environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Caledon Wind Farm Project

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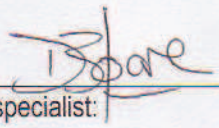
I, David Hoare , declare that --

General declaration:

- 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 71 and is punishable in terms of section 24F of the Act.



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Name of company (if applicable):

15 November 2011

Date:

Arcus GIBB (PTY) LTD

Environmental Impact Assessment for the Establishment of the Caledon Wind Farm, Western Cape Province

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Environmental Impact Report

Fauna Impact Assessment Study

Date: November 2011

EXECUTIVE SUMMARY

An EIA is being undertaken to assess the potential environmental impacts associated with the construction and operation of a wind farm in the Caledon area of the Western Cape Province. A desktop and field-based assessment was undertaken to identify the major issues associated with the construction and operation of a wind farm and to assess the potential significance of impacts on local fauna.

The approach taken for this faunal assessment was to identify any species of conservation concern that could occur in the study area and that may use the site for some purpose. Literature sources and databases containing distribution records for all species were consulted to identify a list of species of conservation concern that have a likelihood of occurring on site. Species with a distribution range that included the site were evaluated to determine whether the site was likely to contain habitat important for each species. The species considered to have a high likelihood of occurring on site or in the surrounding areas were the Natal Long-fingered Bat, Cape Horseshoe Bat, Temminck's Hairy Bat, Geoffroy's Horseshoe Bat, Cape Rain Frog, Cape Mountain Toad, Montane Marsh Frog, Geometric Tortoise, Yellow-bellied House Snake and Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU), Cape Mountain Toad (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The other species are listed as Near Threatened, which is a lower category of concern.

An evaluation was undertaken to identify potential impacts on faunal species that could occur on site. Impacts include those that affect important habitat and those that directly affect individuals of species. It was found that the proposed project may cause significant impacts on bats and on habitats of threatened fauna. The most important potential impact is on bats, primarily due to the reported high rates of mortality associated with bats and turbine blades during the operational phase. The impact was evaluated as having medium significance, which can be reduced with mitigation measures proposed. The only other potential impact assessed as having medium significance is the construction impact on the habitat for threatened fauna. Vegetation in some localities potentially provides habitat for the threatened Cape Rain Frog (VU) and the Geometric Tortoise (EN). It was assessed that there is a high probability of the Cape Rain Frog and a moderate probability of the Geometric Tortoise utilizing the types of habitat available on site. Mitigation measures to protect remaining suitable natural habitat are proposed that will reduce the significance of this potential impact to low. The most important habitat to protect is the renosterveld in good condition found in the north-eastern part of the site.

Environmental Impact Assessment for the Establishment of the Caledon Wind Farm, Western Cape Province

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Appendix 1: Threatened species with a distribution that includes the study area

ABBREVIATIONS

DEA **Department of Environmental Affairs**

GLOSSARY

1 INTRODUCTION

1.1 Background

Arcus GIBB was appointed by Genesyswind to undertake an application for environmental authorisation through an Environmental Impact Assessment (EIA) for the proposed "Caledon Wind Energy Facility Project." The project involves the establishment of a wind energy facility and associated infrastructure, including up to 150 wind turbines, sub-stations, power-lines linking to the main grid and access roads. The purpose of the EIA is to identify environmental impacts associated with the project.

Arcus GIBB identified which specialist studies were required and approached relevant specialists for proposals to undertake studies. David Hoare Consulting cc was appointed to undertake the fauna impact assessment. This report provides details of the results of the environmental impact assessment phase.

1.2 Scope and Limitations

1.2.1 Scope of Work

The scope of work was to undertake an impact assessment for those issues identified during the scoping phase of the project. The main components of the Impact Assessment Report were to be the following:

- The description of environmental issues that were identified during the environmental impact assessment process,
- An assessment of the significance of direct, indirect and cumulative impacts in terms of standard criteria,
- recommendations regarding practical mitigation measures for potentially significant impacts and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.

1.2.2 Approach

Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple

approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

- Environment Conservation Act (Act 73 of 1989)
- National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
- National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004)

1.2.3 Limitations

Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.

This study included detailed desktop and field-based evaluation of the site. It was considered to be adequate for assessing the major issues associated with the impacts of the proposed project on fauna in the area.

1.3 Methodology

Lists of species of conservation concern were compiled. The purpose of listing Red Data animal species was to provide information on the potential occurrence of species of special concern in the study area that may be affected by the proposed infrastructure. Species appearing on these lists could then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species of conservation concern previously recorded in the area and any other species with potential conservation value. Lists of threatened animal species that have a geographical range that includes the study area were obtained from literature sources (for example, Alexander & Marais 2007, Branch 1988, 2001, Du Preez & Carruthers 2009, Friedmann & Daly 2004, Marais 2004, Mills & Hes 1997, Minter et al. 2004, Monadjem et al. 2010, Tolley & Burger 2007). The likelihood of any of them occurring was evaluated on the basis of habitat preference and habitats available at the proposed site. The three parameters used to assess the probability of occurrence for each species were as follows:

- *Habitat requirements*: most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics within the study area were assessed;
- *Habitat status*: in the event that available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water-quality plays a major role); and
- *Habitat linkage*: movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to these surrounding habitats and adequacy of these linkages was assessed for the ecological functioning Red Data species within the study area.

For all threatened animals that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- LOW: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- MEDIUM: habitats on site match general habitat description for species (e.g. fynbos), but detailed microhabitat requirements (e.g. mountain fynbos on shallow soils overlying Table Mountain sandstone) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;

- HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. mountain fynbos on shallow soils overlying Table Mountain sandstone);

1.3.1 Study Area Sensitivity Analysis

The study site was evaluated in terms of the potential for containing habitat for animal species of conservation concern. Any habitat considered important for species of concern was considered to be sensitive whereas habitat not important for species of conservation concern was considered t be not sensitive.

Table 1: Sensitivity analysis

	Description
Lower Sensitivity	Habitat with no breeding, inhabiting or foraging importance for animal species of conservation concern
Medium Sensitivity	Habitat with breeding, inhabiting or foraging importance for animal species of low conservation concern (Near Threatened, Declining, Rare or Restricted)
Higher Sensitivity	Habitat with breeding, inhabiting or foraging importance for animal species of high conservation concern (Critically Endangered, Endangered or Vulnerable)

1.3.2 Assessment of Impacts

The assessment of impacts follows the methodology outlined below. The assessment of potential impacts was based on the professional judgement of the specialists, fieldwork and desktop analysis, as appropriate. Potential impacts are evaluated for each infrastructure component according to *magnitude, extent, duration* and *probability* and, based on the above, the rated significance of the impacts is given (rated “Low”, “Medium” or “High”). These criteria are drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989 and are defined as follows:

- Nature
  The nature of the impact is whether it is a negative (destructive) or positive (beneficial) impact.

- Extent of the impact

A description of whether the impact will be: (1) local extending only as far as the development site area; or (2) limited to the site and its immediate surroundings (up to 10 km); or (3) will have an impact on the region, or (4) will have an impact on a national scale or (5) across international borders. The criterion is scored according to the number in brackets.

- Duration of the impact
  The impact is evaluated in terms of whether the lifespan of the impact would be (1) very short term (0-1), (2) short term (2-5 years), (3) medium term (5-15 years), (4) long term (16-30 years) or (5) permanent.

- Magnitude (intensity or severity)
  The magnitude of the impacts is quantified on a scale from 0-5, where 0 is small and will have no effect on the environment, 1 is minor and will not result in an impact on processes, 2 is low and will cause a slight impact on processes, 3 is moderate and will result in processes continuing but in a modified way, 4 is high (processes are altered to the extent that they temporarily cease), and 5 is very high and results in complete destruction of patterns and permanent cessation of processes.

- Probability of occurrence
  The probability of the impact actually occurring is estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The significance is calculated by combining the criteria in the following formula:

$$S=(E+D+M)P$$

S = significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

< 20 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area, provided that recommended

mitigation measures to mitigate impacts are implemented), <10 = very low, < 20 = low.

20-45 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated).

> 45 points: High (i.e. would strongly influence the decision to proceed with the proposed project, i.e. where it could have a no-go implication for the project irrespective of any possible mitigation), >45 = high, > 60 = very high.

Where negative impacts were identified, mitigation measures (ways of reducing impacts) were proposed. Where no mitigation is feasible, this is stated and reasons given. Impacts were assessed separately for the following components of the project:

- turbines and substations,
- internal access roads and underground cables (the footprint of these two infrastructure components coincide,
- overhead power lines.

2 DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section provides an overview of the general study area in terms of those elements of the environment around which the specialist study is centred. It describes the location of the site as well as environmental characteristics of the site, including geology, topography, land-use/landcover and general vegetation patterns. These are all components that affect the available habitat for faunal species of concern that may occur in the general study area and provide the context in which potential occurrence of faunal species of concern is assessed.

2.1 General Study Area

2.1.1 Location

The study site is located just to the north of the N2 national road along the section between Caledon and Botrivier. In a regional context, this is approximately 65 km east of the Cape Town International Airport. The site straddles farm portions to either side of the R43 road to Villiersdorp. These are located within the quarter degree grids 3419AA and 3419AB. The farm portions include the following, which are shown in Figure 1:

- Portion of the farm De Vleytjes 261
- Farm 744
- Farm 749
- Portion 9 of Farm 259
- Remainder of Farm 351
- Portion 1 of the farm Goedvertrouw 264
- Portion 3 of the farm Goedvertrouw 264
- Portion 4 of the farm Goedvertrouw 264
- Remainder of farm Goedvertrouw 264
- Portion 1 of the farm Hawston View 271
- Portion 3 of the farm Hawston View 271
- Portion 1 of the farm Keissies Kraal 350
- Portion 2 of the farm Keissies Kraal South 273
- Portion 3 of the farm Land Road
- Portion 2 of the farm Paarde Valley 266
- Remainder of the farm Paarde Vley 276

- Portion 3 of the farm Rietfontein 259
- Portion 7 of the farm Rietfontein 259
- Portion 8 of the farm Rietfontein 259
- Portion 1 of the farm Warmoeskraal 259
- Portion 1 of the farm Warmoeskraal 263
- Remainder of farm Warmoeskraal 263
- A portion of farm Windheuwel 354
- Portion 1 of the farm Windheuwel 354

2.1.2 Geology

The main geological types in the study area are as follows:

- Bidouw Subgroup of the Bokkeveld Group, consisting of shale, siltstone and arenite,
- Ceres Subgroup of the Bokkeveld Group, consisting of shale and arenite, and
- Weltevrede Subgroup of the Witteberg Group, consisting of arenite and shale.

Bokkeveld shales are less resistant to weathering than the dominant sandstones of the Cape region and tend to form rounded hills in undulating country. They typically underlie valleys and lower mountain slopes. The Witteberg Group consists of siltstones imbedded with thin beds of sandstone capped by quartzite. In the study area the group has been weathered over geological time to the lower siltstone levels, but still form the backbone of the hills on site.

Soils derived from Cape Supergroup rocks tend to be course-grained, rocky and shallow, whereas soils derived from Bokkeveld shales tend to be clay-rich and more fertile. The geology and soil-type may affect the distribution of some fauna species, especially small mammals that rely on substrate properties to locate suitable habitats.

2.1.3 Topography

The study site is dominated by a ridge running in an east-west direction. from the central part of the study area, rising towards the east. These are the foothills of the Riviersonderendberge and are a ridge running parallel to and to the south of the Donkerhoekberge, an off-shoot of the Riviersonderendberge. Around the base of this ridge are low undulating hills that characterise the remainder of the study area. The topography drops towards the north-west of the site, which is where the Botrivier runs. Slopes on site vary from moderately sloping to steeply sloping.

The elevation on site ranges from 551 m at the top of the ridge in the north-east to 116 m in the river valley in the north-west. The hills in the southern half of the site vary in height from 190 to 330 m.

2.1.4 Land-use / landcover

A map of remaining natural habitats on site is provided in Figure 2. Most of the study site is consists of cultivated lands. There are some significant patches of remaining vegetation along the upper parts of the ridge in the north-eastern part of the site and overlooking the Botrivier in the north-western part of the site. Other natural vegetation consists primarily of drainage lines between cultivated fields and small patches scattered throughout the site. Secondary fynbos has developed on some of the fields on the north-west of the site, otherwise most of the site appears to be under active cultivation.

The significance of the high degree of cultivation of the site is that there is little natural vegetation remaining which could support indigenous fauna. Some species of conservation concern may make use of cultivated fields for foraging, but this is generally the exception for most other animal species.

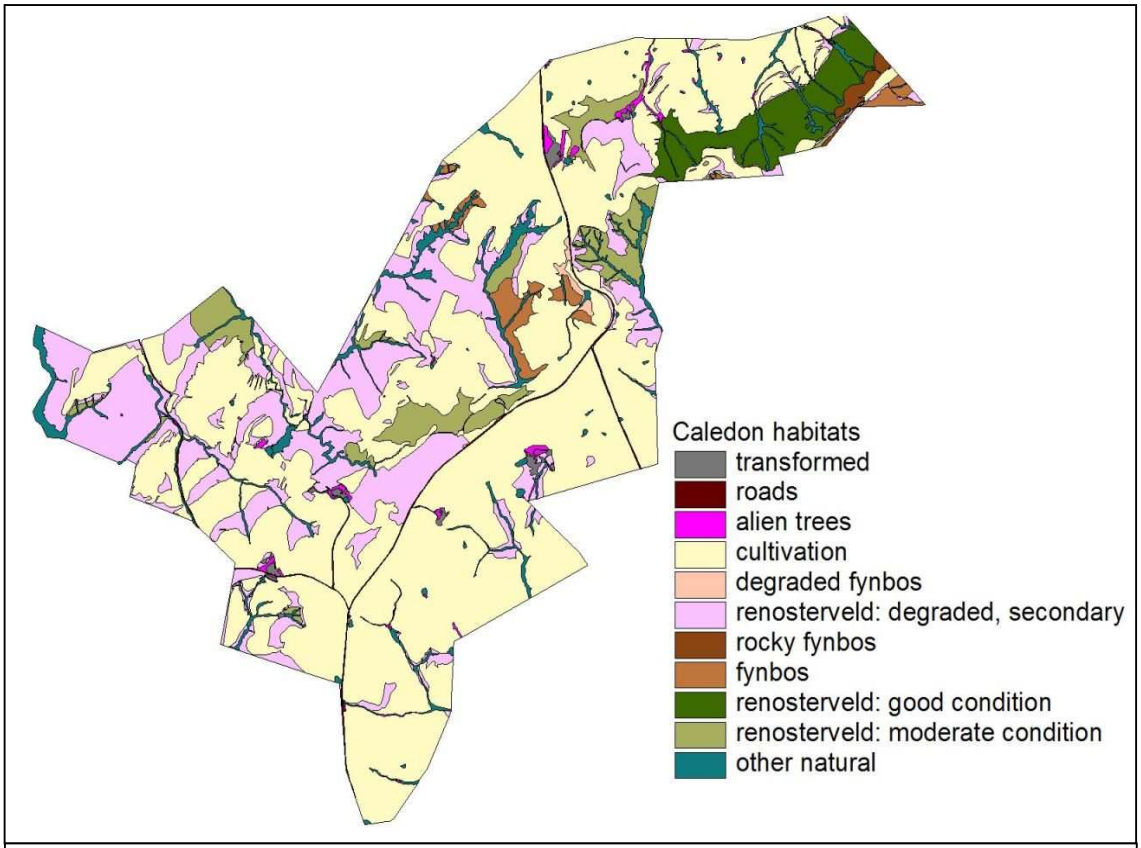

Figure 2: Landcover of the proposed Caledon Wind Energy Facility.

2.1.5 General vegetation patterns

The study site is located within the Cape Floristic Region (CFR), which is recognized as one of the principal centres of diversity and endemism in Africa. Fynbos and Renosterveld are considered to be the main vegetation types in the CFR. Fynbos is very species rich, but has been transformed or degraded to a high degree and is therefore considered to be of high conservation concern.

Most of the site occurs within a vegetation type classified as Western Rûens Shale Renosterveld, classified as Critically Endangered (Mucina et al. 2005, Mucina & Rutherford 2006). There is also some Greyton Shale Fynbos along the ridge, which is classified as Vulnerable, and some Kogelberg Sandstone Fynbos along the Botrivier valley in the north-west, classified as Least Threatened.

The vegetation-type descriptions provide an indication that vegetation on site consists primarily of fynbos and renosterveld. There are, however, also strips of thicket along drainage lines in the areas of steeper topography and wetland vegetation within the remaining drainage lines. Despite high levels of transformation on site, there are a number of different habitat types that may provide suitable habitat for a variety of faunal species.

2.1.6 Fauna of conservation concern

There are a number of species of conservation concern that have a geographical distribution that includes the study area. These are listed in Appendix 1. Note that this list has been updated since the scoping phase of this project to take into account updated status information for many species of animal in South Africa. Based on habitat requirements, there are a number of species that were considered to have a high possibility of occurring on site or making use of habitats available on site. These are the following:

- Natal Long-fingered Bat (Near Threatened)
- Cape Horseshoe Bat (Near Threatened)
- Temminck's Hairy Bat (Near Threatened in SA only)
- Geoffroy’s Horseshoe Bat (Near Threatened in SA only)
- Cape Rain Frog (Vulnerable)
- Cape Mountain Toad (Vulnerable)
- Montane Marsh Frog (Near Threatened)
- Geometric Tortoise (Endangered)

- Yellow-bellied House Snake (Near Threatened)
- Hawequa Flat Gecko (Near Threatened)

Of these, only the Cape Rain Frog (VU), Cape Mountain Toad (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The other species are listed as Near Threatened, which is a lower category of concern.

2.1.7 Protected fauna

Various mammal species are protected in the Western Cape, including insectivores, primates, bats and carnivores. All amphibians are protected in the Western Cape. Amphibians include frogs and toads. Amongst reptiles, all lizards, tortoises, turtles and snakes of the families Typhlopidae, Leptotyphlopidae and Colubrinae are protected in the Western Cape. Lizards are a diverse group and include agamas, chameleons (including dwarf chameleons), monitors, lacertids, amphisbaenids, skinks, cordylids, plated lizards and geckos.

A complete list of protected species for the Western Province may be found in Schedule 2 of the Western Cape Nature Conservation Laws Amendment Act of 2000 (Act 3 of 2000). Those that are classified as threatened or near threatened also appear in Appendix 1 of this report and have been discussed in the section above. The species in this Schedule for which there is conservation concern have, therefore, already been addressed in this study.

According to the Western Cape Nature Conservation Laws Amendment Act of 2000 (Act 3 of 2000), Section 26, "*No person shall without a permit hunt or be in possession of any endangered wild animal or the carcass of any such animal*". This Act provides no specific permit requirements in the case where a protected species may be affected by a proposed development. The implication of this Act is that if such a species occurs on site, it should not be hunted or possessed by any member of the construction or management team. There appears to be no legal obligation to obtain environmental authorization to negatively impact upon the habitat of a protected species listed in the Western Cape Nature Conservation Laws Amendment Act of 2000 (Act 3 of 2000) and the Act appears to be primarily concerned with hunting or trading of these animals.

3 IMPACTS AND ISSUES IDENTIFICATION

A number of direct risks would result from construction of the proposed WEF, as follows:

- Clearing of land for construction.
- Construction of access roads.
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Operation of construction camps.
- Storage of materials required for construction.

Possible issues include the following:

- Impacts on habitats or resources important for species of conservation concern. This may be from clearing of land or from indirect impacts that affect sensitive habitats, e.g. runoff from hard surfaces leading to erosion impacts on down-slope areas.
- Direct loss of individuals of species of conservation concern through factors that cause mortality, e.g. aerial animals flying into infrastructure.

Based on the species of concern that could occur on site and the available habitat types on site, these can be translated into assessable impacts, as follows:

- Loss of terrestrial habitat (fynbos and/or renosterveld) for threatened fauna
- Loss of wetland habitat for threatened fauna.
- Displacement of threatened fauna due to construction disturbance (noise, dust and general disturbance).
- Fragmentation of populations of threatened fauna species of conservation concern.
- Loss of individuals of bat species through collision with wind turbines.

3.1 Turbines and Substations

3.1.1 Loss of terrestrial habitat for threatened fauna

Construction of the wind farm will lead to loss of habitat directly under each wind turbine or substation. There are some small patches of natural habitat remaining on site of which only small fragments are potentially affected by the construction of wind turbines. The condition of this varies in different parts of the site (see Figure 2). The current layout indicates that two of the 74 proposed turbines are located within natural vegetation that may constitute habit for threatened fauna. Vegetation in some localities potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- There is not much natural habitat remaining intact on site.
- Construction of wind turbines will probably only affect a very small proportion of remaining natural habitat on site.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 1: LOSS OF TERRESTRIAL HABITAT FOR THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local (1)	Permanent (5)	Low (4)	Improbable (2)	LOW (20)
	Operation	Local (1)	Permanent (5)	Small (1)	Very improbable (1)	LOW (14)
WITH MITIGATION	Construction	Local (1)	Permanent (5)	Minor (2)	Improbable (2)	LOW (16)
	Operation	Local (1)	Permanent (5)	Small (1)	very improbable (1)	LOW (14)
MITIGATION MEASURES:	• Any sensitive habitat outside the direct construction zone should be demarcated and no activities should take place within these areas. Demarcation should be with “danger tape” and/or appropriate fencing. • Minimise and restrict clearing to the area required for construction and lay-down purposes only and limit disturbance to adjacent vegetation. All impacts should be contained within the defined impact zone. • Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds.					

	• Protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets. • Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal. • Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos vegetation.

The extent of the impact will be local (limited to the immediate area or site of development). It will be permanent, since construction results in permanent loss of natural vegetation at the locality of the infrastructure. At the construction phase, the amount of natural vegetation likely to be lost, according to the layout plans provided, will be very small. The potential magnitude of the impact is therefore also small. At the worst, it is possible that it will cause a slight impact on population processes within affected species, and is rated as low. At the operational phase of the project, the loss of habitat will already have occurred and no additional impacts are expected. The magnitude of the impact at this stage is therefore considered to be small (will have no effect on terrestrial habitat). Due to the small relative area of natural habitat potentially affected and the fact that there is only a moderate probability of threatened species occurring in these habitats, it is considered improbable that the impact will occur at the construction phase (some possibility, but low likelihood). It is very improbable that any impact will occur during the operational phase.

Proposed mitigation measures are to ensure limited effects on natural habitat.

3.1.2 Loss of wetland habitat for threatened fauna

There are various drainage lines on site, most of which have been heavily impacted by cultivation activities on site and/or have been invaded by exotic plants. Construction of the wind farm will lead to loss of habitat directly under each wind turbine or substation. There are no turbines or substations that are planned to be situated within wetland habitat that is considered to be in moderate to good condition and containing indigenous natural habitat suitable for threatened fauna that occurs within these types of habitats. The fauna species of concern that could occur on site within such habitats are the Cape Mountain Toad (Vulnerable) and the Montane Marsh Frog (Near Threatened). It is assessed that no impacts on suitable habitat for these species will occur, according to the current layout. The significance of the impact is therefore rated as zero.

3.1.3 Fragmentation of populations of threatened fauna

Construction activities may cause available habitat to be fragmented in some way. Any of the species listed as potentially occurring on site may be affected by fragmentation. The potential for fragmentation of habitat or populations is affected by the following factors:

- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.
- Turbines and substations are either placed within transformed areas or (in the case of two turbines) very close to the edge of natural habitat.

This impact is therefore not likely to be significant in terms of its effect on non-flying fauna. The most serious potential fragmentation effect may be on bats, in the case where the turbines (during the operational phase) may disrupt migration or foraging routes. The bat species of concern that may occur on site are the Natal Long-fingered Bat, the Cape Horseshoe Bat, Temminck's Hairy Bat and Geoffroy's Horseshoe Bat. None of these species are listed as threatened.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 3: FRAGMENTATION OF POPULATIONS OF THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	n/a	n/a	n/a	n/a	n/a
	Operation	Regional (3)	Long term (4)	Moderate (6)	improbable (2)	LOW (26)
WITH MITIGATION	Construction	n/a	n/a	n/a	n/a	n/a
	Operation	Regional (3)	Long term (4)	Low (2)	improbable (2)	LOW (18)
MITIGATION MEASURES:	**Significance is low, therefore mitigation may not necessarily be required. If considered necessary, then the following measures could be applied:** • Implement an environmental monitoring programme to document the impact on affected bat species. This should involve the following: a. Determine densities of affected species within the area occupied by WEF before construction. b. Document patterns of bat movement in the vicinity of the WEF. • Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys. • If significant bat movements are found to occur on site, halt turbine operation during low wind speeds when bats are most active.					

The extent of the impact will be regional (includes the general region surrounding the site). The effect will be long-term (for the duration of the operation of the

infrastructure). At the worst, it is possible that it will result in population processes continuing but in a modified way, and is rated as moderate. It is considered improbable that the impact will occur (some possibility, but low likelihood). The potential significance of the impact is therefore calculated as being low.

Proposed mitigation measures are to attempt to limit bat mortality. This will ensure that population fragmentation is less likely to occur. The significance of the impact is, however, assessed as low without mitigation, so mitigation measures may potentially not be required.

3.1.4 Loss of bats through collisions with operational turbines

Bats have been found to be particularly vulnerable to being killed by wind turbines. It has long been a mystery why they should be so badly affected since bat echo-location allows them to detect moving objects very well. A recent study in America has found that the primary cause for mortality is a combination of direct strikes and barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage the bat's lungs, Baerwald *et al*. 2008). The relative importance of this impact on bat populations depends on which species are likely to be affected, the importance of the site for those species and whether the site is within a migration corridor for particular bat species. The bat species of concern that may occur on site are the Natal Long-fingered Bat, the Cape Horseshoe Bat, Temminck's Hairy Bat and Geoffroy's Horseshoe Bat.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 4: LOSS OF BATS THROUGH COLLISIONS WITH OPERATIONAL TURBINES						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	n/a	n/a	n/a	n/a	n/a
	Operation	Surroundings (2)	Long term (4)	Moderate (6)	Highly probable (4)	MEDIUM (48)
WITH MITIGATION	Construction	n/a	n/a	n/a	n/a	n/a
	Operation	Surroundings (2)	Long term (4)	Low (2)	probable (3)	LOW (24)
MITIGATION MEASURES:	• Implement an environmental monitoring programme to document the impact on affected bat species. This should involve the following: c. Determine densities of affected species within the area occupied by WEF before construction.					

	d. Document patterns of bat movement in the vicinity of the WEF. • Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys. • If significant bat movements are found to occur on site, halt turbine operation during low wind speeds when bats are most active.

The extent of the impact will limited to the site of development and surrounding areas since it could affect any populations of bats within foraging distance of the site. The effect will be long-term (for the duration of the operation of the infrastructure). At the worst, it is possible that it will result in population processes continuing but in a modified way, and is rated as moderate. On the basis of the documented effect of wind turbines on bats, it is considered highly probable that the impact will occur (most likely). The potential significance of the impact is therefore calculated as being medium.

Proposed mitigation measures are to attempt to limit bat mortality.

3.2 Internal access roads and underground cables

3.2.1 Loss of terrestrial habitat for threatened fauna

Construction of the internal access roads and underground cables will lead to loss of habitat directly within the footprint of such infrastructure. There are some small patches of natural habitat remaining on site of which only small areas are potentially affected by the construction of wind turbines. The condition of this varies in different parts of the site (see Figure 2). The current layout indicates that some roads in Phase 1 of the project are located within natural vegetation that may constitute habit for threatened fauna. Vegetation in some localities potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The potential impact on this natural habitat for species of conservation concern is affected by the following factors:

- There is not much natural habitat remaining intact on site.
- Construction of wind turbines will probably only affect a very small proportion of remaining natural habitat on site.
- The natural areas potentially affected are on steep slopes. Down-slope impacts are therefore a high probability in the absence of erosion control measures.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 1: LOSS OF TERRESTRIAL HABITAT FOR THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local (1)	Permanent (5)	Low (4)	probable (3)	MEDIUM (30)
	Operation	Local (1)	Permanent (5)	Small (2)	Improbable (2)	LOW (16)
WITH MITIGATION	Construction	Local (1)	Permanent (5)	Low (3)	Improbable (2)	LOW (16)
	Operation	Local (1)	Permanent (5)	Small (1)	very improbable (1)	LOW (14)
MITIGATION MEASURES:	• Any sensitive habitat outside the direct construction zone should be demarcated and no activities should take place within these areas. Demarcation should be with "danger tape" and/or appropriate fencing. • Minimise and restrict clearing to the area required for construction and lay-down purposes only and limit disturbance to adjacent vegetation. All impacts should be contained within the defined impact zone. • Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds. • Protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets. • Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal. • Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos vegetation.					

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the vegetation *per se*. The extent of the impact will be local (limited to the immediate area or site of development). It will be permanent, since construction results in permanent loss of natural vegetation at the locality of the infrastructure. At the construction phase, the amount of natural vegetation likely to be lost, according to the layout plans provided, will be small. The potential magnitude of the impact is low. At the worst, it is possible that it will cause a slight impact on population processes within affected species, and is rated as low. At the operational phase of the project, the loss of habitat will already have occurred and no additional impacts are expected. The magnitude of the impact at the operational stage is therefore considered to be small (will have no effect on terrestrial habitat). Even though there is only a moderate probability of threatened species occurring in these habitats, it is considered probable that the impact will occur

at the construction phase. It is very improbable that any impact will occur during the operational phase.

Proposed mitigation measures are to ensure limited effects on natural habitat.

3.2.2 Loss of wetland habitat for threatened fauna

There are various drainage lines on site, most of which have been heavily impacted by cultivation activities on site and/or have been invaded by exotic plants. Construction of internal access roads and underground cables will lead to loss of habitat directly within the footprint of such infrastructure. There are a small number of crossings that are planned to be situated within wetland habitat that is considered to be in moderate to good condition and containing indigenous natural habitat suitable for threatened fauna that occurs within these types of habitats. The fauna species of concern that could occur on site within such habitats are the Cape Mountain Toad (Vulnerable) and the Montane Marsh Frog (Near Threatened).

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 2: LOSS OF WETLAND HABITAT FOR THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local + (2)	Long-term (4)	Low (4)	improbable (2)	LOW (20)
	Operation	Local + (2)	Long-term (4)	Low (4)	Improbable (2)	LOW (20)
WITH MITIGATION	Construction	Local + (2)	Long-term (4)	Low (3)	Very improbable (1)	LOW (9)
	Operation	Local + (2)	Long-term (4)	Low (3)	Very improbable (1)	LOW (9)
MITIGATION MEASURES:	• Proper culvert and bridge structures are required for wetland crossings. • Water-flow under roads must not be channeled in such a way as to promote erosion channels or channels where none existed previously. • Protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets. • Obtain a permit (Water Use License) for any impacts on water courses or wetlands. • Rehabilitate disturbed areas with site indigenous species.					

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the wetland *per se*. The extent of the impact will be local (limited to the immediate area or site of development). It will be long-term, since construction results in loss of natural habitat at the locality of the infrastructure, although this may recover and stabilize over the long-term. At the construction phase, the amount of natural wetland likely to be lost, according to the layout plans provided, will be small. The potential magnitude of the impact is low, because it may cause a slight impact on population processes (assuming any populations of potentially affected species are affected). Even though there is only a moderate probability of threatened species occurring in these habitats, it is considered probable that the impact will occur at the construction phase. It is very improbable that any impact will occur during the operational phase.

At the operational phase of the project, the loss of habitat will already have occurred, but continued hydrological impacts are expected. The magnitude of the impact at the operational stage is therefore considered to also be low.

Proposed mitigation measures are to ensure limited direct effects on natural wetland habitat and to reduce the probability of an impact occurring.

3.2.3 Fragmentation of populations of threatened fauna

Construction activities may cause available habitat to be fragmented in some way. Vegetation in some localities potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The potential for fragmentation of habitat or populations is affected by the following factors:

- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.
- Internal access roads and underground cables are either placed within transformed areas or (in the case of a small section of road in Phase 1) very close to the edge of natural habitat.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 3: FRAGMENTATION OF POPULATIONS OF THREATENED FAUNA

ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local (1)	Permanent (5)	Small (2)	improbable (2)	LOW (16)
	Operation	n/a	n/a	n/a	n/a	n/a
WITH MITIGATION	Construction	Local (1)	Permanent (5)	Low (1)	Improbable (2)	LOW (14)
	Operation	n/a	n/a	n/a	n/a	n/a
MITIGATION MEASURES:	• Any sensitive habitat outside the direct construction zone should be demarcated and no activities should take place within these areas. Demarcation should be with "danger tape" and/or appropriate fencing. • Minimise and restrict clearing to the area required for construction and lay-down purposes only and limit disturbance to adjacent vegetation. All impacts should be contained within the defined impact zone. • Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds. • Protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets. • Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal. • Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos vegetation.					

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the vegetation *per se*. The extent of the impact will be local (limited to the immediate area or site of development). It will be permanent, since construction results in permanent loss of natural vegetation at the locality of the infrastructure. At the construction phase, the amount of natural vegetation likely to be lost, according to the layout plans provided, will be small. The potential magnitude of the impact is small (will have no effect on processes). It is considered improbable that the impact will occur (some possibility, but low likelihood). The potential significance of the impact is therefore calculated as being low

Proposed mitigation measures are to ensure limited effects on natural habitat.

3.2.4 Loss of bats through collisions with infrastructure

Bat echo-location allows them to detect objects very well and it is therefore unlikely that bats will collide with internal access roads and/or underground cables. The significance of this impact is rated as zero.

3.3 Transmission Line

3.3.1 Loss of terrestrial habitat for threatened fauna

Construction of transmission lines associated with the wind farm will lead to loss of habitat directly around each pylon as well as where access roads are located. There are some small patches of natural habitat remaining on site in the areas proposed for the alternative power line routes. The condition of this is mostly degraded, but there are a few patches of moderate condition renosterveld that may be affected (see Figure 2). This vegetation potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- There is not much natural habitat remaining intact on site.
- Construction of power line towers will probably only affect a very small proportion of remaining natural habitat on site.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 1: LOSS OF TERRESTRIAL HABITAT FOR THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local (1)	Permanent (5)	Low (4)	Improbable (2)	LOW (20)
	Operation	Local (1)	Permanent (5)	Low (4)	Improbable (2)	LOW (20)
WITH MITIGATION	Construction	Local (1)	Permanent (5)	Minor (2)	Improbable (2)	LOW (16)
	Operation	Local (1)	Permanent (5)	Minor (2)	Improbable (2)	LOW (16)
MITIGATION MEASURES:	• No construction activities should occur outside the servitude, where there is any sensitive habitat outside the power line servitude. Demarcation should be with “danger tape” and/or appropriate fencing. • Minimise and restrict clearing to the area required for construction only and avoid disturbance to adjacent vegetation. All impacts should be contained within the power line servitude. • Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds. • Protection of habitat through implementation of erosion and sediment					

	control measures, including storm water management and providing grassy channels at storm water outlets. • Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal. • Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos or renosterveld vegetation.

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the vegetation *per se*. The extent of the impact will be local (limited to the immediate area or site of development or the power line). It will be permanent, since construction results in permanent loss of natural vegetation at the locality of the infrastructure. At the construction phase, the amount of natural vegetation likely to be lost, according to the layout plans provided, will be very small. The potential magnitude of the impact is therefore also small. At the worst, it is possible that it will cause a slight impact on population processes within affected species, and is rated as low. At the operational phase of the project, the loss of habitat will already have occurred. Some additional impacts could occur as a result of management of the servitude, for example clearing tall vegetation under power lines. The magnitude of the impact at this stage is therefore considered to be low (may cause a slight impact on population processes). Due to the small relative area of natural habitat potentially affected and the fact that there is only a moderate probability of threatened species occurring in these habitats, it is considered improbable that the impact will occur at the construction phase (some possibility, but low likelihood). It is also improbable that any impact will occur during the operational phase.

Proposed mitigation measures are to ensure limited effects on natural habitat.

3.3.2 Loss of wetland habitat for threatened fauna

There are various drainage lines on site, most of which have been heavily impacted by cultivation activities on site and/or have been invaded by exotic plants. Construction of the power line will lead to loss of habitat directly under each tower structure. There are a small number of crossings that are planned to be situated within wetland habitat that is considered to be in moderate to good condition and containing indigenous natural habitat suitable for threatened fauna that occurs within these types of habitats. The fauna species of concern that could occur on site within such habitats are the Cape Mountain Toad (Vulnerable) and the Montane Marsh Frog (Near Threatened).

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 2: LOSS OF WETLAND HABITAT FOR THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local + (2)	Long-term (4)	Low (4)	improbable (2)	LOW (20)
	Operation	Local + (2)	Long-term (4)	Low (4)	Improbable (2)	LOW (20)
WITH MITIGATION	Construction	Local + (2)	Long-term (4)	Low (3)	Improbable (2)	LOW (18)
	Operation	Local + (2)	Long-term (4)	Low (3)	Improbable (2)	LOW (18)
MITIGATION MEASURES:	• Place tower structures a minimum of 50 m outside of mapped wetland and drainage line areas. • Do not allow power line service roads to cross drainage lines unnecessarily. • Obtain a permit (Water Use License) for any impacts on water courses or wetlands. • Rehabilitate disturbed areas with site indigenous species.					

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the wetland *per se*. The extent of the impact will be local (limited to the immediate area or site of development). It will be long-term, since construction results in loss of natural habitat at the locality of the infrastructure, although this may recover and stabilize over the long-term. At the construction phase, the amount of natural wetland likely to be lost, according to the layout plans provided, will be small. The potential magnitude of the impact is low, because it may cause a slight impact on population processes (assuming any populations of potentially affected species are affected). Even though there is only a moderate probability of threatened species occurring in these habitats, it is considered probable that the impact will occur at the construction phase.

It is very improbable that any impact will occur during the operational phase. At the operational phase of the project, the loss of habitat will already have occurred, but continued hydrological impacts may occur, depending on where infrastructure is located. Some additional impacts could occur as a result of management of the servitude, for example clearing tall vegetation under power lines. The magnitude of the impact at the operational stage is therefore considered to also be low.

Proposed mitigation measures are to ensure limited direct effects on natural wetland habitat and to reduce the probability of an impact occurring.

3.3.3 Fragmentation of populations of threatened fauna

Construction activities may cause available habitat to be fragmented in some way. Vegetation in some localities potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The potential for fragmentation of habitat or populations is affected by the following factors:

- There is not much habitat remaining intact on site. Most of the remaining natural habitat through which the proposed power line is aligned is secondary/degraded renosterveld, although there are some patches of natural renosterveld in moderate condition that could be affected.
- Individuals of affected species (if they occur on site) may return once construction activities are completed.
- There is a high degree of local fragmentation already existing on site.

The assessment of impacts both without and with mitigation measures is presented in the Table below.

IMPACT 3: FRAGMENTATION OF POPULATIONS OF THREATENED FAUNA						
ISSUE / IMPACT	PHASE	EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE
WITHOUT MITIGATION	Construction	Local (1)	Permanent (5)	Small (2)	Highly improbable (1)	LOW (8)
	Operation	n/a	n/a	n/a	n/a	n/a
WITH MITIGATION	Construction	Local (1)	Permanent (5)	Low (1)	Highly improbable (1)	LOW (7)
	Operation	n/a	n/a	n/a	n/a	n/a
MITIGATION MEASURES:	**Significance is low, therefore mitigation may not necessarily be required. If considered necessary, then the following measures could be applied:** • No construction activities should occur outside the servitude, where there is any sensitive habitat outside the power line servitude. Demarcation should be with "danger tape" and/or appropriate fencing. • Minimise and restrict clearing to the area required for construction only and avoid disturbance to adjacent vegetation. All impacts should be contained within the power line servitude. • Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds. • Protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets. • Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal. • Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos or renosterveld vegetation.					

It is important to note that the assessment of this impact concerns evaluating natural habitat in terms of the effect of its loss on threatened fauna and not on the vegetation *per se*. The extent of the impact will be local (limited to the immediate area or site of development). It will be permanent, since construction results in permanent loss of natural vegetation at the locality of the infrastructure. At the construction phase, the amount of natural vegetation likely to be lost, according to the layout plans provided, will be small. The potential magnitude of the impact is small (will have no effect on processes). It is considered highly improbable that the impact will occur (probably will not happen). The potential significance of the impact is therefore calculated as being low.

Proposed mitigation measures are to ensure limited effects on natural habitat. This will ensure that population fragmentation is less likely to occur. The significance of the impact is, however, assessed as low without mitigation, so mitigation measures may potentially not be required.

3.3.4 Loss of bats through collisions with infrastructure

Bat echo-location allows them to detect objects very well and it is therefore unlikely that bats will collide with transmission lines to any extent. The significance of the impact is therefore rated as zero.

4 CONCLUSIONS AND RECOMMENDATIONS

An evaluation of the habitat on site in association with the potential occurrence of species of conservation concern indicates that only a small number of species are likely to be negatively affected by the proposed infrastructure. These include the following:

- Natal Long-fingered Bat (Near Threatened)
- Cape Horseshoe Bat (Near Threatened)
- Temminck's Hairy Bat (Near Threatened in SA only)
- Geoffroy's Horseshoe Bat (Near Threatened in SA only)
- Cape Rain Frog (Vulnerable)
- Cape Mountain Toad (Vulnerable)
- Montane Marsh Frog (Near Threatened)
- Geometric Tortoise (Endangered)
- Yellow-bellied House Snake (Near Threatened)
- Hawequa Flat Gecko (Near Threatened)

Of these, only the Cape Rain Frog (VU), Cape Mountain Toad (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The other species are listed as Near Threatened, which is a lower category of concern.

Bats are the species most likely to be affected by the operation of a wind farm. Bat mortality associated with wind turbines is reported to be quite high. The impact is through direct collisions with turbine blades or barotrauma caused by moving turbine blades leading to mortality. The potential significance of this impact was rated as medium (see Table 3). Proposed mitigation measures could reduce the significance of this impact to low. This is an operation phase impact.

One other impact was rated as having medium significance (see Tables 2 and 3), the potential loss of terrestrial habitat for threatened fauna due to the construction of internal access roads (in combination with underground cables). This is a construction phase impact. Vegetation in some localities potentially provides habitat for the Cape Rain Frog, the Geometric Tortoise, the Yellow-bellied House Snake and the Hawequa Flat Gecko. Of these, only the Cape Rain Frog (VU) and the Geometric Tortoise (EN) are listed in a threatened category. The other three species are listed as Near Threatened. Neither the Cape Rain Frog nor the Geometric Tortoise were found on site. It was, however, assessed that there is a high probability of the Cape Rain Frog and a moderate probability of the Geometric Tortoise utilizing the types of habitat available on site. Mitigation measures to protect remaining suitable natural habitat are proposed that will reduce the significance of this potential impact to low. The most

important habitat to protect is the renosterveld in good condition, fynbos and rocky fynbos found in the north-eastern part of the site (Figure 2).

Two alternative power line routes have been proposed. Either route is acceptable from the point of view of potential impacts on threatened fauna, although the more north-westerly route is preferred since it affects a smaller area of natural renosterveld in moderate condition, which is potential habitat for fauna.

Table 2: Summary of the significance of impacts for different infrastructure components before and after mitigation (construction phase).

Impact	Wind turbines & substations		Underground cables & access roads		Overhead powerlines	
	Without mitigation	Without mitigation	With mitigation	With mitigation	Without mitigation	With mitigation
1. loss of terrestrial habitat for threatened fauna	low (20)	low (16)	medium (30)	low (16)	low (20)	low (16)
2. loss of wetland habitat for threatened fauna	zero (0)	zero (0)	low (20)	low (9)	low (20)	low (18)
3. fragmentation of populations of threatened fauna	n/a	n/a	low (16)	low (14)	low (8)	low (7)
4. bat mortality	n/a	n/a	zero (0)	zero (0)	zero (0)	zero (0)

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Table 3: Summary of the significance of impacts for different infrastructure components before and after mitigation (operational phase).

Impact	Wind turbines & substations		Underground cables & access roads		Overhead powerlines	
	Without mitigation	Without mitigation	With mitigation	With mitigation	Without mitigation	With mitigation
5. loss of terrestrial habitat for threatened fauna	low (14)	low (14)	low (16)	low (14)	low (20)	low (16)
6. loss of wetland habitat for threatened fauna	zero (0)	zero (0)	low (20)	low (9)	low (20)	low (18)
7. fragmentation of populations of threatened fauna	low (26)	low (18)	n/a	n/a	n/a	n/a
8. bat mortality	medium (48)	low (24)	zero (0)	zero (0)	zero (0)	zero (0)

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

4.1 Summary of mitigation measures

A summary of proposed mitigation measures to ensure minimal impacts on threatened fauna is as follows:

- Any sensitive habitat outside the direct construction zone should be demarcated and no activities should take place within these areas. Demarcation should be with “danger tape” and/or appropriate fencing.
- Minimise and restrict clearing to the area required for construction and lay-down purposes only and limit disturbance to adjacent vegetation. All impacts should be contained within the defined impact zone.
- Re-vegetation of disturbed areas must be undertaken with site indigenous species. This can provide a buffer to protect indigenous vegetation from invasion by weeds.
- Proper culvert and bridge structures are required for internal access road wetland crossings.
- Water-flow under internal access roads at wetland crossings must not be channeled in such a way as to promote erosion channels or channels where none existed previously.
- Obtain a permit (Water Use License) for any impacts on water courses or wetlands.
- Where appropriate, protection of habitat through implementation of erosion and sediment control measures, including storm water management and providing grassy channels at storm water outlets.
- Ongoing monitoring and maintenance of re-vegetation works following commissioning of proposal.
- Appropriate locating of stockpiles, site offices and infrastructure, to limit damage to any nearby sensitive fynbos or renosterveld vegetation.
- Implement an environmental monitoring programme prior to construction to document the impact on affected bat species. This should involve the following:
    - Determine densities of affected species within the area occupied by WEF before construction.
    - Document patterns of bat movement in the vicinity of the WEF.
    - Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys.
    - If significant bat movements are found to occur on site, halt turbine operation during low wind speeds when bats are most active.

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6 APPENDIX 1: THREATENED SPECIES WITH A DISTRIBUTION THAT INCLUDES THE STUDY AREA.

MAMMALS

Common name	Taxon	Habitat[1]	Status[2]	Likelihood of occurrence
Black rhinoceros	*Diceros bicornis bicornis*	Wide variety of habitats.	CR	NONE, only occurs in game reserves
White-tailed rat	*Mystromus albicaudatus*	Highveld and montane grassland, fynbos, requires sandy soils with good cover	EN	LOW, recorded in neighbouring grid, substrate properties on site not suitable
Bontebok	Damaliscus pygargus pygargus	Used to inhabit renosterveld. Now only in reserves.	VU	NONE, only occurs in game reserves
Lesueur's Wing-gland bat	*Cistugo lisueuri*	Rock crevices in fynbos. Endemic to South Africa and Lesotho, occurs mostly in Drakensberg & Lesotho with only sporadic records in fynbos (e.g. Cedarberg).	NT	LOW, within overall distribution range, but not previously recorded near site. Occurs in very mountainous areas.
Natal long-fingered bat	*Miniopterus natalensis*	Caves and sub-terranean habitats in Fynbos, savanna, woodland, succulent & Nama Karoo, grassland; cave-dwelling aerial insectivore.	NT	**HIGH**, previously recorded in two neighbouring grids.
Temminck's hairy bat	*Myotis tricolor*	Roosts gregariously in caves in forests, shrubland, savanna, grassland. Found in mountainous terrain from Cape Town eastwards into the Eastern Cape then northwards into East Africa.	NT (in SA, LC globally)	**MEDIUM**, site within distribution range, no records in grid or neighbouring grids. May be suitable habitat inland of site or to west (Hottentots-Holland mountains).
Cape horseshoe bat	*Rhinolophus capensis*	Caves and subterranean habitats; fynbos, shrubland and Nama-karoo in western and south-western parts of South Africa.	NT	**HIGH**, previously recorded in neighbouring grids.
Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Caves and subterranean habitats; fynbos, shrubland, grassland, succulent and Nama-karoo; insectivore.	NT (in SA, LC globally)	**HIGH**, previously recorded in neighbouring grids.
Fynbos golden mole	*Amblysomus corriae*	Lowland fynbos and Knysna forest, also in urban areas. Prefers sandy soils with deep litter layer.	NT	LOW, previously recorded in neighbouring grid to the south, but substrate properties on site not considered to be suitable for this species.
Cape marsh rat	*Dasymus capensis*	Semi-aquatic, occurring in various wetland types	NT	LOW, site just within distribution range, but no records in grid or neighbouring grids.

[1]Distribution according to Friedmann & Daly 2004.
[2]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 10 January 2011.

AMPHIBIANS

Common name	Species	Habitat[1]	Status[2]	Likelihood of occurrence
Micro frog	*Microbatrachella capensis*	Found in undisturbed seasonal vleis in acid fynbos. Highly threatened by alteration of hydrological cycle and direct habitat transformation. Very sensitive to disturbance of habitat.	CR	LOW, found in qds just to south (3419AD and 3419AC), but is a coastal species occurring below 80 m a.s.l. and within 10 km of the coast.
Cape platanna	*Xenopus gilli*	Found in seepages in flat areas where fynbos occurs on acid sands. Highly threatened by alteration of hydrological cycle and direct habitat transformation.	EN	LOW, found in qds just to south (3419AD and 3419AC), but is a coastal species occurring below 140 m a.s.l. and within 10 km of the coast.
Western Leopard Toad	*Bufo pantherinus*	Mostly associated with sandy coastal lowlands	EN	LOW, previously found in qds just to south (3419AD), but substrate properties on site not considered to be suitable for this species
Cape rain frog	*Breviceps gibbosus*	Inhabits gently sloping well drained ground, where it burrows. Foothills of mountains and low isolated hills. Threatened by direct habitat destruction, such as intensive ploughing, but can be found in disturbed areas and is adaptable and fairly resilient to disturbance. Most localities where species is found have fine-grained, heavy substrates derived from shales or granites.	VU	**HIGH**, found in qds directly west of study area (3418BB) and substrate and habitat properties on site are suitable for this species. Due to intensive cultivation of parts of site, prob. only occurs in natural vegetation on site.
Cape mountain toad	*Capensibufo rosei*	Inhabits seepage zones and shallow pools in fynbos on mountains above 500m a.s.l. Breeds in small shallow temporary pools, usually dominated by restios.	VU	**HIGH,** occurs in all neighbouring grids.
Cape caco	*Cacosternum capense*	Occurs in flat, low-lying areas, in Renosterveld or cultivated lands formerly covered by this vegetation. Heavy, poorly drained clay and loamy soils. Spends most of the year buried underground, emerging in the wet winter to breed in shallow pools.	VU	LOW, Occurs west of 3419AA in the adjacent grid, Substrate and habitat properties on site are suitable for this species, but it has not previously been recorded this far east.
Montane marsh frog	*Poyntonia paludicola*	Marshy areas, shallow seepage zones and shallow streams along rock outcrops in Mountain Fynbos. Found from 200 - 1800 m.	NT	MEDIUM, previously recorded in qds to west of site, but atlas data considered to be incomplete.

[1]Distribution according to du Preez & Carruthers 2009.
[2]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 10 January 2011.

REPTILES

Common name	Species	Habitat[1]	Status[2]	Likelihood of occurrence
Geometric tortoise	*Psammobates geometricus*	Inhabits coastal Renosterveld in south-western Cape. Threatened by habitat destruction.	EN	MEDIUM, found in qds west and north-west of study area (3418BB).
Yellowbellied house snake	*Lamprophis fuscus*	Old termitaria and under stones, underground. Most likely to occur in mountain fynbos in study area, although secondary grassland may also be suitable habitat. Found throughout more mesic parts of South Africa (Cape, east coast, Highveld)	NT	MEDIUM, previously recorded in neighbouring grid (occurs in the grid to the north adjacent to 3419AA)
Hawequa flat gecko	*Afroedura hawequensis*	Narrow cracks in sandstone boulders in shady conditions in the mountains of the south-western Cape. Mesic montane fynbos.	NT	MEDIUM, occurs in grid directly north of 3419AA and AB.

[1]Distribution according to Alexander & Marais 2008.
[2]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 10 January 2011.

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24 October 2011

Rebecca Thomas
Arcus Gibb
14 Eglin Road,
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Dear Rebecca

Re: Caledon Wind Farm EIA

I conducted the Fauna specialist study for the proposed Caledon Wind Farm project. This letter serves to comment on the final position of the turbines and other infrastructure, as communicated to me by email on 28 September 2011. The position of the turbines has an effect on the significance of impacts associated with loss of terrestrial habitat for fauna, which would occur during the construction phase. The original assessment of this impact was that it had a low significance before and after mitigation. In my opinion, the potential impacts associated with the final turbine layout are no different to that described in my original EIA report.

Yours faithfully

Dr David Hoare (Pr.Sci.Nat.)