Arcus GIBB (PTY) LTD

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

Environmental Scoping Report

Fauna Impact Assessment Study

Date: 10 November 2009

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 assessment was undertaken to identify the major issues associated with the construction and operation of a wind farm on local fauna.

The approach taken for this desktop 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 Honey Badger, four species of bats and two species of frogs.

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 is unlikely to cause significant impacts on the Honey Badger. The potential impact on frog species depends on whether they occur on site or not. If they occur on site, they are likely to have a localized distribution, in which case measures can be taken to avoid impacts on these species. The most important potential impact is on bats, primarily due to the reported high rates of mortality associated with bats and turbine blades. The evaluation of this impact depends on obtaining more detailed information on the identity of bat species in the study area and the likelihood of them being significantly affected by the installation.

Based on the evaluation of potential impacts, it is recommended that detailed field studies are undertaken to identify which frog and bat species of conservation concern occur on site and thus which habitats on site may be important for them. It will also facilitate confident assessment of the potential impacts of the wind farm on these species, especially on bats.

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DEA **Department of Environmental Affairs**

GLOSSARY

1 INTRODUCTION

1.1 Background

Arcus GIBB was appointed by Caledon Wind 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 scoping assessment. Due to the fact that the site is relatively well known and there is much information that can be accessed with respect to biophysical information about the site, only a broad screening study was required.

1.2 Scope and Limitations

1.2.1 Scope of Work

The scope of work was to undertake a screening assessment/ scoping report. The two main components of the Scoping Report were to be the following:

- The identification of potential issues that may be expected as a result of the proposed project,
- The methodology which will be undertaken in later stages of the project in confirming the occurrence of those issues and the significance thereof, if identified.

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 was undertaken at a desktop level. 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 (Barnes 2000, Branch 1988, 2001, Friedmann & Daly 2004, Mills & Hes 1997). 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 to 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)

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
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- Portion 1 of the farm Hawston View 271
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- Portion 1 of the farm Keissies Kraal 350
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- 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 part of 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

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, especially birds, may make use of cultivated fields for foraging, but this is generally the exception for most other animal species.

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. 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:

- Honey Badger (Near Threatened)
- Lesueur's Wing-gland Bat (Near Threatened)
- Schreiber's Long-fingered Bat (Near Threatened)
- Cape Horseshoe Bat (Near Threatened)
- Geoffroy's Horseshoe Bat (Near Threatened)
- Cape Rain Frog (Vulnerable)
- Cape Mountain Toad (Vulnerable)

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)
- Loss of wetland habitat.
- Change in runoff and drainage leading to soil erosion and increase in silt loads and sedimentation.
- Displacement of animals due to construction disturbance (noise, dust and general disturbance).
- Fragmentation of populations of species of conservation concern.
- Loss of individuals of bat species through collision with wind turbines.

3.1 300 MW Windfarm

3.1.1 Loss of terrestrial habitat

Construction of the wind farm will lead to loss of habitat directly under each wind turbine as well as where access roads are located. There are some small patches of natural habitat remaining on site. The condition of this is unknown. This vegetation potentially provides habitat for the Honey Badger and the Cape Rain Frog. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Construction of wind turbines will probably only affect a small proportion of remaining natural habitat on site.

It is considered unlikely that the site constitutes important habitat for the Honey Badger and that loss of some of this habitat during construction is unlikely to have a significant impact on this species. The value of the site for the Cape Rain Frog can only be evaluated once it has been established whether the species occurs on site or not. If this frog species does occur on site, it is likely to be restricted to specific areas, which can be avoided once identified.

3.1.2 Loss of wetland habitat

Construction of the wind farm will lead to loss of habitat directly under each wind turbine as well as where access roads are located. There are a number of drainage lines on site in which seasonal wetland vegetation may occur. This wetland vegetation potentially provides habitat for the Cape Rain Frog and the Cape Mountain Toad. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- Construction of wind turbines will probably only affect a small proportion of remaining natural habitat on site.
- There are legislative issues with development within a wetland which will probably lead to turbines being positioned elsewhere.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. If they do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.1.3 Change in runoff and drainage

Any hard surfaces constructed on site will cause increased overland flow and reduced infiltration. This may lead to increased erosion, changed hydrology and increased siltation in wetlands and drainage areas. Construction of the wind farm will lead to establishment of hard surfaces directly under each wind turbine as well as where access roads are located. If these areas are located up-slope of wetlands and/or drainage lines then this may cause impacts on habitats that are of potential value to frog species of conservation concern.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. Only then may it be possible to establish whether changed runoff and drainage will affect sensitive habitats or not. Also, if these species do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.1.4 Displacement of animals

Construction activities will create noise, dust and general disturbance which may cause animals to move away. The species most likely to be affected are the Honey Badger and the four species of bat that could occur on site. The potential value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another. Displacement of a population may therefore have severe impacts on that population. The value of the site may also be reduced following construction and returning bats may be negatively affected by the infrastructure (see last impact) or they may never return to that site.

3.1.5 Fragmentation of populations

Construction activities 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 value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat and frog species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another and frog populations are often restricted to a particular site. Fragmenting of a population may therefore have severe impacts on that population. The value of the site may also be reduced following construction and returning bats may be negatively affected by the infrastructure (see last impact) or they may never return to that site. The potential for fragmenting frog populations depends on whether they occur on site and also on here other populations of the species are likely to be located. It is important to establish whether the site constitutes important habitat for any of the bat or frog species and to evaluate whether it is an important linkage between different populations before the potential significance of this impact can be evaluated.

3.1.6 Loss of bats through collisions with 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. Additional information is required before this impact can be properly evaluated, but it is likely to be the most important impact on threatened animal species associated with the construction and operation of the wind farm.

3.2 Associated Infrastructure for the Windfarm

3.2.1 Loss of terrestrial habitat

Construction of infrastructure associated with the wind farm will lead to loss of habitat directly around each piece of infrastructure as well as where access roads are located. There are some small patches of natural habitat remaining on site. The condition of this is unknown. This vegetation potentially provides habitat for the Honey Badger and the Cape Rain Frog. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Construction of associated infrastructure will probably only affect a very small proportion of remaining natural habitat on site.

It is considered unlikely that the site constitutes important habitat for the Honey Badger and that loss of a small amount of this habitat during construction is unlikely to have a significant impact on this species. The value of the site for the Cape Rain Frog can only be evaluated once it has been established whether the species occurs on site or not. If this frog species does occur on site, it is likely to be restricted to specific areas, which can be avoided once identified.

3.2.2 Loss of wetland habitat

Construction of infrastructure associated with the wind farm will lead to loss of habitat directly around each piece of infrastructure as well as where access roads are located. There are a number of drainage lines on site in which seasonal wetland vegetation may occur. This wetland vegetation potentially provides habitat for the Cape Rain Frog and the Cape Mountain Toad. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- Construction of associated infrastructure will probably only affect a small proportion of remaining natural habitat on site.
- There are legislative issues with development within a wetland which will probably lead to infrastructure being positioned elsewhere.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species

occur on site or not. If they do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.2.3 Change in runoff and drainage

Any hard surfaces constructed on site will cause increased overland flow and reduced infiltration. This may lead to increased erosion, changed hydrology and increased siltation in wetlands and drainage areas. Construction of infrastructure associated with the wind farm will lead to establishment of hard surfaces directly under each wind turbine as well as where access roads are located. If these areas are located up-slope of wetlands and/or drainage lines then this may cause impacts on habitats that are of potential value to frog species of conservation concern.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. Only then may it be possible to establish whether changed runoff and drainage will affect sensitive habitats or not. Also, if these species do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.2.4 Displacement of animals

Construction activities will create noise, dust and general disturbance which may cause animals to move away. The species most likely to be affected are the Honey Badger and the four species of bat that could occur on site. The potential value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another. Displacement of a population may therefore have severe impacts on that population. Existing farming activities on site suggest that construction of associated infrastructure is unlikely to cause significant impacts on bats through displacement.

3.2.5 Fragmentation of populations

Construction activities 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 value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat and frog species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another and frog populations are often restricted to a particular site. Fragmenting of a population may therefore have severe impacts on that population. The value of the site may also be reduced following construction and returning bats may be negatively affected by the infrastructure (see last impact) or they may never return to that site. The potential for fragmenting frog populations depends on whether they occur on site and also on here other populations of the species are likely to be located. It is important to establish whether the site constitutes important habitat for any of the bat or frog species and to evaluate whether it is an important linkage between different populations before the potential significance of this impact can be evaluated.

3.2.6 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 associated infrastructure to any great extent.

3.3 Transmission Line

3.3.1 Loss of terrestrial habitat

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. The condition of this is unknown. This vegetation potentially provides habitat for the Honey Badger and the

Cape Rain Frog. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Construction of transmission lines will probably only affect a very small proportion of remaining natural habitat on site.

It is considered unlikely that the site constitutes important habitat for the Honey Badger and that loss of a small amount of this habitat during construction is unlikely to have a significant impact on this species. The value of the site for the Cape Rain Frog can only be evaluated once it has been established whether the species occurs on site or not. If this frog species does occur on site, it is likely to be restricted to specific areas, which can be avoided once identified.

3.3.2 Loss of wetland habitat

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 a number of drainage lines on site in which seasonal wetland vegetation may occur. This wetland vegetation potentially provides habitat for the Cape Rain Frog and the Cape Mountain Toad. The potential value of this natural habitat for species of conservation concern is affected by the following factors:

- Construction of associated infrastructure will probably only affect a small proportion of remaining natural habitat on site.
- There are legislative issues with development within a wetland which will probably lead to infrastructure being positioned elsewhere.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. If they do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.3.3 Change in runoff and drainage

Any hard surfaces constructed on site will cause increased overland flow and reduced infiltration. This may lead to increased erosion, changed hydrology and increased siltation in wetlands and drainage areas. Construction of transmission lines associated with the wind farm will lead to establishment of hard surfaces where

access roads are located. If these areas are located up-slope of wetlands and/or drainage lines then this may cause impacts on habitats that are of potential value to frog species of conservation concern.

The value of the wetlands on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. Only then may it be possible to establish whether changed runoff and drainage will affect sensitive habitats or not. Also, if these species do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

3.3.4 Displacement of animals

Construction activities will create noise, dust and general disturbance which may cause animals to move away. The species most likely to be affected are the Honey Badger and the four species of bat that could occur on site. The potential value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another. Displacement of a population may therefore have severe impacts on that population. Existing farming activities on site suggest that construction of transmission lines is unlikely to cause significant long-term impacts on bats through displacement.

3.3.5 Fragmentation of populations

Construction activities 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 value of the sit for the Honey Badger is affected by the following factors:

- The Honey Badger is widely distributed in South Africa.
- There is not much habitat remaining intact on site.
- Individuals may return once construction activities are completed.

This impact is therefore not likely to be significant in terms of its effect on the Honey Badger.

The bat and frog species may be affected quite differently. Many bat populations utilize the same site for roosting from one year to another and frog populations are often restricted to a particular site. Fragmenting of a population may therefore have severe impacts on that population. Bats are likely to return following construction of a powerline since it does not impede their movement significantly. The potential for fragmenting frog populations depends on whether they occur on site and also on where other populations of the species are likely to be located. It is important to establish whether the site constitutes important habitat for any of the frog species and to evaluate whether it is an important linkage between different populations before the potential significance of this impact can be evaluated.

3.3.6 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 great extent.

4 TERMS OF REFERENCE FOR IMPACT ASSESSMENT PHASE

The following section provides a detailed outline of the methodology that will be adopted for assessing the potential impacts identified in the sections above. The proposed methods are as follows:

- A survey of which bats occur in the vicinity of the site, especially those bat species of conservation concern that have been identified as having a high probability of occurring on site. This will confirm the absence of presence of species assessed as having a high probability of occurring there or not.
- A targeted survey of potential habitats for threatened frog species that have a high likelihood of occurring on site. Any potential habitats will be assessed for suitability for these species. The value of habitats on site for the Cape Rain Frog and the Cape Mountain Toad can only be evaluated once it has been established whether these species occur on site or not. Only then may it be possible to establish whether construction of the wind farm will affect sensitive habitats or not. Also, if these species do occur on site, they are likely to be restricted to specific areas, which can be avoided once identified.

5 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 Honey Badger, four species of bats and two species of frogs.

Potential impacts due to the proposed wind farm affect habitat for species or affect individuals of species directly. Different infrastructure has different impacts, each of which affects the potentially sensitive species in different ways.

The Honey Badger is unlikely to be significantly affected by the construction of the wind farm. The site is small in comparison to its overall range and it is likely to be able to continue using the site once operation of the wind farm is underway.

The two species of frogs will only be affected if they occur on site, which is unknown at this stage. If they do occur on site then their habitat is likely to be localized and impacts on such areas could be managed through re-location of infrastructure to avoid such sites.

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 depends on the identity of species of conservation concern that occur in the area. There are four species of concern that have been assessed as having a high probability of occurring on site or in the surrounding areas.

Based on the assessment of these factors, it is recommended that surveys are undertaken in the field to identify which species of bats and frogs of conservation concern occur on site or may use the site for foraging. This will provide the background information to make a more informative assessment of the potential impact of the wind farm on animal species of conservation concern.

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

MAMMALS

Common name	Taxon	Habitat	Status[1]	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, previously recorded in neighbouring grid, but substrate properties on site not considered to be suitable for this species
Bontebok	Damaliscus pygargus pygargus	Used to inhabit renosterveld. Now only in reserves.	VU	NONE, only occurs in game reserves
Honey badger	*Mellivora capensis*	Wide variety of habitats. Probably only in natural habitats.	NT	**HIGH**, previously recorded in neighbouring grid, confirmed record east (adjacent) to study site
Lesueur's Wing-gland bat	*Cistugo lisueuri*	Rock crevices in fynbos.	NT	**HIGH**, previously recorded in neighbouring grid and there may be suitable habitat available on site.
Schreiber's long-fingered bat	*Miniopterus schreibersii*	Fynbos, savanna, woodland. Caves and sub-terranean habitats.	NT	**HIGH**, previously recorded in two neighbouring grids.
Temminck's hairy bat	*Myotis tricolor*	Caves in forests, shrubland, savanna, grassland	NT	MEDIUM, site within distribution range, but no records in grid or neighbouring grids. There may be suitable habitat on site.
Cape horseshoe bat	*Rhinolophus capensis*	Caves and subterranean habitats; fynbos, shrubland and Nama-karoo.	NT	**HIGH**, previously recorded in neighbouring grid and there may be suitable habitat on site.
Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Caves and subterranean habitats; fynbos, shrubland and Nama-karoo	NT	**HIGH**, previously recorded in neighbouring grids and there may be suitable habitat on site.
Fynbos golden mole	*Amblysomus corriae*	Lowland fynbos and Knysna forest, also in urban areas. Prefers sandy soils with deep	NT	LOW, previously recorded in neighbouring grid to the south, but

		litter layer.		substrate properties on site not considered to be suitable for this species.
Water rat	*Dasymus incomtus*	Semi-aquatic, occurring in various wetland types	NT	LOW, site just within distribution range, but no records in grid or neighbouring grids.
African weasel	*Poecilogale albinucha*	Moist grassland or woodland with more than 700 mm rainfall per year and where flourishing populations of small rodents occur. Grassland, scrub woodland.	DD	MEDIUM, previously recorded in neighbouring grid, but habitat on site may be too degraded
Cape Golden Mole	*Chrysochloris asiatica*	Subterranean habitats; arable land; urban areas; renosterveld; fynbos and strandveld succulent karoo; sandy soil	DD	LOW, previously recorded in neighbouring grids, but substrate properties on site not considered to be suitable for this species.
Reddish-grey musk shrew	*Crocidura cyanea*	Wide variety of habitats.	DD	MEDIUM, previously recorded in neighbouring grid
Greater musk shrew	*Crocidura flavescens*	Wide variety of habitats.	DD	MEDIUM, previously recorded in neighbouring grids
Forest shrew	*Myosorex varius*	Wide variety of vegetation types, usually primary. Terrestrial habitats adjacent to wetlands; forest	DD	MEDIUM, previously recorded in neighbouring grid
Lesser dwarf shrew	*Suncus varilla*	Broad habitat tolerance. Widespread in Africa and South Africa. Reliant on termite mounds.	DD	MEDIUM, previously recorded in grid

[1]Status according to Friedmann & Daly 2004.

AMPHIBIANS

Common name	Species	Habitat	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
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	VU	MEDIUM, Occurs west of 3419AA in the adjacent grid, Substrate and habitat properties on site are suitable

		most of the year buried underground, emerging in the wet winter to breed in shallow pools.		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.

[2]Status according to Minter et al. 2004.

REPTILES

Common name	Species	Habitat	Status[3]	Likelihood of occurrence
Geometric tortoise	*Psammobates geometricus*	Inhabits coastal Renosterveld in south-western Cape. Threatened by habitat destruction.	EN[4]	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[4]	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.	Restricted[3], NT[4]	MEDIUM, occurs in grid directly north of 3419AA and AB.

[3]Status according to Branch 1988.
[4]Status according to Groombridge 1994.

CURRICULUM VITAE

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Personal information

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Education

Matric - Graeme College, Grahamstown, 1984
B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction
M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (in progress) – Nelson Mandela Metropolitan University, Port Elizabeth, "Patterns and determinants of plant biodiversity in temperate, mesic grasslands of South Africa" under supervision of Prof. Richard Cowling

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, savanna, thicket, coastal systems, wetlands and fynbos
- Plant biodiversity and threatened species specialist
- Remote sensing, analysis and mapping of vegetation
- Specialist consultant for environmental management projects

Courses

Soil Classification Competence Certificate, Dept. of Agriculture, 1994.
Environmental Law Course, Potchefstroom University for CHE, 1999.
Environmental Management Systems (ISO 14001) Course, Potchefstroom University for CHE, 1999.
ERDAS Imagine software course (No. ES02/04/ERDASIM), Geographic Information Management Systems (Pty) Ltd, Midrand, 2002.

Membership

Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present.
Professional member: South African Institute of Ecologists and Environmental Scientists, 10 July 2001 – present.
Associate member: International Association of Vegetation Scientists, South African Chapter, 1997 – present.

Employment history

1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing, environmental management.

1 December 2004 – present, Member, David Hoare Consulting cc no. 2001/034446/23. Consultant, specialist consultant contracted to a number of existing companies and organisations.

Project experience at ARC

Vegetation pattern in Pilanesberg National Park using digital photogrammetric data preparation techniques, 1 August – present.

VegMap digital mapping and description of vegetation units of Eastern Cape for new national vegetation map (Dept. of Environmental Affairs and Tourism/National Botanical Institute) and contributions to text and vegetation descriptions in accompanying booklet.

Classification and mapping of the savanna biome of South Africa using remote sensing techniques, 1 February 1998 – 20 November 1999.

Natural resource survey of nodes O R Tambo and Maputuland, using remote sensing techniques, 1 November 2001 – December 2003.

Field data collection for National Land Cover Change Project, Dec 2003 – March 2004.

Vegetation survey of KwaMhlanaga Landcare site, March 2004.

Scale physiognomic survey of Suikerbosrand Nature Reserve, 1 March 1998 – 1 April 1998.

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Vegetation of the corridor of the proposed ESKOM powerline from Port Elizabeth to Bedford. September 2000.

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Hoare, D.B. 2005. Red Data Flora assessment of the quarry at Sterkfontein for Umhlaba Environmental Consulting
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Hoare, D.B. 2003. Ecological investigation of the proposed Goldfields West golf estate for Environmental Impact Management Services (Pty) Ltd.
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Coastal Environmental Services (CES), 2000. Vegetation survey: Corridor sands project, Environmental impact assessment for Chibuto to Chokwe rail link: (consultant).

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Coastal Environmental Services (CES), 2000. Biological survey: Douglas Colliery Vandyksdrift proposed new discard dump: (consultant).

Coastal Environmental Services (CES), 2000. Suitability of KCI private game reserve for elephants: (consultant).

Hoare, D.B. & Victor, J.E., 2000. Ecological survey of the proposed Heidelberg Ext. 23. (For LawGibb Group).

Coastal Environmental Services (CES), 1999. Botanical and wetland survey for Optimum Colliery: (consultant).

Coastal Environmental Services (CES), 1999. Botanical and wetland survey for Douglas Colliery: (consultant).

Hoare, D.B., 1998. Biological survey of south-east section of Kriel Colliery. (for Amcoal)

Hoare, D.B., 1998. Biological survey of proposed South-west 1 shaft and overland conveyor route of Bank Colliery. (for Amcoal)

Britton , D. , Silberbauer, L., Robertson, H., Lubke, R., Hoare, D., Victor, J., Edge, D. and Ball, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.

Coastal Environmental Services, 1997. The habitat of the Brenton Blue butterfly (for Environmental Wildlife Trust)

Hoare, D.B. & Victor, J.E., 1997. Vegetation survey of Gqutuini (for North East Cape Forests)

Hoare, D.B. & Victor, J.E., 1997. Vegetation survey of Mtintloni (for North East Cape Forests)

Coastal Environmental Services, 1997. Ecological survey of Boschmanskrans section of Douglas Colliery: (subcontracted by CES to do field study).

Coastal Environmental Services (CES), 1997. Vegetation and wildlife survey of the South-East Section, Douglas Colliery: (consultant).

Coastal Environmental Services (CES), 1996. Vegetation and wetland survey of South-East Section, Optimum Colliery: (consultant).

Coastal Environmental Services (CES), 1995. Botanical and wetland survey of Steenkoolspruit Section, Douglas Colliery: (consultant).

Teaching and mentorship experience:

Gauteng Nature Conservation, mentorship programme: Monitoring of Suikerbosrand Nature Reserve

Gauteng Nature Conservation, mentorship programme: Fine-Scale vegetation mapping of Gauteng Province

Lecture series (3 weeks) to Biology I, Rhodes University, 2002 (“Plant diversity”)

Lecture series to “Beyond Adventure” students, 2002 (“Ecology of coastal plants and vegetation”)

Promotional lecture: Botany I, Rhodes University, 2000 (“Botany in the real world”)

Lecture to Landscape Architecture III class, University of Pretoria, 2000 ("Coastal Vegetation").

Lecture to Landscape Architecture III class, University of Pretoria, 1997 ("Coastal Vegetation").

Lecture to Wildlife Management (Honours) class, University of Pretoria, 1997 ("Grassland Biome of South Africa").

Demonstrated 1st & 2nd year undergraduates in Botany and Biology at Rhodes University for three years (1992-1994). Included class paractical work demonstration and marking of assignments, tutorial supervision and field trip practical supervision and demonstration.

Computer literacy:

Windows, MS Word, MS Excel, MS Powerpoint, Corel Draw, IDRISI for Windows 2, ArcView 3.x (including Spatial Analyst and Grid Analyst modules), ERDAS Imagine Professional, TurboVeg, and the Internet.

Workshops / symposia attended:

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.
34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999
Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.
South African Association of Botanists Annual Congress, Cape Town, January 1998
Randse Afriakaanse Universiteit postgraduate symposium, 1997.
South African Association of Botanists Annual Congress, Bloemfontein, January 1995.

Referees:

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Prof. Laco Mucina, Botany Dept., Dept. of Botany, Univ. of Stellenbosch, Private Bag X1, 7602 Matieland Tel. (021)-808-2716 / 082 564 9297 E-mail: LM3@sun.ac.za
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