Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape:
Final Environmental Impact Assessment Report

Chapter 7:
Impact on Bats

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CHAPTER 7. IMPACT ON BATS

This chapter presents the findings of the specialist study on bats that was conducted by Stephanie Dippenaar, in collaboration with Anna Doty (Nelson Mandela Metropolitan University), for CSIR as part of the EIA for the Ubuntu Wind Energy Project, in the Eastern Cape, close to Jeffrey's Bay.

7.1 INTRODUCTION

7.1.1 Approach to the study

The approach adopted included:

- A review of available literature to establish which species could occur in the area;
- Site visits to investigate the environment and availability of suitable bat habitat, as well as recording echolocation of bats on site;
- Incorporating available bat monitoring data in the EIA report;
- Identification of potential impacts that the development could have on bats;
- Evaluation of predicted impact on bats, including those of a cumulative nature; and
- Recommending mitigation measures and monitoring requirements.

7.1.2 Terms of reference

The Terms of Reference for the bat specialist study are:

- Identify which species may occur in the area and their relevant conservation status;
- Conduct field work to assess the likelihood of bats occurring in the area;
- Identify the potential impacts of the wind project on bats and bat mortality; and
- Identifying potential management actions to reduce the impact of the wind farm on the local bat community and propose monitoring actions.

7.1.3 Assumptions and limitations

The following limitations apply to this study:

- Two sets of monitoring data are included in the EIA: A comprehensive bat survey would require monitoring of bats in all habitats, during all seasons, from dusk until dawn. Furthermore, although bat monitoring is in process, no monitoring has yet been done during the 'migration periods' in autumn and spring when some species, not resident at the proposed sites, may migrate through the area.
- Given the lack of comprehensive site monitoring data, the confidence in the assessment is therefore shown as "medium" in the assessment tables.
- Most research regarding the impacts of wind turbines on bats is found in studies conducted in North America, Canada and parts of Europe. As limited knowledge exists on the impact of wind farms on bats in South Africa, information from international sources is used in this study.
- Therefore no verified information on a micro-habitat level was available on bat occurrence, densities or migration patterns. Shortcomings arising from these limitations

can be addressed through acquisition of data from a period of site-specific monitoring. Until such data are available, the application of the precautionary principle will prevail.

7.1.4 Information sources

Information was gathered from the following sources in order to investigate the existing situation that would be affected by the project:

- Sowler, S and S Stoffberg, 2011: *South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments*, Endangered Wildlife Trust;
- Other existing literature, including journal papers and the recently compiled bat atlas for southern and central Africa (Monadjem *et al.,* 2010);
- Project information as provided by WKN Windcurrent;
- Bat occurrence data from existing studies in the Jeffrey's Bay area and wider region;
- Site visits on 19 January 2011 and 20 May 2011 to the proposed site and a review of surrounding habitats; and
- Monitoring data from May and June 2011, which were available at the time of submission of the bat specialist study.

The assessment methodology applied in this chapter is presented in Chapter 4 (Approach to the EIA).

7.1.5 Declaration of Independence

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998, I, Stephanie C Dippenaar, do hereby declare that I have no conflicts of interest related to the work of this report. I have no personal financial interest in the proposed development and/or properties and have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the development.

Stephanie C Dippenaar

7.2 DESCRIPTION OF ASPECTS OF THE PROJECT THAT POTENTIALLY COULD CAUSE IMPACTS ON BATS

For further detail on the project components, refer to Chapter 2 (Project Description). Only those aspects that could affect bats are described below.

7.2.1 Importance of bats

In general, bats play important functional roles as insect predators and as pollinators and seed dispersers. Except for mortality and disturbance resulting from wind turbine developments, the major threats faced by bats include habitat destruction and change, cave disturbance, natural disasters and the introduction of exotic species.

7.2.1.1 Economic

The economic consequences of losing bat populations could be substantial. Although the loss of bats in southern Africa has not been quantified in economic terms, in Indiana (USA) a single colony of 150 big brown bats (*Eptesicus fuscus*) has been estimated to eat nearly 1.3 million pest insects each year, possibly contributing to the disruption of population cycles of agricultural pests (Boyles, *et al*, 2011). Other estimates suggest that a single little brown bat can consume 4 to 8 g of insects each night during the active season. Even if the southern African situation is different from that of the USA, this clearly shows how bats have an enormous potential to influence the economics of agriculture and forestry.

7.2.1.2 Ecological

Fruit bats play a major role in the dissemination of forest tree seeds and habitat regeneration and restoration. In areas where fruit bats have been locally extirpated a reduction can be measured in the ability of forests to redevelop naturally after disturbance. Recent research has indicated that bats play an even greater role in ecosystem functioning than previously realised.

7.2.1.3 Disease control

The consumption of insects by insectivorous bats also play a role in the control of diseases that afflict humans, such as malaria and dengue. Some species consume a large number of mosquitoes and flies, the most important vectors in the transmission of these diseases. Monadjem, *et al*, 2010, mention that "some species of bats can consume up to 500 insects per night and, hence, a colony of 1000 individuals devours 500 000 insects per night or approaching 200 million per year." On a larger scale, malaria afflicts millions of people in Africa and the contribution bats make to reduce the number of insects that transmit diseases should not be underestimated.

7.2.2 Components of the project which could impact on bats

Components of wind energy projects which could impact on bats, directly through mortality during the operational phase, and indirectly, through the loss of foraging habitat, are the following:

- *Wind turbines* -– WKN Windcurrent proposes to establish 33 to 50 wind turbines across the proposed site with an approximate power generation capacity of between 2 MW and 3 MW each, with a total combined generation capacity of approximately 100 MW.
- Any clearance of natural vegetation for electrical connections, upgrading of access roads and creating hard standing areas.

The potential impact on bats includes the following:

- Loss of foraging habitat;
- Direct collisions with the rotating turbine blades; and
- Fatalities from barotrauma, which is usually the most important impact of wind turbine developments on bats. Barotrauma may occur when the rotating turbine blades cause a change in air pressure that affects the lungs of bats and causes internal bleeding or total collapse of the lungs.

Bats are long-lived mammals and females often produce only one pup per year, resulting in a life-strategy characterized by slow reproduction (Barclay & Harder 2003). Because of this, bat populations are sensitive to changes in mortality rates and their populations tend to recover slowly from declines. Although the impact of wind farms on birds has been studied for years, it is only recently that attention has been given to the impact of wind farms on bats. In some studies, bat fatalities have outnumbered bird fatalities by 10 to 1 (Barclay *et al*. 2007).

The following aspects of the project that will affect bats have been identified:

7.2.3 Loss of habitat

Some of the bat species that occur on the proposed site are known to roost in hollow trees, on tree trunks and under the bark of trees (see Table 7.1). The removal of the limited natural vegetation during the construction phase might alter the foraging habitat of some species.

Disturbance resulting from construction activities, such as noise after sunset from engines or generators, might also deter bats resulting in loss of feeding habitat.

7.2.4 Construction of new buildings

The presence of new buildings within the study area may provide additional roost sites for those species making use of man-made structures (e.g. roofs of buildings; Table 7.1), especially if roofs are not properly sealed. If possible buildings should not be placed close to wind turbines. However, this may be unavoidable in some instances in which case all openings around the roofs must be closed to prevent bats from roosting.

7.2.5 Operation of wind turbines

The most important aspect of the project that would affect bats adversely are the wind turbines themselves, and in particular, the operational turning blades. Bat mortality has been attributed to direct collisions with the turbine blades, but 90% of fatalities involve internal bleeding consistent with barotrauma (Baerwald *et al*. 2008). As the air moves over the turning turbine blades, an area of low pressure is created. Barotrauma occurs when bats experience a sharp decrease in atmospheric pressure near rotating turbine blades. This pressure drop causes a rapid expansion of the lungs, which is unable to be remedied through proper exhalation (the decompression hypothesis) (Baerwald, *et al*. 2008) thus resulting in haemorrhaged lungs and ultimately mortality.

Bats approach turbines (rotating or not), follow or get trapped in the blade-tip vortices, and make regular and repeated passes close to turbines. However, it is not yet known *why* bats approach moving turbines. Various hypotheses and questions have been established and are being tested to inform researchers, developers and decision makers (Kunz *et al*. 2007). These hypotheses include: Acoustic attraction (bats are attracted to sounds produced by wind turbines); Heat attraction (insects are attracted to the heat produced by the nacelles and bats are pursuing the insects); Echolocation failure (bats cannot acoustically detect moving blades or miscalculate rotor velocity); Electromagnetic field disorientation (moving turbine blades produce a complex electromagnetic field, causing bats to become disoriented); and Thermal inversion (thermal inversions create dense fog in cool valleys, concentrating insects, and bats, on ridge tops).

7.3 DESCRIPTION OF AFFECTED ENVIRONMENT

Maps showing the various turbine layouts for the proposed windfarm are provided in Chapter 2 (Project Description).

Although the site itself does not seem to have habitat that is attractive to bats such as caves, ridges with rock crevices or dense foliage, the broader areas surrounding the site are potentially attractive to bats habitat. The open grassland situated at an elevation of more than 200m also provides good foraging habitat for bats feeding in the open air.

Cultivated cereal croplands dominate this site, and the little remaining natural vegetation occurs mostly along drainage lines. The proposed turbine positions all fall within disturbed Fynbos Biome vegetation which is utilised for cattle grazing. The little natural vegetation left occurs mostly along drainage lines. Invasive plants, mainly rooikrans, occur along the dry river beds. Bats usually don't roost in rooikrans, but isolated aloes and occasional clumps of indigenous vegetation on site might be utilised by bats.

One semi-inhabited house and some dilapidated farm buildings are present on the farm. Bat species, such as *Taphozous mauritianus,* a species that has been confirmed on the site, could use such buildings for roosting. The buildings on site were investigated during the field visit in January and no bats or bat remnants were found. During future monitoring surveys, a bat specialist will investigate these buildings again.

A large farm dam is situated just west of the proposed site. Movement of bats takes place between water bodies and the foraging and roosting areas. Bats roosting on the cliff overhangs on the northern side of the proposed site might cross locations of the proposed turbines to drink water at the dam.

7.3.1 Bat Species Potentially Affected by the Proposed Project

Bats can be classified into three broad functional groups on the basis of their wing morphology and echolocation call structure. Clutter foragers are bats that have a wing design and echolocation call that enables them to fly slowly and manoeuvre easily within vegetated areas. Clutter-edge foragers include bats that fly close to or around vegetation. Open-air foragers are bats that have a wing design and echolocation call adapted to flying fast, high above the vegetation. Some open-air foragers have been recorded foraging 500 m above ground (Monadjem *et al.* 2010). It is these species that are most likely to be negatively impacted by the turning turbine blades because the blades will be within the range of their foraging altitude. Clutter-edge and clutter foragers are less likely to encounter turning turbine blades because they forage close to the ground and vegetation. However, as a precaution it is important to note that all species may be negatively impacted by the turning turbines at some stage e.g. whilst migrating through the proposed site, or moving between foraging sites and water bodies within the proposed site.

The proposed turbine site falls within the distributional ranges of 13 species that have been recorded in the area. This follows the most recent distribution maps of Friedmann & Daly (2004) and Monadjem *et al.* (2010). Of the 13 species which have been confirmed in the area, five have a conservation status of Near Threatened in South Africa, while one, *Miniopterus natalensis*, a clutter-edge feeder, has a global conservation status of Near Threatened. The other species have all been classified as Least Concern. *Rhinolophus capensis* is endemic to South Africa and has, mostly due to agricultural activities, limited suitable habitat left.

A summary of bat species distribution, their feeding behaviour, preferred roosting habitat, and conservation status is presented in Table 7.1. This information shows that the three open air feeders likely to occur at the proposed sites are all identified as a conservation status of being of *Least Concern*. This classification, however, does not mean that no attention should be given to these species. As indicated in section 7.2.4, bats are of ecological and economic importance, regardless of their Red Data Conservation status. The presence of a wind farm, and particularly the cumulative effect of several wind farms situated in a sensitive bat area, might not only be the cause of a disruption of the ecological balance, but also a reduction in the positive contribution bats make to the economy, besides the potential to play a role in the extinction of a species.

Table 7.1: Review of bat species that could occur at the Ubuntu

Species	Common Name	SA conservation status	Global conservation status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	Least Concern	Least Concern	Dense foliage of large leafy trees	Clutter: Fruit, nectar, pollen, flowers	Not known, foraging trips up to 13 km from roost
Eptesicus hottentotus	Long-tailed serotine (endemic)	Least Concern	Least Concern	Caves, rock crevices, rocky outcrops	Clutter-edge, insectivorous	Not known
Kerivoula lanosa	Lesser woolly bat	Near Threatened	Least Concern	Not known, although individuals found roosting in weaver and sunbird nests	Clutter, insectivorous	Not known
Minioptersu fraterculus	Lesser long-fingered bat	Least Concern	Least Concern	Caves	Clutter-edge, insectivorous	Not known
Miniopterus natalensis	Natal long-fingered bat	Near Threatened	Near Threatened	Caves	Clutter-edge, insectivorous	Seasonal, up to 150 km
Myotis tricolor	Temminck's myotis	Near Threatened	Least Concern	Caves	Clutter-edge, insectivorous	Seasonal
Neoromicia capensis	Cape serotine	Least Concern	Least Concern	Roofs of houses, under bark of trees, at bases of aloes	Clutter-edge, insectivorous	Not known
Nycteris thebaica	Egyptian slit-faced bat	Least Concern	Least Concern	Cave, aardvark burrows, road culverts, hollow trees. Night roosts used.	Clutter, insectivorous, carnivorous	No known
Rhinolophus capensis	Cape horseshoe bat (endemic)	Near Threatened	Least Concern	Caves, old mines. Night roosts used	Clutter, insectivorous	Not known
Rhinolophus clivosus	Geoffroy's horseshoe bat (endemic)	Near Threatened	Least Concern	Caves, old mines. Night roosts* used	Clutter, insectivorous	Up to 13 km from roost nightly
Rousettus aegyptiacus	Egyptian Rousette (endemic)	Least Concern	Least Concern	Caves	Open-air; insectivorous	Not known
Taphozous mauritianus	Mauritian tomb bat	Least Concern	Least Concern	Rock faces, tree trunks, walls	Open air, insectivorous	Not known
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
Species that might occur in the area, but have not been recorded as far south as Jeffrey's Bay						
Rhinolophus simulator	Bushveld horseshoe bat	Least Concern	Least Concern	Caves, mines, rocky outcrops	Clutter, insectivorous	Not known
Rhinolophus swinnyi	Swinny's horseshoe bat	Near threatened	Near threatened	Caves, old mines	Clutter, insectivorous	Not known

From: Monadjem, et al (2010) and Friedmann and Daly (2004)

7.3.2 Site visit during January

During the site visit on 19 January 2011 few bat calls were recorded. A Magenta Bat5 Heterodyne Detector, for which the primary use is presence of species rather than identify species, was used after sunset. Nevertheless species identification using this bat detector is approximately 80 percent accurate. Five species listed in Table 7.2, were identified. These species correlated with the species which have distribution ranges overlaying the proposed site, as well as species recorded at other wind developments in the vicinity of Jeffrey's Bay. Of the five bat species found on the proposed site two, *Taphozous mauritianus and Tadarida aegyptiaca,* are open air feeders.

Table 7.2: Bat species recorded on the site during January 2011

Species	Common Name
Taphozous mauritianus	Mauritian tomb bat
Tadarida aegyptiaca	Egyptian free-tailed bat
Miniopterus natalensis	Natal long-fingered bat
Neoromicia capensis	Cape serotine bat
Myotis tricolor	Temminck's hairy bat

7.3.3 Site visit during May

A second site visit took place on the evening of 19 May 2011. A transect (see Figure 7.1) was done using aSM2 bat recorder, which records the echolocation sounds emitted by the bats which is then analysed afterwards; This allows for more accurate species identification. As indicated in Table 7.3, three species were recorded. *Tadarida aegyptiaca* was recorded again, as well as *Miniopterus natalensis/Myotis tricolor* and *Neoromicia capensis*. It must be noted that the recordings were done towards the end of autumn and the temperature was already fairly low. Bat activity declines towards the colder winter months. As expected, the number of bat species recorded was less than during the January field visit.

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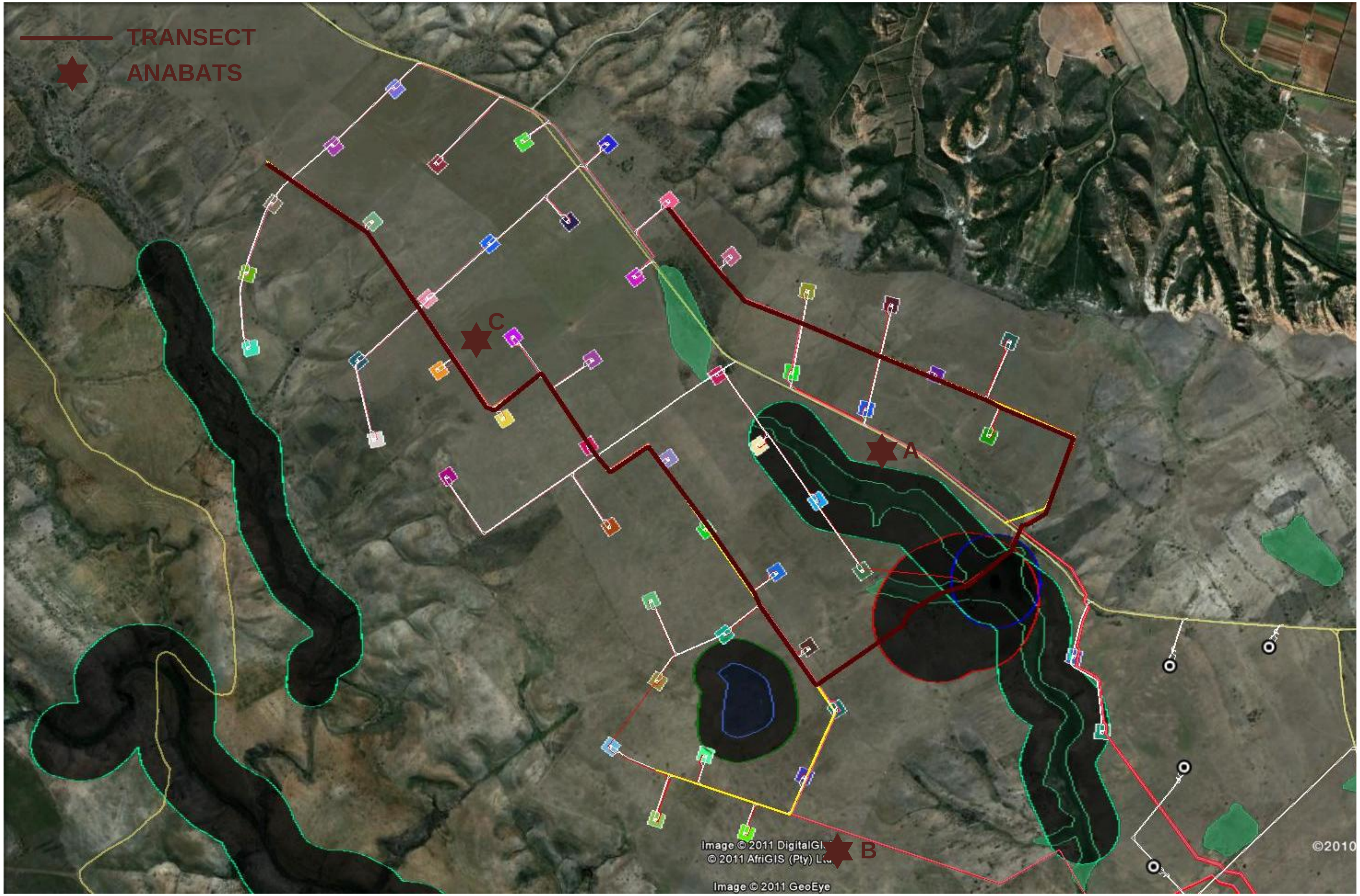
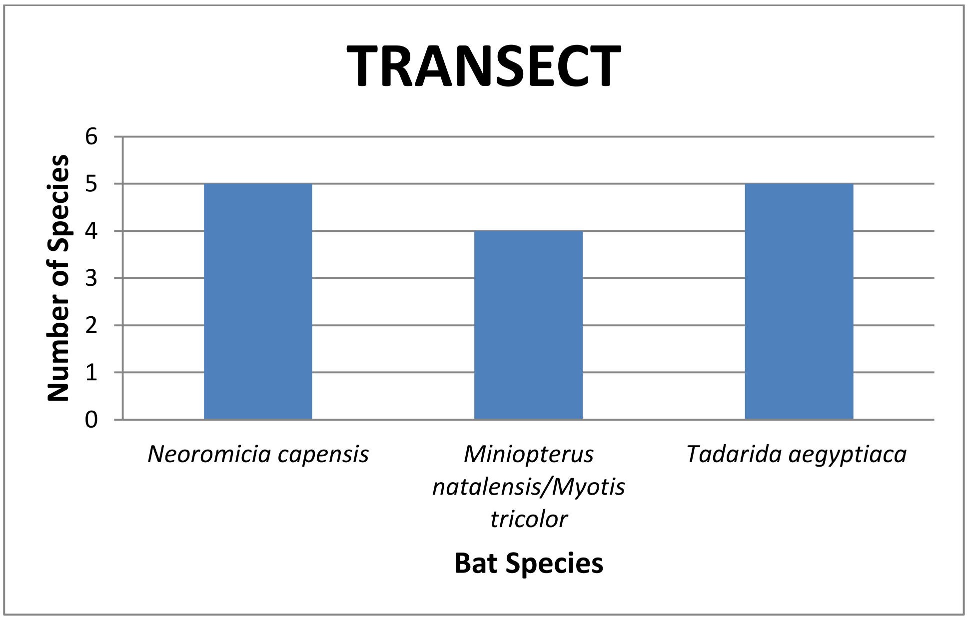


Figure 7.1: The transect route and the positions of the three Anabat bat detecting recorders, A, B and C.

Table 7.3: Bat species recorded on the site during the transect on 19 May 2011



7.3.4 Installation of Anabats and monitoring data of May and June

During the site visit in May three Anabat recorders were installed on the proposed Ubuntu site (see Figure 7.1 for the positions of the Anabat recorders). Anabat A is situated at a height of 50 m up the wind monitoring mast so as to record high-flying bats on site. Anabat B is situated on a water tank, where bats might go to drink water, and Anabat C is situated at a cattle kraal, where cow dung attracts insects, which could attract bats. The bat detectors were positioned approximately 2km apart, so as to provide a fairly accurate account of species visiting the site.

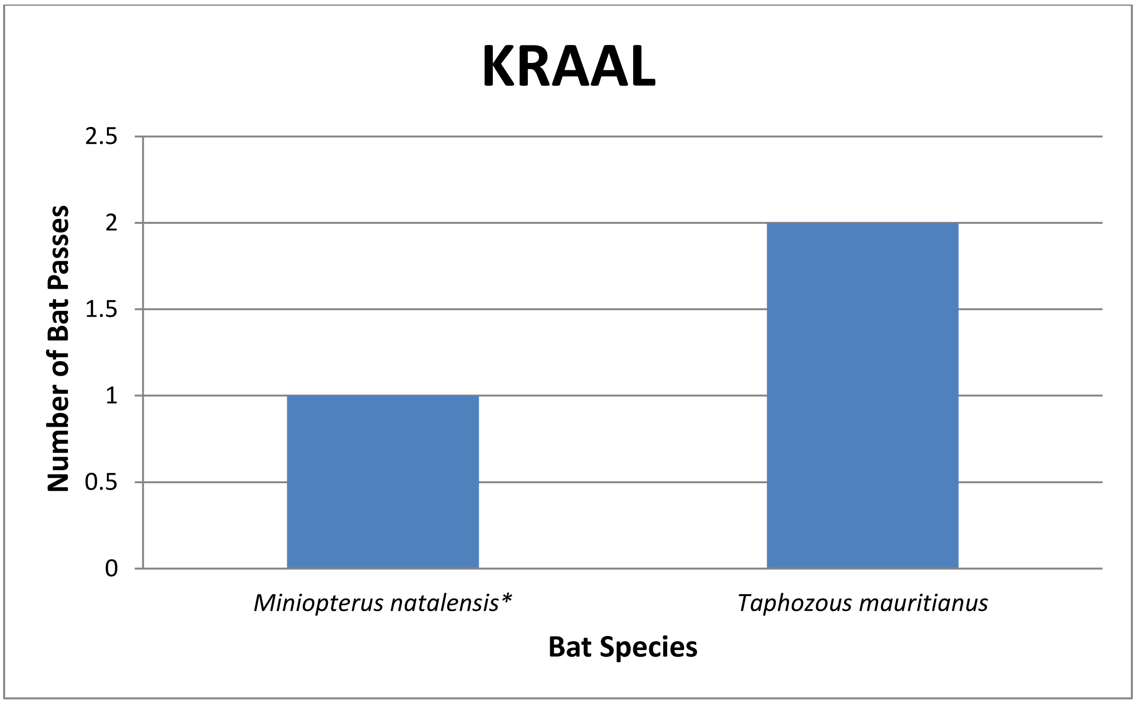
The *South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments* prescribes seven days recording per month, for a period of a year. These recordings started in May 2011 and two months' data, May and June, have been incorporated in this report.

Figure 7.2: *Miniopterus natalensis*, the Natal Long-fingered bat

Though other countries have years of data from bat recordings concerning bats and wind developments it must be noted that using Anabat recordings for wind turbine developments is a fairly new concept in South Africa. Some calls are faint, and species identification will become more accurate as experience in this method is gained. Dr. Samantha Stoffberg was approached to assist with species identification, but there is still some uncertainty where calls of species overlap, such as *Miniopterus natalensis* and *Myotis tricolor*. These species have overlapping call parameters and often roost together; therefore daily flight paths also have similarities. Consequently these species have been grouped together until more clarity has been gained. Both these species are clutter-edge foragers and therefore it is predicted that the impact of the wind turbines to a large extent might be similar for both species.

During May no bats were recorded on site and three bats passed the recorders during June. In total only three bats were recorded for the two months monitoring at the proposed site. No call recognition software was used; therefore all calls have been looked at individually. Anabat B was not functional during June, otherwise all the monitoring equipment was fully functional during the two months period. The Anabat on the wind data recording mast, Anabat A, recorded no bats. Anabat C, situated at the cattle kraal, recorded two species, *Miniopterus natalensis*, a clutter-edge forager, *Taphozous mauritianus*, an open-air forager (see Table 7.4). The calls of *Taphozous mauritianus* were not very clear and further verification is needed.

Table 7.4: Bat species recorded on the site at Anabat C during June 2011



*Calls are closely related to *Myotis tricolor*

7.4 IDENTIFICATION OF ISSUES AND IMPACTS

Direct issues related to wind farms that are of importance to bats include the following:

- The direct loss of roosting, flight paths and foraging habitat;
- Bat mortality through collisions with turbines or barotrauma from turning turbine blades; and
- The cumulative effect of bat fatalities associated with wind farms and the density of wind farms in any particular geographic area. Although the species most likely to be negatively impacted (open-air foragers such as *Tadarida aegyptiaca*) are listed as *Least Concern* in terms of their conservation status and are fairly common, numerous wind farms erected in a particular geographic area could contribute to a drastic decline in population numbers through the cumulative effect of bat fatalities. The review of EIAs for wind farm applications in the vicinity of the proposed Ubuntu site should carefully consider the bat situation in order to avoid a localised decline in certain bat species resulting from the cumulative impact of these farms.

Indirect issues related to wind farms include the consequences of a large scale loss of bats as discussed in Section 7.2.1.

7.5 PERMIT REQUIREMENTS

No permits are required for removing bats or killing them, unless for the purpose of research. If bats are to be collected, a permit from the Province of the Eastern Cape: Economic Development and Environmental Affairs is required to undertake research or collection of biological material on privately owned land in the Eastern Cape Province.

7.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The impact assessment applied the standard impact assessment criteria (see Chapter 4: Approach to the EIA), with a summary assessment provided in Table 7.5. As mentioned in Section 7.1.3 the confidence in the predictions concerning the impact of the operation of the wind farm is 'medium', as only two months of bat monitoring has been done and no site-specific data from a full autumn, spring or summer season are available. These are the times when bats migrate and when they would be more active. Bat monitoring commenced when temperatures were already dropping. The second half of May, when the bat recorders were in operation, was characterised by windy and stormy conditions, which are not conducive to bat activity. Furthermore, the use of a bat detector or recorder confirms bat activity (or non-activity) at that particular time and season. Further monitoring might confirm the presence of more bat species on site. A comprehensive species list of the site, will only become available in May 2012 once the full year monitoring has been complete

Different turbine sizes and generator types were taken into consideration for the impact assessment. Four alternatives were provided as follow:

- 33 Vestas V112, 3 MW turbines;
- 50 Vestas V90, 2 MW turbines;
- 40 Nordex N100, 2,5 MW turbines; and
- four alternative turbine positions on the south eastern part of the property.

Bat buffers were taken into account during the design phase of the project, so that the present turbine layouts are not situated within high risk areas for bats. Barcley, et al (2007) suggests that bat fatalities increased exponentially with tower height, suggesting that larger turbines are reaching the airspace of migrating bats. As limited bat activity has been recorded on the site up to now, all turbine sizes are acceptable. If it is established, after 12 months of pre-construction monitoring that the wind project is situated within an area that has high bat activity during certain times of the year, turbine size will be discussed with a bat specialist. .

Although a reliable impact assessment cannot be done by visiting a site once or twice, it does provide a sense of the suitability of the site for bats. As mentioned in section 7.3, the open grassland, where the turbines will be situated, provides good foraging habitat for bats feeding in the open air. Limited numbers of *Thaphozous mauritianus* and *Tadarida aegyptiaca* were recorded on site. According to the data available at present, the proposed site has low bat activity.

7.6.1 Loss of habitat

Farm buildings provide bat habitats suitable for daytime roosting, but no bats were observed in the dwellings on the Ubuntu site. There are no other dwellings in close proximity to the wind farm development. The main attractions to bats are open water bodies and the escarpment on the north eastern side of the property. Bats may traverse a wider territory when travelling to their primary feeding locations during dusk and dawn. It is probable that bats visiting the proposed development site roost along the cliff sides of the escarpment, in the limited clumps of indigenous trees and aloes, in rock crevices and aardvark burrows, or fly in from roosts in the surrounding area. It is not expected that trees will be removed during construction, but construction activities might cause some disturbance to bats and the foraging habitat of some species might be affected.

During construction, the impact on bat fauna at the proposed project site is expected to be low to insignificant.

During operations, as a precautionary measure, the developer must avoid attracting bat colonies to the vicinity of the wind farm site. Therefore, old buildings within the study area should be investigated, and if there are no bats roosting, the roofs should be sealed. This will avoid bats being attracted to the area in future. One could consider roost boxes (to attract bats) to "safe" areas, away from any turbine developments, when more is known of the bat population. Pre-construction monitoring should inform the potential placement of bat roost boxes, if necessary, and the potential need to seal off existing buildings.

7.6.2 Mortality during the operation of wind turbines

The most important aspect of the project that would affect bats are the turning blades when the turbines are operating. Bat mortality has been attributed to direct collisions with the turbine blades, but approximately 90% of fatalities involve internal bleeding consistent with barotrauma

(Baerwald *et al.* 2008), see Section 7.2.4). Open air foragers that might be present on site, such as *Rousettus aegyptiacus, Taphozous mauritianus* and *Tadarida aegyptiaca,* are expected to be the most affected. *Tadarida aegyptiaca* was recorded at the site in January and May and *Taphozous mauritianus* was recorded during June.

Figure 7.3: *Tadarida aegyptiaca* (Egyptian Free-tailed bat), rescued from a wind turbine injury in Coega near Port Elizabeth. It is predicted that this species will be affected by the wind turbine development as it is an open-air forager.

7.6.3 Management actions to avoid or reduce negative impact

Management actions are proposed for the following stages of the project:

- Detailed design (pre-construction);
- Construction; and
- Operations.

7.6.3.1 Actions to inform the detailed design (pre-construction)

a) Pre-construction monitoring

According to the *SA Good Practice Guidelines for Surveying Bats in Wind Farm developments* (Sowler and Stoffberg, 2011) the EIA should allow for 12 months of bat monitoring. This guideline was published in May 2011, at which time the Ubuntu EIA process was well advanced. Nevertheless, the client decided to progress with the monitoring while the EIA is in progress. Available monitoring results will be incorporated into the Draft and Final EIA Reports. The full 12 months of pre-construction monitoring will be completed and the monitoring report submitted to DEA before construction will be permitted to start. At present it appears that there is low bat activity on site. If the monitoring data show high activity, the client and a bat specialist should investigate possible ways to minimise bat mortality. The findings of this monitoring must be incorporated into the EMP for the project and inform the following actions:

- potential need to seal off existing buildings within the study area;
- possible need to refine turbine operational procedures (described below);
- possible need to re-look at the turbine layout; and
- potential placement of bat roost boxes in safe areas away from turbines.

7.6.3.2 Actions to reduce impacts during construction

a) Protect existing bat habitat

Destruction of trees, especially limited stands of indigenous trees in the drainage lines and the few aloe plants on site, must be avoided as they may provide existing roosts.

b) Avoid creating new habitat close to turbines

Care needs to be taken to completely seal off roofs of new buildings (e.g. substations) within the study area to prevent bats from moving in, thus making them more prone to coming into contact with the turbines in the surrounding area.

The presence of old building structures within the study area may provide roost sites for species such as *Neoromicia capensis* that make use of man-made structures, particularly if roofs are not properly sealed. Species which use walls and/or roofs for roosting habitats need rough surfaces on which to grip and thus by modifying these surfaces potential bat colonies can be either attracted or detracted. Buildings which do not house bats within the study area at present need to be sealed off so as to avoid bats to use the buildings as roosting sites. Consideration should be given to demolishing existing redundant or dilapidated buildings which could house bat roosts.

c) Set-back from waterbodies and structures

Bats visit waterbodies to drink and therefore it is recommended that the turbines be located at least 200 m away from any permanent waterbodies (e.g. dams) on site to reduce the risk of collision/barotrauma. If the monitoring data show a high bat occurrence and/or high bat mortality rates, a bat specialist should be contacted and these setbacks should be increased as is appropriate.

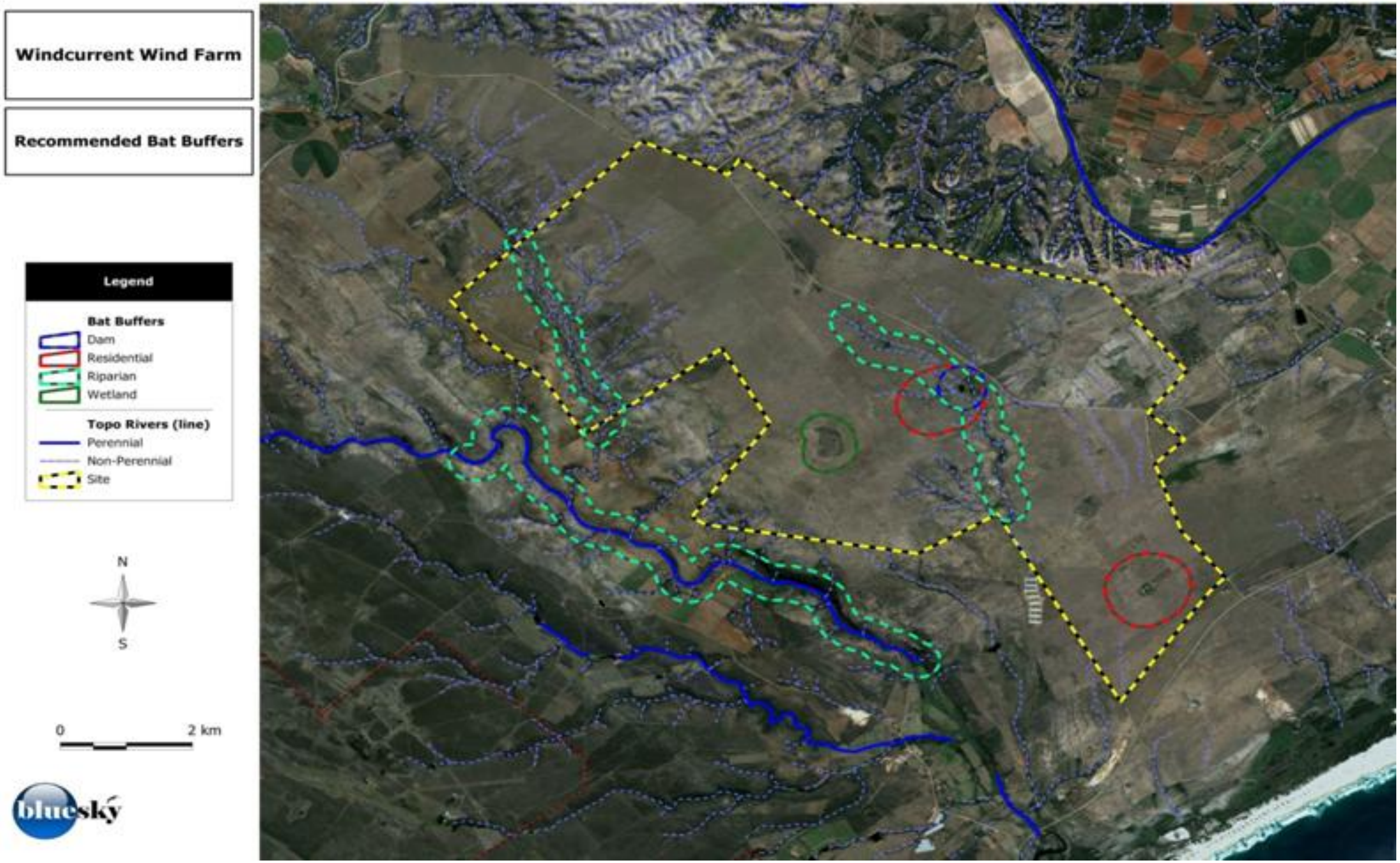


Figure 7.4: Recommended bat buffers

7.6.3.3 Actions to reduce impacts during operations

a) Operational management of blade speeds

Nights with low wind speeds are associated with increased mortality as bats are most active under these conditions (Hoso and Hayes, 2010). If during monitoring bat occurrence is found to be high, there are mitigation measures for the turbine operations that could be applied. An effective and tested mitigation at present is changing cut-in speeds (Huso and Hayes, 2010). For example, the cut-in speed of the turbines could be increased, to 5 m per second, so that turbines start operating under slightly stronger wind conditions when bats are less likely to be active. This mitigation measure is costly in terms of energy efficiency, and is not recommended if not necessary. It may also only be applicable at certain times of year such as during bat migration periods.

b) Attract bats away from turbines

If a high number of bats are recorded during the complete monitoring period, bat roost sites could be established (e.g. roost boxes) as a trade-off to offset potential mortalities during turbine operation.

7.6.3.4 Pre-construction

At national and project scale, research is needed to provide more information on specific impacts and novel mitigation measures that might reduce impacts of wind turbines on South African species of bats. *The South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments* (Sowler and Stoffberg, 2011) was finalised during May 2011 and it recommends monitoring of at least "7 consecutive days (during good weather conditions) per month over a period of 12 consecutive months." As the EIA commenced before the Guidelines were published, the client did not do any bat monitoring at the beginning of the project. Consequently monitoring only commenced in May 2011. Three Anabat bat detecting recorders were installed on site and the monitoring data for May and June are included in this report (see Section 7.3.4). This monitoring will continue until April 2012 and a monitoring report will be submitted to DEA. It is understood that DEA will continue with the decision making process for the EIA, but that the bat monitoring report, as well as the outcome of the results of the bat monitoring, will be a pre-requisite before construction can commence.

7.6.3.5 Post-construction/operational monitoring

It is recommended that operational monitoring be undertaken to determine the extent of bat fatalities, and the species affected, if any. Although it is expected not to be as successful in South Africa as in European countries, carcass searches are the standard method employed to determine the level of bat mortality. Monitoring is especially important during the periods April to May and August to September, when bats are migrating between summer and winter roosts. Carcass searches should be done early in the morning to minimize the effect of scavengers (which remove carcasses). Carcasses should be frozen and sent to a bat specialist for identification purposes. This information is critical to improve the understanding of the effect of wind farms on bat populations in South Africa.

7.6.4 Cumulative effect of various wind farms in the area

Apart from the Ubuntu Wind Energy Project seven other wind development projects are in progress in the Jeffrey's Bay-Humansdorp vicinity. None of these developers have twelve month's bat monitoring data available yet. Furthermore, no bat migration data are available for this area. Although it is not possible to make confident predictions with the limited data available, it is expected that the combined proposed wind developments in the area will have a cumulative impact on the bat population, at least through a loss of habitat. What is of importance is that wind farms are not situated on migration routes of bats. Yearly migration patterns, if there is an inland migration of some bat species, from the coastal areas inland, can easily extent over more than 100 km. This put all the present wind proposals at risk. Current bat monitoring at Ubuntu will indicate whether the proposed development is situated on a bat migration route, and similar requirements are expected from other wind farms in the vicinity so that mass mortality through placing several wind farms on a migratory route is avoided.

The Jeffrey's Bay Wind Project, a 180MW wind farm stretching over more than 3000 ha is situated less than 10 km, as the crow flies, to the west of Ubuntu Wind Energy Project. The Kabeljous River is situated between the two proposed wind farms. It is expected that most bat activity will be found around the riparian vegetation of the Kabeljous and its tributaries. Open air insectivorous feeders, which feed on the plateau to the east (Ubuntu Wind Energy Project) and the west (Jeffrey's Bay Wind Project) of the Kabeljous, such as *Rousettus aegyptiacus, Taphozous mauritianus and Tadarida aegyptiaca,* are mostly at risk. Bats usually don't have a daily migration of more than 5 km per day. They are habitual animals and literature suggests that they tend to return to the same area for feeding and roosting. It is therefore expected that bats will still visit the wind turbine sites after construction. At this stage though, with the limited data available, it is not possible to make confident predictions concerning the effect of the cumulative impact of all these proposed wind farms.

Table 7.5: Impact assessment

Nature of impact	Status (Negative or positive)	Extent	Duration	Intensity	Probability	Significance (no mitigation)	Mitigation/Management Actions	Significance (with mitigation)	Confidence level
CONSTRUCTION PHASE									
Scenario: Construction of Wind Turbines									
1.1 Loss of roosts for bat species using trees and aloes as roosts	Negative	Localised	Permanent	Low	Low	Low	Avoid removal of trees and large aloes.	Low	High
1.2. Loss of roosts for bat species using manmade structures as roosts	Negative	Localised	Permanent	Low	Low	Low	Seal all existing buildings within the study area which have not got bat roosts. Seal off all new building structures within the study area.	Low	High
1.3. Construction noise during night time	Negative	Localised	Permanent	Low	Low	Low	Night time activities and noise on the construction site should be minimised.	Low	High
OPERATIONAL PHASE									
Scenario: Operation of Wind Turbines									
Displacement or exclusion from foraging areas and the loss or shifting of flight paths	Negative	Localised	Long Term (life of project)	Low	High	Medium	Setback of 500 m from areas where bats may roost, such as human dwellings or sheds, and a setback of 200 m around water bodies where bats might drink.	Low	Medium
Mortality due to collision with turning turbine blades or due to barotrauma	Negative	Localised and Regional (migratory species)	Permanent	Medium	Highly probable (may be species specific)	Medium	Pre-construction monitoring to confirm turbines not on a migration pathway. Optimise turbine rotation speeds to reduce bat fatalities, if needed, and for specific times of year only.	Low	Medium

Table 7.6: Monitoring programme

Impact	Mitigation/Management action	Monitoring		
		Methodology	*Frequency*	*Responsibility*
CONSTRUCTION PHASE				
1.1 Loss of roosts for bat species using trees and aloes as roosts	Avoid the removal of clumps of indigenous trees and aloes.	Protect existing bat habitat.	During construction	Construction manager and ECO
1.2. Loss of roosts for bat species using manmade structures as roosts	Seal all existing buildings within the study area which have not got bat roosts. Seal off all new building structures within the study area.	Avoid creating any new bat habitat on site	Once off, during construction of building	Construction manager and ECO
1.3. Construction noise during night time	Construction activities should as far as possible take place during daytime.	Avoid disturbance of bat activity after sunset	During construction	ECO
OPERATIONAL PHASE				
Mortality due to collision with turning turbine blades or due to barotrauma	Pre-construction monitoring to confirm turbines not on a migration pathway.	Try to avoid bat fatalities	Monitor bat activity for 7 days per month for one year	Bat specialist and client
	Optimise turbine rotation speeds to reduce bat fatalities, if needed, and for specific times of year only.	Try to avoid bat fatalities	Monitor bat activity for 7 days per month for one year	Client in collaboration with bat specialist

7.7 CONCLUSIONS

Monitoring, which is in progress, is required to determine the extent of bat fatalities, and the species affected. If data collected up to now is taken into account, the impact of the wind turbines on bats on the Ubuntu site is predicted to be of **low** significance with mitigation. Confidence levels are medium, as only two months of monitoring data have been incorporated, but the report will be updated with additional information from the forthcoming monitoring results. After the full set of pre-construction data are available, and if it is confirmed that there is little bat activity on the site, the predicted impact could then be deemed to be low. It is further recommended that post-construction monitoring be undertaken to determine the extent of bat fatalities, and the species affected, if any, while the turbines are in operation.