10.2 Turbine positions

Usually, the first step in mitigating the potential negative impacts of a proposed WEF on bats is to site turbines outside of sensitive areas. Due to the sensitive environment surrounding the proposed turbine placement at the Latrodex WEF development, the whole area could be seen as sensitive, see Figure 26. Apart from moving turbines at least 500 m from the dwellings, and avoiding dense clumps of vegetation, there is not really a less bat sensitive area in the nearby environment; Therefore, apart from above recommendations for shifting turbines, changing turbine positions might not be a solution. It is rather recommended that the applicant considers other forms of mitigation.

10.3 Curtailment

Currently, the most reliable and effective mitigation is curtailment (Arnett and Alay, 2016; Hayes, 2019). Curtailment entails locking or feathering the turbine blades to a near standstill during high bat activity periods to reduce the risk of bat mortality via collision with blades and barotrauma. This results in a reduction of the power generation during conditions when electricity would usually be supplied. Curtailment regimes are developed by examining the relationship between relative bat activity levels and weather conditions. Bat activity is reduced at higher wind speeds and lower temperatures, although experience and unpublished data in South Africa indicate that *Molossidae* bats fly at higher wind speeds than originally expected. Lower wind speeds and warmer temperatures typically correlate with higher bat activity levels, as indicated when weather and bat activity is plotted at the Latrodex WEF. This relationship between weather conditions and bats informs curtailment schedules when bat activity is high to try to reduce potential encounters of bats with wind turbine blades.

Curtailment should be applied during the specified time periods when both the relevant temperatures and wind speeds prevail; thus, from September to May, all the nights when temperature is above 16 ^{o} C and wind speed is less than 9 m/s, see Table 7.

No humidity data was available. Only wind and temperature data were used to develop the mitigation schedule. Data from the Met mast at 80 m informed the mitigation schedule, as this sampling point is situated within the proposed sweep of the turbine blades.

Table 7: Curtailment recommendation for turbines at the Latrodex WEF

CURTAILMENT FOR ALL TURBINES			
Months	**Time periods**	**Temperature (°C)**	**Wind speed (m/s)**
September to May	One hour after sunset up to one hour before sunrise	Above 16 °C	Up to 9 m/s

Any curtailment plan should be continuously refined and adapted based on incoming bat fatality data and the applicant must budget beforehand for the possibility of increasing the curtailment period or installing bat deterrents, as required. Less stringent curtailment could also be recommended at the discretion of the operational bat specialist, but if curtailment is adapted, it is important to evaluate the curtailment for an extended period of at least one monitoring year.

10.4 Feathering of all turbines below cut-in speed

The cut-in speed is the lowest wind speed at which turbines generate power. Freewheeling occurs when turbine blades are allowed to rotate below the cut-in speed and thereby increase the risk of collision at areas already highly sensitive to bat activity. Normally operating turbine blades are at right angles to the wind. To avoid bat fatality feathering as a mitigation measure is applied and the angle of the blades is pitched parallel with the wind direction so that the blades only spin at very low rotation and that there is no risk to bats. The turbines will not come to a complete standstill, but the movement of the turbines would be minimal to prevent bat fatalities during conditions when power is not generated.

Freewheeling should be prevented as much as possible, and to an extent that bat mortality is avoided below cut-in speed and should commence immediately after installation for the duration of the project, to prevent bat mortality. Feathering of turbines blades are usually around 90 degrees to prevent freewheeling, but the angle will depend on the turbine make and model.

10.5 Bat deterrents

Bat deterrent suppliers indicate that *Molossidae* bats react well to deterrents. This could be an option for mitigation and must be discussed with a bat specialist and the applicant. Deterrents are now deployed at two operational wind farms in South Africa and the current bat specialist, Stephanie Dippenaar, is managing one of these WEFs. They are awaiting bat monitoring information to determine the effectiveness of deterrents within the South African context.

SECTION 11: SPECIALIST FINDINGS - IDENTIFICATION AND ASSESSMENT OF IMPACTS

11.1 Summary of potential impacts

Construction Phase:

- Potential impact 1: Roost disturbance, destruction, and fragmentation due to construction activities.
- Potential impact 2: Creating new habitat amongst the turbines, such as buildings, excavations, or quarries.
- Potential impact 3: Construction activities during night-time.

Operational Phase:

- Potential impact 4: Mortality due to direct collision or barotrauma of resident bats.
- Potential impact 5: Mortality due to direct collision or barotrauma of migrating bats
- Potential impact 6: Loss of bats of conservation value
- Potential impact 7: Attraction of bats to wind turbines
- Potential impact 8: Loss of habitat and foraging space
- Potential impact 9: Reduction in the size, genetic diversity, resilience, and persistence of bat populations

Decommissioning Phase:

- Potential impact 10: Disturbance due to decommissioning activities.

Cumulative Impact:

- Potential impact 11: Cumulative Effect of construction activities of wind farms
- Potential impact 12: Cumulative resident bat mortality of all the wind farms
- Potential impact 13: Cumulative bat mortality due to direct blade impact or barotrauma during foraging of migrating bats
- Potential impact 14: Cumulative Effect of habitat loss over thousands of hectares of all wind farms
- Potential impact 15: Cumulative reduction in the size, genetic diversity, resilience, and persistence of bat populations

11.2 Potential impacts: Construction phase

11.2.1 Potential impact 1: Roost disturbance, destruction, and fragmentation

Cause and Comment**:** During the construction phase there could occur the destruction of active bat roosts and/or features that could serve as potential roosts, such as rock formations and the removal of trees on site. In addition, the destruction of derelict holes, such as aardvark holes, and any fragmentation of woody habitat, which includes dense bushes. The removal of trees and bushes would have an impact on all bats that could potentially roost in trees, including fruit bats, and on the foraging range of clutter and clutter-edge species.

Mitigation measures:

- Construction activities to be kept out of possible bat roosting areas, such as the farm dwelling structures.
- Rock formations should be avoided during construction, as these serve as roosting space for bats, but with the current layout, it is not expected that there will be any rock formations along the turbine positions.
- Care should be taken if any bushes or trees are destroyed.
- Aardvark holes or any large derelict holes or excavations should not be destroyed before careful examination for bats.
- The Environmental Control Officer (ECO), a responsible appointed person or site manager should contact a bat specialist before construction commences so that they know what to look out for during construction.

Significance Assessment:

IMPACT 1: ROOST DISTURBANCE, DESTRUCTION, AND FRAGMENTATION					
Nature	Negative				
Type	Direct				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Short term	Localised	Moderate	Definite	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Reversible	Resource will be partly lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

11.2.2 Potential Impact 3: Construction activities during night-time

Cause and Comment**:** Construction noise, especially during night-time, as well as lighting disturbance to bats.

Mitigation measures:

- Nightly construction activities should be avoided, or if necessary, minimised to the shortest period possible.
- With the exception of compulsory civil aviation lighting, artificial lighting during construction should be minimised, especially bright lights or spotlights.
- Lights should avoid skyward illumination.
- Turbine tower lights should be switched off when not in operation, where possible, depending on regulations.

Significance Assessment:

IMPACT 2: CONSTRUCTION ACTIVITIES DURING NIGHT-TIME					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Short term	Localised	Slight	May occur	LOW NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

*11.2.3 **Potential Impact 3: Creating new habitat amongst the turbines***

Cause and Comment**:** Creating new habitats amongst the turbines which might attract bats. These include buildings with roofs that could serve as roosting spaces, open water sources from quarries or excavation where water could accumulate.

Mitigation measures:

- Completely seal off roofs of new buildings (e.g., substations and site buildings). Note: a small bat species could enter a hole the size of 1 cm^2.
- Carefully inspect roofs of existing buildings and if there are no bat roosts, it is recommended that these roofs are sealed.
- Roofs need to be regularly inspected during the lifetime of the wind farm and any new holes need to be sealed.
- Excavation areas or artificial depressions should be filled and rehabilitated to avoid creating areas of open water sources which could attract bats during the rainy season.

Significance Assessment:

IMPACT 3: CREATING NEW HABITAT AMONGST THE TURBINES					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long term	Localised	Slight	May occur	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

11.3 Potential impacts: Operational phase

*11.3.1 **Potential Impact 4: Mortality of resident bats due to direct collision or barotrauma***

Cause and Comment**:** Fatality through direct collision or barotrauma of resident bats occupying the airspace amongst the turbines. The turning blades of the turbines during operation are the most important aspect of the project that would impact negatively on bats.

Mitigation measures:

- The windfarm should adhere to mitigation recommendations.
- Mitigation as proposed in Section 10 should be applied as soon as the turbines start turning.
- A bat specialist should be appointed before the commercial operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be discussed between the bat specialist and developer.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible and depending on aviation specifications.
- At least two years of post-construction bat monitoring is to be conducted which must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, more refined static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.

- The use of ultrasound as a mitigation measure to deter bats should be discussed with the operational bat specialist and investigated for use at turbines displaying high mortality at the Latrodex WEF site.

Significance Assessment:

IMPACT 4: MORTALITY OF RESIDENT BATS DUE TO DIRECT COLLISION OR BAROTRAUMA					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Severe	Definite	HIGH NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Difficult	MODERATE NEGATIVE
No-Go Alternative	*NOT APPLICABLE, STATUS QUO REMAINS*				

*11.3.2 **Potential Impact 5: Mortality of migrating bats due to direct collision or barotrauma***

Cause and Comment**:** 10% of the calls recorded are associated with *Miniopterus natalensis* (Natal Long-fingered bat), a Near Threatened migration species, as well as *Miniopterus fraterculus* (Lesser long-fingered bat), suspected to migrate seasonally. Minimal research has been conducted on migration of bats in South Africa, and some of the other species occurring on site could also migrate. *Rousettus aegyptiacus* (Egyptian rousette), a fruit bat with distribution maps overlaying the site, is a migratory species with a high risk of fatality; Furthermore, another fruit bat species, *Epomophorus wahlbergi* (Wahlberg's epauletted fruit bat), is recorded to travel up to 13 km between roosting and feeding sites in a single night.

Mitigation measures:

- The windfarm should adhere to mitigation recommendations.
- Mitigation as proposed in Section 10 should be applied as soon as the turbines start turning.
- A bat specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be discussed between the bat specialist and developer.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.

- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, more refined static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.
- The use of ultrasound as a mitigation measure to deter bats should be discussed with the operational bat specialist and investigated for use at turbines displaying high mortality at the Latrodex WEF site.

Significance Assessment:

IMPACT 5: MORTALITY OF MIGRATING BATS DUE TO DIRECT COLLISION OR BAROTRAUMA					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Regional	Severe	May occur	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Difficult	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

*11.3.3 **Potential Impact 6: Loss of bats of conservation value***

Cause and Comment**:** Approximately 10% of the calls recorded are associated with *Miniopterus natalensis* (Natal Long-fingered bat) and four more species of conservation value were recorded.

Mitigation measures:

- The windfarm should adhere to mitigation recommendations.
- Mitigation as proposed in Section 10 should be applied as soon as the turbines start turning.
- A bat specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be discussed between the bat specialist and developer.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- To avoid time delays in tracking the mortality of especially red data species, careful preliminary carcass analysis should be conducted in collaboration with a bat biologist, before caresses are

send to Durban Museum, or any other relevant institution. If preliminary carcass analysis is not an option, carcasses should be sent to a bat biologist without delay, so that there is a timeous identification of species with conservation value.

- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines but having more refined static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.

Significance Assessment:

IMPACT 6: LOSS OF BATS OF CONSERVATION VALUE					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Severe	May occur	HIGH NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Difficult	MODERATE NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

*11.3.4 **Potential Impact 7: Attraction of bats to wind turbines***

Cause and Comment**:** Bat mortality due to the attraction of bats to wind turbines (Horn, *et al*. 2008). Bats have been shown to sometimes be attracted to wind turbines out of curiosity or reasons still under investigation.

Mitigation measures:

- Bat mortality due to the attraction of bats to wind turbines (Horn, *et al*. 2008). Bats have been shown to sometimes be attracted to wind turbines out of curiosity or reasons still under investigation.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights.
- Lights should rather be turned downwards, where possible.
- Turbine tower lights should be switched off when not in operation, subjected to civil aviation regulations.
- Little is known about this impact, and mitigation could be adapted if more research becomes available.

Significance Assessment:

IMPACT 7: ATTRACTION OF BATS TO WIND TURBINES					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Moderate	May occur	LOW NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

Commented [SCD<1]: Robyn, you suggested that this should be reversable, as the resource is not lost, but a component might be lost if bats are killed. Therefore, the argument is that, depending on the number of bats killed, a section of the resource might not be replaced, as it might influence the growth of the bat population. In a way, stating it as "partly irreversible", we are applying the precautionary approach.

*11.3.5 **Potential Impact 8: Loss of habitat and foraging space***

Cause and Comment**:** Loss of habitat and foraging space during operation of the wind turbines. Usually this negative impact is high, but due to the small number of turbines and the vast areas of foraging space still left in the surroundings, the impact is reduced.

Mitigation measures:

- The windfarm should adhere to mitigation recommendations.
- Mitigation as proposed in Section 10 should be applied as soon as the turbines start turning.
- A bat specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be discussed between the bat specialist and developer.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, more refined static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.
- The use of ultrasound as a mitigation measure to deter bats should be discussed with the operational bat specialist and investigated for use at turbines displaying high mortality at the Latrodex WEF site.

Significance Assessment:

IMPACT 8: LOSS OF HABITAT AND FORAGING SPACE					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Moderate	Definite	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Difficult	LOW NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

*11.3.6 **Potential Impact 9: Reduction in the size, genetic diversity, resilience, and persistence of bat populations***

Cause and Comment**:** Bats have low reproductive rates and populations are susceptible to reduction by fatalities other than natural death. Furthermore, smaller bat populations are more susceptible to genetic inbreeding. High species diversity and bat activity have been recorded on the proposed site and the turbines positions are in proximity of roost sites. Since only five turbines will be deployed and that the bats with conservation status were present in small numbers, the impact is expected to be moderate. This overall significance remains moderate negative.

Mitigation measures:

- The windfarm should adhere to mitigation recommendations.
- Mitigation as proposed in Section 10 should be applied as soon as the turbines start turning.
- A bat specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be discussed between the bat specialist and developer.
- Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, more refined static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.

- The use of ultrasound as a mitigation measure to deter bats should be discussed with the operational bat specialist and investigated for use at turbines displaying high mortality at the Latrodex WEF site.

Significance Assessment:

IMPACT 9: REDUCTION IN THE SIZE, GENETIC DIVERSITY, RESILIENCE, AND PERSISTENCE OF BAT POPULATIONS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Severe	Possible	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Achievable	MODERATE NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

11.4 Potential impacts: Decommissioning phase

*11.4.1 **Potential Impact 10: Disturbance due to decommissioning activities***

Cause and Comment**:** Bat disturbance due to decommissioning activities and associated noise, especially during night-time.

Mitigation measures:

- Decommissioning activities should, as far as possible, not be conducted during night-time.
- Except for compulsory lighting required in terms of civil aviation, artificial lighting during construction should be minimized, especially bright lights or spotlights. Lights should avoid skyward illumination.

Significance Assessment:

IMPACT 10: DISTURBANCE DUE TO DECOMMISSIONING ACTIVITIES					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Short-term	Study Area	Slight	Definite	LOW NEGATIVE

Impact		Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance
With Mitigation		Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	*NOT APPLICABLE, STATUS QUO REMAINS*				

11.5 Potential impacts: Cumulative impact

*11.5.1 **Potential Impact 11: Cumulative Effect of several construction activities of wind farms***

Cause and Comment: Cumulative effect of destruction of active roost of several wind farms as well as features that could serve as potential roosts.

Mitigation measures:

- Although not enforceable on the Latrodex WEF applicant, it is important that all REFs adhere to their project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation. Adhering to these recommendations is the only possible mitigation at this stage for the cumulative effect.
- Post construction monitoring as per the relevant South African guidelines.

Significance Assessment:

IMPACT 11: CUMULATIVE EFFECT OF SEVERAL CONSTRUCTION ACTIVITIES OF WIND FARMS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Short-term	Study Area	Slight	Definite	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
No-Go Alternative	*NOT APPLICABLE, STATUS QUO REMAINS*				

11.5.2 *Potential Impact 12: Cumulative resident bat mortality of all the wind farms*

Cause and Comment: Cumulative bat mortality of resident bats at several wind WEF sites due to direct collision with the blades or barotrauma during foraging. Due to the other current and potential wind farms within a 30 km radius, and the combined high bat species diversity and activity, it is expected that the overall significance will stay high, even with mitigation.

Mitigation measures:

- Although not enforceable on the Latrodex applicant, it is important that all REFs adhere to their project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation. Adhering to these recommendations is the only possible mitigation at this stage for the cumulative effect.
- Post construction monitoring as per the relevant South African Bat Guidelines applicable at the time, is of crucial importance.

Significance Assessment:

IMPACT 12: CUMULATIVE RESIDENT BAT MORTALITY OF ALL THE WIND FARMS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study	Severe	Definite	HIGH NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Achievable	HIGH NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

11.5.3 *Potential Impact 13: Cumulative bat mortality on migrating bats at the combined wind farms*

Cause and Comment: Cumulative bat mortality of migrating bats at several wind development sites due to direct collision with the blades or barotrauma. Due to the presence of the endangered *Miniopterus natalensis* as well as the high probability of Rousettus *aegyptiacus* and *Epomophorus wahlbergi* on site and in the wider area.

Mitigation measures:

- Although not enforceable on the Latrodex applicant, it is important that all REFs adhere to their project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation. Adhering to these recommendations is the only possible mitigation at this stage for the cumulative effect.
- Post construction monitoring as per the relevant South African Bat Guidelines.

Significance Assessment:

IMPACT 13: CUMULATIVE BAT MORTALITY ON MIGRATING BATS DURING FORAGING AT ALL THE WIND FARMS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Study Area	Severe	Probable	HIGH NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Achievable	MODERATE NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

*11.5.4 **Potential Impact 14: Cumulative Effect of habitat loss all wind farms***

Cause and Comment: Cumulative Effect of habitat loss over several thousand hectares of wind farms.

Mitigation measures:

- Although not enforceable on the Latrodex WEF applicant, it is important that all REFs adhere to their project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation. Adhering to these recommendations is the only possible mitigation at this stage for the cumulative effect.
- Post construction monitoring as per the relevant South African Bat Guidelines applicable at the time.

Significance Assessment:

IMPACT 14: CUMULATIVE EFFECT OF HABITAT LOSS OVER ALL WIND FARMS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Regional	Severe	Definite	HIGH NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Difficult	MODERATE NEGATIVE
No-Go Alternative	***NOT APPLICABLE, STATUS QUO REMAINS***				

11.5.5 *Potential Impact 15: Cumulative reduction in the size, genetic diversity, resilience, and persistence of bat populations*

Cause and Comment: Several wind farms with the associated bat mortality over the lifespan of wind energy facilities are inevitably going to have an influence on the bat populations, but no long term South African research has been published yet.

Mitigation measures:

- Although not enforceable on the Latrodex WEF applicant, it is important that all REFs adhere to their project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation. Adhering to these recommendations is the only possible mitigation at this stage for the cumulative effect.
- Post construction monitoring as per the relevant South African Bat Guidelines applicable at the time.

Significance Assessment:

IMPACT 15: CUMULATIVE REDUCTION IN THE SIZE, GENETIC DIVERSITY, RESILIENCE, AND PERSISTENCE OF BAT POPULATIONS					
Nature	Direct				
Type	Negative				
Impact	**Effect**			**Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation	Long-term	Regional	Severe	Definite	MODERATE NEGATIVE
Impact		**Reversibility**	**Irreplaceable Loss**	**Mitigation Potential**	**Overall Significance**
With Mitigation		Partly Irreversible	Resource will be partially lost	Achievable	MODERATE NEGATIVE
No-Go Alternative	***Not Applicable, Status Quo Remains***				

11.6 Overall Impact Rating

Table 8 below summarises the change in impacts from pre- to post- mitigation during development of the proposed Latrodex WEF.

Table 8: Assessment of pre- and post-mitigation impact significance.

Impacts	**PRE-MITIGATION**			**POST-MITIGATION**		
Rating	**LOW**	**MODERATE**	**HIGH**	**LOW**	**MODERATE**	**HIGH**
Construction	**1**	**2**	**0**	**3**	**0**	**0**
Operational	**1**	**3**	**2**	**3**	**3**	**0**
Cumulative	**0**	**2**	**3**	**1**	**3**	**1**
Decommissioning	**1**	**0**	**0**	**1**	**0**	**0**
TOTAL	**3**	**7**	**5**	**8**	**6**	**1**

SECTION 12: INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

Table 7: Input to the environmental management programme (EMPR). The overarching aim from a bat perspective is to maintain the present roosts as it is, but not to attract new bat populations to the area.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DESIGN PHASE					
Impacts on Bats	Mitigate impacts on bat habitat caused by destruction, disturbance, and displacement.	Ensure the design of the WEF takes the sensitivity mapping of the bat specialist into account to avoid and reduce impacts on bat species and bat important features. Maintain buffers around these sensitive areas	Ensure that buffers are implemented around the farm dwellings. Avoid no-go areas.	Prior to construction during design and planning phase.	Project developer
	Mitigate impacts leading to bat population decline in future project phases	Conduct one year of bat monitoring at height.		Prior to construction	Project developer
	Prevent bat activity in sensitive areas.	Minimise artificial light at night.	Choice of lights and light placement is crucial.	Final design	Project developer
	Minimize footprint of the construction to an acceptable level i.e. no placement of turbines in buffer zones.	Turbines need to have sufficient space from blade tip to blade tip.	Final layout design	During design and Prior to construction commences.	Project developer
	Appoint people with necessary environmental skills before the start of the project, so that environmental supervision is available from the start of the project.	Appoint an ECO to oversee the EMPr is adhered to.	Monitor the efficiency of the EMP. Monitor whether proposed measures are adhered to. ECO should be trained to recognize bat species and roost locations. If buildings, trees or structures providing potential roosts need to be demolished, a specialist visit is required prior to commencement of construction.	During construction phase. ECO should be trained before construction commences.	Project developer ECO
CONSTRUCTION PHASE					
Construction activities could cause active roost disturbance and of features that could serve as potential roots such as rock formations, removal of trees on site, destruction of derelict holes, fragmentation of woody and bushy habitat and removal of trees causing habitat loss.	Minimise impacts on bats during construction activities by avoiding potential bat roosting areas. Keep construction activities out of buffers zones. Avoid the destruction of dense bushes and trees to avoid unnecessary roost destruction, where possible. All aardvark holes, derelict holes or excavations should be carefully investigated for bat roosts before construction commences.	Adhere to No-go areas. However, with the current layout there should not be potential roosts such as rock formations around the turbine positions. Bat specialist to train ECO, if necessary, to identify possible bat roosts or signs of bat presence. Clearance and removal of natural vegetation should be kept to a minimum. Avoid pollution of water courses.	Visual inspection and continuous monitoring of construction activities. Appoint an independent ECO to oversee that the EMPR is being adhered and to contact a Bat Specialist before construction commences so that they know what to look out for during construction.	Throughout construction. ECO to be present during all site clearance activities. Access to bat specialist if ECO needs information regarding bat presence during construction.	Project developer Construction manager ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
Disturbance of bats due to construction noise, especially during the night.	Prevent disturbance to bats	Construction activities should be avoided during the night as far as possible. Noise levels should be prevented as far as possible. Artificial lighting should be minimised. Especially bright lights or spotlights. Lights should avoid skyward illumination. Turbine tower lights should be switched off when not in operation where possible, depending on regulations.	Avoid construction activities at night as far as possible.	Throughout construction phase	Project developer Construction manager
Creating new habitat amongst the turbines which might attract bats. This includes buildings with roofs that could serve as roosting space or open water sources from quarries or excavations where water could accumulate.	Avoid the construction/installation of any new structures or features that could attract bats to the development site.	Inspect all buildings and infrastructure for possible roosting opportunities on a regular basis. Discuss possible bat roosts in the existing buildings with the operational bat specialist. Completely seal off roofs or new buildings (substations or site buildings). *Note that a small bat species could enter a hole the size of 1cm2. Roofs need to be regularly inspected during the lifetime of the wind farm and any new holes need to be sealed. Rehabilitate any holes or ditches that could collect water amongst the turbines.	Monitor construction to reduce noise and minimise disturbance in bat sensitive areas, especially if there are any night time construction activities. Avoid creating any new structures which could serve as bat roosts or features which could attract bats to the development site.	Throughout construction phase	Project Developer and ECO.
OPERATIONAL PHASE					
Mortality through direct collision or barotrauma of resident bats occupying the airspace amongst the turbines. The turning blades of the turbines during operation are the most important aspect of the project that would impact negatively on bats.	Monitor potential impacts on bats during operation of wind farm. Prevent activities that will attract bats to high-risk areas on site.	A Bat Specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation should take place during the operational phase and mitigation should be regularly discussed between the bat specialist and developer. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. Mitigation recommendations as proposed in Section 10 should be adhered to as soon as the turbines start turning. The use of ultrasound as a mitigation measure to deter bats should be considered and discussed with the bat specialist.	Maintain a register of action taken regarding bat mortality/injury as well as queries or complaints. Fatalities of bats should be monitored by fatality searches and a record kept of date, time, location, sex, cause of death. Carcasses should be photographed and recorded. Verify on a regular basis that mitigation recommendations are followed as proposed in Section 10 of this report. At least two years of post-construction bat monitoring is be conducted and must be performed according to the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson, *et al*., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant	Throughout operation. Static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but obtaining static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.	Project developer Site manager Operational bat specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			South African guidelines as applicable during the monitoring period.		
Mortality of migratory bat species due to direct collision or barotrauma.	Monitor potential impacts on migratory bats during operation of wind farm. Prevent activities that will attract bats to the site.	A Bat Specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation of migratory bat species should take place during the operational phase and mitigation should be regularly discussed between the bat specialist and developer. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. Mitigation recommendations as proposed in Section 10 should be adhered to as soon as the turbines start turning. The use of ultrasound as a mitigation measure to deter bats should be considered and discussed with the bat specialist.	Maintain a register of action taken regarding bat mortality/injury of migratory bat species as well as queries or complaints. Fatalities of migratory bats should be monitored by fatality searches and a record kept of date, time, location, sex, cause of death. Carcasses should be photographed and recorded. Verify on a regular basis that mitigation recommendations are followed as proposed in Section 10 of this report. At least two years of post-construction bat monitoring is be conducted and must be performed according to the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson, *et al*., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.	Throughout operation. Static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but obtaining static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.	Project developer Site manager Operational bat specialist
Loss of bats of conservation value.	Monitor potential impacts on bats of conservation value during operation of wind farm. Prevent activities that will attract bats to the site.	A Bat Specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation of bat species of conservation value should take place during the operational phase and mitigation should be regularly discussed between the bat specialist and developer. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. Mitigation recommendations as proposed in Section 10 should be adhered to as soon as the turbines start turning. The use of ultrasound as a mitigation measure to deter bats should be considered and discussed with the bat specialist.	Details of Bat carcasses of conservation value should be recorded. Maintain a register of action taken regarding bat mortality/injury as well as queries or complaints. Fatalities of bats with conservation value should be monitored by fatality searches and a record kept of date, time, location, sex, cause of death. Carcasses should be photographed and recorded. To avoid time delays in tracking the mortality of especially red data species, careful preliminary carcass analysis should be conducted in collaboration with a bat biologist before carcasses are sent to the Durban Museum, or any other relevant institution. If preliminary carcass analysis is not an option, carcasses should be sent to a bat biologist without delay, so that there is a timeous identification of species with conservation value.	During Operations. Static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but obtaining static data from a sampling point at height would aid in interpreting future bat fatality records of the Latrodex WEF.	Project developer Site manager Operational bat specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			At least two years of post-construction bat monitoring is be conducted and must be performed according to the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson, *et al*., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.		
Bat fatality due to the attraction of bats to wind turbine blades out of curiosity.	Prevent activities that will attract bats to turbines.	Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.	Little is known about this impact and a mitigation plan could be adapted as more research becomes available.	During operations	Project Developer Site manager Bat specialist
Loss of habitat and foraging space during operation of the wind turbines.	Monitor potential impacts on bats during operation of wind farm. Prevent activities that will attract bats to the site.	Adhere to buffers around farm dwellings and sensitive and roosting areas. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.	Avoid roosting areas and buffer zones.	During operations	Project developer Site manager ECO
Reduction in size, genetic diversity, resilience, and persistence of bat populations.	Monitor potential impacts on bats during operation of wind farm.	A Bat Specialist should be appointed before the operation date and operational bat monitoring should start immediately when the turbines start to turn. Careful observation of bat species of conservation value should take place during the operational phase and mitigation should be regularly discussed between the bat specialist and developer. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. Mitigation recommendations as proposed in Section 10 should be adhered to as soon as the turbines start turning. The use of ultrasound as a mitigation measure to deter bats should be considered and discussed with the bat specialist.	Details of Bat carcasses of conservation value should be recorded. Maintain a register of action taken regarding bat mortality/injury as well as queries or complaints. Fatalities of bats with conservation value should be monitored by fatality searches and a record kept of date, time, location, sex, cause of death. Carcasses should be photographed and recorded. To avoid time delays in tracking the mortality of especially red data species, careful preliminary carcass analysis should be conducted in collaboration with a bat biologist before carcasses are sent to the Durban Museum, or any other relevant institution. If preliminary carcass analysis is not an option, carcasses should be sent to a bat biologist without delay, so that there is a timeous identification of species with conservation value.	During operations.	Project Developer Site manager Operational bat specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			At least two years of post-construction bat monitoring is be conducted and must be performed according to the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson, *et al*., 2020) or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.		
DECOMMISSIONING PHASE					
Bat disturbance due to decommissioning activities and associated noise, especially during night-time.	Decommissioning activities should as far as possible, not be conducted during night-time.	Develop a decommissioning and remedial rehabilitation plan and adhere to compliance monitoring plan. Except for compulsory lighting required for civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.	Implement the decommissioning and rehabilitation plan to reduce the footprint of the development to pre-construction state.	During decommissioning phase.	Project Developer and commitment from all levels of management.
CUMULATIVE IMPACTS					
Cumulative effect of several construction activities on WEFs causing the destruction of active roosts of several wind farms as well as features that could serve as potential roosts.	All REFs adhere to their project specific mitigation measures to prevent or minimise negative cumulative impacts of construction activities.	All REFs should adhere to project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation as the only possible mitigation for preventing negative cumulative impacts. Compliance to post construction monitoring as per the relevant South African guidelines.	Although not enforceable, for each renewable energy project, all REFs should comply with an adaptive mitigation plan based on their project specific mitigation measures as included in the BA or EIA or in the respective projects in the surrounding area.	During construction, operations and decommissioning of the wind farm.	Project Developer and commitment from all levels of management of all nearby REFs.
Cumulative resident bat mortality of all the wind farms.	It is important that each renewable energy project adhere to their project specific mitigation measures to prevent or minimise negative cumulative impacts.	All REFs should adhere to project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation as the only possible mitigation for preventing negative cumulative impacts. Compliance to post construction monitoring as per the relevant South African guidelines.	Although not enforceable, for each renewable energy project, all REFs should comply with an adaptive mitigation plan based on their project specific mitigation measures as included in the BA or EIA or in the respective projects in the surrounding area.	During construction, operations and decommissioning of the wind farm.	Project Developer and commitment from all levels of management of all nearby REFs.
Cumulative bat mortality on migrating bats at the combined wind farms due to direct collision with the blades or barotrauma.	Although not enforceable on the Latrodex applicant, it is important that all REFs adhere to their project specific mitigation measures to prevent or minimise negative cumulative impacts.	All REFs should adhere to project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation as the only possible mitigation for preventing negative cumulative impacts. Compliance to post construction monitoring as per the relevant South African guidelines.	Although not enforceable, for each renewable energy project, all REFs should comply with an adaptive mitigation plan based on their project specific mitigation measures as included in the BA or EIA or in the respective projects in the surrounding area.	During construction, operations and decommissioning of the wind farm.	Project Developer and commitment from all levels of management of all nearby REFs.
Cumulative impact of habitat loss over several thousand hectares of wind farms.	Although not enforceable on the Latrodex applicant, it is important that all REFs adhere to their project specific mitigation measures to prevent or minimise negative cumulative impacts.	REFs should adhere to project specific mitigation measures, especially buffer zones, sensitivity areas and recommended mitigation as the only possible mitigation for preventing negative cumulative impacts. Compliance to post construction monitoring as per the relevant South African guidelines.	Although not enforceable, for each renewable energy project, all REFs should comply with an adaptive mitigation plan based on their project specific mitigation measures as included in the BA or EIA or in the respective projects in the surrounding area.	During construction, operations and decommissioning of the wind farm.	Project Developer and commitment from all levels of management of all nearby REFs.

SECTION 13: CONCLUSION AND IMPACT STATEMENT

Of the two fruit bat species and twenty-three insectivorous bat species which have distribution maps overlaying the proposed development area, seven have a Near Threatened and two have an Endangered conservation status in South Africa, while three of these have a global conservation status of being Near Threatened. Two of the Near Threatened bat species *Miniopterus fraterculus* (Lesser long-fingered bat) and *Rhinolophus capensis* (Cape horseshoe bat), as well as two Least Concern bat species *Eptesicus hottentotus* (the Long-tailed serotine) and *Sauromys petrophilus* (Roberts's flat-headed bat) are endemic to Southern Africa, and mainly due to agricultural activities, have limited suitable habitat remaining (Monadjem, 2010).

According to the likelihood of fatality risk, as indicated by the pre-construction guidelines (MacEwan, *et al*, 2020), 12 of the species have a high risk of fatality due to its foraging habitat at high altitudes. Three more species have a medium to high risk of fatality while one has a medium fatality risk.

The proposed Latrodex WEF site has a rich species diversity. Calls similar to 14 of the 25 species with distribution maps overlaying the proposed development site were recorded by the static recorders. 45% of the calls at the proposed Latrodex WEF represent *Neoromicia capensis*, which is the dominant species on site. *N. capensis* is a high-risk species that forage in the vicinity of the turbine blades, so that the risk of collision and barotrauma is high. 60% of the activity recorded within the sweep of the turbine blades at the 80 m sampling point (A) is from the Molossidae family, with 40% of these related to the high flying *Tadarida aegyptiaca*. 4% of the activity recorded indicates the presence of the red data *Miniopterus natalensis* of the Miniopteridae family. Higher activity was recorded at the lower monitoring system (B), if compared to the system at high altitude (A), indicating the bat activity decreases with altitude at the terrain.

Apart from the period from June to July 2020, bat activity is high. All species' activity declines towards the winter months. Increased activity is then portrayed from the end of winter, through three seasons, until the end of autumn. According to the data from the monitoring period, in general, bats show an increase in activity towards the end of summer and an increase in autumn. Then a decrease in activity is displayed as winter approaches with a second increase during spring or summer (for some species), when warmer temperatures set in.

Although higher activity was recorded at the lower monitoring system (B), both monitoring systems display similar trends in nightly hourly activity.

Linear regression of bat activity and weather conditions show that as wind speed increases, bat activity decreases. Furthermore, as temperature increases, bat activity increases. This is confirmed and refined by cumulative distribution functions as well as cumulative distribution function (CDF) heat maps. The data from the Met high sampling system (A) informs the mitigation regime, with most bat activity at Met High recorded below 10m/s windspeed and temperature above 16 ^{o}C.

High activity was recorded during all transects with the majority of calls similar to *N.capensis. E. hottentotus, S. petrophilus, N. nana* and the Near Threatened *M.natalensis* were also recorded on the transects, confirming these species on site.

The bat sensitivity map indicates a general high bat sensitivity area. Due to the small footprint of five turbines, the proposed wind turbines will have a lower effect in comparison with the larger wind farms in the vicinity. Note that natural habitat surrounds the wind farm, with natural bat conducive features.

Recommended mitigation measures for operational bat monitoring, as per Section 10, include the following **and should be incorporated in the EMPR:**

- Two years operational bat monitoring as per the relevant SABAA operational bat monitoring guidelines.
- Shifting turbines at least 500 m away from the human dwellings.
- Feathering of turbines below cut-in speed.
- The operational bat specialist will recommend Bat deterrent options.
- Curtailment as indicated in the table below:

CURTAILMENT FOR ALL TURBINES			
Months	**Time periods**	**Temperature (°C)**	**Wind speed (m/s)**
September to May	One hour after sunset up to one hour before sunrise	Above 16 °C	Turbines to be feathered up to 9 m/s

South African legislation requires a year pre-construction bat monitoring, but the environmental conditions vary from year to year. These changes usually result in changes in the bat situation not accounted for in this report. Operational monitoring will provide further clarity on the bat monitoring situation as well as refinement of the mitigation protocol.

Impacts	PRE-MITIGATION			POST-MITIGATION		
Rating	**LOW**	**MODERATE**	**HIGH**	**LOW**	**MODERATE**	**HIGH**
Construction	**1**	**2**	**0**	**3**	**0**	**0**
Operational	**1**	**3**	**2**	**3**	**3**	**0**
Cumulative	**0**	**2**	**3**	**1**	**3**	**1**
Decommissioning	**1**	**0**	**0**	**1**	**0**	**0**
TOTAL	**3**	**7**	**5**	**8**	**6**	**1**

The outcome of the monitoring process predicts the potential Negative impact on the site as Moderate pre-mitigation with seven overall impacts rating Moderate and five rating High. The High rating impacts occur during the Operational phase as well as Cumulative impacts. The nature or the Negative impacts that rate High during the Operational phase as well as the Cumulative impact have severe consequences that include the mortality of resident and migrating bats due to direct collision or barotrauma, loss of bats of conservation value and habitat loss. Should the applicant adhere to the proposed mitigation measures, the potential impact on bats from the proposed Latrodex WEF post-mitigation is predicted to be Negative and remains of Moderate significance with both operational and cumulative impacts to be Negative and rating as Moderate impacts on the environment. These impacts include those mentioned above as well as the Negative Moderate impacts on bat populations.

Considering the findings of the one-year pre-construction monitoring undertaken at the proposed Latrodex WEF site, the bat specialist is of the opinion that no fatal flaws exist, but that the site is sensitive to bats and the developer should proceed with caution. **The bat specialist recommends the granting of Environmental Authorisation with compliance to precautionary mitigation principles.**

SECTION 14: REFERENCES

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APPENDIX A: ABBREVIATED CURRICULUM VITAE: STEPHANIE CHRISTIA DIPPENAAR

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Nationality: South African
ID number: 6402040117089

CONTACT DETAILS

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EDUCATION

1986 BA University of Stellenbosch
1987 BA Hon (Geography) University of Stellenbosch
1999 MEM (Masters in Environmental Management) University of the Free State

PROFESSIONAL MEMBERSHIP

Member of the Southern African Institute of Ecologists and Environmental Scientists (SAIEES), since 2002.

SACNASP registration in process.

EMPLOYMENT RECORD

- 1989: The Academy: University of Namibia. One-year contract as a lecturer in the Department of Geography.
- 1990: Windhoek College of Education. One-year contract as a lecturer in the Department of Geography.
  - Research assistant, Namibian Institute for Social and Economic Research, working on, amongst others, a situation analyses on women and children in Namibia, contracted by UNICEF.
  - Media officer for Earthlife African, Namibian Branch.
- 1991: University of Limpopo. One-year contract as a lecturer in the Department of Environmental Sciences.
- 1992: Max Planck Institute (Radolfzell-Germany). Mainly involved in handling birds and assisting with aviary studies.

- Swiss Ornithological Institute. Working in the Arava valley, Negev – Israel, as a radar operator on a project, contracted by Voice of America, involved in an Impact Assessment Study concerning shortwave towers on bird migration patterns.
- 1993 - 2004: University of Limpopo. Lecturer in the sub-discipline Geography, School of Agriculture and Environmental Sciences. Teaching post- and pre-graduate courses in environment related subjects in the Faculty of Mathematics and Natural Sciences, Faculty of Law, Faculty of Health and the Water and Sanitation Institute.
  - 2002-2004: Member of the Faculty Board of the Faculty of Natural Sciences and Mathematics.
  - 2002: Principle investigator of the Blue Swallow project, Northern Province, Birdlife SA.
  - 2002: Evaluating committee for the EMEM awards (award system for environmental practice at mines in South Africa)
  - 2001-2004: Private consultancy work, focussing on environmental management plans for game reserves.
- 2004-2011: CSIR, South Africa, doing environmental strategy and management plans and environmental impact assessments, mainly on renewable energy projects.
- 2011 onwards: Sole proprietor private consultancy;
- From 2015 to 2017: Teaching a part-time course in Environmental Management to Post-graduate students at the Department of Geography and Environmental Studies, University of Stellenbosch.

PROJECT EXPERIENCE RECORD

The following table presents an abridged list of project involvement, as well as the role played in each project:

Completion	Project description	Role
In progress	Preconstruction Bat monitoring at Hugo and Koe WEFs, De Doorns	Bat specialist
In progress	Preconstruction Bat monitoring at Ezelsjacht WEF, De Doorns	Bat specialist
In progress	Preconstruction Bat monitoring at Patatskloof WEF, Ceres	Bat specialist
In progress	Preconstruction Bat monitoring at Kareerivier WEF, Ceres	Bat specialist
In progress	Operational bat monitoring at Kangnas wind energy facility, Springbok	Bat specialist
In progress	Operational bat monitoring at Excelsior wind energy facility, Swellendam	Bat specialist
2021	Preconstruction Bat monitoring at Koup 1 and Koup 2 WEFs, Prins Albert	Bat specialist
In progress	Preconstruction bat monitoring for two wind energy facilities at Kleinzee	Bat specialist
In progress	Preconstruction bat monitoring at Komas and Gromis Wind Farms, Kleinzee	Bat specialsit
In progress	Preconstruction Bat monitoring at Kappa 1 and 2 Wind Farms, Touwsrivier	Bat specialist

Completion	Project description	Role
2020	Operational bat monitoring at Khobab Wind Farm, Loeriesfontein	Bat specialist
2020	Operational bat monitoring at Loeriesfontein 2 Wind Farm	Bat specialist
In progress (year 5)	Operational bat monitoring at the Noupoort Wind Farm	Bat specialist
2019	Paalfontein bat screening study, Matjiesfontein	Bat specialist
2019	12 Amendment reports	Bat specialist
2019	Preconstruction bat impact assessment for the Bosjesmansberg WEF, Kopperton	Bat specialist
2018	Preconstruction Bat Monitoring at the Tooverberg Wind Energy Facility, Touwsrivier	Bat specialist
2016	Bat “walk through” for the Hopefield Powerline associated with the Hopefield Community WEF	Bat specialist
2016	Environmental Management Plan for Elephants in Captivity at the Elephant Section, Camp Jabulani, Kapama Private Game Reserve.	Project Manager
2016	Environmental Management Plan for Hoedspruit Endangered Species Centre, Kapama Game Reserve.	Project Manager
2012-2013	Bat impact assessment for the Karookop Wind Energy Project EIA.	Bat specialist
2012	Bat specialist study for Vredendal Wind Farm EIA.	Bat specialist
2011-2012	Bat monitoring and bat impact assessment for the Ubuntu Wind Project EIA, Jeffreys Bay.	Bat specialist
2011	Bat specialist study for the Banna Ba Pifhu Wind Energy Development, Jeffrey’s Bay .	Bat specialist
2011(project cancelled)	Basic Assessment for the development of an air strip outside Betty’s Bay.	Project Manager
2011	Bat specialist study for the wind energy facility EIA at zone 12, Coega IDZ, Port Elizabeth.	Bat specialist
2010-2011	Bat specialist study for the Wind Energy Facility EIA at Langefontein, Darling.	Bat specialist
2010-2011	Bat specialist study for the EIA concerning four wind energy development sites in the Western Cape.	Bat specialist
2010	Bat specialist study for Electrawinds Wind Project EIA, Port Elizabeth.	Bat specialist
2010	Environmental Management Plan for the Goukou Estuary.	Project Manager
2010	EIA for the 180MW Jeffrey’s Bay Wind Project, Eastern Cape (Authorisation received).	Project Manager
2010	EIA for 9 Wind Monitoring Masts for the Jeffrey’s Bay Wind Project (Authorisation received).	Project Manager
2009-2010	EIA for the NamWater Desalination Plant, Swakopmund (Authorisation received).	Project Manager
2007 -2011	EIA for the proposed Jacobsbaai Tortoise reserve, Western Cape(Letf CSIR before completion of project, Authorisation rejected).	Project Manager
2007-2008	Environmental Impact Assessment for the Kouga Wind Farm, Jeffrey’s Bay, Eastern Cape (Authorisation received).	Project Manager
2006-2008	Site Selection Criteria for Nuclear Power Stations in South Africa.	Co-author
2005	Auditing the Environmental Impact Assessment process for the Department of Environment and Agriculture, Kwazulu Natal, South Africa	Project Manager

Completion	Project description	Role
2005	Background paper on Water Issues for discussions between OECD countries and Developing Countries.	Author
2005	Integrated Environmental Education Strategy for the City of Tshwane.	Co- author
2005	Developing a ranking system prioritizing derelict mines in South Africa, steering the biodiversity section.	Contributor
2005	Policy and Legislative Section for a Strategy to improve the contribution of Granite Mining to Sustainable Development in the Brits-Rustenburg Region, North-West Province, South Africa.	Author
2005	Environmental Management Plan for the purpose of Leopard permits: Dinaka Game Reserve.	Project Manager in collaboration with Flip Schoeman✞
2004	Environmental Management Plan for the introduction of lion: Pride of Africa.	Project Manager in collaboration with Flip Schoeman✞
2004	Environmental Management Plan for the establishment of a Conservancy: Greater Kudu Safaris	Project Manager in collaboration with Flip Schoeman✞

MEMBERSHIPS, CONFERENCES, WORKSHOPS AND COURSES

- Steering committee Member of the South Africa Bat Assessment Association.
- Member of the KZN Bat Rescue Group.
- Updated Basic Fall Arrest certification.
- Presenting a paper at the South African Bat Assessment Association conference, October 2017: Ackerman, C and S.C Dippenaar, 2017: Friend or Foe? The Perception of Stellenbosch Residents Towards Bats, 2017.
- Attend Snake Awareness, Identification and Handling course by Cape Reptile Institute, 2016.
- Attend a course in the management and care of bats injured by wind turbines by Dr. Elaenor Richardson, Kirstenbosch, 27 August 2014
- Mist netting and bat handling course by Dr. Sandie Sowler, Swellendam, 5 November 2013.
- Attendance and fieldwork to identify bat species and look at new AnalookW software with Chris Corben, the writer of the Analook bat identification software package and the Anabat Detector, during 10 and 11 October 2013.
- Attend yearly Bats and Wind Energy workshops.
- A four day training course on Bat Surveys at proposed Wind Energy Facilities in South Africa, hosted by The Endangered Wildlife Trust, Greyton, between 22 and 26 January 2012.
- Presentation as a plenary speaker at the 4th Wind Power Africa Conference and Renewable Energy Exhibition, at the Cape Town International Convention Centre, on 28 May 2012. Title: *Bat Impact Assessments in South Africa: An advantage or disadvantage to wind development EIAs.*
- Anabat course by Dr. Sandy Sowler, Greyton, 13 February 2011.

- Attending a Biodiversity Course for Environmental Impact Assessments presented by the University of the Free State, May 2010.

LANGUAGE CAPABILITY

Fluent in Afrikaans and English

PEER REVIEWED PUBLICATIONS

Dippenaar, S, and Lochner, P (2010): EIA for a proposed Wind Energy Project, Jeffrey's Bay in SEA/EIA Case Studies for Renewable Energy.

Dippenaar, S. and Kotze, N. (2005): People with disabilities and nature tourism: A South African case study. Social work, 41(1), p96-108.

Kotze, N.J. and Dippenaar, S.C. (2004): Accessibility for tourists with disabilities in the Limpopo Province, South Africa. In: Rodgerson, CM & G Visser (Eds.), Tourism and Development: Issues in contemporary South Africa. Institute of South.

REFERENCES

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APPENDIX B: SITE SENSITIVITY VERIFICATION: LATRODEX WIND ENERGY FACILITY

In terms of Part A of the Assessment Protocols published in GN 320 on 20 March 2020

1. INTRODUCTION

Stephanie Dippenaar Consulting has been appointed by Latrodex (Ptys) Ltd Wind Energy Facility, to conduct a 12-month bat study for the proposed Latrodex Wind Energy Facility (WEF) near Haga Haga in the Eastern Cape Province of South Africa. The project proposes a maximum of 10 MW Wind Energy Facility, with associated infrastructure, covering a study area of approximately 150 ha.

In accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification has been undertaken to confirm the current land use and environmental sensitivity of the proposed project area as identified by the national web-based environmental screening tool (Screening Tool).

2. SITE SENSITIVITY VERIFICATION

The screening tool was applied to the study area and it was determined that areas of high bat sensitivity is expected to occur on site (Figure A).

To verify this classification, the following methods were applied during the 16-months pre-construction bat monitoring exercise:

- A desktop analysis was undertaken utilising available national and provincial databases as well as digital satellite imagery (Google Earth Pro and ArcGis 10.4).
- Onsite inspections and roost searches were conducted by a bat specialist or an assistant during field work sessions. In total five field work sessions were conducted.
- Data, consisting of nightly bat activity, was recorded for 16 months from two static monitoring points, which were positioned amongst the proposed turbine blades at heights of 10 m and 80 m.
- Interviews with tenants renting the dwelling on the farm. outcome of site sensitivity verification

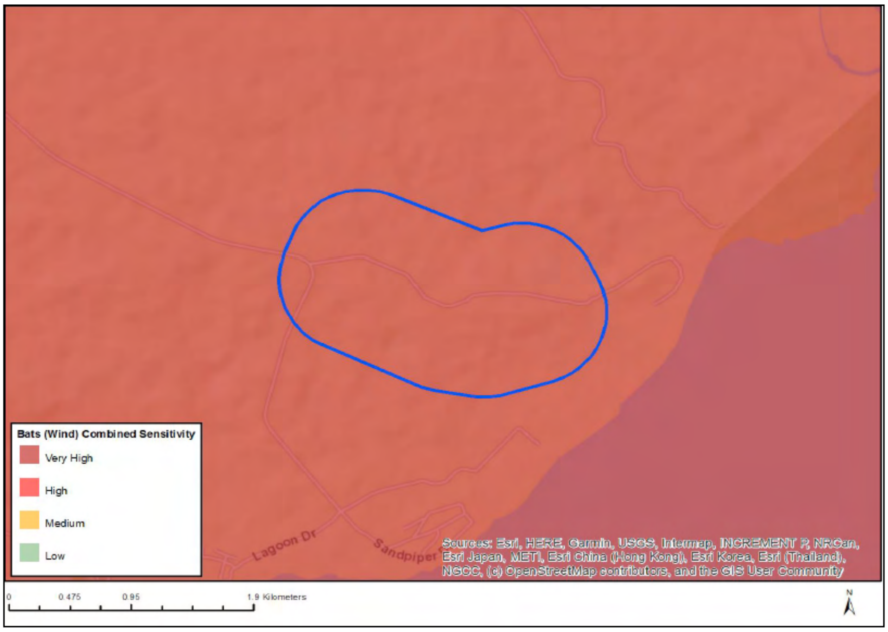

Figure A: Expected bat sensitive features at the Latrodex WEF site according to the screening tool.

The following favourable bat features are present on the site as well as the close vicinity:

- Vegetation: The vegetation is typical of Albany Coastal Belt zone, comprising of clumps of dense vegetation with grassland in between. This type of vegetation, with various flowering and fruit baring plant species and associated insects, lends itself to high bat activity. The wild fruit trees, including palm tree species, could be a food source for fruit bat species. Fruit bats as well as insectivores bats could roost in the dense vegetation and insect occurrence associated with the vegetation cover, could attract insectivorous bats. *Neoromicia nana* (Banana bat) was recorded during the bat monitoring and banana trees at the dwelling could provide roosting opportunities to this species.
- Rock formations and rock faces:
  - Although no rocky areas occur on the site itself, the surrounding areas have valley floors with rock formations and rock faces.
- Human dwellings:
  - Lush gardens and large trees are surrounding the farmhouse. This dense vegetation might attract bats for roosting and in particular fruit bats, which utilise trees for roosting and fruit bearing trees as a food source. The person staying on the premises confirmed that they have observed fruit bats in the past.

- Open water and food sources:
  - Although no natural open water sources occur amongst the turbine positions, various dams and water troughs for livestock occur in the close vicinity of the proposed development.
- Livestock grazing:
  - The site is being used for cattle grazing at present and the droppings of livestock attracts insects, which, in turn, could attract insectivorous bats.

As indicated by the Screening Tool Site Sensitivity Map above, the greater part of the site is classified as very high sensitivity.

The Screening Tool site sensitivity also indicate that wetland areas, areas within 500 m of a wetland and areas within 500 m of a river are classified as high sensitivity. Furthermore, according to the Screening Tool site sensitivity, areas within 5 km of the coastline are classified as very high sensitivity.

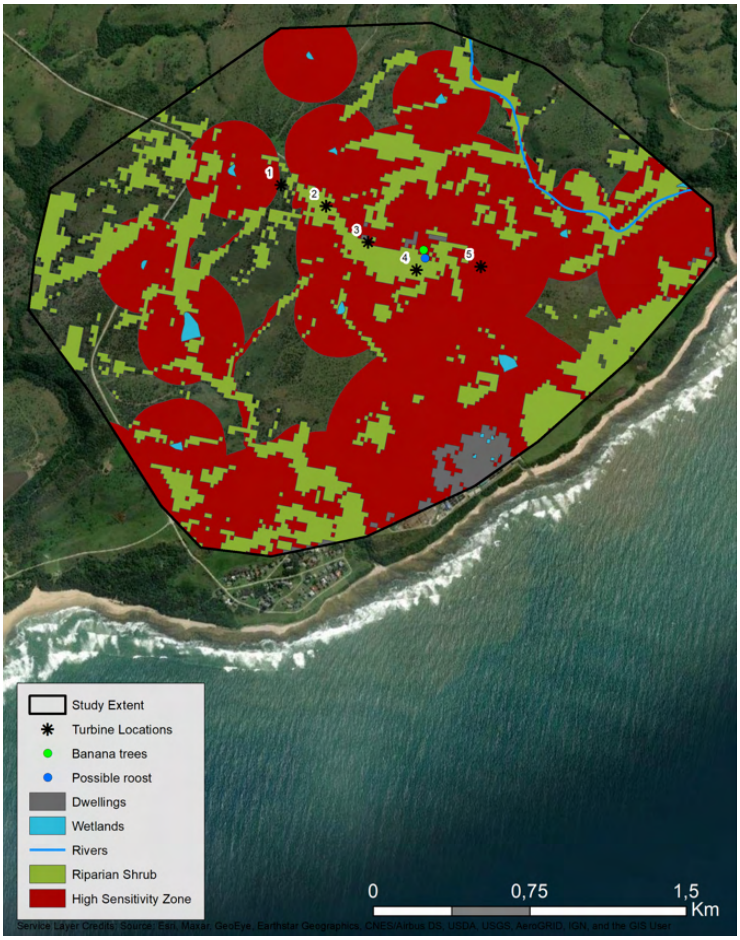

Figure B: Bat sensitivity map at the Latrodex WEF as confirmed during the bat monitoring.

3. CONCLUSION

The DFFE Screening Tool sensitivity indicate that the area has a very high bat sensitivity rating. Although the biophysical environment contains numerous bat conducive features, the bat monitoring exercise indicates that the bat activity is high; especially if the 2020 bat guidelines' threshold (MacEwan, *et al*, 2020) is considered. A more in-depth discussion supporting this conclusion, is presented in Section 9 of the present report.

APPENDIX C: 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

Environmental Impact Assessment for the proposed Latrodex Wind Energy Facility

Kindly note the following:

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

Departmental Details

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

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

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

1. SPECIALIST INFORMATION

Specialist Company Name:	Sole proprietor: Stephanie Dippenaar Consulting trading as EkoVler			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	5	Percentage Procurement recognition	80%
Specialist name:	Stephanie Dippenaar			
Specialist Qualifications:	MEM (Masters in Environmental Management)			
Professional affiliation/registration:	SAAIES			
Physical address:	8 Florida Street, Stellenbosch			
Postal address:	8 Florida Street, Stellenbosch			
Postal code:	7600	Cell:	0822005244	
Telephone:	0822005244	Fax:		
E-mail:	Sdippenaar@snowisp.com			

2. DECLARATION BY THE SPECIALIST

I, ________Stephanie C. Dippenaar_______, 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

Stephanie Dippenaar Consulting

Name of Company:

24 Feb 2022

Date

Details of Specialist, Declaration and Undertaking Under Oath

Page 2 of 3

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, ___Stephanie C. Dippenaar____, 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

Stephanie Dippenaar Consulting
____
Name of Company

24 Feb 2022
____
Date

____
Signature of the Commissioner of Oaths

2022-02-24
____
Date

SUID-AFRIKAANSE POLISIEDIENS
2022-02-24
STATION COMMANDER
SOUTH AFRICAN POLICE SERVICE