ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED PHEZUKOMOYA WIND FARM AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE:

FAUNA & FLORA SPECIALIST IMPACT ASSESSMENT

PRODUCED FOR ARCUS

ON BEHALF OF INNOWIND (Pty) Ltd

BY

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EXECUTIVE SUMMARY

Innowind (Pty) Ltd proposes the establishment of a wind energy facility, Phezukomoya, located approximately 6 km south east of the town of Noupoort in the Pixley ka Seme District Municipality, Northern Cape. The proposed project will have up to 63 wind turbines with a range of 3 to 5 MW generation capacity. The facility will be connected to the national grid by connecting an onsite switching station by a 132 kV powerline connecting the onsite substation to the proposed 400 kV Umsobomvu Substation to be located approximately 15 km south west of the proposed onsite switching station. The development is currently in the EIA phase and as part of the required specialist studies, this fauna and flora specialist study details the ecological characteristics of the site and provides an assessment of the likely impacts associated with the development of the proposed Phezukomoya WEF and grid connection infrastructure on fauna and flora.

The Phezukomoya Wind Farm site consists largely of mountainous terrain, with karroid plains interrupted by mesas and buttes, which are relatively flat-topped, but with steep sides. The low-lying plains of the site consist of Eastern Upper Karoo which is a widespread vegetation type of low overall sensitivity. The slopes of the site are considered generally of moderate to high sensitivity on account of their high biodiversity value for fauna and flora as well as their vulnerability to disturbance and consequent erosion. The plateau areas consist of Karoo Escarpment Grassland, which is considered to be generally of moderate sensitivity. All of the affected vegetation types are still overwhelmingly intact and have not been significantly affected by transformation to date.

The fauna of the area is considered to be composed of widespread species, with very few species of conservation concern likely to be present at the site. The most important areas for fauna at the site are the drainage systems and well-vegetated slopes which are largely outside of the development footprint and would not be significantly affected. The major impact on fauna would be habitat loss associated largely with the high-elevation plateau habitat of the site. As there are no species of high conservation concern prevalent in the area, impacts on terrestrial fauna are likely to be relatively low and of local significance only.

A significant portion of the Phezukomoya WEF is located within CBAs which raises the potential for significant negative impact on CBAs and associated biodiversity due to the development. The CBAs in the area are related to the maintenance of ecosystem processes and not biodiversity pattern and the approximate 150ha footprint of the development represents a small proportion of the affected CBAs and is not likely to significantly disrupt or alter the ecological functioning or ability of the landscape to provide ecosystem services. Consequently, the development of a wind farm partly within a CBA is not seen as a critical flaw associated with the project and the predicted impacts on the affected CBAs would be of a local nature only.

In terms of cumulative impacts, there are several other wind farms and solar developments that have been approved in the area. However, at a vegetation-type level, both Besemkaree Koppies Shrubland and Karoo Escarpment Grassland which would receive the brunt of the development footprint are more than 97% intact and the current developments would not significantly impact their remaining extent. The main concern for cumulative impact is at a more local level as there are four wind farms all in close proximity to one another around Noupoort and where cumulative impacts are more likely due to the more restricted nature of the affected high elevation habitat. However, even if all projects in the area are constructed, the total direct footprint would be less than 300ha and is not likely to generate significant cumulative impact given the widespread nature of the habitat and affected species.

Overall, after mitigation the majority of impacts associated with the development of the Phezukomoya Wind Energy Facility can be reduced to a low level, with some impacts likely to remain at moderate levels of local impact. No fatal flaws or highly significant impacts are likely to be associated with the project. As such, there are no visible reasons to oppose the development of the Phezukomoya Wind Farm from a terrestrial ecology perspective.

The Phezukomoya Grid Connection and associated infrastructure is likely to generate low impacts on fauna and flora after mitigation. No high impacts that cannot be avoided were observed and from a flora and terrestrial fauna perspective, there are no reasons to oppose the development of the grid connection and associated infrastructure.

NEMA 2017 CHECKLIST

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	See Page 8 as well as main EIA Report
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	
(c) an indication of the scope of, and the purpose for which, the report was prepared;	P9
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 3.5
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.2
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 3 Section 4
(g) an identification of any areas to be avoided, including buffers;	Section 3.6
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3.6
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.4
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	Section 4
(k) any mitigation measures for inclusion in the EMPr;	Section 4
(l) any conditions for inclusion in the environmental authorisation;	Section 4
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 4
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance,	Section 6

management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Main EIA Report
(p) any other information requested by the competent authority	See Main EIA Report
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

PROFESSIONAL PROFILE OF CONSULTANT:

Simon Todd Consulting has extensive experience in the assessment of renewable energy developments, having provided ecological assessments for more than 100 different renewable energy developments. This includes a large number of wind farm developments in the Northern Cape Province. Simon Todd is a recognised ecological expert and is a past chairman of the Arid-Zone Ecology Forum and has 20 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Recent wind farm and power line projects include the following:

- Mainstream South Africa Dwarsrug Wind Energy Facility: Fauna & Flora Specialist Impact Assessment Report. Sivest 2014.
- Rietkloof Wind Farm and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment Report. EOH 2016.
- Brandvallei Wind Farm and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment Report. EOH 2016.
- Environmental Impact Assessment for the Proposed Komsberg East and Komsberg West Wind Farms and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment Report. Arcus 2014.
- Vryheid Grid Strengthening Project, near Swellendam. Nsovo Environmental Consultants. 2016.
- Proposed Juno-Aurora 765kV Power Line in the Western Cape: Fauna & Flora Specialist Report for Impact Assessment. Nzumbulolo Heritage Solutions 2015.
- The proposed Mookodi Integration Phase 2 132kV Power Lines and Ganyesa Substation near Vryburg, North West Province: Fauna & Flora Specialist Basic Assessment Report. Sivest 2014.

1 INTRODUCTION

Innowind (Pty) Ltd proposes the establishment of a wind energy facility, Phezukomoya, located approximately 8 km south east of the town of Noupoort in the Northern Cape, and bordering the Eastern Cape. The site falls within the Pixley ka Seme District Municipality, Northern Cape. The proposed project will have up to 63 wind turbines with a range of 3 to 5 MW generation capacity. The facility will be connected to the national grid by connecting an onsite switching station by a 132 kV powerline connecting the onsite substation to the proposed 400 kV Umsobomvu Substation to be located approximately 15 km south west of the proposed onsite switching station. Three alternative grid route options are proposed for this. The development is currently in the environmental impact assessment (EIA) phase and the Department of Environmental Affairs (DEA) has accepted the Scoping Study for the site. Arcus has appointed Simon Todd Consulting to provide a specialist terrestrial biodiversity impact assessment of the development as part of the EIA process.

As part of the above EIA process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts associated with the development of the proposed Phezukomoya WEF and grid connection infrastructure. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the EMPr for the development. The full scope of study is detailed in Section 1.1 below.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities:

- a description of the environment that may be affected by a specific activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of environmental issues and potential impacts (including assessment of direct, indirect and cumulative impacts) that have been identified;
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts;
- an indication of the methodology used in determining the significance of potential environmental impacts;
- an assessment of the significance of direct, indirect and cumulative impacts of the development;
- a description and comparative assessment of all alternatives including cumulative impacts;
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr);

- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- a description of any assumptions uncertainties and gaps in knowledge; and
- an environmental impact statement which contains:
  - a summary of the key findings of the environmental impact assessment;
  - an assessment of the positive and negative implications of the proposed activity; and
  - a comparative assessment of the positive and negative implications of identified alternatives.

General Considerations for the study included the following:

- Disclose any gaps in information (and limitations in the study) or assumptions made.
- Identify recommendations for mitigation measures to minimise impacts.
- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the EMPr for faunal or flora related issues.
- The assessment of the potential impacts of the development and the recommended mitigation measures provided have been separated into the following project phases:
  - Pre-construction
  - Construction
  - Operational
  - Decommissioning

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the 2014 EIA Regulations, as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

- In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
- Avoid degradation of the environment;
- Avoid jeopardising ecosystem integrity;
- Pursue the best practicable environmental option by means of integrated environmental management;
- Protect the environment as the people's common heritage;
- Control and minimise environmental damage; and
- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:

The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. new SA vegetation map/National Spatial Biodiversity Assessment1, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book (RDB) species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
- endemic to the region;
- that are considered to be of conservational concern;
- that are in commercial trade (CITES listed species);
- or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed project for the Phezukomoya WEF is located approximately 8 km south east of the town of Noupoort in the Northern Cape, and borders the Eastern Cape.

The proposed 315 MW Phezukomoya WEF would consist of the following infrastructural components:

- Up to 63 wind turbines with a generation capacity between 3 – 5 MW and a rotor diameter of up to 150 m, a hub height of up to 150 m and blade length of up to 75 m;
- Foundations and hardstands associated with the wind turbines;
- Internal access roads of between 8 m (during operation) and 14 m (during construction) wide to each turbine;
- Two 10 000m^2 on-site switching stations.
- Medium voltage underground electrical cables will be laid to transmit electricity generated by the wind turbines to the on-site switching station or substation;
- Overhead medium voltage cables between turbine rows where necessary;
- An on-site substation and OMS area (180 000 m^2) to facilitate stepping up the voltage from medium to high voltage (132 kV) to enable the connection of the WEF to the proposed Umsobomvu WEF 132/400 kV Substation, from which the generated power will be fed into the national grid;
- Two medium voltage overhead powerlines (approximately 3km and 5.6km in length) connecting the on-site switching stations with the on-site medium voltage/132 kV substation;
- An approximately 16km 132kV voltage overhead power line from the on-site substation to the proposed 132/400 kV Umsobomvu Substation where the electricity will be transferred to the national grid;
- A 100 m corridor surrounding Umsobomvu substation so that the grid connection can turn into the substation from any direction;
- A 90 000m^2 area for batching plant, temporary laydown area and construction compound;
- Temporary infrastructure including a site camp; and a laydown area approximately 7500m^2 in extent, per turbine.

The total size of the development site is 15 271 hectares. The footprint of the proposed development is estimated to be less than 1% of this area.

Description	**Dimensions**		
	Length (m)	**Breadth (m)**	**Area (ha)**
Eskom 400kV Umsobomvu substation	600	600	36
Phezukomoya medium	600	300	18

voltage/132 kV substation and OMS area			
Construction compound, temporary laydown area and batching plant	300	300	9

A 132 kV powerline/s will connect the WEF to the proposed western 400 kV Umsobomvu substation; and the generated power will be fed to the National Grid and the following alternatives are considered:

- The preferred option is to connect the project via 132 KV powerlines to the proposed Umsobomvu substation to be located 15 km south west of the proposed switching station. Three powerline routes have been proposed, one preferred option, which is a 132 kV powerline cutting across to the northern section of the site; and two alternative 132 kV powerline routes passing through the southern section of the site.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006 and Powrie 2012 Update) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Information on plant species recorded for the Quarter or Half Degree Squares (QDS) 3124B and 3125A was extracted from the SABIF/SIBIS and POSA database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has probably not been well sampled in the past.
- The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants.

Ecosystem:

- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011). This includes rivers, wetlands and catchments defined under the study.
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

- Critical Biodiversity Areas were extracted from the Northern Cape Conservation Plan (Oosthuysen & Holness 2016), available from the SANBI BGIS web portal.

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and the ADU databases http://vmus.adu.org.za.
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2016) (See Figure 1) and where species have not been assessed under these criteria, the CITES status is reported where possible.

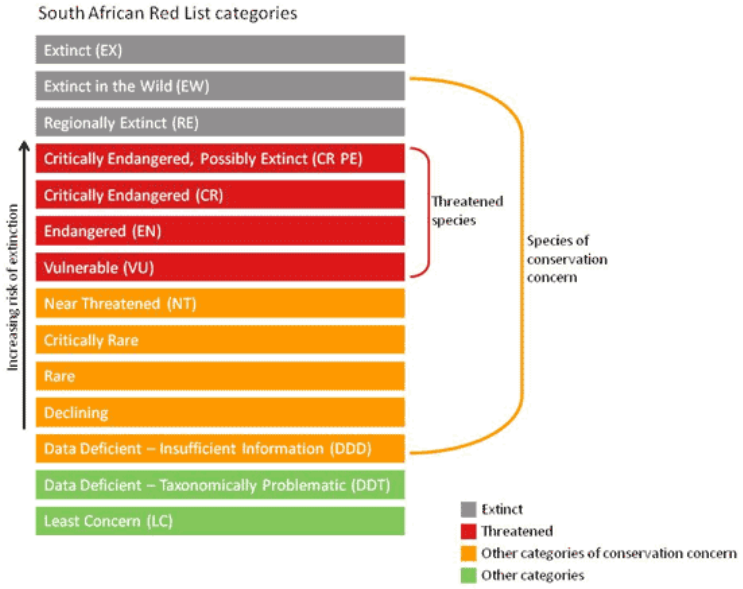

Figure 1. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php**.**

2.2 SITE VISIT

The main site visit for the EIA phase was conducted over 5 days from the 5th to the 9th of September 2017. During the site visit, the different biodiversity features, habitat, and landscape units present at the site were identified and mapped in the field. Specific features visible on the satellite imagery of the site were also marked for field inspection and were verified and assessed during the site visit. This included features such as pans and

rocky outcrops that were not visible from the access roads of the site and might have otherwise been missed. Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species such as around wetlands and in the rocky hills. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS. The conditions at the time of the site visit were adequate for the field assessment and there are few limitations resulting from the site visit and the plant species lists obtained for the site are considered reliable and comprehensive. Additional information on plant species that were not visible at the time of the site visit was included from the Scoping Phase site visit in April 2016 as well as the adjacent Mainstream wind energy facility for which the consultant sampled in March 2014.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases as described above. Sensitive features such as wetlands, drainage lines and water bodies were mapped and buffered where appropriate to comply with legislative requirements or ecological considerations. Additional sensitive areas were then identified based on the results of the site visit and delineated. Features that were specifically captured in the sensitivity map include drainage features, wetlands and dams, as well as rocky outcrops and steep slopes. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a low impact on ecological processes and terrestrial biodiversity. This category represents transformed or natural areas where the impact of development is likely to be local in nature and of low significance with standard mitigation measures.
- **Medium** - Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas are not no-go areas, however development within these areas is considered to be undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

- In some situations, areas were also categorised between the above categories, such as **Medium-High**, where an area appeared to be of intermediate sensitivity with respect to the two defining categories. However, it is important to note that there are no sensitivities that are identified as "Medium to High" or similar ranged categories because this adds uncertainty to the mapping as it is not clear if an area falls at the bottom or top of such a range.

2.4 LIMITATIONS & ASSUMPTIONS

The current study is based on an extensive and detailed site visit as well as a desktop study of the available information. As the vegetation was in a good condition for sampling at the time of the field assessment, there are few limitations with regards to the vegetation sampling and the species lists obtained for the site are considered reliable and comprehensive. Additional sampling at the site is highly unlikely to reveal any patterns, habitats or species of conservation concern that were no visible at the time of the field assessment. The assessment is therefore considered to comply well with the DEA requirement of sampling the site at the appropriate time of year.

The faunal component of the study also relies to some extent on existing information as available in the various spatial databases and coverages. In many cases, these databases are not intended for fine-scale use and the reliability and adequacy of these data sources relies heavily on the extent to which the area has been sampled in the past. Many remote areas have not been well sampled with the result that the species lists for an area do not always adequately reflect the actual fauna and flora present at the site. In order to counter the likelihood that the area has not been well sampled in the past and in order ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger (quarter and half) degree squares (3125A, 3124B) than the study area and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 VEGETATION PATTERNS

According to the national vegetation map, four vegetation types occur within the study area (Figure 2); the majority of the site falls within the Eastern Upper Karoo, but the central and southern areas of the site contains substantial areas of Besemkaree Koppies Shrubland and the eastern extent of the site contains Karoo Escarpment Grassland on the plateau areas vegetation bordered by Tarkastad Montane Shrubland associated with the steep slopes of this area. These different units are briefly described below and then illustrated and characterised as they occur at the site. The species lists provided Mucina and Rutherford

(2006) are not repeated here as the actual species as present at the site are described and this is considered substantially more reliable than the lists provided by Mucina and Rutherford.

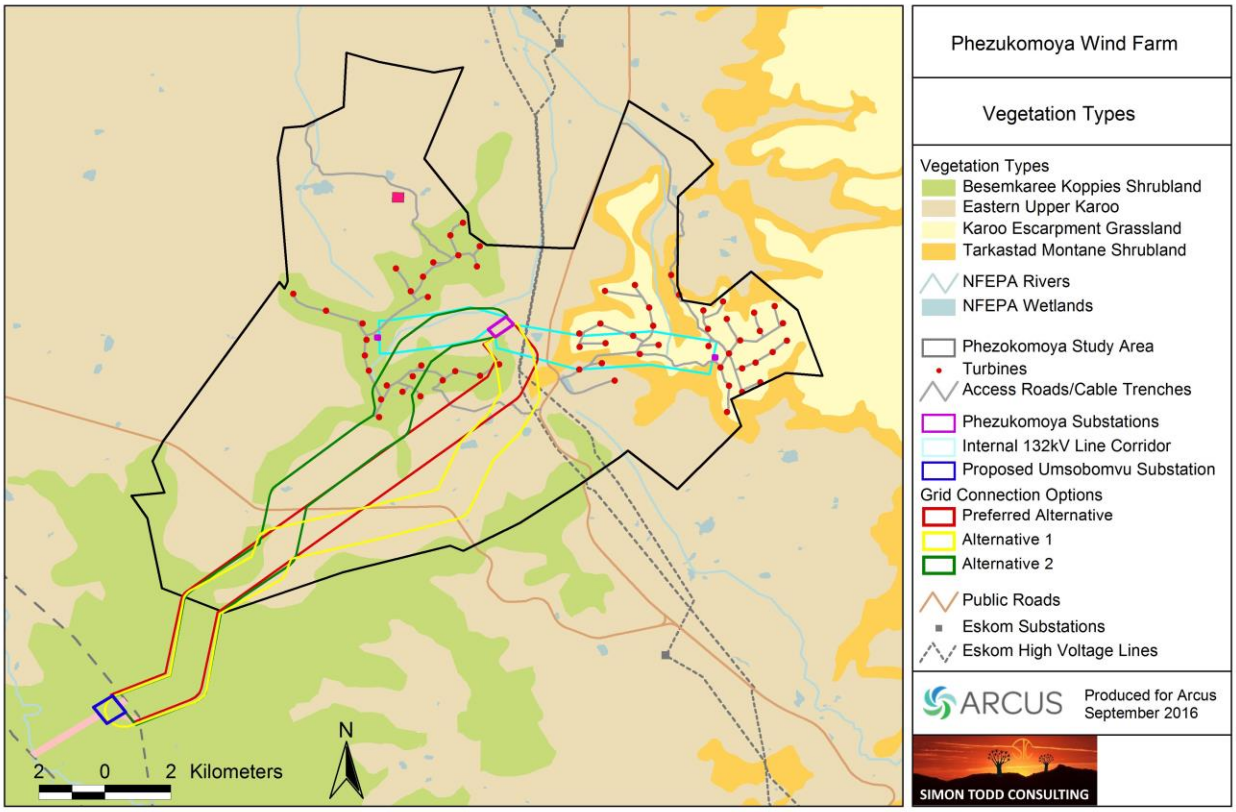

Figure 2. Vegetation map (Mucina and Rutherford 2006) of the Phezukomoya Wind Farm and grid connection study area. Although the majority of the site falls within the Eastern Upper Karoo, the majority of the development footprint is located within the Karoo Escarpment Grassland vegetation and Besemkaree Koppies Shrubland vegetation types.

According to Mucina & Rutherford (2006), Karoo Escarpment Grassland occurs in the Eastern, Western and Northern Cape on the Karoo escarpment, running in an east-west direction from Molteno in the south to Noupoort in the north, and from Somerset East in a northwesterly direction towards Nieu-Bethesda. It is associated with mountain summits, low mountains and hills with wiry, tussock grasslands, usually dominated by *Merxmuellera disticha*, but also contains an important low-shrub component (Mucina & Rutherford 2006). Although the vegetation type is listed as Least Threatened, it has very little area under formal protection (<4%) and contains many Camdebo endemic species. The vegetation type is associated with shallow soils typical of Ib, Fb and Fc land types on mudstones and sandstones of the Beaufort Group and includes dolerite intrusions which form ridges in the area (Mucina & Rutherford 2006). Levels of transformation are however low and it is considered to be more than 97% intact.

Within the site, Karoo Escarpment Grassland is mapped by Mucina and Rutherford as occurring only in the eastern section of the site, east of the N9. However, the site visit revealed that it also occurs on some of the larger plateau areas west of the N9 as well and there was little to differentiate between the grass-dominated plateau areas east and west of the N9 (Figure 3, Figure 4). Overall, these areas were generally fairly homogenous with not a lot of variation in species composition or habitat condition. The plateau areas dominated by Karoo Escarpment Grassland are generally flat to gently sloping with sandy soils interspersed with occasional low rocky areas and small outcrops which have a higher proportion of woody species (Figure 5).

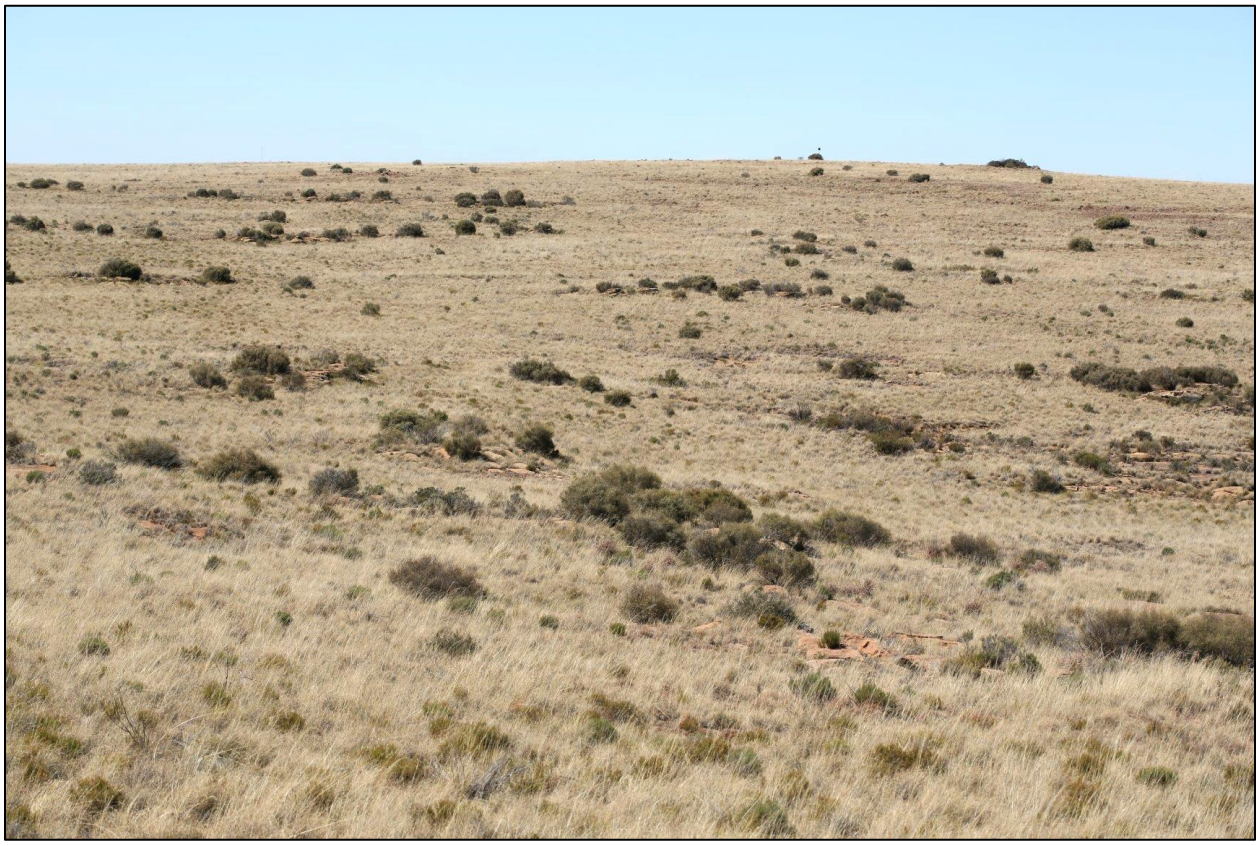

Figure 3. Typical Karoo Escarpment Grassland on the eastern plateau area of the Phezukomoya site. These areas are generally fairly flat and homogenous and dominated by grasses with more shrubby areas dominated by *Searia erosa*.

Figure 4. Although the plateau areas west of the N9 are mapped by Mucina and Rutherford as Besemkaree Koppies Shrubland, the majority of these areas would better be described as Karoo Escarpment Grassland and are not different from the plateau areas east of the N9.

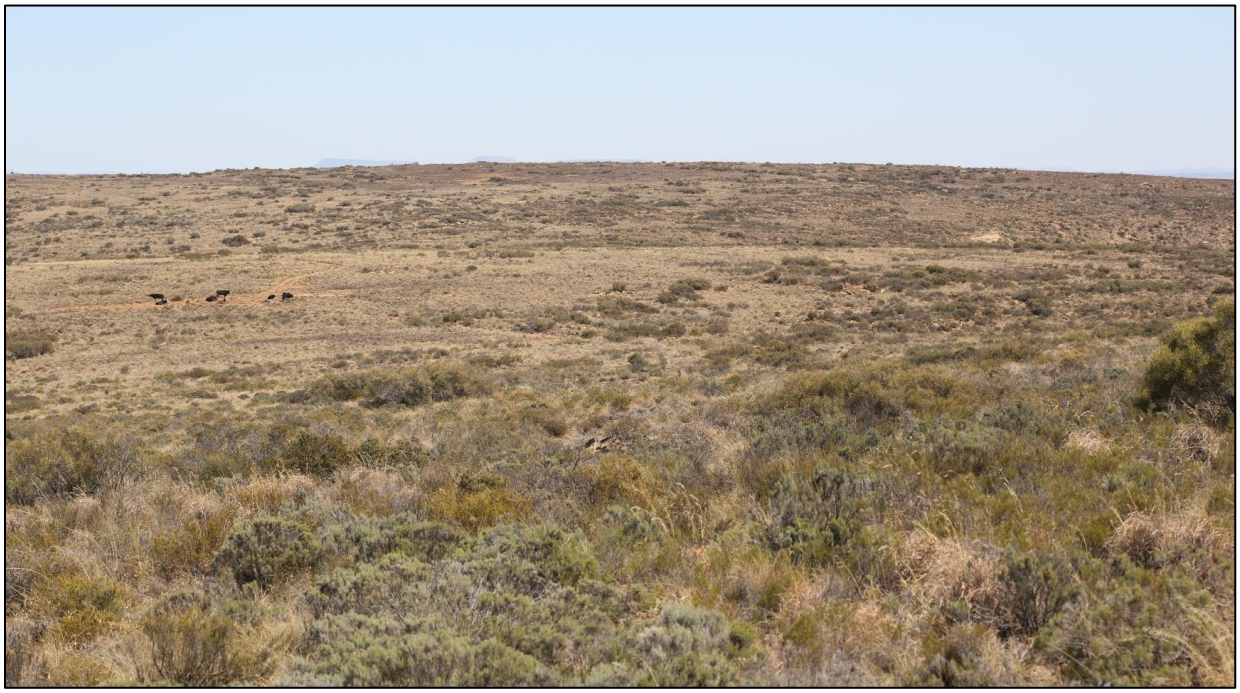

Figure 5. Although parts of the western plateau areas are more shrubby than pictured in Figure 4 above, typical shrubs species include *Elytropappus rhinocerotis*, *Searsia ciliata* and *Felicia fillifolia* and even these areas cannot be considered to represent Besemkaree Koppies Shrubland**.**

Within the site, the areas of Karoo Escarpment Grassland are dominated by grasses such as *Aristida diffusa*, *Heteropogon contortus*, *Merxmeullera disticha*, *Digitaria eriantha*, *Tragus koelerioides*, *Themeda triandra*, *Cymbopogon pospischilii*, *Eragrostis curvula*, *Aristida congesta* and *Eragrostis obtusa*; shrubs such as *Dicerothamnus rhinocerotis*, *Dimorphotheca cuneata*, *Asparagus capensis*, *Chrysocoma ciliata*, *Felicia filifolia*, *Rosenia oppositifolia*, *Melolobium candicans*, *Nenax microphylla* and *Selago saxatilis*. Trees and taller shrubs are not common in the open veld, but are usually prevalent around the rocky outcrops which occur scattered across the plateau areas, with species such as *Searsia erosa*, *Passerina obtusifolia*, *Colpoon compressum*, *Rhamnus prinoides* and *Diospyros austro-africana*. The abundance of species of conservation concern within this habitat is relatively low and no species of high conservation concern were observed. Some provincially protected species are however present including *Brunsvigia radulosa*, *Boophone disticha*, *Aloe broomii* var. *broomii* and *Avonia ustulata*.

The Tarkastad Montane Shrubland vegetation type has an extent of 4714 km^2. This unit occurs in the Eastern Cape and slightly into the Northern Cape, with Noupoort and Middelburg defining the western extent of this unit. The unit lies between the Great Escarpment in the north and the minor Escarpment in the south, and is characterized by ridges, hills and isolated mountain slopes, often covered in large, round boulders (Mucina & Rutherford 2006). The vegetation consists of low, semi-open, mixed shrubland with 'white' grasses and dwarf shrubs forming a large component (Mucina & Rutherford 2006). The unit's soils are sedimentary rocks of the Beaufort Group, with dolerite intrusions. The vegetation type is considered Least Threatened although less than 2% is formally protected (Mucina & Rutherford 2006). One of the important taxa from this vegetation type is the rare cycad *Encephalartos friderici-guilielmi* (Mucina & Rutherford 2006), but this does not appear to occur in the vicinity of the site.

As with Karoo Escarpment Grassland, Tarkastad Montane Shrubland is mapped as occurring east of the N9 and is replaced by Besemkaree Koppies Shrubland west of the N9. However, based on the site visit, there did not appear to be a material difference in the vegetation composition of the slopes between the east and west of the site (Figure 6, Figure 7). This can be interpreted as being indicative of the site falling along the boundary of these two units and the transitional nature of the vegetation in the area. In addition, these two units are usually associated with dolerite intrusions and as there is very little dolerite in the study area, the vegetation may not represent the typical forms. Due to the lack of differentiation of these two units in the study area, they are described together as a single unit here.

Besemkaree Koppies Shrubland occurs in the Northern Cape, Free State and Eastern Cape provinces on the plains of the Eastern Upper Karoo, between Richmond and Middelburg in the south and the Orange River in the north (Mucina & Rutherford 2006). The vegetation occurs on the slopes of koppies, butts and tafelbergs and consists of a two-layered karroid shrubland (Mucina & Rutherford 2006). The lower layer of the vegetation is dominated by dwarf small-leaved shrubs and the upper layer is dominated by tall shrubs. The geology

consists of dolerite koppies and sills embedded within Karoo Super Group sediments (Mucina & Rutherford 2006). According to Mucina and Rutherford (2206), the vegetation is classified as Least Threatened and the target for conservation is 28%; only 5% is formally conserved at present.

Figure 6. The vegetation of the slopes of the site is usually dominated by taller shrubs such as *Searsia erosa*, *Diospyros austro-africana*, *Rhamnus prinoides* and *Maytenus undata*. These areas are associated with the Besemkaree Koppies Shrubland and Tarkastad Montane Shrubland vegetation types.

Figure 7. Another example of the slopes of the Phezukomoya site, showing the influence of aspect, with dry grassland in the east facing slope and more woody vegetation on the cooler west-facing slope. These areas also provide a transitional zone between the Eastern Upper Karoo of the plains and Escarpment Grassland of the plateau areas.

The slopes of the site are differentiated from the plains and plateau areas in that the vegetation tends to be denser and at least on wetter aspect slopes, contains a significantly higher abundance of taller woody species. The grass component is largely similar to the plateau areas with some changes in abundance, with *Themeda triandra*, *Heteropogon contortus*, *Sporobolus fimbriatus* and *Digitaria eriantha* being especially prevalent. Typical and common trees and shrubs include *Searsia erosa*, *Searsia ciliata*, *Euclea crispa*, *Colpoon compressum*, *Rhamnus prinoides*, *Diospyros austro-africana*, *Tarchonanthus minor*, *Maytenus undata*, *Euryops lateriflorus*, *Dicerothamnus rhinocerotis*, *Felicia filifolia* and *Pentzia sphaerocephala*. Although the abundance of species of conservation concern within this habitat is relatively low, the slopes are generally considered sensitive on account of the high diversity of these areas as well as their vulnerability to soil erosion. The development footprint in this habitat is however low and restricted to a few turbines and some access roads.

The Eastern Upper Karoo vegetation type is one of the largest vegetation types in the country and consists of flat and gently sloping plains vegetation dominated by dwarf microphyllous shrubs with 'white' grasses, especially *Aristida*, *Eragrostis* and *Stipagrostis* and occupies an extent of 20324 km^2 (Mucina & Rutherford 2006). Eastern Upper Karoo is found in the Northern, Western and Eastern Cape, between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north and Burgersdorp and Cradock in the east, and the Great Escarpment in the south (Mucina & Rutherford 2006). The Eastern

Upper Karoo is classified as Least Threatened and less than 2% has been transformed (Mucina & Rutherford 2006). The vegetation type is however poorly represented in formal protected areas. Its geology consists of mudstones and sandstones of the Beaufort Group supporting duplex soils, which are vulnerable to erosion as illustrated below.

The vegetation of the Eastern Lower Karoo (Figure 8) is dominated by low shrubs and grasses, with greater abundance of shrubs in shallow and stony soils. Characteristic species observed within this habitat includes shrubs such as *Lycium cinereum*, *Lycium pumilum*, *Chrysocoma ciliata*, *Eriocephalus ericiodes*, *Pentzia incana*, *Felicia muricata*, *Gnidia polycephala*, *Helichrysum lucilioides*, *Rosenia humilis* and *Ruschia intricata* as well as grasses such as *Aristida adscensionis*, *A.congesta*, *A.diffusa*, *Cynodon incompletus*, *Enneapogon desvauxii*, *Eragrostis chloromelas*, *E.curvula*, *E.lehmanniana*, *E.obtusa*, *Sporobolus fimbriatus* and *Tragus koelerioides*. Species of conservation concern were not abundant and this habitat is not considered sensitive.

Figure 8. Eastern Upper Karoo along the power line alignment in the central part of the Phezukomoya site. The proportion of shrubs in the vegetation varies depending on soils, with more shrubs on rocky soils and more grasses on deeper clay or sandy soils.

Figure 9. Although the low-lying areas of Eastern Upper Karoo are generally considered to be low sensitivity, the areas of deeper soils are vulnerable to erosion and areas such as this with extensive erosion are common at the site.

3.2 LISTED & PROTECTED PLANT SPECIES

According to the SANBI POSA database, 112 indigenous plant species have been recorded from the four degree squares around the site, which is clearly an underestimate and reflects the poor historical sampling of the area rather than an indication of the species richness of the site. There is a relatively low number (13) of species of conservation concern known from the area (Appendix 1), but given the low number of records there are likely to be additional species present as well. Species which can be confirmed present in the area include *Anacampseros subnuda subsp. lubbersii* (Vulnerable), *Boophone disticha* (Declining) and *Pelargonium sidoides*, which is listed as Declining on account of heavy harvesting pressure for use in herbal and traditional medicine. This species is common in the higher lying grasslands of the site. Listed and protected species are usually confined to specific habitats such as wetlands and rock pavements which occur mostly around the edge of the plateau areas or other exposed ridges within the site. Some species such as *Boophone* and *Pelargonium sidoides* are however widespread and avoiding these would be more difficult.

3.3 FAUNAL COMMUNITIES

Mammals

At least 50 mammal species potentially occur at the site (Appendix 2). Due to the diversity of habitats available, which includes rocky uplands and ridges, some small wetlands areas, as well as open plains and low shrublands, the majority of species with a distribution that includes the site are likely to be present in at least part of the broader site. The mammalian community is therefore relatively rich and due to the remote and inaccessible nature of large parts of the area current disturbance levels are generally relatively low.

Medium sized carnivores such as jackal and caracal are relatively common in the area, despite widespread eradication efforts by livestock farmers in the region. The ridges, hills and uplands of the site, with rocky outcrops, rocky bluffs and cliffs provide suitable habitat for species which require or prefer rock cover such as Cape Rock Elephant Shrew, *Elephantulus edwardii*, Smith's Red Rock Hare *Pronolagus saundersiae*, Namaqua Rock Mouse *Micaelamys namaquensis* and Rock Hyrax, *Procavia capensis*. The lowlands contain an abundance of species associated with lowland habitats and deeper soils, which includes the Bush Vlei Rat *Otomys unisulcatus*, Hairy-footed Gerbil *Gerbillurus paeba* and Common Duiker *Sylvicapra grimmia*.

A number of antelope are relatively common at the site and would potentially be impacted by the development. Springbuck are confined by fences and occur only where farmers have introduced them or allowed them to persist and should be considered as part of the farming system rather than as wildlife per se. Both Duiker and Steenbok *Raphicerus campestris* are adaptable species that are able to tolerate moderate to high levels of human activity and are not likely to be highly sensitive to the disturbance associated with the development. Grey Rhebok *Pelea capreolus* and Mountain Rhebok *Redunca fulvorufula* are usually present on the higher-lying ground where turbines are more likely to be located.

Overall, long-term impacts on mammals are likely to be restricted largely to habitat loss equivalent to approximately the footprint of the development. Most mammals appear to become habituated to wind turbines and do not avoid them to a significant degree. There may however be some species which are more wary of the turbines and which would experience a greater degree of habitat loss. As there are no species of high conservation concern prevalent in the area, impacts on mammals are likely to be relatively low and of local significance only.

Reptiles

There is a wide range of habitats for reptiles present at the site, including rocky uplands and cliffs, open flat and lowlands and densely vegetated areas. As a result the site is likely to have a relatively rich reptile fauna which is potentially composed of 2 tortoise species, 15

snakes species, 16 lizard species and skinks, one chameleon and 5 gecko species. The rocky outcrops are of above average sensitivity for reptiles due to the likely presence of a variety of associated species and general shelter and cover provided by these areas. Similarly, the more-densely vegetated wetlands and kloofs are also likely to be of significance. While no snakes were found during the site visit, which can probably be ascribed to the dry conditions, a variety of lizards and skinks were captured or observed and proved to be very abundant in some areas. The flat mudstone rocks that characterise parts of the high-lying plateau areas create an abundance of narrow crevices which are particularly attractive for reptiles. Species observed (Figure 10) include Karoo Girdled Lizard, Ground Agama, Rock Agama, Spotted Sand Lizard, Burchell's Sand Lizard, Rock Monitor and Red-sided Skink.

In general, the major impact associated with the development would be habitat loss and fragmentation for reptiles, with the potential for increased levels of predation being a secondary impact which may occur as a result of vegetation clearing for roads and turbine pads. There are not likely to be any reptiles which are specifically restricted to the higher-lying ridges of the site and which would be particularly vulnerable to impact as a result.

Figure 10. Common reptiles at the Phezukomoya site include clockwise from left, Karoo girdled Lizard, Spotted Sand Lizard and Rock Agama.

Amphibians

Although there are no perennial rivers within the site, there are several areas where amphibians are present and breeding. There are several farm dams distributed across the site with frogs present as well as pools in rocky reaches of the streams which offer breeding opportunities. The amphibian diversity at the site is however relatively low as the site lies within the distribution range of only nine frog and toad species. The only species of conservation concern that occurs in the area is the Giant Bullfrog (Near Threatened) which breeds in ephemeral pans and vegetated, silted-up farm dams. Although there are some such dams present at the site, these are outside of the development footprint and not likely to be impacted in any way. Although no frogs were observed within the Phezukomoya site, several species were observed in adjacent areas including Common Platanna, Cape River Frog and .

In general, the most important areas for amphibians at the site are the seeps and wetlands and the man-made earth dams which occur in the area. The natural wetlands are generally associated with the lowlands of the site and well outside of the majority of the development footprint of the development and not likely to be affected. The high-lying target areas are not likely to have many amphibian species present on account of the general lack of water and suitable habitat features.

Direct impacts on amphibians at the site are likely to be fairly low. Amphibians are however highly sensitive to pollutants and the large amount of construction machinery and materials present at the site during the construction phase would pose a risk to amphibians should any spills occur.

3.4 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The recently completed Northern Cape Critical Biodiversity Areas (CBAs) map (Oosthuysen & Holness 2016) is depicted below for the study area (Figure 11). This biodiversity assessment identifies CBAs which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives.

A significant portion of the eastern section of the Phezukomoya WEF is located within a Tier 1 CBA, while part of the western development area is located within a Tier 2 CBA. In addition, the majority of the grid connection infrastructure is located within a Tier 2 CBA. This is a potentially significant issue for the development as some types of development are not compatible with the stated conservation goals of CBAs. Unfortunately the CBA map does not include a lookup layer which provides the reasons areas have been selected as CBA1 or CBA2. However, based on the technical report which accompanies the map, it appears that the CBAs in the area are determined primarily due to their potential as areas

supporting climate change resilience and in the south west due their potential as conservation expansion areas associated with the Karoo Seekoei River Nature Reserve.

Based on the above, the primary drivers for the CBAs in the area are related to the maintenance of ecosystem processes and not to protect biodiversity pattern as the area does not have any features of known high significance in this regard (i.e. rare habitats or an abundance of localized or endangered species). The suitability of the development of a wind farm in the area therefore centers on the extent to which the development can be considered compatible with the presence and functioning of the CBAs and the extent to which it may compromise or disrupt the processes the CBAs are intended to protect. A key component of the development that needs to be considered in this regard is the total footprint of the development. Transformation of intact habitat is a key driver of habitat loss and is also the main driver leading to declines in ecosystem function and the effective delivery of ecosystem services. The total footprint of the development can be estimated at approximately 150ha. In context of the 15 000ha site this is relatively small proportion of the site and with the appropriate mitigation is not likely to significantly disrupt or alter the ability of the landscape to provide ecosystem services or provide gradients and corridors for flora and faunal movement and dispersal. The development will however result in some habitat loss within the high elevation parts of the site equivalent to about 3.5% of the extent of Karoo Escarpment Grassland and Besemkaree Koppies Shrubland that is within the site. This will have a limited impact on the habitat quality of these areas as the habitat will be somewhat fragmented and the additional disturbance caused by the turbines may be a deterrent for some species.

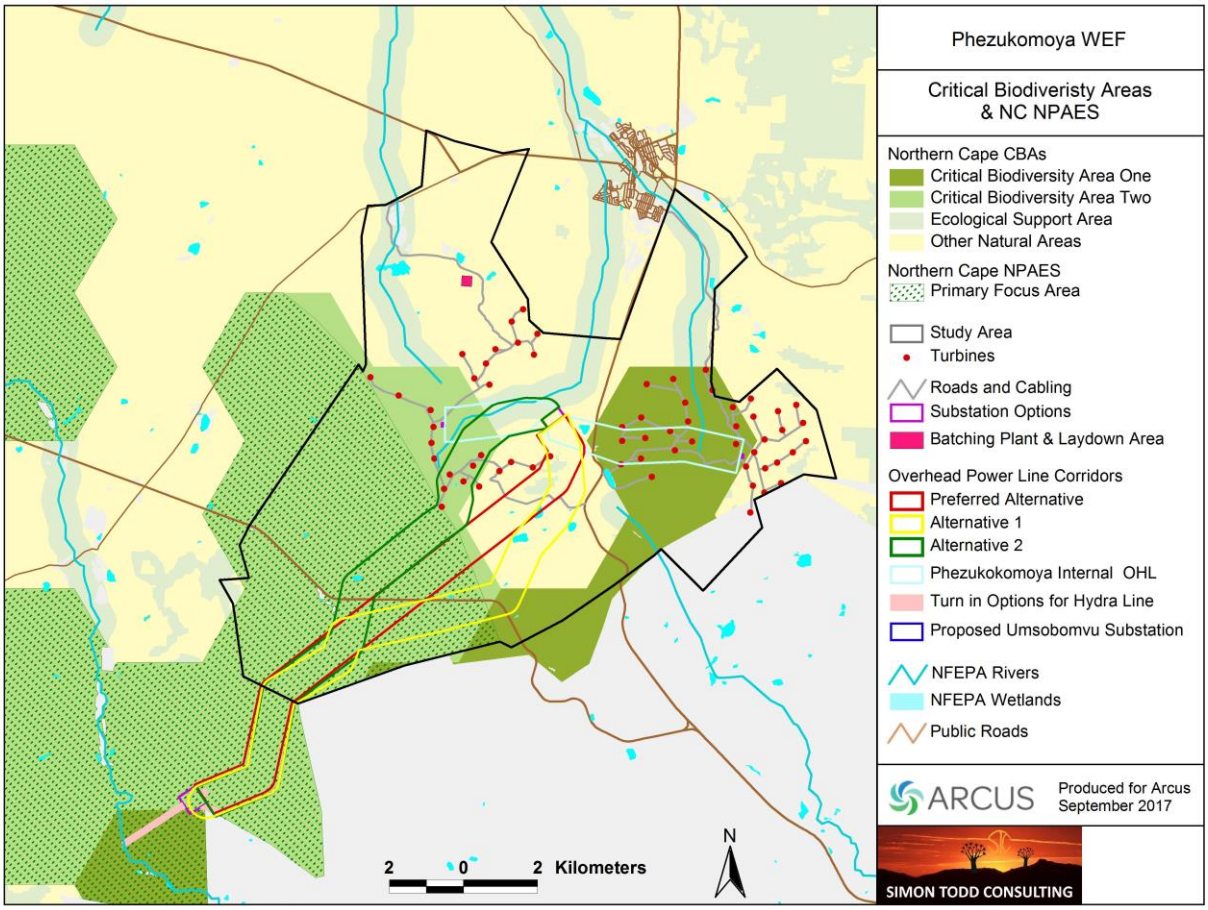

Figure 11. Extract of the Northern Cape Critical Biodiversity Areas map (Oosthuysen & Holness 2016) for the study area.

Although the wind farm development does not lie within a Northern Cape Protected Area Expansion Strategy Focus Area (NCPAES), that part of the grid connection outside of the development area is within a Focus Area linking to the proposed Karoo Seekoei River Nature Reserve. The proposed Karoo Seekoei River Nature Reserve (KSRNR) is located along the Seekoei River from Nieu Bethesda in the south to Petrusville in the north. This is approximately 30km west of the site and the development of the site would not impinge on conservation expansion options in that area. In addition, the power line would have a relatively small terrestrial footprint and would not significantly impact on conservation expansion options in the area, especially as it would link into an existing power line.

3.5 CUMULATIVE IMPACT

According to the map of DEA-registered projects as at September 2017, there are a number of wind farm applications in the wider area as well as the existing already constructed

Noupoort Wind Farm (Figure 12). Immediately south of the site is the Umsombomvu Wind Energy Facility, which according to the EIA report would have a construction footprint of approximately 100ha. A little further west of that is the 100MW Mulilo Wind Farm "near De Aar" which would also have a footprint of approximately 100-150ha. The only constructed wind farm within 50km of the site is the 80MW Noupoort Wind Farm north east of the site, with a footprint of less than 80ha. Finally, there is also the sister project to the current development, the San Kraal WEF which would also have a footprint of up to 150ha. Apart from these wind farms there are also a number of proposed solar energy facilities in the area. There is however a clear differentiation of affected habitats between solar and wind energy developments in the area, with solar projects restricted to the low-lying flats and the wind energy facilities restricted to the higher-lying mountainous terrain. As such, these should to some extent be considered independently as the affected habitats are different and not equally susceptible to impact. The low-lying areas are within the Eastern Upper Karoo, which is an extensive vegetation type of relatively low diversity and which can at a general level be considered low sensitivity and fairly robust to impact. The higher lying ground is however potentially more sensitive as these areas have greater diversity of fauna and flora and the affected vegetation types are comparatively much more restricted in nature.

The existing and proposed wind farm developments give rise to a total potential footprint in the area of about 450ha of which about 80ha has been realized. The current development would contribute another 120-150ha to this. As mentioned above, this needs to be interpreted in terms of the affected vegetation types and habitats and not just the total surrounding area. The Noupoort Wind Farm is restricted largely to the Karoo Escarpment Grassland vegetation type, while the current Phezukomoya development occurs within this as well as the Besemkaree Koppies Shrubland vegetation type. The proposed San Kraal WEF is also largely restricted to the Karoo Escarpment Grassland vegetation type. The Mulilo Project appears to be restricted to the Eastern Upper Karoo and as such contributes little to cumulative impact in the current area given the extensive nature of this unit. At a vegetation-type level, both Besemkaree Koppies Shrubland and Karoo Escarpment Grassland are similar in that they are 8000-10 000km^2 in extent and more than 97% intact. As such, they have been little impacted by transformation and the current developments would not significantly impact their remaining extent. The concern is therefore at a more local level, with four wind farms (Noupoort, San Kraal, Phezukomoya & Umsombomvu) all in close proximity to one another. Concentrated development can reduce impacts when it is focused on low sensitivity areas or it can exacerbate impacts when focused on high sensitivity environments. In the current case, the affected habitats are all considered moderate sensitivity and do not have exceptional levels of biodiversity. In terms of the potential to disrupt broad-scale ecological processes, the projects do tend to lie along a higher-lying mountain system and so there would be a potential impact on species restricted to the high elevation grasslands. The wind farms are however not continuous and so there would still be undeveloped gaps where fauna would still likely be able to pass unimpeded.

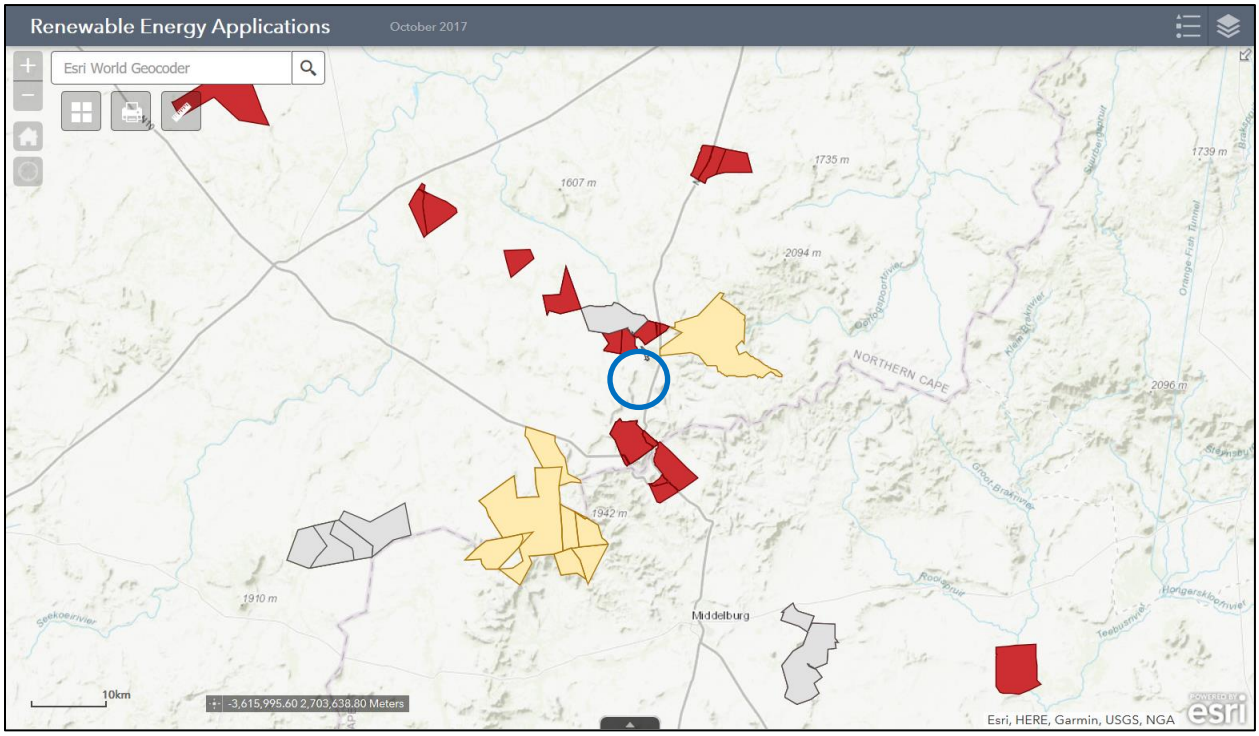

Figure 12. Current (October 2017) DEA-registered projects known from the vicinity of the Phezukomoya Wind Farm, the general area of which is outlined in blue. Red cadastral units are registered solar projects and the pale yellow units are wind energy facilities. To date, the Noupoort Wind Farm north east of the site is the only built project.

3.6 Site Sensitivity Assessment

The sensitivity of the Phezukomoya Wind Farm site is determined largely by the topography and elevation of the landscape. The low-lying plains are dominated by Eastern Upper Karoo which is a widespread vegetation type of low overall sensitivity, with few species or features of concern. The slopes of the site are often steep and considered generally of moderate to high sensitivity on account of their high biodiversity value for fauna and flora as well as their vulnerability to disturbance and consequent erosion. The high-lying plateau areas consist of Karoo Escarpment Grassland and are considered potentially sensitive due to the higher elevation and limited extent, but in practice these areas were observed to contain few species or features of concern and are considered to be of moderate sensitivity, although there are certain areas of higher sensitivity present. All of the affected vegetation types are still overwhelmingly intact and have not been significantly affected by transformation to date, with the result that the habitat loss that each would experience is not considered to be of high significance.

The fauna of the area is composed of widespread species, with very few species of conservation concern likely to be present in the area. The most important areas for fauna

at the site are the drainage systems and the well-vegetated slopes which are largely outside of the development footprint and would not be significantly affected. The rocky outcrops on the plateau were however observed to have a high abundance of reptiles, which relates to the weathering patterns of the mudstones and the resultant abundance of refugia. The major impact on fauna would be habitat loss associated largely with the high-elevation plateau habitat of the site.

Although some very high sensitivity areas were observed in the wider area, no No-Go areas were observed within the Phezukomoya development area and the layout is considered generally acceptable, although there are a few turbines which are marginally within areas considered to be High sensitivity.

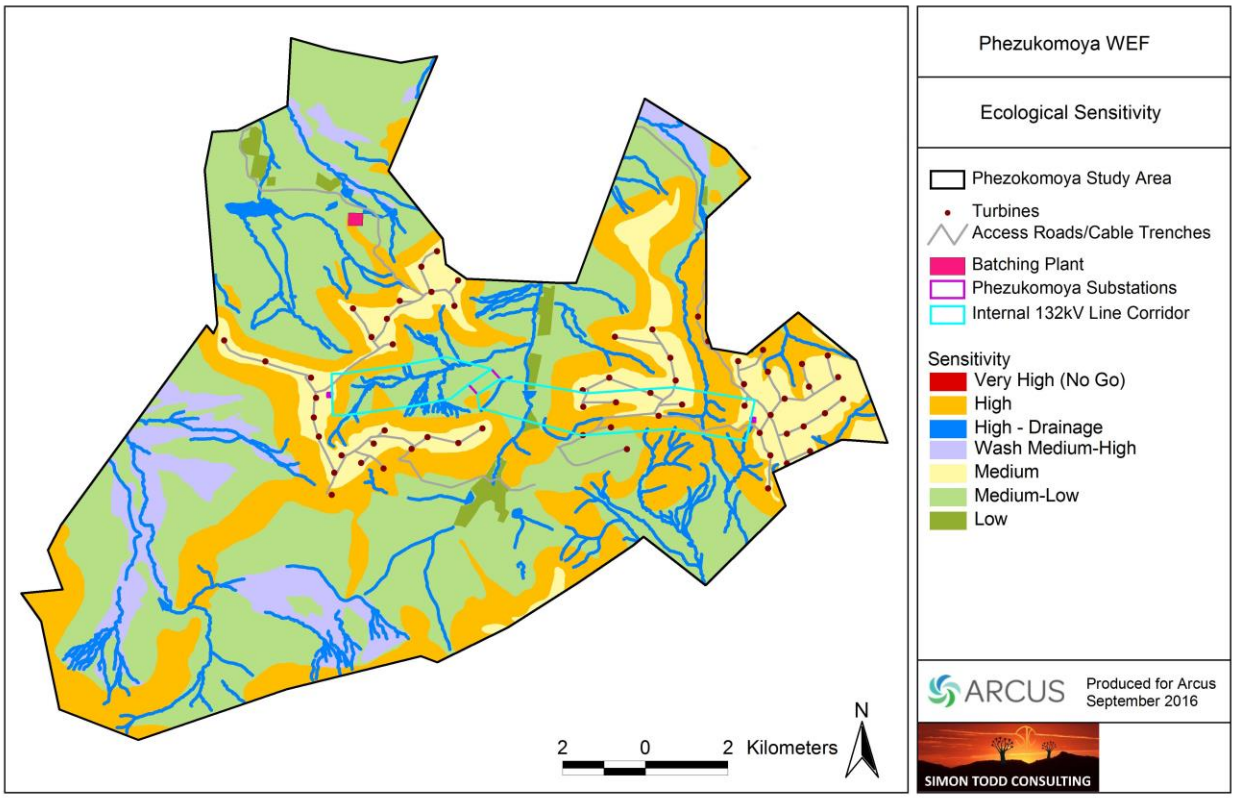

Figure 13. Ecological sensitivity map of the Phezukomoya Wind Farm study area.

In terms of the Phezukomoya Grid Connection (Figure 14), the section outside of the Phezukomoya Wind Farm area is considered to be fairly high sensitivity on account of the steep topography, but all three alignments share a similar route through this section, so there is no preference in this regard across this section of line. Overall, Alternative 1 is considered to be the most favourable alternative as it traverses the flattest terrain and would be likely to generate the lowest overall impact. The footprint of the power line is

relatively low and no highly significant impacts are likely to result from the development of the grid connection and associated infrastructure.

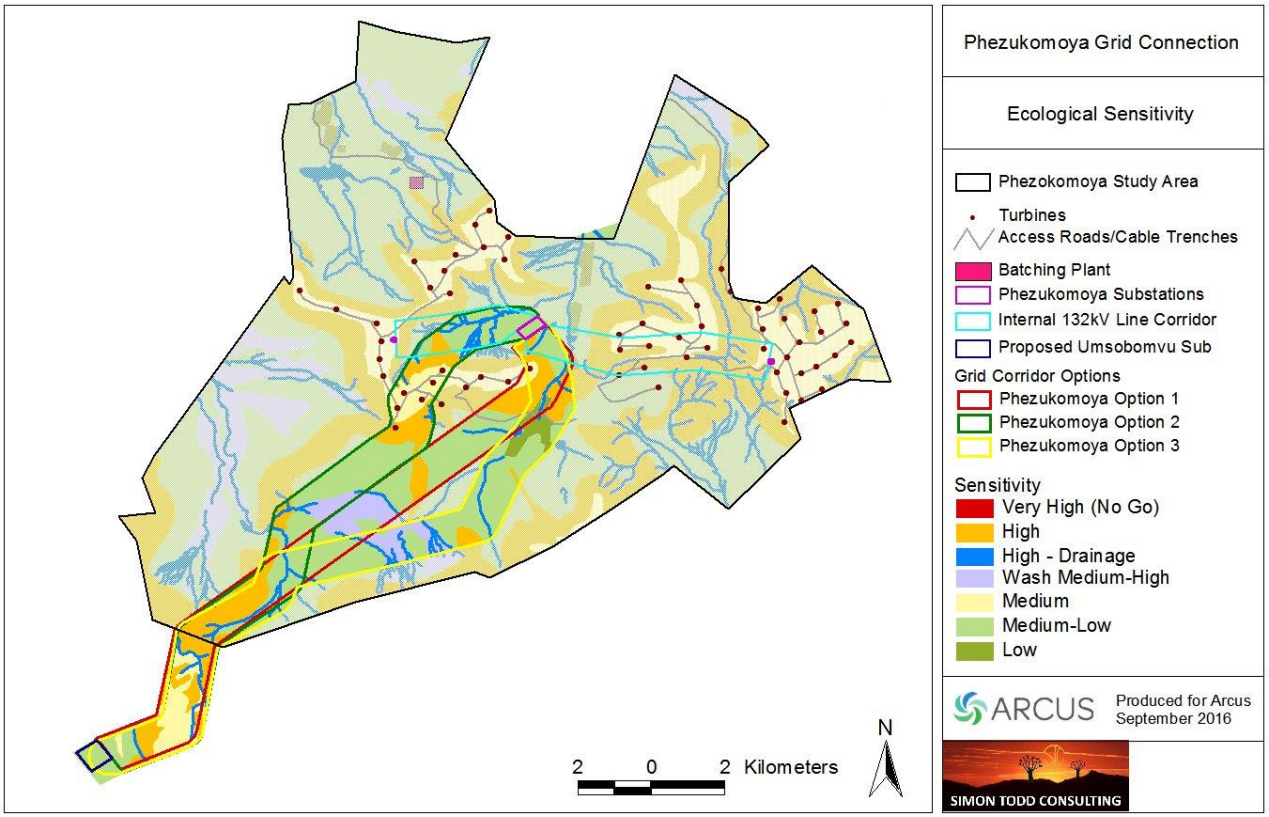

Figure 14. Ecological sensitivity map of the Phezukomoya WEF Grid Connection alternatives.

4 IMPACT ASSESSMENT

4.1 ASSESSMENT METHODOLOGY

The assessment methodology is in accordance with the recent revised 2014 EIA regulations. The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

a) Extent (spatial scale):

Ranking criteria

L	M	H
Impact is localized within	Widespread impact beyond	Impact widespread far

site boundary	site boundary; Local	beyond site boundary; Regional/national

b) Duration:

Ranking criteria

L	M	H
Quickly reversible, less than project life, short term (0-5 years)	Reversible over time; medium term to life of project (5-15 years)	Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources

c) Intensity (severity):

Type of Criteria	Negative			Positive		
	H-	M-	L-	L+	M+	H+
Qualitative	Substantial deterioration, death, illness or injury, loss of habitat/diversity or resource, severe alteration or disturbance of important processes.	Moderate deterioration, discomfort, Partial loss of habitat/biodiversity/resource or slight or alteration	Minor deterioration, nuisance or irritation, minor change in species/habitat/ diversity or resource, no or very little quality deterioration.	Minor improvement, restoration, improved management	Moderate improvement, restoration, improved management, substitution	Substantial improvement, substitution
Quantitative	Measurable deterioration Recommended level will often be violated (e.g. pollution)	Measurable deterioration Recommended level will occasionally be violated	No measurable change; Recommended level will never be violated	No measurable change; Within or better than recommended level.	Measurable improvement	Measurable improvement

d) Probability of occurrence:

Ranking criteria

L	M	H
Unlikely; low likelihood; Seldom No known risk or vulnerability to natural or induced hazards.	Possible, distinct possibility, frequent Low to medium risk or vulnerability to natural or induced hazards.	Definite (regardless of prevention measures), highly likely, continuous High risk or vulnerability to natural or induced hazards.

e) Status of the impact:

Describe whether the impact is positive, negative or neutral for each parameter. The ranking criteria are described in negative terms. Where positive impacts are identified, use the opposite, positive descriptions for criteria.

Based on a synthesis of the information contained in (a) to (e) above, the specialist will be required to assess the significance of potential impacts in terms of the following criteria:

f) Significance: (Duration X Extent X Intensity)

Intensity = L				
Duration	**H**			
	M			Medium
	L	Low		
Intensity = M				
Duration	**H**			High
	M		Medium	
	L	Low		
Intensity = H				
Duration	**H**			
	M			High
	L	Medium		
		L	M	H
		Extent		

Positive impacts would be ranked in the same way as negative impacts, but result in high, medium or low positive consequence.

g) Degree of confidence in predictions:

State the degree of confidence in the predictions, based on the availability of information and specialist knowledge.

h) Ranking the overall significance of impacts

Combining the consequence of the impact and the probability of occurrence provides the overall significance (risk) of the impacts.

PROBABILITY	Definite Continuous	**H**	**MEDIUM**		**HIGH**
	Possible Frequent	**M**		**MEDIUM**	

	Unlikely Seldom	**L**	**LOW**		**MEDIUM**
			L	**M**	**H**
			CONSEQUENCE		

4.2 Assessment of Impacts - Phezukomoya Wind Energy Facility

The impacts of the development are assessed below, first for the wind energy facility, and then for the grid connection for each of the different phases of development. Each impact and the associated damaging activities are briefly described, after which the impact is assessed, before and after the implementation of the mitigation measures as listed.

Planning & Construction Phase Impacts

Impact 1. *Impact on vegetation and listed plant species.*

The development of the wind farm would require vegetation clearing for turbines, roads, internal powerlines or cable trenches and other hard infrastructure. Apart from the direct loss of vegetation within the development footprint, listed and protected species are also highly likely to be impacted. The total extent of habitat loss is expected to be in the order of 150ha. As the abundance of species of conservation concern in the area is low, the impact on SCC is likely to be relatively low and primary impact would be on gross habitat loss of the affected veld types. As the surrounding landscape is still overwhelmingly intact and there are no very high value plant habitats within the development footprint, post-mitigation impacts are likely to be of Medium Significance.

Impact Phase: Construction							
Impact Description: Impact on vegetation and listed plant species due to transformation within the development footprint							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**H**	**-'tve**	**High**	**H**	**High**
With Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**High**
Can the impact be reversed?	No - transformation is a necessary outcome of the development and will largely persist for the lifetime of the development and some time thereafter. Some residual impact will remain even after decommissioning and rehabilitation.						
Will impact cause irreplaceable loss or resources?	No, no critical or rare habitats are within the development footprint.						
Can impact be avoided, managed or mitigated?	Possibly, through avoidance, but some residual impact is likely						
Mitigation measures to reduce residual risk or enhance opportunities:							

1) Placement of turbines within the High Sensitivity areas and drainage lines should be avoided. 2) Preconstruction walk-though of the approved development footprint to ensure that sensitive habitats and species are avoided where possible. 3) Ensure that lay-down and other temporary infrastructure is within medium- or low-sensitivity areas. The current proposed locations are considered acceptable, but should be rehabilitated after use. 4) Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development. 5) The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-though of the facility. 6) Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. 7) Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area.	
Residual Impact	The will be some habitat loss that is an unavoidable impact of the development and cannot be effectively mitigated.

Impact 2. *Faunal impacts due to construction activities*

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Traffic during construction will be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. Many of these impacts can however be effectively managed or mitigated. However, faunal habitat loss cannot be mitigated and would persist for the operational lifetime of the facility. After mitigation, faunal impacts are likely to be of moderate significance but not of broader implication as there are no listed species which would be significantly affected by the development.

Impact Phase: Construction							
Impact Description: Faunal impacts due to construction-phase noise and physical disturbance.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**H**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**Medium**
Can the impact be reversed?		Construction-phase disturbance will be transient, but some					

	habitat loss would be long term.
Will impact cause irreplaceable loss or resources?	No likely as there do not appear to be any significant populations of species of conservation concern within the affected area.
Can impact be avoided, managed or mitigated?	Only partly as noise and construction phase disturbance and habitat loss cannot be entirely avoided or mitigated.
Mitigation measures to reduce residual risk or enhance opportunities: 1) Preconstruction walk-through of the facility to identify areas of faunal sensitivity. 2) During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person. 3) The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site. 4) Fires within suitable dedicated containers (i.e. braai drums etc) should only be allowed within the construction camp and similar demarcated and cleared areas and no fires should be allowed in the open veld as there is a risk of runaway veld fires. 5) No fuelwood collection should be allowed on-site. 6) No dogs or cats should be allowed on site apart from that of the landowners. 7) If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. 8) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 9) No unauthorized persons should be allowed onto the site and site access should be strictly controlled 10) All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site. 11) All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often needlessly persecuted.	
Residual Impacts	Noise and disturbance during construction cannot be well mitigated, but would be transient. Some habitat loss for fauna would persist for the operational lifetime of the facility.

Operational Phase Impacts

Impact 3. *Faunal impacts due to operational activities*

Although noise and disturbance levels during operation will be significantly reduced compared to construction, some noise and disturbance impacts will persist due to operational activities on the wind farm as well as noise generated by the turbines themselves. Although most fauna are likely to quickly become habituated to the presence of the turbines, some fauna may be negatively affected due to noise or other reason and may avoid the proximity of the turbines and would therefore experience greater long-term habitat loss. This is however likely to be a small subset of the species present and this

effect has not been documented here or elsewhere for wind farms. As the affected areas are not considered to be very high faunal sensitivity and there are no species of very high sensitivity present, the post-mitigation operational impacts on fauna are likely to be of low significance.

<table>
<tr><td colspan="8">Impact Phase: Operation</td></tr>
<tr><td colspan="8">Impact Description: Faunal impacts due to operational phase activities.</td></tr>
<tr><td></td><td>Extent</td><td>Duration</td><td>Intensity</td><td>Status</td><td>Significance</td><td>Probability</td><td>Confidence</td></tr>
<tr><td>Without Mitigation</td><td>L</td><td>M</td><td>M</td><td>-‘tve</td><td>Medium</td><td>H</td><td>High</td></tr>
<tr><td>With Mitigation</td><td>L</td><td>M</td><td>L</td><td>-‘tve</td><td>Low</td><td>M</td><td>High</td></tr>
<tr><td colspan="3">Can the impact be reversed?</td><td colspan="5">The impact will persist for the lifespan of the facility.</td></tr>
<tr><td colspan="3">Will impact cause irreplaceable loss or resources?</td><td colspan="5">Unlikely as there are few species of concern in the area.</td></tr>
<tr><td colspan="3">Can impact be avoided, managed or mitigated?</td><td colspan="5">Some management is possible, but residual impact from the wind turbines and general disturbance will persist, albeit at a low intensity.</td></tr>
<tr><td colspan="8">Mitigation measures to reduce residual risk or enhance opportunities:
1) Management of the site should take place within the context of an Open Space Management Plan.
2) No unauthorized persons should be allowed onto the site.
3) Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
4) The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required.
5) If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects.
6) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
7) All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
8) If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behavior and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of such fenced areas and not the outside.</td></tr>
<tr><td colspan="3">Residual Impacts</td><td colspan="5">Residual impacts will be low and restricted to some low-intensity disturbance associated with the maintenance activities at the site as well as some noise impacts associated with the</td></tr>
</table>

	operation of the turbines.

Impact 4. *Soil Erosion Risk*

The large amount of disturbance created during construction would leave the site vulnerable to soil erosion, especially as many parts of the site are steep and the duplex soils present in some areas are known to be susceptible to soil erosion. The soil disturbance associated with the development will render the impacted areas highly vulnerable to erosion and measures to limit erosion will need to be a key element of mitigation measures at the site. Furthermore, if the eroded material were to enter streams and rivers at the site it could have significant impact on these systems through siltation of pools and changes in the chemistry and turbidity of the water. Although this impact has a potentially high significance it can be well mitigated.

Impact Phase: Operation							
Impact Description: Following construction, the site will be highly vulnerable to soil erosion							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**H**	**-'tve**	**High**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?			With appropriate mitigation the impact can be ameliorated				
Will impact cause irreplaceable loss or resources?			The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.				
Can impact be avoided, managed or mitigated?			With appropriate control measures, erosion risk can be well mitigated				
Mitigation measures to reduce residual risk or enhance opportunities: 1) Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. 2) All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 3) Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. 4) All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 5) All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.							
Residual Impact			With mitigation there would be negligible residual impact.				

Impact 5. *Alien Plant Invasion*

The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion well into the operational period. Some alien invasion is inevitable and regular alien clearing activities would be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and turbine service areas are likely to remain foci of alien plant invasion for the duration of the operational phase.

Impact Phase: Operation							
Impact Description: Following construction, the site will be highly vulnerable to alien plant invasion							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**M**	**High**
Can the impact be reversed?	With appropriate mitigation the impact can be ameliorated						
Will impact cause irreplaceable loss or resources?	With mitigation there would no loss of resources						
Can impact be avoided, managed or mitigated?	With appropriate control measures, alien plants can be controlled and reduced to very low impact						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. 2) Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. 3) Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. 4) Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.							
Residual Impact	With mitigation there would be little to no residual impact.						

Impact 6. *Impact on Critical Biodiversity Areas and Broad-Scale Ecological Processes*

A significant proportion of the development lies within Critical Biodiversity Areas and would potentially negatively impact the biodiversity value and ecological functioning of these areas. The CBAs in the area are however designed to maintain climate resilience and not for biodiversity pattern protection. As such, the development is not likely to significantly compromise this goal. However, the presence of the development would impact habitat quality to some degree within the higher elevation plateau areas of the site, which would

potentially have a low-intensity, long-term impact on some species. With mitigation, this impact is likely to be of medium significance.

Impact Phase: Operation							
Impact Description: Cumulative impact on CBAs and broad scale ecological processes							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**M**	**H**	**M**	**-'tve**	**High**	**H**	**High**
With Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**M**	**High**
Can the impact be reversed?		The impact would last for the lifetime of the development					
Will impact cause irreplaceable loss or resources?		Unlikely					
Can impact be avoided, managed or mitigated?		To some extent, but some of the impact would result from the presence of the facility which cannot be avoided.					
Mitigation measures to reduce residual risk or enhance opportunities: 1) Minimise the development footprint, especially within the high sensitivity areas and some reduction in the number of turbines within these areas may be required. 2) There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora. 3) Specific avoidance and mitigation may be required to reduce the impact on certain habitats of limited extent and high ecological or conservation significance.							
Residual Impact		Some of the impact results from the presence of the facility and would therefore persist for as long as it was operational.					

Decommissioning Phase Impacts

Impact 7. *Faunal impacts due to decommissioning phase activities*

The impacts on fauna at decommissioning would be similar to those at construction, but of a lower severity as the activity will be taking place within the development footprint. The increased levels of noise, pollution, disturbance and human presence during decommissioning will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during this period as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the decommissioning activities and might be killed. Vehicular traffic would be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the decommissioning phase as a result of the large number of personnel that are likely to be present. This would however be a transient impact which would ultimately result in an increase in available habitat for some fauna. After mitigation, faunal impacts due to decommissioning are likely to be of low significance.

Impact Phase: Decommissioning							
Impact Description: Faunal impacts due to decommissioning phase activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**M**	**L**	**H**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**M**	**High**
Can the impact be reversed?	The impact would be transient and persist for the decommissioning period only.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Most the impacts can be mitigated and those that cannot would be transient.						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. 2) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 3) All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 4) No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. 9) All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned.							
Residual Impacts	Decommissioning would in principle return the site to its former state, but in practice, some degradation of the development footprint can be anticipated, which would reduce its' long-term value as faunal habitat.						

Impact 8. *Soil Erosion Risk*

The removal and clearing of the site infrastructure would create some soil disturbance which would leave these areas vulnerable to erosion, which if left unchecked could spread significantly. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk. Although this impact has a potentially high significance it can be well mitigated to low significance.

Impact Phase: Decommissioning

Impact Description: Following decommissioning, the site will be highly vulnerable to soil erosion							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**M**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?		With appropriate mitigation the impact can be ameliorated					
Will impact cause irreplaceable loss or resources?		The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.					
Can impact be avoided, managed or mitigated?		With appropriate control measures, erosion risk can be well mitigated					
Mitigation measures to reduce residual risk or enhance opportunities: 1) Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 2) There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. 3) All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 4) All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.							
Residual Impact		With mitigation, there would be little residual impact.					

Impact 9. *Alien Plant Invasion following decommissioning*

The disturbance associated with the decommissioning phase of the project will render the disturbed areas vulnerable to alien plant invasion. Some alien invasion is highly likely and regular alien clearing for several years after decommissioning is likely to be required. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion. With mitigation, this impact would be of low significance.

Impact Phase: Decommissioning							
Impact Description: Following decommissioning, the site will be vulnerable to alien plant invasion							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?		With appropriate mitigation the impact can be ameliorated					
Will impact cause irreplaceable loss or resources?		With mitigation there would no loss of resources					
Can impact be avoided,		With appropriate control measures, alien plants can be					

managed or mitigated?	controlled and reduced to very low impact
Mitigation measures to reduce residual risk or enhance opportunities: 1) Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. 2) Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. 3) Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem at the site. 5) Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Residual Impact	With mitigation there would be little to no residual impact.

4.3 Assessment of Impacts - Phezukomoya Grid Connection

Planning & Construction Phase Impacts

Impact 1. *Impact on vegetation and listed plant species.*

The development of the grid connection and substation infrastructure would require vegetation clearing for access roads, pylon foundations and substations. Apart from the direct loss of vegetation within the development footprint, listed and protected species are also likely to be impacted. The footprint of the grid connection infrastructure would however be less than 20ha and as the surrounding landscape is still overwhelmingly intact and there are no very high value flora habitats within the development footprint, post-mitigation impacts are likely to be of Low Significance.

Impact Phase: Construction							
Impact Description: Impact on vegetation and listed plant species due to transformation within the development footprint							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**

Mitigation							
Can the impact be reversed?			No - transformation is a necessary outcome of the development and while some areas will become revegetated, some long-term habitat loss is likely.				
Will impact cause irreplaceable loss or resources?			No, no critical or rare habitats are within the development footprint.				
Can impact be avoided, managed or mitigated?			Possibly, through avoidance, but some residual impact is likely				
Mitigation measures to reduce residual risk or enhance opportunities: 1) Preconstruction walk-though of the approved development footprint to ensure that sensitive habitats and species are avoided where possible. 2) Ensure that lay-down and other temporary infrastructure is within medium- or low-sensitivity areas, preferably previously transformed areas if possible. 3) Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development. 4) A large proportion of the impact of the power line would stem from access roads and these should be minimized as far as possible and not be larger than required. 5) Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. 6) Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area.							
Residual Impact			The will be some habitat loss that is an unavoidable impact of the development and cannot be effectively mitigated.				

Impact 2. *Faunal impacts due to construction activities*

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the affected areas during construction, while some slow-moving species would not be able to avoid the construction activities and might be killed. Traffic during construction will be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. Many of these impacts can however be effectively managed or mitigated. After mitigation, faunal impacts are likely to be of low significance.

Impact Phase: Construction							
Impact Description: Faunal impacts due to construction-phase noise and physical disturbance.							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**H**	**-'tve**	**Medium**	**H**	**High**
With	**L**	**L**	**M**	**-'tve**	**Low**	**L**	**Medium**

Mitigation							
Option 2							
Without Mitigation	**L**	**M**	**H**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**L**	**Medium**
Option 3							
Without Mitigation	**L**	**M**	**H**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**L**	**Medium**

Can the impact be reversed?	Construction-phase disturbance will be transient, but some habitat loss would be long term.
Will impact cause irreplaceable loss or resources?	No likely as there do not appear to be any significant populations of species of conservation concern within the affected area.
Can impact be avoided, managed or mitigated?	Only partly as noise and construction phase disturbance and habitat loss cannot be entirely avoided or mitigated.

Mitigation measures to reduce residual risk or enhance opportunities:

1) Preconstruction walk-through of the facility to identify areas of faunal sensitivity.
2) During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
3) The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
4) Fires within suitable dedicated containers (i.e. braai drums etc) should only be allowed within the construction camp and similar demarcated and cleared areas and no fires should be allowed in the open veld as there is a risk of runaway veld fires.
5) If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards.
6) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
7) No unauthorized persons should be allowed onto the site and site access should be strictly controlled
8) All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.
9) All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often needlessly persecuted.

Residual Impacts	Noise and disturbance during construction cannot be well mitigated, but would be transient. Some habitat loss for fauna would persist for the operational lifetime of the facility.

Operational Phase Impacts

Impact 4. *Soil Erosion Risk*

The large amount of disturbance created during construction would leave the disturbed areas vulnerable to soil erosion, especially as many parts of the power lien route are steep and the duplex soils present are known to be susceptible to soil erosion. Consequently, specific measures such as erosion berms and water dispersion features will be required along the power line access roads. Although this impact has a potentially high significance it can be well mitigated.

Impact Phase: Operation							
Impact Description: Following construction, the site will be highly vulnerable to soil erosion							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?			With appropriate mitigation the impact can be ameliorated				
Will impact cause irreplaceable loss or resources?			The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.				
Can impact be avoided, managed or mitigated?			With appropriate control measures, erosion risk can be well mitigated				
Mitigation measures to reduce residual risk or enhance opportunities: 1) Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. 2) All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 3) Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. 4) All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 5) All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.							

Residual Impact	With mitigation there would be negligible residual impact.

Impact 5. *Alien Plant Invasion*

The disturbance associated with the construction phase of the project will render the disturbed areas along the power line vulnerable to alien plant invasion. The pylons are also frequently used by birds such as crows which often carry seed of alien species to such positions where they can then establish. Some alien invasion is inevitable and regular alien clearing activities would be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides which receive runoff are likely to remain foci of alien plant invasion.

Impact Phase: Operation							
Impact Description: Following construction, the site will be vulnerable to alien plant invasion							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?			With appropriate mitigation the impact can be ameliorated				
Will impact cause irreplaceable loss or resources?			With mitigation there would no loss of resources				
Can impact be avoided, managed or mitigated?			With appropriate control measures, alien plants can be controlled and reduced to very low impact				

Mitigation measures to reduce residual risk or enhance opportunities:

1) Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
2) Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled.
3) Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.

4) Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Residual Impact	With mitigation there would be little to no residual impact.

Impact 6. *Impact on Critical Biodiversity Areas and Broad-Scale Ecological Processes*

The majority of the power line route lies within Critical Biodiversity Areas. Development in such as is not encouraged as it can negatively impact the biodiversity value and ecological functioning of these areas. The CBAs in the area are however designed to maintain climate resilience and not for biodiversity pattern protection. In addition, the footprint of the power line is not sufficient to compromise the ecological functioning or biodiversity value of the affected CBAs. With mitigation, this impact is likely to be of low significance.

Impact Phase: Operation							
Impact Description: Cumulative impact on CBAs and broad scale ecological processes							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?		The impact would last for the lifetime of the development					
Will impact cause irreplaceable loss or resources?		Unlikely					
Can impact be avoided, managed or mitigated?		To a large extent, but some residual impact would persist for the lifetime of the infrastructure.					
Mitigation measures to reduce residual risk or enhance opportunities: 1) Minimise the development footprint, especially within the high sensitivity areas. 3) Specific avoidance and mitigation may be required to reduce the impact on certain habitats of limited extent and high ecological or conservation significance as may be informed by the preconstruction walk-through of the power line route and associated infrastructure.							
Residual Impact		Some of the impact results from the presence of the infrastructure and would therefore persist for as long as it was present.					

Decommissioning Phase Impacts

Impact 7. *Faunal impacts due to decommissioning phase activities*

The impacts on fauna at decommissioning would be similar to those at construction, but of a lower severity as the activity will be taking place within the development footprint. The increased levels of noise, pollution, disturbance and human presence during decommissioning will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during this period as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the decommissioning activities and might be killed. Vehicular traffic would be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the decommissioning phase as a result of the large number of personnel that are likely to be present. This would however be a transient impact which would ultimately result in an increase in available habitat for some fauna. After mitigation, faunal impacts due to decommissioning are likely to be of low significance.

Impact Phase: Decommissioning							
Impact Description: Faunal impacts due to decommissioning phase activities.							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Low**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?	The impact would be transient and persist for the decommissioning period only.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Most the impacts can be mitigated and those that cannot would be transient.						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities.							

2) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 3) All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 4) No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. 10) All above-ground infrastructure should be removed from the site.	
Residual Impacts	Decommissioning would in principle return the site to its former state, but in practice, some degradation of the development footprint can be anticipated, which would reduce its' long-term value as faunal habitat.

Impact 8. *Soil Erosion Risk*

The removal and clearing of the grid connection and substation infrastructure would create some soil disturbance which would leave these areas vulnerable to erosion, which if left unchecked could spread significantly. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk. Although this impact has a potentially high significance it can be well mitigated to low significance.

Impact Phase: Decommissioning							
Impact Description: Following decommissioning, the site will be highly vulnerable to soil erosion							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?			With appropriate mitigation the impact can be ameliorated				
Will impact cause irreplaceable loss or resources?			The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.				
Can impact be avoided,			With appropriate control measures, erosion risk can be well				

managed or mitigated?	mitigated
Mitigation measures to reduce residual risk or enhance opportunities: 1) Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 2) There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. 3) All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 4) All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.	
Residual Impact	With mitigation, there would be little residual impact.

Impact 9. *Alien Plant Invasion following decommissioning*

The disturbance associated with the decommissioning phase of the project will render the disturbed areas vulnerable to alien plant invasion. Some alien invasion is highly likely and regular alien clearing for several years after decommissioning is likely to be required. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion. With mitigation, this impact would be of low significance.

Impact Phase: Decommissioning							
Impact Description: Following decommissioning, the site will be vulnerable to alien plant invasion							
Option 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 2							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Option 3							
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?			With appropriate mitigation the impact can be ameliorated				
Will impact cause irreplaceable loss or resources?			With mitigation there would no loss of resources				
Can impact be avoided, managed or mitigated?			With appropriate control measures, alien plants can be controlled and reduced to very low impact				

Mitigation measures to reduce residual risk or enhance opportunities: 1) Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. 2) Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. 3) Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem at the site. 5) Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Residual Impact	With mitigation there would be little to no residual impact.

4.4 CUMULATIVE IMPACTS

The cumulative impacts of the development are assessed below. This is assessed in terms of the entire project and is not divided into the wind farm and power line as they are contingent on one another and neither would be built without the other. As such the assessment considers the footprint and associated impacts of both the power line and wind energy facility.

Impact 1. *Cumulative Impacts on Habitat Loss and Reduced Ability to Meet Conservation Targets*

Apart from the current development, there is the existing Noupoort Wind Farm as well as several other proposed wind and solar energy developments in the broader area. Although each may generate an acceptable, low impact when considered alone, this does account for the potential for cumulative impacts to generate significant impacts on fauna and flora as well as future conservation-use options for the area. Although the affected vegetation types are not listed ecosystems, the wind farm developments are focused largely on the high-lying ground, with the result that potential cumulative impacts on these habitats are higher than when considered at the vegetation type level. Although the wind farm is not within a Northern Cape Protected Area Expansion Strategy focus area, that part of the power line outside the wind farm project boundary lies within a focus area. This is however not likely to be significant, given the low total footprint of this section of power line and proximity to existing grid infrastructure. With mitigation, this impact is likely to be low. With mitigation, this impact is likely to be of medium significance.

Impact Phase: Cumulative Impact
Impact Description: Contribution of the current development to cumulative impacts on habitat loss and future ability to meet conservation targets.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**M**	**High**
Can the impact be reversed?	The impact would persist for as long the various developments were present						
Will impact cause irreplaceable loss or resources?	Potentially if projects do not implement appropriate mitigation and avoidance.						
Can impact be avoided, managed or mitigated?	To some extent, but some of the impact would result from the presence of the facilities themselves which cannot be avoided.						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Minimise the development footprint, especially within the high sensitivity areas as far as possible. 2) There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.							
Residual Impact	Some of the impact results from the presence of the facility and would therefore persist for as long as it was operational.						

5 ASSESSMENT OF ALTERNATIVES

Although no wind farm layout alternatives are considered here, the final layout was arrived at through an iterative approach based on earlier sensitivity maps provided to the developer. As such, the final layout assessed here is considered to be a mitigated layout that reduces impacts compared to earlier layouts provided in the Scoping Phase. In terms of the power line alternatives, these are considered below.

There are three power line route alternatives considered in the current assessment. Alternative 1 is considered the preferred alternative as it traverses the least extent of sensitive habitat. Both the Preferred Alternative and Alternative 2 traverse additional hills that are not traversed by Alternative 1 and as such would be likely to generate greater impact on fauna and flora as well as increased erosion risk. As such Alternative 1 is identified as the preferred alternative. This is not apparent from the assessment as the significance scale is very coarse and moderate differences across a relatively short section of the route do not shift the assessed significance to a higher overall level.

Alternative	**Preference**	**Reasons (incl. potential issues)**
Power Line ALTERNATIVES		
Alternative 1	Preferred	This power line alternative traverses the least extent of sensitive habitat. The majority of the route is across flat plains of Eastern Lower Karoo and is likely to generate the lowest

Alternative	Preference	Reasons (incl. potential issues)
		overall impact on fauna and flora.
Preferred Alternative	Not preferred	Although the sensitivity of the majority of the route is similar to the other options, the route traverses a large ridge that would be likely to require significant transformation for access and also increase the likelihood of erosion.
Alternative 2	Not preferred	Although the sensitivity of the majority of the route is similar to the other options, the route traverses a large ridge that would be likely to require significant transformation for access and also increase the likelihood of erosion.

6 CONCLUSIONS & RECOMMENDATIONS

The Phezukomoya Wind Farm site consists largely of mountainous terrain, with karroid plains interrupted by mesas and buttes, which are relatively flat-topped, but with steep sides. The low-lying plains of the site consist of Eastern Upper Karoo which is a widespread vegetation type of low overall sensitivity. The slopes of the hills and mountains have been mapped as either Besemkaree Koppies Shrubland or Tarkastad Montane Shrubland, but the site visit revealed that this was a false dichotomy in the study area and there were no significant differences in vegetation composition between different areas classified as either of these types. These slopes are however considered generally of moderate to high sensitivity on account of their high biodiversity value for fauna and flora as well as their vulnerability to disturbance and consequent erosion. The plateau areas consist of Karoo Escarpment Grassland, which is considered to be generally of moderate sensitivity. All of the affected vegetation types are still overwhelmingly intact and have not been significantly affected by transformation to date.

The fauna of the area is considered to be composed of widespread species, with very few species of conservation concern likely to be present in the area. The most important areas for fauna at the site are the drainage systems and well-vegetated slopes which are largely outside of the development footprint and would not be significantly affected. The major impact on fauna would be habitat loss associated largely with the high-elevation plateau habitat of the site. As there are no species of high conservation concern prevalent in the area, impacts on terrestrial fauna are likely to be relatively low and of local significance only.

A significant portion of the eastern section of the Phezukomoya WEF is located within a Tier 1 CBA, while part of the western development area is located within a Tier 2 CBA. This raises the potential for significant negative impact on the CBAs and associated biodiversity

due to the development. The primary drivers for the CBAs in the area is related to the maintenance of ecosystem processes and not to protect biodiversity pattern as the area does not have any features of known high significance in this regard. This is of significance as the development footprint is approximately 150ha and this is a small proportion of the affected CBAs and with the appropriate mitigation is not likely to significantly disrupt or alter the ability of the landscape to provide ecosystem services or provide gradients and corridors for flora and faunal movement and dispersal. Consequently, in the current context, development of the wind farm partly within a CBA is not seen as a critical flaw associated with the project and impacts on the affected CBAs would be of a local nature only. In addition, it is worth noting that some significant differences in vegetation condition between properties was observed at the site and this kind of pervasive management-related change would have a much greater impact on biodiversity than the development of the wind farm is likely to have.

In terms of cumulative impacts, there is not currently a lot of development and transformation in the area, although there are several other wind farms and solar developments that have been approved in the area. At a vegetation-type level, both Besemkaree Koppies Shrubland and Karoo Escarpment Grassland are more than 97% intact and the current developments would not significantly impact their remaining extent. The concern in terms of cumulative impact is therefore at a more local level, with four wind farms all in close proximity to one another around Noupoort. Although the abundance of sensitive species and features within these facilities is low, there is some potential to disrupt broad-scale ecological processes as the projects tend to lie along a higher-lying mountain system where cumulative impacts are more likely due to the more restricted nature of the affected habitat. However, even if all projects in the area are constructed, the total direct footprint would be less than 300ha and is not likely to generate significant cumulative impact given the widespread nature of the habitat and affected species.

Overall, after mitigation the majority of impacts associated with the development of the Phezukomoya Wind Energy Facility can be reduced to a low level, with some impacts likely to remain at moderate levels of local impact. No fatal flaws or highly significant impacts are likely to be associated with the project. As such, there are no visible reasons to oppose the development of the Phezukomoya Wind Farm from a terrestrial ecology perspective.

The Phezukomoya Grid Connection and associated infrastructure is likely to generate low impacts on fauna and flora after mitigation. No high impacts that cannot be avoided were observed and from a flora and terrestrial fauna perspective, there are no reasons to oppose the development of the grid connection and associated infrastructure.

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8 APPENDIX 1. LISTED PLANT SPECIES

List of protected plant species of conservation concern which are known to occur in the broad vicinity of the Phezukomoya Wind Farm. The list is derived from the POSA and SANBI SIBIS databases as at April 2016 for grid squares 3124B, 3125A. Species in bold are that can be confirmed present at the site.

Family	Species	IUCN Status
Mesembryanthemaceae	***Chasmatophyllum maninum***	**DDD**
Mesembryanthemaceae	*Drosanthemum subplanum*	DDT
Mesembryanthemaceae	*Nananthus vittatus*	DDT
Santalaceae	*Thesium glomeratum*	DDT
Amaryllidaceae	***Boophone disticha***	**Declining**
Asteraceae	*Cineraria lobata subsp. lobata*	Declining
Geraniaceae	*Pelargonium sidoides*	Declining
Gunneraceae	*Gunnera perpensa*	Declining
Hyacinthaceae	***Drimia altissima***	**Declining**
Asteraceae	*Gnaphalium declinatum*	NT
Asteraceae	*Eriocephalus grandiflorus*	Rare
Portulacaceae	***Anacampseros subnuda subsp. lubbersii***	**VU**
Asphodelaceae	*Aloe longistyla*	DDD

9 APPENDIX 2. LIST OF MAMMALS

List of Mammals which potentially occur at the Phezukomoya Wind Farm site for grid squares 3124, 3125. Taxonomy and habitat notes are derived from Skinner & Chimimba (2005), while conservation status is according to the IUCN 2015.

Scientific Name	Common Name	Status	Habitat	Likelihood
Afrosoricida (Golden Moles):				
Chlorotalpa sclateri	Sclater's Golden Mole	LC	Montane grasslands, scrub and forested kloofs of the Nama Karoo and grassland biomes	High
Macroscledidea (Elephant Shrews):				
Elephantulus myurus	Eastern Rock Elephant Shrew	LC	Confined to rocky koppies and piles of boulders	High
Elephantulus edwardii	Cape Elephant Shrew	LC	From rocky slopes, with or without vegetation, from hard sandy ground bearing little vegetation, quite small rocky outcrops	High
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	High
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	High
Lagomorpha (Hares and Rabbits):				
Pronolagus rupestris	Smith's Red Rock Hare	LR/LC	Confined to areas of krantzes, rocky hillsides, boulder-strewn koppies and rocky ravines	High
Lepus saxatilis	Scrub Hare	LR/LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	High
Aethomys ineptus	Tete Veld Aethomys	LC	Little known, presumably grassland with some scrub cover or woodland	Low
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	High
Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High

Micaelamys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	High
Mastomys coucha	Southern African Mastomys	LC	Wide habitat tolerance.	High
Otomys unisulcatus	Bush Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	High
Otomys irroratus	Southern African Vlei Rat	LC	Abundant in habitats associated with damp soil in vleis or along streams and rivers.	Low
Saccostomus campestris	Southern African Pouched Mouse	LC	Catholic habitat requirements, commoner in areas where there is a sandy substrate.	High
Mystromys albicaudatus	African White-tailed Rat	EN	Variable vegetation, but live in cracks or burrows in the soil	Medium-low
Pedetes capensis	South African Spring Hare	LC	Occur widely on open sandy ground or sandy scrub, on overgrazed grassland, on the fringes of vleis and dry river beds.	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	High
Rhabdomys pumilio	Xeric Four-striped Grass Rat	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Mastomys natalensis	Natal Mastomys	LC	Wide habitat tolerance within areas receiving more than 400mm rainfall	Medium
Primates:				
Papio hamadryas	Chacma Baboon	LR/LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	High

Cercopithecus pygerythrus pygerythrus	Vervet Monkey	LC	Most abundant in and near riparian vegetation of savannahs	High
Eulipotyphla (Shrews & Hedgehogs):				
Myosorex varius	Forest Shrew	LC	Prefers moist, densely vegetated habitat	High
Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Atelerix frontalis	South African Hedgehog	LC	Generally found in semi-arid and subtemperate environments with ample ground cover	Medium
Crocidura flavescens	Greater Red Musk Shrew	DD	Wide habitat tolerance	High
Suncus infinitesimus	Least Dwarf Shrew	DD	Broad habitat tolerance and occurs in forest, montane grassland, savanna and mixed bushveld	Low
Chiroptera (Bats):				
Tadarida aegyptia	Egyptian Free-tailed Bat	LC	In arid areas. often associated with water sources	Low
Neoromicia capensis	Cape Serotine	LC	Wide habitat tolerances, but often found near open water	High
Carnivora:				
Proteles cristatus	Aardwolf	LR/LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LR/LC	Occur in open arid associations	High
Cynictis penicillata	Yellow Mongoose	LR/LC	Semi-arid country on a sandy substrate	High
Atilax paludinosus	Marsh Mongoose	LC	Associated with well-watered terrain, living in close association with rivers, streams, marshes, etc.	Medium
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	High

Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	High
Aonyx capensis	Cape Clawless Otter	LC	Predominantly aquatic and do not occur far from permanent water	Medium
Poecilogale albinucha	African Striped Weasel	DD	Widely distributed throughout the sub-region	High
Rumanantia (Antelope):				
Sylvicapra grimmia	Common Duiker	LR/LC	Presence of bushes is essential	High
Pelea capreolus	Grey Rhebok	LC	Associated with rocky hills, rocky mountainsides, mountain plateaux with good grass cover.	High
Redunca fulvorufula	Mountain Rhebok	LC	Dry grass-covered stony slopes hills and mountains.	Medium
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	High
Raphicerus campestris	Steenbok	LR/LC	Inhabits open country,	High
Tragelaphus strepsice	Greater Kudu	LC	Broken, rocky terrain with a cover of woodland and a nearby water supply.	High

10 APPENDIX 3. LIST OF REPTILES.

List of reptiles which are known from the broad area around the Phezukomoya Wind Farm site, according to the SARCA database, derived for the degree squares 3124 and 3125. Status is according to Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern	20
Chamaeleonidae	*Bradypodion*	*ventrale*		Eastern Cape Dwarf Chameleon	Least Concern	1
Colubridae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	6
Colubridae	*Duberria*	*lutrix*	*lutrix*	South African Slug-eater	Least Concern	3
Colubridae	*Lycodonomorphus*	*rufulus*		Brown Water Snake	Least Concern	1
Colubridae	*Lycophidion*	*capense*	*capense*	Cape Wolf Snake	Least Concern	1
Colubridae	*Lamprophis*	*guttatus*		Spotted House Snake	Least Concern	1
Colubridae	*Psammophis*	*crucifer*		Cross-marked Grass Snake	Least Concern	4
Colubridae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern	4
Colubridae	*Psammophylax*	*rhombeatus*	*rhombeatus*	Spotted Grass Snake	Least Concern	4
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern	2
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	6
Colubridae	*Dispholidus*	*typus*	*typus*	Boomslang	Least Concern	3
Cordylidae	*Karusasaurus*	*polyzonus*		Karoo Girdled Lizard	Least Concern	13
Cordylidae	*Cordylus*	*cordylus*		Cape Girdled Lizard	Least Concern	11
Cordylidae	*Cordylus*	*vittifer*		Common Girdled Lizard	Least Concern	1
Cordylidae	*Pseudocordylus*	*microlepidotus*	*fasciatus*	Karoo Crag Lizard	Least Concern	4
Cordylidae	*Pseudocordylus*	*microlepidotus*		Cape Crag Lizard	Not Listed	3
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not listed	1
Elapidae	*Naja*	*nivea*		Cape Cobra	Least Concern	5
Gekkonidae	*Chondrodactylus*	*bibronii*		Bibron's Gecko	Least Concern	1
Gekkonidae	*Afroedura*	*karroica*		Karoo Flat Gecko	Least Concern	19
Gekkonidae	*Pachydactylus*	*maculatus*		Spotted Gecko	Least Concern	3
Gekkonidae	*Pachydactylus*	*mariquensis*		Marico Gecko	Least Concern	4
Gekkonidae	*Pachydactylus*	*oculatus*		Golden Spotted Gecko	Least Concern	10
Gerrhosauridae	*Tetradactylus*	*tetradactylus*		Cape Long-tailed Seps	Least Concern	2
Lacertidae	*Pedioplanis*	*burchelli*		Burchell's Sand Lizard	Least Concern	4
Lacertidae	*Pedioplanis*	*lineoocellata*	*pulchella*	Common Sand Lizard	Least Concern	9
Lacertidae	*Pedioplanis*	*namaquensis*		Namaqua Sand Lizard	Least Concern	6
Scincidae	*Trachylepis*	*sulcata*	*sulcata*	Western Rock Skink	Least Concern	21
Scincidae	*Acontias*	*breviceps*		Short-headed Legless Skink	Least Concern	2
Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern	14

Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern	1
Scincidae	*Trachylepis*	*homalocephala*		Red-sided Skink	Least Concern	1
Testudinidae	*Homopus*	*femoralis*		Greater Padloper	Least Concern	8
Testudinidae	*Stigmochelys*	*pardalis*		Leopard Tortoise	Least Concern	7
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern	1
Varanidae	*Varanus*	*albigularis*	*albigularis*	Rock Monitor	Least Concern	6
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	3

11 APPENDIX 4. LIST OF AMPHIBIANS

List of amphibians which potentially occur at the Phezukomoya Wind Farm from the half degree squares 3124B and 3125A. Taxonomy and habitat notes are from du Preez and Carruthers (2009) and conservation status from the Minter et al. (2004).

Scientific Name	Common Name	Status	Habitat	Distribution	Likelihood
Amietophrynus rangeri	Raucous Toad	Not Threatened	Rivers and stream in grassland and fynbos	Endemic	High
Vandijkophrynus gariepensis	Karoo Toad	Not Threatened	Karoo Scrub	Widespread	High
Poyntonophrynus vertebralis	Southern Pygmy Toad	Least Concern	Nama karroo shrubland, grassland, dry savannah and pastureland. Breeds in temporary shallow pans, pools or depressions containing rainwater, quarries, and rock pools along rivers.	Endemic	High
Kassina senegalensis	Bubbling Kassina	Least Concern	Grassland around vleis and pans	Widespread	High
Xenopus laevis	Common Platanna	Not Threatened	Any more or less permanent water	Widespread	High
Cacosternum boettgeri	Common Caco	Not Threatened	Marshy areas, vleis and shallow pans	Widespread	High
Amietia fuscigula	Cape River Frog	Not Threatened	Large still bodies of water or permanent streams and rivers.	Widespread	Confirmed
Pyxicephalus adspersus	Giant Bull Frog	Near Threatened	Breed in shallow margins of rain-filled depressions.	Widespread	Low
Tomopterna tandyi	Tandy's Sand Frog	Not Threatened	Nama karoo grassland and savanna.	Widespread	High