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

FAUNA & FLORA SPECIALIST BASIC ASSESSMENT

PRODUCED FOR ARCUS

BY

3Foxes Biodiversity Solutions

Simon.Todd@3foxes.co.za

August 2018

CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

The Highlands Wind Farm site consists of a large ridge system which grades gently to the east and more sharply to the west. The western valleys and slopes are dominated by Camdebo Escarpment thicket and are considered generally sensitive and unsuitable for development. The plateau and eastern slopes and low hills consist of Bedford Dry Grassland and are generally considered less sensitive than the western slopes. The footprint is largely restricted to the lower-lying eastern slopes and gentle hills of the site which are considered generally suitable for development. The abundance of plant species of conservation concern in these areas is low and no species of high conservation concern were observed within the development footprint. A variety of mammals of conservation concern are known from the broader area including Vaal Rhebok (NT), South African Hedgehog (NT), Black-footed cat (VU), Serval (NT), Brown Hyena (NT) and African Striped Weasel (NT). Although this is a potential concern, it is not likely that the affected areas are of high significance for these species and long-term impacts on listed fauna are likely to be low.

The majority of the Highlands North and approximately half of the Highlands Central are within a tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. Although the development would result in some habitat loss within the CBA within the Highlands North and Highlands Central WEF, this is not likely to compromise the overall functioning of the CBA as it is very large and the development occupies a very small proportion of the CBA. The Highlands South development has only 1 turbine within the CBA and this is not likely to generate significant impact on the CBA. The majority of the development footprint from all three Highlands Wind Farm applications lies within a NPAES focus area. The development lies on the margin of the NPAES focus area and the extent of the development would not significantly impact ability to meet conservation targets elsewhere within the focus area which is large in comparison with the development site. As there are no other renewable energy developments in the immediate vicinity of the site, cumulative impacts within 30km of the site are still very low. In the wider area there are several existing wind farms, but these are on different ridge systems and the overall extent of cumulative impact in the area remains low.

Impact Statement

Although there are extensive areas of sensitive habitat within the wider Highlands site, the development footprint is restricted to the medium and low sensitivity parts of the site. These areas are considered suitable for development and there are no impacts associated with the Highlands WEF that cannot be mitigated to a low level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding.

Based on the layouts provided for the assessment, the Highlands North, Central and South WEFs can be supported from a terrestrial ecology point of view.

The Highlands North, Central and South WEF Grid Connections with associated infrastructure are likely to generate low significance impacts on fauna and flora after mitigation. No high impacts that cannot be avoided were observed and therefore from a flora and terrestrial fauna perspective, there are no reasons to oppose the development of the grid connections 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;	P9-10
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 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	Section 6

ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr 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

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Highlands Wind Energy Facilities and associated infrastructure including grid connection infrastructure

Specialist:	3Foxes Biodiversity Solutions		
Contact person:	Simon Todd		
Postal address:	60 Forrest Way, Glencairn		
Postal code:	7975	Cell:	0823326502
Telephone:	0217820377	Fax:	
E-mail:	simon.todd@3foxes.co.za		
Professional affiliation(s) (if any)	SACNASP (400425/11)		

Project Consultant:	Arcus Consultancy Services South Africa (Pty) Ltd		
Contact person:	Anja Albertyn		
Postal address:	Office 220, Cube Workspace, Long Street cnr Hans Strijdom Avenue, Cape Town		
Postal code:	8001	Cell:	0762658933
Telephone:	0214121529	Fax:	
E-mail:	highlands@arcusconsulting.co.za		

SPECIALIST DECLARATION

I, ..Simon Todd..., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

-
- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: ____Simon Todd_____

Date: ____26 August 2018_____

SHORT CV/SUMMARY OF EXPERTISE – SIMON TODD

Simon Todd Pr.Sci.Nat
Director & Principle Scientist
C: 082 3326502
O: 021 782 0377
Simon.Todd@3foxes.co.za

60 Forrest Way
Glencairn
7975

Ecological Solutions for People & the Environment

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He has provided specialist ecological input on more than 200 different developments distributed widely across the country, but with a focus on the three Cape provinces. This includes input on the Wind and Solar SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman and current deputy chair of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

A selection of recent work is as follows:

Strategic Environmental Assessments

- Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.
- Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.
- Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.
- Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.
- Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

Recent Specialist Ecological Studies of other wind energy developments

- Phezukomoya Wind Energy Facility and associated grid connection. Fauna & Flora Specialist Impact Assessment Report. Arcus 2018.
- San Kraal Wind Energy Facility and associated grid connection. Fauna & Flora Specialist Impact Assessment Report. Arcus 2018.
- Kap Vlei Wind Farm. Fauna & Flora Specialist Assessment. CSIR 2018.
- Boulders Wind Farm. Fauna & Flora Specialist Study. Savannah Environmental 2018.
- Kokerboom 1-4 Wind Farms. Fauna & Flora specialist Assessment. Aurecon 2017.
- 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.

1 INTRODUCTION

WKN Windcurrent South Africa (Ltd) Pty ('WKN-WC') are proposing the Highlands Wind Energy Facility (WEF), and associated infrastructure including grid connection infrastructure, located near the town of Somerset East in the Eastern Cape Province. The proposed development site is situated within the Cookhouse REDZ and the affected land parcels cover an area of approximately 11 180 hectares. The area of interest for development within these land parcels is approximately 9000 hectares. Arcus has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial biodiversity impact assessment of the development as part of the required BA process.

As part of the above BA 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 Highlands 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 Assessment, 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

There are six components to the Proposed Development, representing three development phases:

1. Highlands North WEF: Phase 1;
2. Electrical Grid Connection and Associated Infrastructure for Highlands North WEF Phase 1;
3. Highlands Central WEF: Phase 2;
4. Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF Phase 2;
5. Highlands South WEF: Phase 3; and
6. Electrical Grid Connection and Associated Infrastructure for Highlands South WEF Phase 3.

The location of the six components within the Proposed Development Site are presented in Figure 2. It should be noted that this site boundary includes the total area within which all components of the Proposed Development may be developed. The footprint of the combined six development components will only occupy a small portion (approximately 2%) of the land within this boundary, and fall entirely within the REDZ.

Each WEF development phase will comprise of the following:

Highlands North WEF: Phase 1

The proposed Highlands North WEF will comprise of 17 turbines with a maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. One on-site substation location (Substation A) will form part of this application.

Highlands Central WEF: Phase 2

The proposed Highlands Central WEF will comprise of 14 wind turbines, with each turbine having an installed maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. One on-site substation location (Substation B) will form part of this application. An existing access road may require upgrading as part of this application.

Highlands South WEF: Phase 3

The proposed Highlands South WEF will comprise of 18 wind turbines, with each turbine having an installed maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. Two on-site substation locations (Substation C1 and C2) will form part of this application. An existing access road may require upgrading as part of this application.

It is important to note that while Environmental Authorisation will be sought for four substation locations, only a maximum of two substation locations will be used for the actual construction, to connect the two windfarms to the two Eskom transmission line tie-ins.

For all three phases turbines with a maximum height to blade tip of 200 m will be considered (a hub height of up to 135 m, and a rotor diameter of up to 150 m).

In addition to the Highlands WEF, WKN-WC also proposes obtaining Environmental Authorisation from the Department of Environmental Affairs (DEA) for Eskom Transmission and Eskom Distribution Grid Connection to connect the WEFs to the national grid. If Environmental Authorisation is granted, and the project receives preferred bidder status this will be entirely or partially transferred from the Project(s) to Eskom Holdings SOC Limited (Eskom) as applicable in advance of construction. The grid connection infrastructure will be routed from a start location within the WEF Site Boundary to the existing National Grid, which is also within the WEF site boundary (Figure 2).

Electrical Grid Connection and Associated Infrastructure for Highlands North WEF Phase 1:

The proposed Grid Connection will connect Substation A to the Eskom transmission line. Two route alternatives are proposed. The maximum length will be 5 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side). The line will either be a 66 kV line, or a 132 kV line.

Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF Phase 2:

The proposed Grid Connection will be a 132 kV line. It will connect Substation B to the Eskom transmission line. Two route alternatives are proposed. The maximum length will be 8 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side).

Electrical Grid Connection and Associated Infrastructure for Highlands South WEF Phase 3:

The proposed Grid Connection will connect Substation C1 and C2 to the Eskom transmission line. Two route alternatives are proposed. It will be either a 66 kV line, and /or a 132 kV line. The maximum length of the line will be 20 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side).

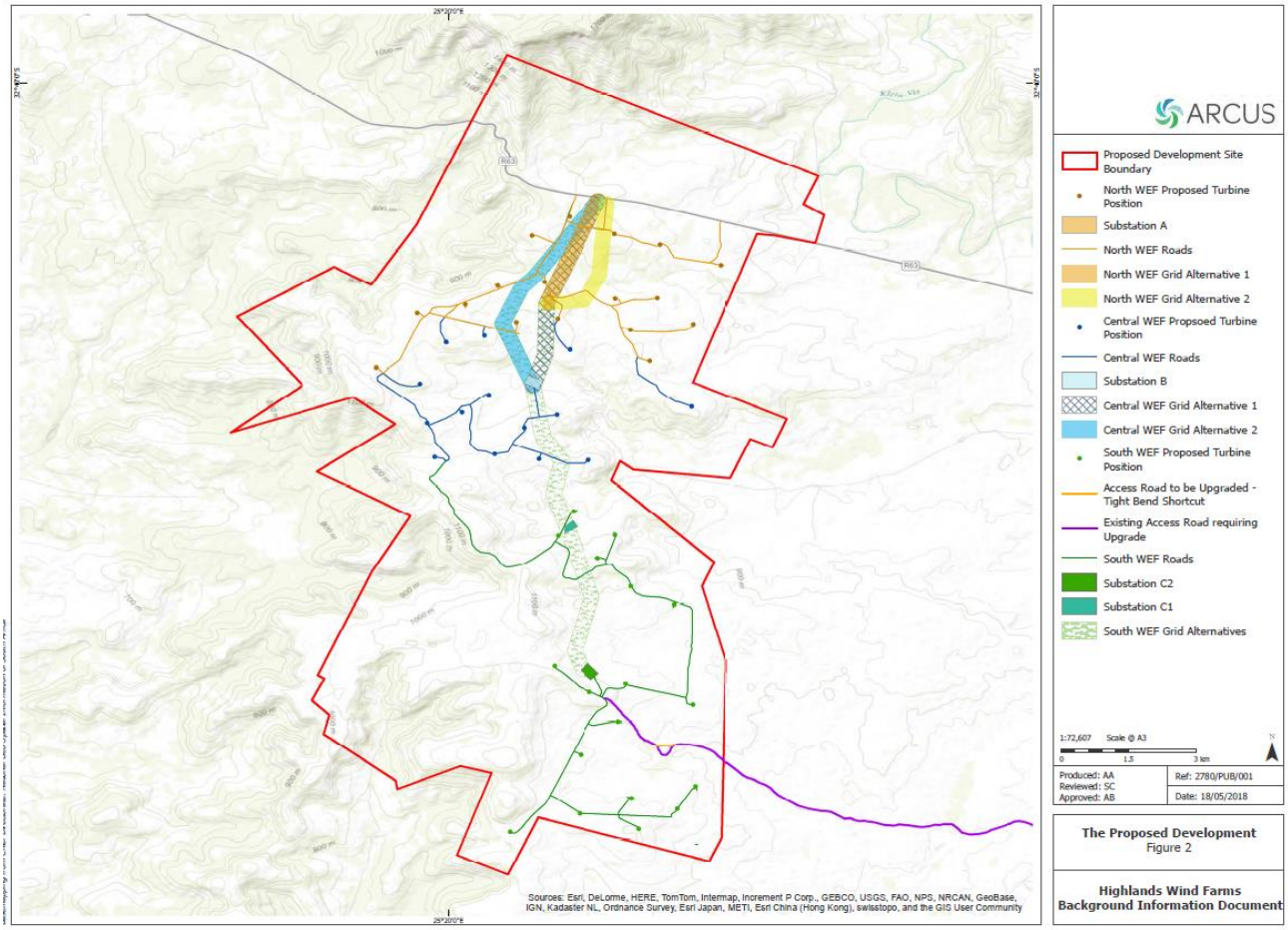

Figure 1. Layout of the proposed Highlands WEF, showing the three phases of the development.

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) 3225CB and 3225CD 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 Eastern Cape Conservation Plan, 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.

2.2 SITE VISITS & FIELD ASSESSMENT

The site was visited numerous times for the study. An initial site visit was conducted on the 9th and 10th of September 2017, with a follow-up study from 3-5 January 2018 and a final site visit to verify the features within the development footprint, from 27-29 June 2018. During the site visits, 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. 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 forest patches were noted in the field where present and recorded on a GPS. In order to obtain greater insight into the faunal community and use of the site, 12 camera traps were distributed across the site during the January 2018 site visit and retrieved in June 2018. The conditions at the time of the site visits varies from dry winter conditions through to wet summer conditions and were adequate for the field assessment and as a result there are

few limitations resulting from the site visit. The plant species lists obtained for the site are considered reliable and comprehensive.

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 extensive and detailed field assessments as well as a desktop study of the available information. As the site was sampled across several seasons and the vegetation was in a good condition for sampling during the summer 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.

The faunal component of the study is based on field observations of species and habitats as well as the results the camera trapping. This is supplemented with species records obtained from 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 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

There are three vegetation types within the study area (Figure 2). The lower lying valleys and low hills in the east consist of Camdebo Escarpment Thicket, while the higher lying areas and east-facing slopes consist of Bedford Dry Grassland and the major drainage systems are dominated by the Southern Karoo Riviere vegetation type. The majority of the development footprint is located within the Bedford Dry Grassland vegetation type. Each of these vegetation types is described more fully below and illustrated as they occur within the site, showing the range of habitats and compositional variation evident within the study area.

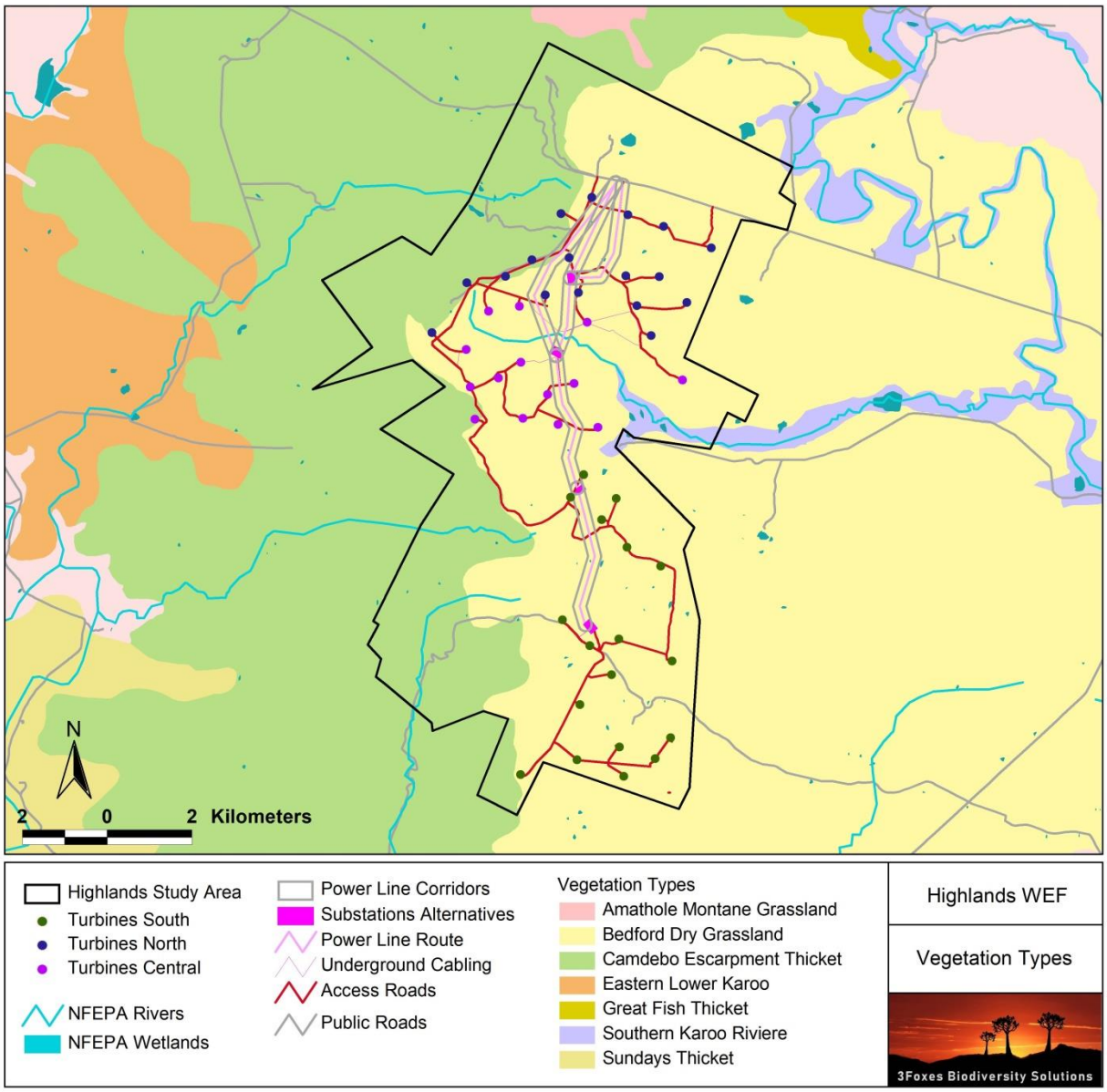

Figure 2. Vegetation map (Mucina and Rutherford 2006) of the Highlands Wind Farm and grid connection study area. The majority of the site falls within the Bedford Dry Grassland vegetation type.

Bedford Dry Grassland

Bedford Dry Grassland occurs in the Eastern Cape Province from south of the Winterberg Mountains from Bruintjieshoogte and Somerset East in the west to Bedford and Adelaide, and to Fort Beaufort in the east, but north of the Great Fish River Valley. It is associated with gently undulating plains supporting open dry grassland interspersed with *Acacia karoo* woodland vegetation. It also contains a dwarf shrubby component of karroid origin in the southern and southwestern parts of its range. It is classified as Least Threatened but is not

conserved within any national or provincial nature reserve and only about 1% occurs within private conservation areas, although this has been improved with the proclamation of the Mountain Zebra–Camdeboo Protected Environment. The majority of the development footprint at the Highlands WEF occurs within this vegetation type.

Within the site, the areas mapped as Bedford Dry Grassland are fairly typical of this vegetation unit based on the description provided by Mucina & Rutherford (2006). There are however some shifts in dominance between the low-lying foothills and the higher plateau areas of the site. In most areas, the transition with the adjacent Camdeboo Escarpment Thicket is fairly abrupt and corresponds with the edge of the escarpment in the west. There are however some areas especially in the north where there is a more gradual gradient from grassland to thicket that is mediated by an increasing density of *Acacia karoo* before more typical thicket elements become dominant. In addition, there are also numerous isolated thicket patches on slopes across the site, associated with rocky areas or cooler slopes with greater moisture availability.

Common and dominant species observed at the site within the areas of Bedford Dry Grassland include grasses such as *Themeda triandra*, *Digitaria eriantha*, *Eragrostis curvula*, *Cynodon dactylon*, *Aristida congesta*, *Eragrostis capensis*, *Tragus koelerioides*, *Aristida diffusa*, *Eragrostis obtusa*, *Sporobolus fimbriatus*, *Heteropogon contortus*, *Cymbopogon pospischilii*, *Melicia decumbens*, *Tenaxia disticha* and *Setaria sphacelata*. Common shrubs include *Selago saxatilis*, *Lycium cinereum*, *Pollichia campestris*, *Asparagus burchellii*, *Gymnosporia buxifolia*, *Lycium schizocalyx*, *Hermannia althaeifolia*, *Helichrysum dregeanum*, *Euryops anthemoides*, *Nenax microphylla*, *Chrysocoma ciliata*, *Melolobium candicans*, *Rosenia humilis*, *Felicia muricata, Asparagus striata*, *Felicia filifolia* and *Aspalathus spinosa* subsp. *spinosa*. A number of geophytes were present including *Moraea polystachya*, *Drimia altissima*, *Hypoxis villosa*, *Drimia anomala*, *Boophone disticha* and *Brunsvigia grandiflora*. Forbs are not very abundant due to the relatively high grass cover, but forbs present include *Pelargonium sidoides*, *Gazania krebsiana*, *Commelina africana*, *Hibiscus pusillus* and *Hermannia coccocarpa*. Succulents include *Aloe ferox*, *Aloe striata*, *Euphorbia stellata*, *Euphorbia aggregata* and *Euphorbia clavarioides*.

There are a numerous bush clumps and thicket patches embedded within the Bedford Dry Grassland in sheltered or fire-protected locations. Species present in the bush-clumps include *Acacia karoo*, *Mystroxylon aethiopicum*, *Asparagus aethiopicus*, *Euclea undulata*, *Putterlickia pyracantha*, *Olea europaea* subsp. *cuspidata*, *Diospyros whyteana*, *Buddleja saligna*, *Grewia occidentalis* var. *occidentalis*, *Cussonia spicata*, *Azima tetracantha*, *Searsia longispina* and *Searsia pyroides* var. *pyroides* and the alien *Opuntia ficus-indica*.

Figure 3. Looking east over the lower hills within the Highlands East area, showing the open grassy plains typical of the Bedford Dry Grassland vegetation type that are the main target for development within the Highlands East site.

Figure 4. Looking north from the central part of the Highlands site, showing the grassy hills with scattered *Acacia karoo* and *Opuntia ficus-indica*.

Figure 5. Looking south within the Highlands North area, showing the Bedford Dry Grassland vegetation type with numerous termite mounds and open stands of *Acacia karoo* along drainage lines, with occasional *Opuntia ficus-indica* and *Aloe ferox* on the plains.

Camdebo Escarpment Thicket

Camdebo Escarpment Thicket occurs in the Eastern Cape Province on south-sloping faces of the Great Escarpment, forming an arc from Bruintjieshoogte in the east via the Coetzeeberg Mountains and Graaff-Reinet to Kamdebooberg and Aberdeen in the west. It is associated with rugged, broken and steeply sloping escarpment and mountain slopes of the region where it forms a 2–3 m tall, largely succulent thicket of *Portulacaria afra*-dominated clumps. It is classified as Least Threatened and about 5% is currently conserved within the Karoo Nature Reserve and a further 15% in private conservation areas. Although very little of Camdebo Escarpment Thicket has been transformed through cultivation, it is vulnerable to degradation through grazing by domestic goats which removes the dominant *Portulacaria afra* component.

Within the site, the thicket is restricted to the valleys and steep slopes along the western escarpment of the site. These areas are generally too steep for development, but are also considered more sensitive than the adjacent plateau areas and not considered suitable for development. Although there are some areas of degraded thicket, the majority of thicket areas are still reasonably intact. Although the vegetation map indicates that some parts of the site are marginally within the Camdebo Escarpment Thicket, the field assessment indicates that these are at best transitional areas and usually consist of grassy shrubland

with scattered *Acacia karoo* trees. There are no parts of the development within well-developed thicket areas dominated by typical thicket species.

The thicket is dominated by woody shrubs, trees and various succulent shrubs and trees. Common and dominant species include *Portulacaria afra, Crassula ovata, Olea europaea* subsp. *cuspidata, Euphorbia mauritanica, Grewia robusta, Aloe ferox, Acacia karroo, Pappea capensis, Boscia oleoides, Cussonia spicata, Maytenus undata, Searsia longispina*, *Schotia afra var. afra, Euclea undulata, Cotyledon campanulata, Cotyledon velutina, Gymnosporia polyacantha, Gymnosporia capitata, Carissa bispinosa* subsp. *bispinosa, Ehretia rigida, Rhigozum obovatum, Asparagus burchellii, Lantana rugosa, Heteropogon contortus, Lycium oxycarpum, Pachypodium bispinosum, Sarcostemma viminale, Rhoicissus digitata, Cynodon incompletus, Enneapogon scoparius, Pollichia campestris, Panicum maximum, Drimia anomala, Crassula sarcocaulis, Crassula rupestris*, *Encephalartos cycadifolius* and *Euphorbia tetragona*.

Figure 6. The valleys and slopes on the western edge of the escarpment consist of Camdebo Escarpment Thicket. Most of these areas are steep and not considered suitable for development.

Figure 7. Typical intact thicket community dominated by *Aloe ferox, Portulacaria afra*, *Crassula ovata, Cussonia spicata* and *Schotia afra*.

Southern Karoo Riviere

The Southern Karoo Riviere vegetation type is associated with the rivers of the central karoo such as the Buffels, Bloed, Dwyka, Gamka, Sout, Kariega and Sundays Rivers. About 12% has been transformed as a result of intensive agriculture and the construction of dams. Although it is classified as Least Threatened, rivers are ecologically important landscape features and should be considered sensitive. Although there are a few roads which traverse drainage lines, these are mostly at existing crossings and the additional habitat loss within the drainage areas would be low. As a result, impact to this habitat would be low.

The majority of drainage lines within the site are relatively small and not well developed, although there are some larger systems with riparian vegetation and a well-developed tree layer. Within the site, dominant and typical species within the drainage lines includes *Acacia karoo*, *Olea europea* subsp. *cuspidata*, *Searsia lancea*, *Diospyros lycioides*, Searsia pyroides, *Mesembryanthemum articulatum*, *Atriplex vestita*, *Salsola aphylla*, *Lycium cinereum*, *Drosanthemum lique Aridaria noctiflora* subsp *straminea*, *Cynodon incompletus*, *Cenchrus ciliata*, *Cyperus marginatus*, *Panicum coloratum*, *Pennisetum sphacelatum* and *Paspalum distichum*.

Figure 8. Typical Karoo Escarpment Grassland on the eastern plateau area of the Highlands site. These areas are generally fairly flat and homogenous and dominated by grasses with more shrubby areas dominated by *Searia erosa*.

Figure 9. There are earth dams on many of the smaller drainage lines of the site. These were observed to be important breeding sites for various amphibians, but also attracted a variety of other mammals and reptiles.

3.2 FAUNAL COMMUNITIES

Mammals

Approximately 50 mammal species potentially occur at the site (Appendix 2). Due to the diversity of habitats available, which includes rocky uplands and ridges, drainage lines and 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. Species that were observed at the site either directly or with the camera traps include Kudu, Duiker, Steenbok, Mountain Reedbuck, Springbok, Fallow Deer, Black-backed Jackal, Caracal, Bat-eared Fox, Cape Fox, Aardwolf, Aardvark, Warthog, Bushpig, Cape Genet, South African Ground Squirrel, Suricate, Yellow Mongoose, Cape Grey Mongoose, Rock Hyrax, Scrub Hare, Cape Porcupine, Chacma Baboon and Vervet Monkey. Important habitats for mammals at the site include the drainage lines, thicket valleys in the west of the site, forest patches in the north and rocky outcrops along the mountain escarpment.

Listed species which have been recorded in the broad area include Vaal Rhebok *Pelea capreolus* (NT), South African Hedgehog *Atelerix frontalis* (NT), Black-footed Cat *Felis nigripes* (VU), Serval *Leptailurus serval* (NT), Brown Hyena *Hyaena brunnea* (NT) and African Striped Weasel *Poecilogale albinucha* (NT). It is highly likely that some of these species are present on the site as the habitat is suitable for most of these species except the Serval which prefers longer grass and greater vegetation cover than is present on the site. The extent of habitat loss resulting from the development is relatively low and localized and given the wide distribution of the above species, this is not likely to result in significant habitat loss for these species. In addition some of the above species such as Hedgehog and Striped Weasel prefer areas with higher vegetation cover and are likely to be using parts of the site that would be little affected by the development. Of the above species, the Vaal Rhebok is probably the most vulnerable to the development given the large degree of overlap between the habitat of the Rhebok and the wind farm target areas. However, most antelope appear to become habituated to wind turbines and it is likely that any resident individuals would become accustomed to the presence and noise generated by the turbines.

Figure 10. Most antelope appear to quickly become habituated to turbines and can sometimes be seen resting up in the shade of turbines.

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. Long-term impacts on mammals are likely to be of moderate to low intensity 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 4 tortoise species, 12 snakes, 16 lizard species and skinks, 1 chameleon, 1 terrapin and 4 gecko species. Species observed at the site include Rock Monitor, Red-lipped Snake, Western Rock Skink, Red-sided Skink, Leopard Tortoise, Ground Agama and Rock Agama (Figure 11).

Important habitats for reptiles at the site include the rocky outcrops along the edge of the escarpment, densely vegetated drainage lines and thicket patches. As these features are

largely outside of the development footprint, impact on important reptiles habitats would be low. 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 target ridges and which would be particularly vulnerable to impact as a result.

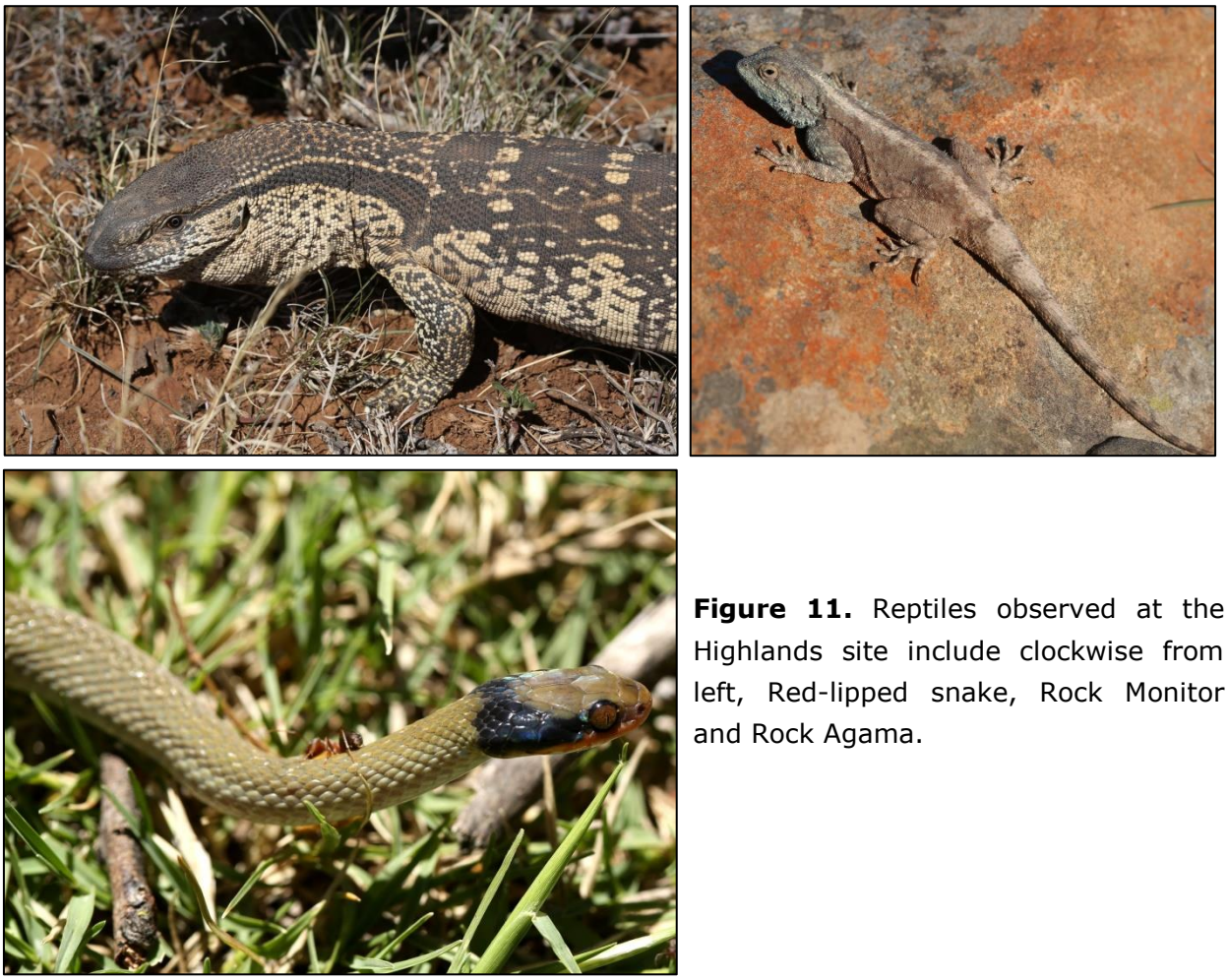

Figure 11. Reptiles observed at the Highlands site include clockwise from left, Red-lipped snake, Rock Monitor and Rock Agama.

Amphibians

Although there are no perennial rivers within the site, there are numerous earth dams that hold water on a near-perennial basis as well as sheltered pools along some of the drainage lines that are likely used by the amphibians for breeding purposes. Species likely to be present at the site include Karoo Toad, Bubbling Kassina, Cape River Frog, Tandy's Sand Frog and Common Caco. No listed species or species with a restricted distribution are known from the area. As the drainage lines and farm dams would not be directly impacted by the development, impact on important amphibian habitats would be relatively low. The

higher-lying target ridges 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.

Figure 12. The Common Caco was observed to be common at the site and was breeding in most of the farm dams on the site.

3.3 Critical Biodiversity Areas & Broad Scale Ecological Processes

A large proportion of the Highlands WEF is located within a Tier 2 CBA, especially within the central and northern part of the site. The CBA 2 status of the area indicates that the CBA which includes the site 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 (i.e. rare habitats or an abundance of localized or endangered species). The underlying information associated with the CBA indicates that the CBA which includes the study area is designed as part of a corridor to maintain broad-scale ecological connectivity. Given the large scale of the CBA and the relatively small proportion of the

CBA that falls within the development footprint, it is not likely that the development would compromise the overall functioning of the CBA as an ecological corridor.

Apart from the CBA 2 status of parts of the site, it also falls partly within a NPAES Focus Area, indicating that the area has been identified as a potential target for protected area expansion. The affected Camdebo Escarpment Focus area is over 421 000ha in extent and the loss of less than 10 000ha from this focus area is not considered highly significant.

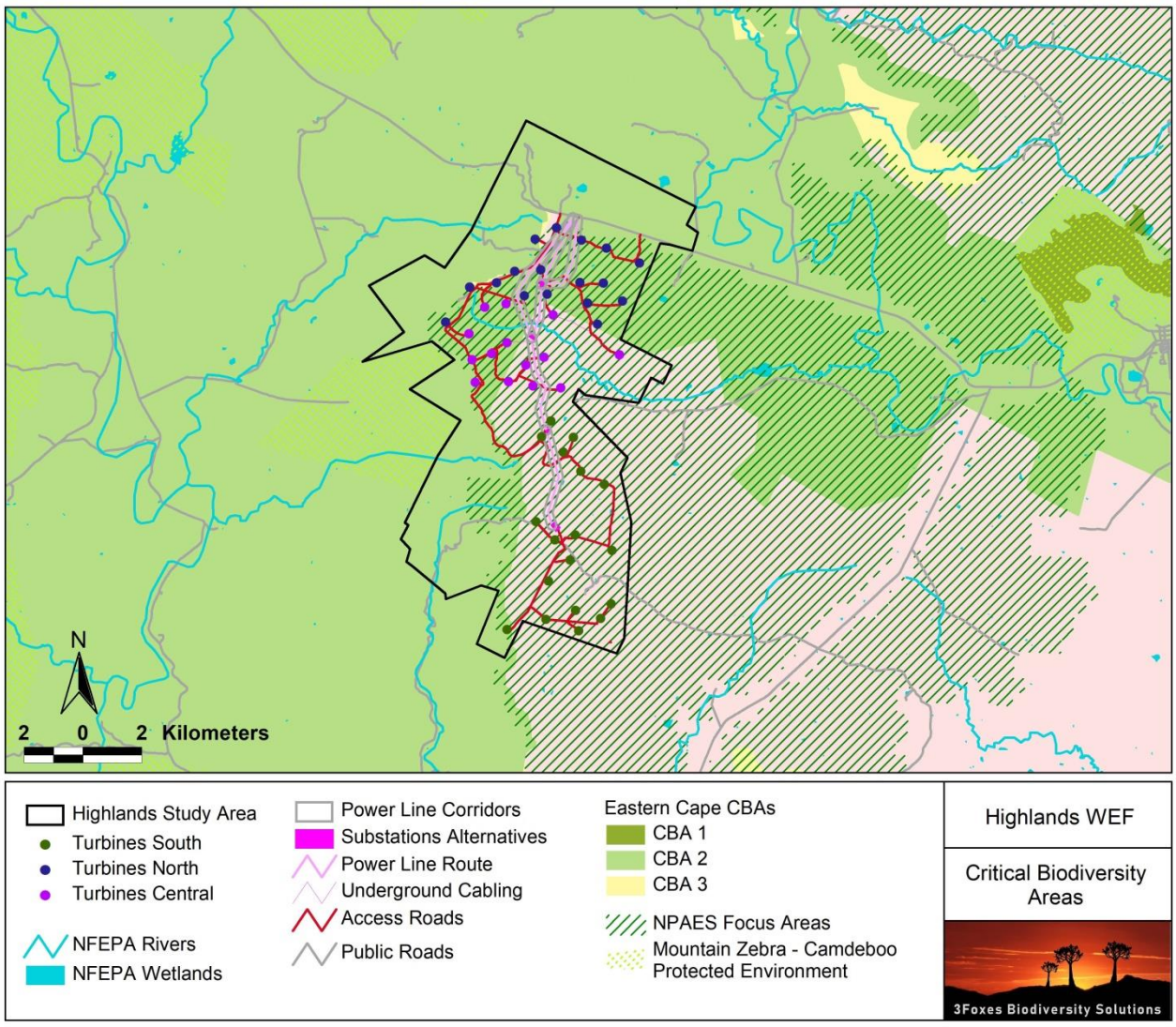

Figure 13. Extract of the Eastern Cape Critical Biodiversity Areas map for the study area as well as NPAES focus areas and protected environments in the vicinity of the study area.

3.4 Cumulative Impact

According to the map of DEA-registered projects as at July 2018 (Figure 14), there are no other renewable energy applications in the immediate vicinity of the site, with the nearest

facilities being the Golden Valley, Amakhala Emoyeni and Middleton Wind Energy projects near to Cookhouse. Apart from these wind energy projects, there are also some solar energy developments around Pearston west of the project site. The solar projects are however on the plains and do not affect the same environment as the Highlands project. Given the distance and extent of these different developments, it is clear that the current level of cumulative impact around the Highlands site is relatively low. From a terrestrial ecology point of view, there are also few linkages between the different facilities and as such the potential disruption of ecological processes is unlikely. The major broad-scale ecological corridors that are likely to be operating in the area include an east-west corridor along the great escarpment to the north of the site as well as a north-south and east-west corridor associated with the bands of thicket vegetation that occur on the western slopes of the site going through to Jansenville in west and south towards Kirkwood. As the development footprint in these areas remains very low, it is highly unlikely that these would be impacted to a significant degree by renewable energy development. Given the location and extent of current developments in the area, the Highlands WEF would generate habitat loss equivalent to approximately 200ha and while this would contribute to habitat loss at the local scale, broader implications for cumulative impacts would remain low.

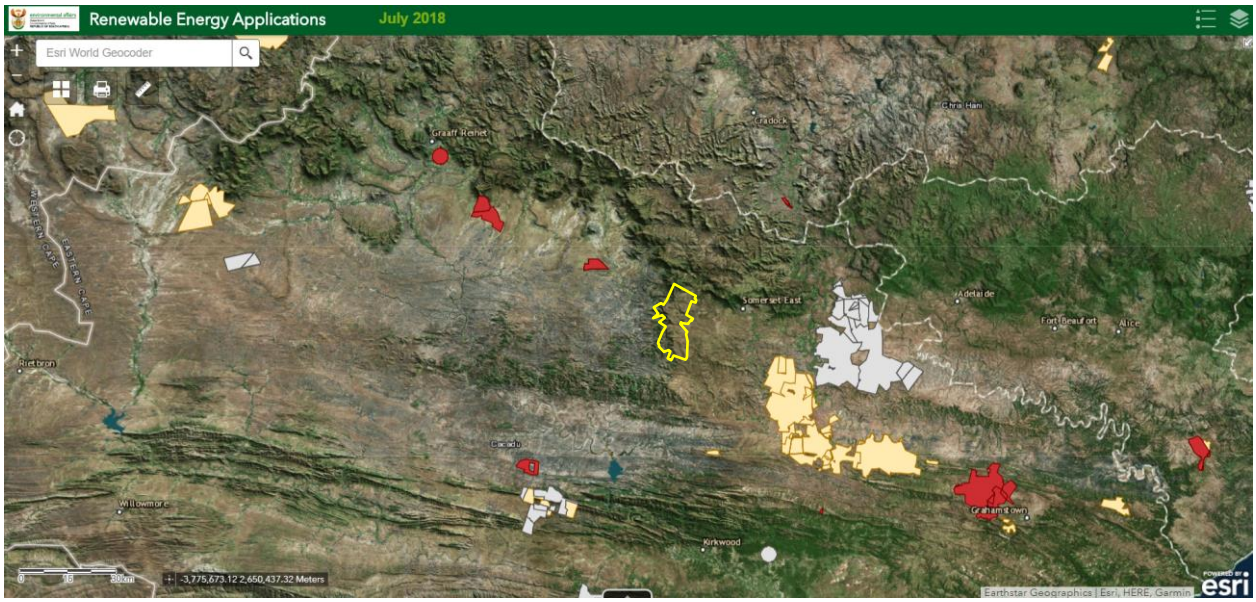

Figure 14. Current (July 2018) DEA-registered projects known from the vicinity of the Highlands Wind Farm, the general area of which is outlined in yellow. Red cadastral units are registered solar projects and the pale yellow units are wind energy facilities.

3.5 Site Sensitivity Assessment

The ecological sensitivity map for the Highlands Wind Farm site is illustrated below in Figure 15. The western valleys and slopes along the edge of the escarpment which are dominated by thicket vegetation are considered to be high sensitivity as are the drainage lines which

mostly drain in an easterly direction. The steep area to the north of the north of R63 is considered to be a no-go area, but there is no development in this area under the current layout. The target ridges consist largely of open grassland belonging to the Bedford Dry Grassland vegetation type with a low density of species of conservation concern. These areas are considered to be low to moderate sensitivity and are considered suitable targets for development. The higher lying ridges especially in the central and southern parts of the site are not within the development footprint and these areas are considered to have greater ecological value than the lower lying hills to the east where the majority of the development is concentrated.

There are several mammals of conservation concern that are likely to be present in the area. Although none of these were observed by the camera traps that were set up across the site, it is likely that some of these are present on the site at low density or on occasion when moving through the area. As these are all mobile species or occur in specific habitats that would be little impacted by the development, it is not likely that any of these would be significantly affected by the development. Similarly for reptiles and amphibians, the important habitats which include drainage lines, farm dams and rocky outcrops are not within the development footprint and would be little impacted by the development.

In terms of the Highlands Grid Connection alternatives, the Central West alternative is seen as less desirable than the Central Central alternative due to the presence of more sensitive areas in the higher lying ground along the Central West option. In the northern section of the site, the North Central and North East options are both considered acceptable as there is little to differentiate them. Overall the impact of the grid connection for each facility is likely to be low as the overall extent of habitat loss is low and sensitive features along the routes such as drainage lines can be easily spanned by the power line.

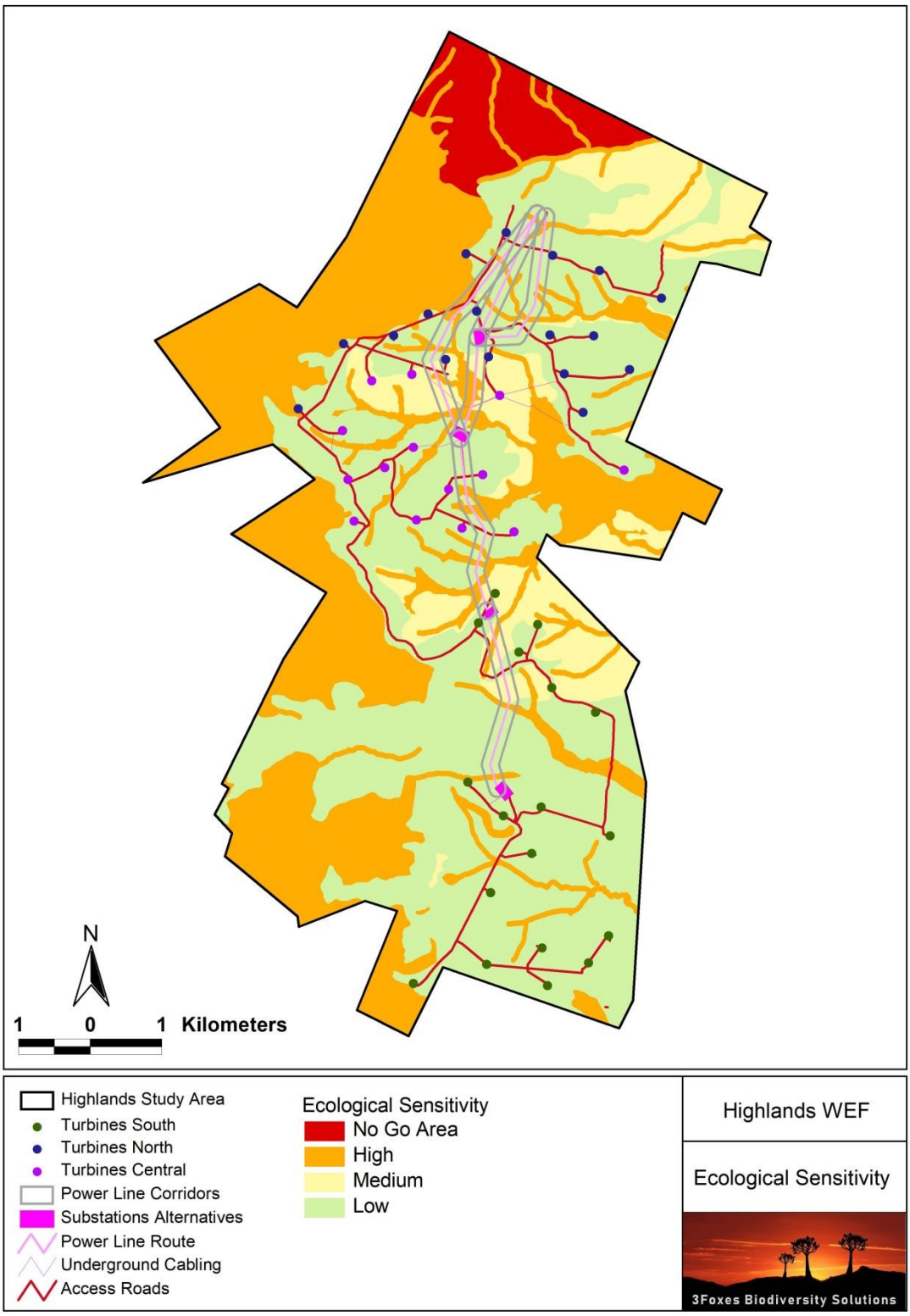

Figure 15. Ecological sensitivity map of the Highlands Wind Farm study area.

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 site boundary	Widespread impact beyond site boundary; Local	Impact widespread far 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 - Highlands North WEF

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, on-site substation, 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 40ha. 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 Bedford Dry Grassland vegetation type. 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**	**M**	**-'tve**	**Medium**	**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?			To some extent, through avoidance of sensitive areas, but some residual impact is likely.				
Mitigation measures to reduce residual risk or enhance opportunities: 1) Preconstruction walk-through of the approved development footprint to ensure that sensitive habitats and species are avoided where possible. 2) Search and Rescue of species of conservation concern (SCCs) should be conducted prior to clearing activities. 3) Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas. 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-through 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			There 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 Low Significance.

<table>
<tr><td colspan="8">Impact Phase: Construction</td></tr>
<tr><td colspan="8">Impact Description: Faunal impacts due to construction-phase noise and physical disturbance.</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>L</td><td>H</td><td>-‘tve</td><td>Medium</td><td>H</td><td>High</td></tr>
<tr><td>With Mitigation</td><td>L</td><td>L</td><td>M</td><td>-‘tve</td><td>Low</td><td>L</td><td>Medium</td></tr>
<tr><td colspan="3">Can the impact be reversed?</td><td colspan="5">Construction-phase disturbance will be transient, but some habitat loss would be long term.</td></tr>
<tr><td colspan="3">Will impact cause irreplaceable loss or resources?</td><td colspan="5">Not likely as there do not appear to be any significant populations of species of conservation concern within the affected area.</td></tr>
<tr><td colspan="3">Can impact be avoided, managed or mitigated?</td><td colspan="5">Only partly as noise and construction phase disturbance and habitat loss cannot be entirely avoided or mitigated.</td></tr>
<tr><td colspan="8">Mitigation measures to reduce residual risk or enhance opportunities:
1) Preconstruction walk-through of the facility to identify areas of faunal sensitivity such as occupied burrows.
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) No fires should be allowed on site as the vegetation is vulnerable to runaway fires.
5) No fuelwood collection should be allowed on-site.
6) No dogs or cats should be allowed on site at the construction camps apart from those 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.</td></tr>
<tr><td colspan="3">Residual Impacts</td><td colspan="5">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.</td></tr>
</table>

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, the post-mitigation operational impacts on fauna are likely to be of Low Significance.

Impact Phase: Operation							
Impact Description: Faunal impacts due to operational phase activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?	The impact will persist for the lifespan of the facility.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Some management is possible, but residual impact from the wind turbines and general disturbance will persist, albeit at a low intensity.						

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 as 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.	
Residual Impacts	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 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 some parts of the site are steep with soils that are evidently quite vulnerable to erosion. The soil disturbance associated with the development will render the impacted areas 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 to Low Significance.

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**	**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 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. With mitigation, this impact would be of Low Significance.

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**	**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 species such as *Opuntia* are already present in the area and are likely to increase 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 these 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. 5) Develop and implement an Invasive Alien Plant Management Plan.							

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 development lies almost entirely within a Critical Biodiversity Area and would potentially negatively impact the biodiversity value and ecological functioning of these areas. The CBAs in the area are however designed as broad-scale ecological corridors. 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 affected areas, which would potentially have a low-intensity, long-term impact on some species. 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.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**H**	**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 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. 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**	**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 of 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**	**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) Compliance with the Erosion Management Plan and Rehabilitation Plan. 2) 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. 3) There should be regular monitoring for erosion for at least 5 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. 4) All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 5) 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, 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. 6) 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. 7) Compliance with the Invasive Alien Plant (IAP) Management Plan.							
Residual Impact	With mitigation there would be little to no residual impact.						

Cumulative Impacts

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

The Highlands North WEF is part of the greater Highlands facility which also consists of the Highlands Central and Highlands South WEFs. In addition, there are numerous other planned wind and solar energy developments in the wider area. Although each may

generate an acceptable, low impact when considered alone, this does not account for the potential for cumulative impacts to generate significant impacts on fauna and flora as well as future conservation-use options for the wider area. Although the affected vegetation types are not listed ecosystems, they are not well protected. In addition, most of the development footprint is within a National Protected Area Expansion Strategy focus area. The habitat loss resulting from the development is however not likely to be significant, given the low total footprint of wind farm development in relation to the large extent of the affected NPAES focus area. With mitigation, this impact is likely to be Low Significance.

Impact Phase: Cumulative Impact							
Impact Description: Contribution of the proposed 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**	**L**	**-'tve**	**Low**	**L**	**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.						

4.3 Assessment of Impacts - Highlands Central WEF

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, on-site substation, 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 30ha. 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 Bedford Dry Grassland vegetation type. 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.

<table>
<tr><td colspan="8">Impact Phase: Construction</td></tr>
<tr><td colspan="8">Impact Description: Impact on vegetation and listed plant species due to transformation within the development footprint.</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>H</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>M</td><td>-‘tve</td><td>Medium</td><td>H</td><td>High</td></tr>
<tr><td colspan="3">Can the impact be reversed?</td><td colspan="5">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.</td></tr>
<tr><td colspan="3">Will impact cause irreplaceable loss or resources?</td><td colspan="5">No, no critical or rare habitats are within the development footprint.</td></tr>
<tr><td colspan="3">Can impact be avoided, managed or mitigated?</td><td colspan="5">To some extent, through avoidance of sensitive areas, but some residual impact is likely.</td></tr>
<tr><td colspan="8">Mitigation measures to reduce residual risk or enhance opportunities:
1) Preconstruction walk-through of the approved development footprint to ensure that sensitive habitats and species are avoided where possible.
2) Search and Rescue of species of conservation concern should be conducted prior to clearing activities.
3) Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas.
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-through 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.</td></tr>
<tr><td colspan="3">Residual Impact</td><td colspan="5">There will be some habitat loss that is an unavoidable impact of the development and cannot be effectively mitigated.</td></tr>
</table>

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 Low Significance.

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**	**L**	**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 such as occupied burrows.
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) No fires should be allowed on site as the vegetation is vulnerable to runaway fires.
5) No fuelwood collection should be allowed on-site.
6) No dogs or cats should be allowed on site at the construction camps apart from those 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, the post-mitigation operational impacts on fauna are likely to be of Low Significance.

Impact Phase: Operation							
Impact Description: Faunal impacts due to operational phase activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?	The impact will persist for the lifespan of the facility.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Some management is possible, but residual impact from the wind turbines and general disturbance will persist, albeit at a low intensity.						

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 as 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.	
Residual Impacts	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 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 some parts of the site are steep with soils that are evidently quite vulnerable to erosion. The soil disturbance associated with the development will render the impacted areas 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 to Low Significance.

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**	**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 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**	**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) Develop and implement an Invasive Alien Plant Management Plan. 2) Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. 3) 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 species such as *Opuntia* are already present in the area and are likely to increase if not controlled. 4) Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as these are also likely to be prone to invasion problems. 5) 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*

About half of the development footprint lies within a Critical Biodiversity Area and would potentially negatively impact the biodiversity value and ecological functioning of these areas. The CBAs in the area are however designed as broad-scale ecological corridors. 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 affected areas, which would potentially have a low-intensity, long-term impact on some species. 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**.**							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**H**	**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 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. 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	**M**	**L**	**H**	**-'tve**	**Medium**	**H**	**High**

Mitigation							
With Mitigation	**L**	**L**	**M**	**-'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 of 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	**M**	**H**	**M**	**-'tve**	**High**	**H**	**High**

Mitigation							
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 5 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. 5) Adhere to Erosion Management and Rehabilitation Plans.							
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, 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) Compliance with Invasive Alien Plant Management Plan. 2) 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. 3) 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. 4) 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. 6) 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.

Cumulative Impacts

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

The Highlands Central WEF is part of the greater Highlands facility which also consists of the Highlands North and Highlands South WEFs. In addition, there are numerous other planned wind and solar energy developments in the wider area. Although each may generate an acceptable, low impact when considered alone, this does not account for the potential for cumulative impacts to generate significant impacts on fauna and flora as well as future conservation-use options for the wider area. Although the affected vegetation types are not listed ecosystems, they are not well protected. In addition, most of the development footprint is within a National Protected Area Expansion Strategy focus area. The habitat loss resulting from the development is however not likely to be significant, given the low total footprint of wind farm development in relation to the large extent of the affected NPAES focus area. With mitigation, this impact is likely to be of Low Significance.

Impact Phase: Cumulative Impact							
Impact Description: Contribution of the proposed 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**	**L**	**-'tve**	**Low**	**L**	**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.

4.4 Assessment of Impacts - Highlands South WEF

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 40ha. 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 Bedford Dry Grassland vegetation type. 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**	**M**	**-'tve**	**Medium**	**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?	To some extent, through avoidance of sensitive areas, but some residual impact is likely.
Mitigation measures to reduce residual risk or enhance opportunities: 1) Preconstruction walk-through of the approved development footprint to ensure that sensitive habitats and species are avoided where possible. 2) Search and Rescue of species of conservation concern prior to clearing activities. 3) Ensure that lay-down and other temporary infrastructure is within low-sensitivity areas. 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-through 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 Low Significance.

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**	**L**	**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?	Not 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 such as occupied burrows.
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) No fires should be allowed on site as the vegetation is vulnerable to runaway fires.
5) No fuelwood collection should be allowed on-site.
6) No dogs or cats should be allowed on site at the construction camps apart from those 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, the post-mitigation operational impacts on fauna are likely to be of Low Significance.

Impact Phase: Operation							
Impact Description: Faunal impacts due to operational phase activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Can the impact be reversed?	The impact will persist for the lifespan of the facility.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Some management is possible, but residual impact from the wind turbines and general disturbance will persist, albeit at a low intensity.						

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 as 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.	
Residual Impacts	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 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 some parts of the site are steep with soils that are evidently quite vulnerable to erosion. The soil disturbance associated with the development will render the impacted areas 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 to Low Significance.

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**	**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 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**	**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 species such as *Opuntia* are already present in the area and are likely to increase 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 very small proportion of the development is within the Critical Biodiversity Area with only one turbine within the CBA. As a result, impacts on CBAs would be minimal and the development is not likely to have significant impact on the CBA and 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**.**							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**H**	**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 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. 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**	**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. 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 5 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. 5) Adhere to Erosion Management and Rehabilitation Plans.							
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, 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) Compliance with Invasive Alien Plant Management Plan. 2) 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. 3) 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. 4) 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.						

Cumulative Impacts

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

The Highlands South WEF is part of the greater Highlands facility which also consists of the Highlands Central and Highlands North WEFs. In addition, there are numerous other planned wind and solar energy developments in the wider area. Although each may generate an acceptable, low impact when considered alone, this does not account for the potential for cumulative impacts to generate significant impacts on fauna and flora as well as future conservation-use options for the wider area. Although the affected vegetation types are not listed ecosystems, they are not well protected. In addition, most of the development footprint is within National Protected Area Expansion Strategy focus area. The habitat loss resulting from the development is however not likely to be significant, given the low total footprint of wind farm development in relation to the large extent of the affected NPAES focus area. With mitigation, this impact is likely to be Low Significance.

Impact Phase: Cumulative Impact							
Impact Description: Contribution of the proposed 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**	**L**	**-'tve**	**Low**	**L**	**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.						

4.5 Assessment of Impacts - Highlands North Grid Connection

Planning & Construction Phase Impacts

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

The development of the grid connection infrastructure would require vegetation clearing for access roads and pylon foundations. 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 10ha 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**.**							
North East	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
North Central							
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**

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-through 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 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.							
North East	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**Medium**
North Central							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'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?	Not 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) No fires should be allowed on site as there is a risk of uncontrolled 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 3. *Soil Erosion Risk*

The large amount of disturbance created during construction would leave the disturbed areas vulnerable to soil erosion, especially as several parts of the power line route are steep and 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 to Low Significance.

Impact Phase: Operation							
Impact Description: Following construction, the site will be highly vulnerable to soil erosion.							
North East	**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**
North Central							
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 4. *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.							
North East	**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**
North Central							
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 these 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 5. *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							
North East	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
North Central							
Without Mitigation	**L**	**M**	**L**	**-'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. 2) 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 6. *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.							
North East	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
North Central							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**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 of 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. 5) 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 7. *Soil Erosion Risk*

The removal and clearing of the grid connection 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.							
North East	**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**
North Central							
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, 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 8. *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.							
North East	**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**
North Central							
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 be 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 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.						

4.6 Assessment of Impacts - Highlands Central Grid Connection

Planning & Construction Phase Impacts

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

The development of the grid connection infrastructure would require vegetation clearing for access roads and pylon foundations. 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 10ha 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**.**							
Central West	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**

With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Central Central							
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**

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-through 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 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.							
Central West	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**Medium**
Central Central							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'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?	Not 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) No fires should be allowed on site as there is a risk of uncontrolled 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 3. *Soil Erosion Risk*

The large amount of disturbance created during construction would leave the disturbed areas vulnerable to soil erosion, especially as several parts of the power line route are steep and 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.							
Central West	**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**
Central Central							
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 4. *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.							
Central West	**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**
Central Central							
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 these 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 5. *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 areas 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.							
Central West	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
Central Central							
Without Mitigation	**L**	**M**	**L**	**-'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. 2) 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 6. *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.							
Central West	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
Central Central							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**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 of 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. 6) 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 7. *Soil Erosion Risk*

The removal and clearing of the grid connection 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.							
Central West	**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**
Central Central							
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, 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 8. *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.							
Central West	**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**
Central Central							
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.

4.7 Assessment of Impacts - Highlands South Grid Connection

Planning & Construction Phase Impacts

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

The development of the grid connection infrastructure would require vegetation clearing for access roads and pylon foundations. 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 10ha 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**.**							
South 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
South 2							
Without Mitigation	**L**	**H**	**L**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**M**	**L**	**-'tve**	**Low**	**L**	**High**
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-through 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 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.							
South 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**Medium**
South 2							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**H**	**High**
With Mitigation	**L**	**L**	**L**	**-'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?			Not 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			Only partly as noise and construction phase disturbance and				

mitigated?	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) No fires should be allowed on site as there is a risk of uncontrolled 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 3. *Soil Erosion Risk*

The large amount of disturbance created during construction would leave the disturbed areas vulnerable to soil erosion, especially as several parts of the power line route are steep and 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 to Low Significance.

Impact Phase: Operation							
Impact Description: Following construction, the site will be highly vulnerable to soil erosion.							
South 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**
South 2							
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 4. *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.							
South 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**
South 2							
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.

Decommissioning Phase Impacts

Impact 5. *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.							
South 1	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**M**	**High**
With Mitigation	**L**	**L**	**L**	**-'tve**	**Low**	**L**	**High**
South 2							
Without Mitigation	**L**	**L**	**M**	**-'tve**	**Medium**	**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 of 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. 7) 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 6. *Soil Erosion Risk*

The removal and clearing of the grid connection 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							
South 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**
South 2							
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, 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 7. *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.							
South 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**
South 2							
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.

5 ASSESSMENT OF ALTERNATIVES

There are several power line route alternatives considered in the current assessment. These are compared below and the preferred alternative identified. Although the assessment for several of the alternatives is the same, the significance classes are coarse and there is still a preferred alternative in each case.

Alternative	Preference	Reasons (incl. potential issues)
Highlands North		
North East	Not Preferred	This power line alternative is similar to the other alternative in terms of sensitivity but is longer and traverses more drainage lines with the result that it is less preferred.
North Central	Preferred	Although the sensitivity of the majority of the route is similar to the other option, the route is shorter and traverses less drainage features with the result that it is the preferred alternative.
Highlands Central		
Central West	Not Preferred	This power line alternative is similar to the other alternative in terms of sensitivity but is longer and traverses more sensitive areas with the result that it is less preferred.
Central Central	Preferred	Although the sensitivity of the majority of the route is similar to the other option, the route is shorter and traverses less sensitive features with the result that it is the preferred alternative.
Highlands South		
South 1	Preferred	This route is shorter than South 2 and is the preferred option.
South 2	Not preferred	The required power line is longer than South 1 and as such is not preferred.

6 CONCLUSIONS & RECOMMENDATIONS

The Highlands Wind Farm site consists of a large ridge system which grades gently to the east and more sharply to the west. The western valleys and slopes are dominated by Camdebo Escarpment Thicket and are considered generally sensitive and unsuitable for development. The plateau and eastern slopes and low hills consist of Bedford Dry Grassland and are generally considered less sensitive than the western slopes. The footprint is largely restricted to the lower-lying eastern slopes and gentle hills of the site and are considered generally suitable for development. The abundance of plant species of conservation concern in these areas is low and species of high conservation concern were not observed within the development footprint.

Although there are a variety of mammals of conservation concern known from the broader area including Vaal Rhebok (NT), South African Hedgehog (NT), Black-footed cat (VU), Serval (NT), Brown Hyena (NT) and African Striped Weasel (NT), it is not likely that the affected areas are of high significance for these species and long-term impacts on listed fauna are likely to be low.

The majority of the Highlands North and approximately half of the Highlands Central are within a tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. Although the development would result in some habitat loss within the CBA, this is not likely to compromise the overall functioning of the CBA as it is very large and the development occupies a very small proportion of the CBA. The Highlands South development has only 1 turbine within the CBA and this is not likely to generate significant impact on the CBA. The majority of the development footprint from all three Highlands Wind Farm applications lies within a NPAES focus area. The development however lies on the margin of the NPAES focus area and the extent of the development would not significantly impact ability to meet conservation targets elsewhere within the focus area which is large in comparison with the development site. Similarly, there are no other renewable energy developments in the immediate area with the result that cumulative impacts within 50km of the site are still very low. In the wider area there are several existing wind farms, but these are on different ridge systems and the overall extent of cumulative impact in the area remains low.

Comment on Final Mitigated Layout

The final mitigated layout produced by the developer in response to the various sensitivtities idenitified in the BA processs is illustratd below in Figure 16. The changes include minor adjustment of the substation locations onto flatter ground as well as various minor turbine and access road improvements. From an ecological perspective, the changes are largely positive and do not increase the impact from the assessed layout. As such, the final mitigated layout is considered acceptable and in line with the assessed impacts.

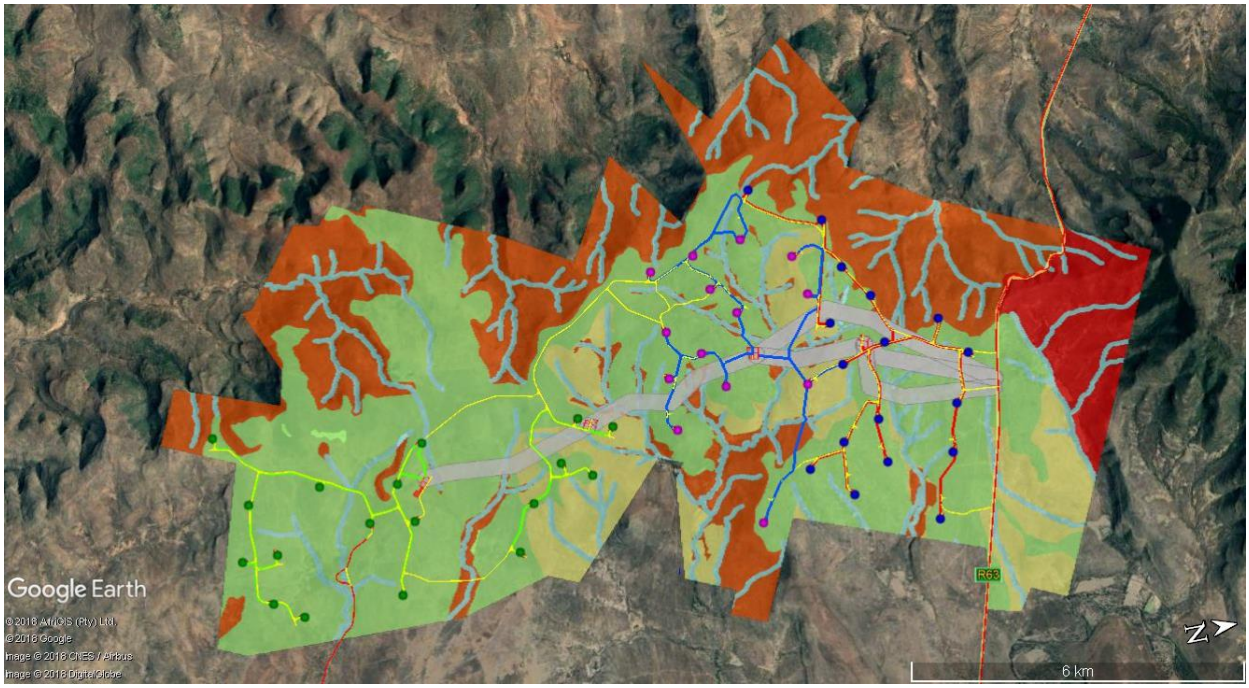

Figure 16. The final mitigated layout of the Highlands WEF, showing the final layout of the development.

Impact Statement-

Although there are extensive areas of sensitive habitat within the wider Highlands site, the development footprint is restricted to the medium and low sensitivity parts of the site. These areas are considered suitable for development and there are no impacts associated with the Highlands WEF that cannot be mitigated to a low level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layouts provided for the assessment, the Highlands North, Central and South WEFs can be supported from a terrestrial ecology point of view.

The Highlands North, Central and South WEF Grid Connections with associated infrastructure are 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 connections and associated infrastructure.

7 LITERATURE CITED

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M. (eds.). 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. South African National Biodiversity Institute, Pretoria.

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Brownlie, S. 2005. Guideline for Involving Biodiversity Specialists in EIA Processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town. 63 pp.

Clark, V.R., Barker, N.P., & Mucina, L. 2011. The Roggeveldberge – notes on a botanically hot area on a cold corner of the southern Great Escarpment, South Africa. *South African Journal of Botany* 77: 112-126.

Desmet, P and Marsh A. 2008. Namakwa District Biodiversity Sector Plan. Available from BGIS at http://bgis.sanbi.org/namakwa/project.asp.

De Villiers CC, Driver A, Clark B, Euston-Brown DIW, Day EG, Job N, Helme NA, Holmes PM, Brownlie S and Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape.* Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Passmore, N.I. & Carruthers, V.C. 1995. *South African Frogs: A complete guide*. Witwatersrand University Press, Johannesburg. 322 pp.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge.

8 APPENDIX 1. LIST OF PLANT SPECIES

List of plant species of which are known to occur in the broad vicinity of the Highlands Wind Farm.

Family	Genus	Species	Family	Genus	Species
Acanthaceae	*Barleria*	*obtusa*	Acanthaceae	*Hypoestes*	*forskaolii*
Acanthaceae	*Justicia*	*campylostemon*	Achariaceae	*Kiggelaria*	*africana*
Agapanthaceae	*Agapanthus*	*praecox*	Aizoaceae	*Bergeranthus*	*vespertinus*
Aizoaceae	*Drosanthemum*	*hispidum*	Aizoaceae	*Faucaria*	*felina*
Aizoaceae	*Malephora*	*crassa*	Aizoaceae	*Mesembryanthemum*	*granulicaule*
Aizoaceae	*Mesembryanthemum*	*splendens*	Aizoaceae	*Trichodiadema*	*pomeridianum*
Alliaceae	*Tulbaghia*	*cernua*	Alliaceae	*Tulbaghia*	*galpinii*
Amaranthaceae	*Suaeda*	*fruticosa*	Amaryllidaceae	*Ammocharis*	*coranica*
Amaryllidaceae	*Boophone*	*disticha*	Amaryllidaceae	*Brunsvigia*	*grandiflora*
Amaryllidaceae	*Brunsvigia*	*josephinae*	Amaryllidaceae	*Crinum*	*campanulatum*
Amaryllidaceae	*Crinum*	*macowanii*	Amaryllidaceae	*Cyrtanthus*	*huttonii*
Amaryllidaceae	*Cyrtanthus*	*macowanii*	Amaryllidaceae	*Cyrtanthus*	*smithiae*
Amaryllidaceae	*Haemanthus*	*albiflos*	Amaryllidaceae	*Haemanthus*	*carneus*
Amaryllidaceae	*Haemanthus*	*humilis*	Amaryllidaceae	*Nerine*	*huttoniae*
Amaryllidaceae	*Nerine*	*undulata*	Amaryllidaceae	*Scadoxus*	*puniceus*
Anacardiaceae	*Searsia*	*chirindensis*	Anacardiaceae	*Searsia*	*dentata*
Anacardiaceae	*Searsia*	*dregeana*	Anacardiaceae	*Searsia*	*laevigata*
Anacardiaceae	*Searsia*	*longispina*	Anacardiaceae	*Searsia*	*lucida*
Anacardiaceae	*Searsia*	*rehmanniana*	Anacardiaceae	*Searsia*	*tomentosa*
Anomodontaceae	*Anomodon*	*pseudotristis*	Apiaceae	*Alepidea*	*delicatula*
Apiaceae	*Alepidea*	*macowani*	Apiaceae	*Alepidea*	*serrata*
Apiaceae	*Ammi*	*majus*	Apiaceae	*Sanicula*	*elata*
Apocynaceae	*Carissa*	*bispinosa*	Apocynaceae	*Ceropegia*	*zeyheri*
Apocynaceae	*Duvalia*	*modesta*	Apocynaceae	*Gomphocarpus*	*fruticosus*
Apocynaceae	*Huernia*	*guttata*	Apocynaceae	*Orbea*	*verrucosa*
Apocynaceae	*Pachypodium*	*bispinosum*	Apocynaceae	*Pachypodium*	*succulentum*
Apocynaceae	*Schizoglossum*	*aschersonianum*	Apocynaceae	*Stapelia*	*grandiflora*
Apocynaceae	*Tylophora*	*cordata*	Araliaceae	*Cussonia*	*paniculata*
Araliaceae	*Cussonia*	*spicata*	Asparagaceae	*Asparagus*	*aethiopicus*
Asparagaceae	*Asparagus*	*burchellii*	Asparagaceae	*Asparagus*	*densiflorus*
Asparagaceae	*Asparagus*	*laricinus*	Asparagaceae	*Asparagus*	*macowanii*
Asparagaceae	*Asparagus*	*multiflorus*	Asparagaceae	*Asparagus*	*oxyacanthus*
Asparagaceae	*Asparagus*	*ramosissimus*	Asparagaceae	*Asparagus*	*setaceus*
Asparagaceae	*Asparagus*	*striatus*	Asphodelaceae	*Aloe*	*africana*
Asphodelaceae	*Aloe*	*broomii*	Asphodelaceae	*Aloe*	*maculata*
Asphodelaceae	*Aloe*	*pluridens*	Asphodelaceae	*Aloe*	*speciosa*
Asphodelaceae	*Aloe*	*striata*	Asphodelaceae	*Astroloba*	*foliolosa*
Asphodelaceae	*Bulbine*	*abyssinica*	Asphodelaceae	*Bulbine*	*frutescens*
Asphodelaceae	*Bulbine*	*latifolia*	Asphodelaceae	*Bulbine*	*narcissifolia*
Asphodelaceae	*Gasteria*	*baylissiana*	Asphodelaceae	*Gasteria*	*bicolor*
Asphodelaceae	*Gonialoe*	*variegata*	Asphodelaceae	*Haworthia*	*angustifolia*

Asphodelaceae	*Haworthia*	*bolusii*	Asphodelaceae	*Haworthia*	*cooperi*
Asphodelaceae	*Haworthia*	*cooperi*	Asphodelaceae	*Haworthia*	*cooperi*
Asphodelaceae	*Haworthia*	*decipiens*	Asphodelaceae	*Haworthia*	*glauca*
Asphodelaceae	*Haworthia*	*mucronata*	Asphodelaceae	*Haworthia*	*nigra*
Asphodelaceae	*Kniphofia*	*acraea*	Asphodelaceae	*Kniphofia*	*linearifolia*
Asphodelaceae	*Kniphofia*	*triangularis*	Asphodelaceae	*Trachyandra*	*affinis*
Asphodelaceae	*Trachyandra*	*asperata*	Asphodelaceae	*Trachyandra*	*giffenii*
Aspleniaceae	*Asplenium*	*cordatum*	Aspleniaceae	*Asplenium*	*protensum*
Aspleniaceae	*Asplenium*	*trichomanes*	Aspleniaceae	*Asplenium*	*varians*
Asteraceae	*Amellus*	*strigosus*	Asteraceae	*Amellus*	*strigosus*
Asteraceae	*Arctotis*	*arctotoides*	Asteraceae	*Arctotis*	*microcephala*
Asteraceae	*Berkheya*	*carduoides*	Asteraceae	*Berkheya*	*decurrens*
Asteraceae	*Berkheya*	*heterophylla*	Asteraceae	*Brachylaena*	*ilicifolia*
Asteraceae	*Cichorium*	*intybus*	Asteraceae	*Cineraria*	*saxifraga*
Asteraceae	*Conyza*	*bonariensis*	Asteraceae	*Conyza*	*pinnata*
Asteraceae	*Cotula*	*anthemoides*	Asteraceae	*Cotula*	*nigellifolia*
Asteraceae	*Denekia*	*capensis*	Asteraceae	*Dicerothamnus*	*rhinocerotis*
Asteraceae	*Eriocephalus*	*africanus*	Asteraceae	*Euryops*	*algoensis*
Asteraceae	*Felicia*	*filifolia*	Asteraceae	*Felicia*	*filifolia*
Asteraceae	*Felicia*	*muricata*	Asteraceae	*Garuleum*	*pinnatifidum*
Asteraceae	*Garuleum*	*tanacetifolium*	Asteraceae	*Gnaphalium*	*capense*
Asteraceae	*Gnaphalium*	*confine*	Asteraceae	*Haplocarpha*	*nervosa*
Asteraceae	*Haplocarpha*	*scaposa*	Asteraceae	*Helichrysum*	*anomalum*
Asteraceae	*Helichrysum*	*appendiculatum*	Asteraceae	*Helichrysum*	*aureum*
Asteraceae	*Helichrysum*	*cephaloideum*	Asteraceae	*Helichrysum*	*cymosum*
Asteraceae	*Helichrysum*	*felinum*	Asteraceae	*Helichrysum*	*hamulosum*
Asteraceae	*Helichrysum*	*lineare*	Asteraceae	*Helichrysum*	*nudifolium*
Asteraceae	*Helichrysum*	*nudifolium*	Asteraceae	*Helichrysum*	*odoratissimum*
Asteraceae	*Helichrysum*	*pallidum*	Asteraceae	*Helichrysum*	*petiolare*
Asteraceae	*Helichrysum*	*rosum*	Asteraceae	*Helichrysum*	*rosum*
Asteraceae	*Helichrysum*	*rugulosum*	Asteraceae	*Helichrysum*	*splendidum*
Asteraceae	*Helichrysum*	*subglomeratum*	Asteraceae	*Helichrysum*	*teretifolium*
Asteraceae	*Helichrysum*	*umbraculigerum*	Asteraceae	*Helichrysum*	*xerochrysum*
Asteraceae	*Helichrysum*	*zeyheri*	Asteraceae	*Lasiospermum*	*bipinnatum*
Asteraceae	*Lasiospermum*	*pedunculare*	Asteraceae	*Microglossa*	*mespilifolia*
Asteraceae	*Nidorella*	*undulata*	Asteraceae	*Osteospermum*	*calendulaceum*
Asteraceae	*Osteospermum*	*imbricatum*	Asteraceae	*Pegolettia*	*retrofracta*
Asteraceae	*Pteronia*	*adenocarpa*	Asteraceae	*Pteronia*	*membranacea*
Asteraceae	*Pteronia*	*paniculata*	Asteraceae	*Relhania*	*pungens*
Asteraceae	*Senecio*	*inornatus*	Asteraceae	*Senecio*	*linifolius*
Asteraceae	*Senecio*	*othonniflorus*	Asteraceae	*Senecio*	*pterophorus*
Asteraceae	*Senecio*	*quinquelobus*	Asteraceae	*Senecio*	*ruwenzoriensis*
Asteraceae	*Senecio*	*speciosus*	Asteraceae	*Silybum*	*marianum*
Asteraceae	*Troglophyton*	*capillaceum*	Aytoniaceae	*Asterella*	*bachmannii*
Bartramiaceae	*Bartramia*	*capensis*	Bartramiaceae	*Bartramia*	*compacta*
Bartramiaceae	*Breutelia*	*microdonta*	Bartramiaceae	*Philonotis*	*dregeana*
Bartramiaceae	*Philonotis*	*globosa*	Boraginaceae	*Buglossoides*	*arvensis*

Boraginaceae	*Cynoglossum*	*hispidum*	Boraginaceae	*Echium*	*plantagineum*
Boraginaceae	*Echium*	*vulgare*	Boraginaceae	*Ehretia*	*rigida*
Boraginaceae	*Lappula*	*heteracantha*	Boraginaceae	*Lithospermum*	*papillosum*
Boraginaceae	*Lobostemon*	*argenteus*	Brachytheciaceae	*Brachythecium*	*ruderale*
Brachytheciaceae	*Brachythecium*	*subrutabulum*	Brachytheciaceae	*Palamocladium*	*leskeoides*
Brassicaceae	*Lepidium*	*africanum*	Brassicaceae	*Rapistrum*	*rugosum*
Brassicaceae	*Turritis*	*glabra*	Bryaceae	*Bryum*	*andicola*
Bryaceae	*Bryum*	*canariense*	Cactaceae	*Harrisia*	*martinii*
Cactaceae	*Harrisia*	*pomanensis*	Cactaceae	*Opuntia*	*engelmannii*
Campanulaceae	*Wahlenbergia*	*juncea*	Campanulaceae	*Wahlenbergia*	*krebsii*
Campanulaceae	*Wahlenbergia*	*stellarioides*	Capparaceae	*Capparis*	*sepiaria*
Caryophyllaceae	*Dianthus*	*basuticus*	Caryophyllaceae	*Dianthus*	*namaensis*
Caryophyllaceae	*Stellaria*	*media*	Celastraceae	*Elaeodendron*	*zeyheri*
Celastraceae	*Gymnosporia*	*buxifolia*	Celastraceae	*Maytenus*	*undata*
Celastraceae	*Mystroxylon*	*aethiopicum*	Celastraceae	*Pterocelastrus*	*tricuspidatus*
Convolvulaceae	*Convolvulus*	*farinosus*	Convolvulaceae	*Cuscuta*	*africana*
Convolvulaceae	*Cuscuta*	*campestris*	Convolvulaceae	*Cuscuta*	*cassytoides*
Crassulaceae	*Cotyledon*	*campanulata*	Crassulaceae	*Cotyledon*	*velutina*
Crassulaceae	*Crassula*	*cultrata*	Crassulaceae	*Crassula*	*decidua*
Crassulaceae	*Crassula*	*ericoides*	Crassulaceae	*Crassula*	*gemmifera*
Crassulaceae	*Crassula*	*mesembryanthemoides*	Crassulaceae	*Crassula*	*montana*
Crassulaceae	*Crassula*	*multicava*	Crassulaceae	*Crassula*	*muscosa*
Crassulaceae	*Crassula*	*natans*	Crassulaceae	*Crassula*	*obovata*
Crassulaceae	*Crassula*	*orbicularis*	Crassulaceae	*Crassula*	*pellucida*
Crassulaceae	*Crassula*	*pellucida*	Crassulaceae	*Crassula*	*pubescens*
Crassulaceae	*Crassula*	*sarcocaulis*	Crassulaceae	*Crassula*	*spathulata*
Crassulaceae	*Crassula*	*vaillantii*	Crassulaceae	*Tylecodon*	*ventricosus*
Cucurbitaceae	*Coccinia*	*quinqueloba*	Cucurbitaceae	*Cucumis*	*myriocarpus*
Cyperaceae	*Carex*	*glomerabilis*	Cyperaceae	*Carex*	*spartea*
Cyperaceae	*Cyperus*	*pulcher*	Cyperaceae	*Cyperus*	*rubicundus*
Cyperaceae	*Cyperus*	*rupestris*	Cyperaceae	*Cyperus*	*usitatus*
Cyperaceae	*Ficinia*	*cinnamomea*	Cyperaceae	*Ficinia*	*fascicularis*
Cyperaceae	*Ficinia*	*stolonifera*	Cyperaceae	*Isolepis*	*costata*
Cyperaceae	*Isolepis*	*fluitans*	Cyperaceae	*Schoenoplectus*	*decipiens*
Cyperaceae	*Schoenoplectus*	*paludicola*	Dennstaedtiaceae	*Hypolepis*	*villosa-viscida*
Dioscoreaceae	*Dioscorea*	*elephantipes*	Dipsacaceae	*Cephalaria*	*humilis*
Dipsacaceae	*Scabiosa*	*albanensis*	Dryopteridaceae	*Dryopteris*	*inaequalis*
Dryopteridaceae	*Dryopteris*	*pentheri*	Dryopteridaceae	*Polystichum*	*luctuosum*
Dryopteridaceae	*Rumohra*	*adiantiformis*	Ebenaceae	*Diospyros*	*lycioides*
Ebenaceae	*Diospyros*	*whyteana*	Ebenaceae	*Euclea*	*coriacea*
Ebenaceae	*Euclea*	*undulata*	Entodontaceae	*Entodon*	*macropodus*
Equisetaceae	*Equisetum*	*ramosissimum*	Ericaceae	*Erica*	*caespitosa*
Ericaceae	*Erica*	*caffrorum*	Ericaceae	*Erica*	*cumuliflora*
Ericaceae	*Erica*	*demissa*	Ericaceae	*Erica*	*formosa*
Ericaceae	*Erica*	*simulans*	Ericaceae	*Erica*	*trachysantha*
Euphorbiaceae	*Clutia*	*polifolia*	Euphorbiaceae	*Clutia*	*pulchella*
Euphorbiaceae	*Euphorbia*	*pulvinata*	Euphorbiaceae	*Euphorbia*	*rhombifolia*

Euphorbiaceae	*Euphorbia*	*sclerophylla*	Euphorbiaceae	*Euphorbia*	*stellata*
Euphorbiaceae	*Euphorbia*	*tridentata*	Fabaceae	*Acacia*	*mearnsii*
Fabaceae	*Argyrolobium*	*pumilum*	Fabaceae	*Aspalathus*	*cinerascens*
Fabaceae	*Aspalathus*	*spinosa*	Fabaceae	*Aspalathus*	*subtingens*
Fabaceae	*Calobota*	*psiloloba*	Fabaceae	*Calpurnia*	*aurea*
Fabaceae	*Dipogon*	*lignosus*	Fabaceae	*Indigofera*	*alternans*
Fabaceae	*Indigofera*	*alternans*	Fabaceae	*Indigofera*	*disticha*
Fabaceae	*Indigofera*	*elandsbergensis*	Fabaceae	*Indigofera*	*sessilifolia*
Fabaceae	*Indigofera*	*zeyheri*	Fabaceae	*Lessertia*	*flexuosa*
Fabaceae	*Lessertia*	*fruticosa*	Fabaceae	*Lessertia*	*pauciflora*
Fabaceae	*Lessertia*	*sp.*	Fabaceae	*Medicago*	*polymorpha*
Fabaceae	*Melilotus*	*indicus*	Fabaceae	*Melolobium*	*candicans*
Fabaceae	*Melolobium*	*microphyllum*	Fabaceae	*Otholobium*	*bracteolatum*
Fabaceae	*Podalyria*	*burchellii*	Fabaceae	*Psoralea*	*glabra*
Fabaceae	*Rhynchosia*	*adenodes*	Fabaceae	*Rhynchosia*	*argentea*
Fabaceae	*Rhynchosia*	*sp.*	Fabaceae	*Tephrosia*	*capensis*
Fabaceae	*Tephrosia*	*grandiflora*	Fissidentaceae	*Fissidens*	*bryoides*
Fissidentaceae	*Fissidens*	*ovatus*	Fissidentaceae	*Fissidens*	*rufescens*
Gentianaceae	*Chironia*	*tetragona*	Gentianaceae	*Sebaea*	*bojeri*
Gentianaceae	*Sebaea*	*macrophylla*	Geraniaceae	*Geranium*	*caffrum*
Geraniaceae	*Geranium*	*harveyi*	Geraniaceae	*Pelargonium*	*abrotanifolium*
Geraniaceae	*Pelargonium*	*alchemilloides*	Geraniaceae	*Pelargonium*	*aridum*
Geraniaceae	*Pelargonium*	*pulverulentum*	Geraniaceae	*Pelargonium*	*sidoides*
Gleicheniaceae	*Gleichenia*	*polypodioides*	Grimmiaceae	*Grimmia*	*laevigata*
Grimmiaceae	*Schistidium*	*apocarpum*	Hedwigiaceae	*Braunia*	*secunda*
Hedwigiaceae	*Hedwigia*	*ciliata*	Hyacinthaceae	*Albuca*	*bracteata*
Hyacinthaceae	*Albuca*	*nelsonii*	Hyacinthaceae	*Albuca*	*shawii*
Hyacinthaceae	*Albuca*	*virens*	Hyacinthaceae	*Drimia*	*altissima*
Hyacinthaceae	*Drimia*	*angustifolia*	Hyacinthaceae	*Drimia*	*anomala*
Hyacinthaceae	*Drimia*	*calcarata*	Hyacinthaceae	*Eucomis*	*autumnalis*
Hyacinthaceae	*Lachenalia*	*campanulata*	Hyacinthaceae	*Ledebouria*	*cooperi*
Hyacinthaceae	*Ledebouria*	*ensifolia*	Hyacinthaceae	*Ornithogalum*	*capillare*
Hyacinthaceae	*Ornithogalum*	*constrictum*	Hyacinthaceae	*Ornithogalum*	*dubium*
Hyacinthaceae	*Ornithogalum*	*graminifolium*	Hyacinthaceae	*Ornithogalum*	*juncifolium*
Hyacinthaceae	*Ornithogalum*	*paludosum*	Hypericaceae	*Hypericum*	*lalandii*
Hypnaceae	*Hypnum*	*cupressiforme*	Hypoxidaceae	*Empodium*	*gloriosum*
Hypoxidaceae	*Hypoxis*	*angustifolia*	Hypoxidaceae	*Hypoxis*	*argentea*
Hypoxidaceae	*Hypoxis*	*villosa*	Hypoxidaceae	*Hypoxis*	*villosa*
Hypoxidaceae	*Pauridia*	*trifurcillata*	Icacinaceae	*Apodytes*	*dimidiata*
Icacinaceae	*Cassinopsis*	*ilicifolia*	Iridaceae	*Aristea*	*abyssinica*
Iridaceae	*Aristea*	*schizolaena*	Iridaceae	*Dierama*	*grandiflorum*
Iridaceae	*Dietes*	*iridioides*	Iridaceae	*Gladiolus*	*carinatus*
Iridaceae	*Gladiolus*	*longicollis*	Iridaceae	*Gladiolus*	*mortonius*
Iridaceae	*Gladiolus*	*permeabilis*	Iridaceae	*Gladiolus*	*saundersii*
Iridaceae	*Hesperantha*	*bachmannii*	Iridaceae	*Hesperantha*	*longituba*
Iridaceae	*Moraea*	*elliotii*	Iridaceae	*Moraea*	*huttonii*
Iridaceae	*Moraea*	*polystachya*	Iridaceae	*Romulea*	*macowanii*

Iridaceae	*Romulea*	*macowanii*	Iridaceae	*Syringodea*	*pulchella*
Iridaceae	*Tritonia*	*gladiolaris*	Iridaceae	*Tritonia*	*laxifolia*
Iridaceae	*Tritonia*	*securigera*	Iridaceae	*Watsonia*	*knysnana*
Juncaceae	*Juncus*	*effusus*	Lamiaceae	*Ballota*	*africana*
Lamiaceae	*Leonotis*	*pentadentata*	Lamiaceae	*Mentha*	*longifolia*
Lamiaceae	*Ocimum*	*burchellianum*	Lamiaceae	*Plectranthus*	*ecklonii*
Lamiaceae	*Salvia*	*aurita*	Lamiaceae	*Salvia*	*aurita*
Lamiaceae	*Salvia*	*repens*	Lamiaceae	*Salvia*	*verbenaca*
Lamiaceae	*Stachys*	*aethiopica*	Lamiaceae	*Stachys*	*dregeana*
Lamiaceae	*Stachys*	*grandifolia*	Lamiaceae	*Teucrium*	*africanum*
Lamiaceae	*Teucrium*	*trifidum*	Leptodontaceae	*Leptodon*	*smithii*
Linaceae	*Linum*	*thunbergii*	Lobeliaceae	*Lobelia*	*cuneifolia*
Lobeliaceae	*Lobelia*	*flaccida*	Lobeliaceae	*Monopsis*	*stellarioides*
Loranthaceae	*Moquiniella*	*rubra*	Lycopodiaceae	*Lycopodium*	*clavatum*
Malvaceae	*Anisodontea*	*scabrosa*	Malvaceae	*Grewia*	*occidentalis*
Malvaceae	*Grewia*	*robusta*	Malvaceae	*Hermannia*	*althaeoides*
Malvaceae	*Hermannia*	*flammula*	Malvaceae	*Hermannia*	*glabrata*
Malvaceae	*Hermannia*	*gracilis*	Malvaceae	*Hermannia*	*parviflora*
Malvaceae	*Hermannia*	*velutina*	Malvaceae	*Hibiscus*	*pusillus*
Malvaceae	*Sida*	*ternata*	Meliaceae	*Nymania*	*capensis*
Mniaceae	*Plagiomnium*	*rhynchophorum*	Myricaceae	*Morella*	*brevifolia*
Myrsinaceae	*Myrsine*	*africana*	Neckeraceae	*Neckera*	*valentiniana*
Neckeraceae	*Porotrichum*	*madagassum*	Nyctaginaceae	*Boerhavia*	*erecta*
Oleaceae	*Olea*	*europaea*	Oliniaceae	*Olinia*	*emarginata*
Onagraceae	*Epilobium*	*capense*	Orchidaceae	*Brownleea*	*parviflora*
Orchidaceae	*Brownleea*	*recurvata*	Orchidaceae	*Disa*	*caulescens*
Orchidaceae	*Disa*	*crassicornis*	Orchidaceae	*Disa*	*lugens*
Orchidaceae	*Disa*	*porrecta*	Orchidaceae	*Disa*	*sagittalis*
Orchidaceae	*Disa*	*versicolor*	Orchidaceae	*Disperis*	*macowanii*
Orchidaceae	*Eulophia*	*tuberculata*	Orchidaceae	*Habenaria*	*arenaria*
Orchidaceae	*Holothrix*	*parviflora*	Orchidaceae	*Holothrix*	*scopularia*
Orchidaceae	*Huttonaea*	*pulchra*	Orchidaceae	*Polystachya*	*pubescens*
Orchidaceae	*Satyrium*	*cristatum*	Orchidaceae	*Satyrium*	*longicauda*
Orthotrichaceae	*Macrocoma*	*tenuis*	Orthotrichaceae	*Orthotrichum*	*diaphanum*
Papaveraceae	*Papaver*	*aculeatum*	Phytolaccaceae	*Phytolacca*	*heptandra*
Pilotrichaceae	*Hookeriopsis*	*utacamundiana*	Plantaginaceae	*Plantago*	*lanceolata*
Plantaginaceae	*Veronica*	*persica*	Poaceae	*Agrostis*	*avenacea*
Poaceae	*Agrostis*	*barbuligera*	Poaceae	*Agrostis*	*bergiana*
Poaceae	*Agrostis*	*eriantha*	Poaceae	*Agrostis*	*lachnantha*
Poaceae	*Aristida*	*adscensionis*	Poaceae	*Aristida*	*canescens*
Poaceae	*Aristida*	*congesta*	Poaceae	*Bothriochloa*	*radicans*
Poaceae	*Brachypodium*	*distachyon*	Poaceae	*Briza*	*subaristatum*
Poaceae	*Bromus*	*catharticus*	Poaceae	*Bromus*	*diandrus*
Poaceae	*Bromus*	*hordeaceus*	Poaceae	*Bromus*	*leptoclados*
Poaceae	*Bromus*	*pectinatus*	Poaceae	*Bromus*	*speciosus*
Poaceae	*Chloris*	*virgata*	Poaceae	*Digitaria*	*eriantha*
Poaceae	*Digitaria*	*ternata*	Poaceae	*Echinochloa*	*colona*

Poaceae	*Echinochloa*	*crus-galli*	Poaceae	*Enneapogon*	*scoparius*
Poaceae	*Eragrostis*	*capensis*	Poaceae	*Eragrostis*	*curvula*
Poaceae	*Eragrostis*	*lehmanniana*	Poaceae	*Eragrostis*	*planiculmis*
Poaceae	*Eustachys*	*paspaloides*	Poaceae	*Festuca*	*longipes*
Poaceae	*Festuca*	*scabra*	Poaceae	*Fingerhuthia*	*africana*
Poaceae	*Helictotrichon*	*turgidulum*	Poaceae	*Holcus*	*lanatus*
Poaceae	*Hordeum*	*murinum*	Poaceae	*Koeleria*	*capensis*
Poaceae	*Lolium*	*multiflorum*	Poaceae	*Lolium*	*temulentum*
Poaceae	*Melica*	*decumbens*	Poaceae	*Melinis*	*nerviglumis*
Poaceae	*Melinis*	*repens*	Poaceae	*Nassella*	*neesiana*
Poaceae	*Nassella*	*trichotoma*	Poaceae	*Oropetium*	*capense*
Poaceae	*Panicum*	*coloratum*	Poaceae	*Panicum*	*deustum*
Poaceae	*Panicum*	*maximum*	Poaceae	*Panicum*	*stapfianum*
Poaceae	*Paspalum*	*dilatatum*	Poaceae	*Pennisetum*	*sphacelatum*
Poaceae	*Pentameris*	*glandulosa*	Poaceae	*Pentameris*	*pallida*
Poaceae	*Phalaris*	*aquatica*	Poaceae	*Phalaris*	*minor*
Poaceae	*Poa*	*annua*	Poaceae	*Poa*	*binata*
Poaceae	*Polypogon*	*viridis*	Poaceae	*Setaria*	*sphacelata*
Poaceae	*Setaria*	*sphacelata*	Poaceae	*Sporobolus*	*africanus*
Poaceae	*Sporobolus*	*fimbriatus*	Poaceae	*Sporobolus*	*natalensis*
Poaceae	*Stipa*	*dregeana*	Poaceae	*Stipa*	*dregeana*
Poaceae	*Streblochaete*	*longiarista*	Poaceae	*Tenaxia*	*disticha*
Poaceae	*Themeda*	*triandra*	Poaceae	*Tragus*	*berteronianus*
Poaceae	*Tribolium*	*curvum*	Poaceae	*Tristachya*	*leucothrix*
Poaceae	*Vulpia*	*bromoides*	Poaceae	*Vulpia*	*myuros*
Polygalaceae	*Muraltia*	*alopecuroides*	Polygalaceae	*Muraltia*	*alticola*
Polygalaceae	*Muraltia*	*mixta*	Polygalaceae	*Muraltia*	*saxicola*
Polygalaceae	*Polygala*	*ephedroides*	Polygalaceae	*Polygala*	*fruticosa*
Polygonaceae	*Persicaria*	*lapathifolia*	Polygonaceae	*Rumex*	*acetosella*
Polygonaceae	*Rumex*	*crispus*	Polygonaceae	*Rumex*	*lanceolatus*
Polypodiaceae	*Pleopeltis*	*macrocarpa*	Polypodiaceae	*Polypodium*	*vulgare*
Polytrichaceae	*Atrichum*	*androgynum*	Porellaceae	*Porella*	*vallis-gratiae*
Potamogetonaceae	*Potamogeton*	*pectinatus*	Pottiaceae	*Syntrichia*	*fragilis*
Pottiaceae	*Trichostomum*	*brachydontium*	Pottiaceae	*Trichostomum*	*tenuirostre*
Pottiaceae	*Weissia*	*humicola*	Proteaceae	*Protea*	*subvestita*
Proteaceae	*Spatalla*	*setacea*	Pteridaceae	*Adiantum*	*capillus-veneris*
Pteridaceae	*Adiantum*	*poiretii*	Pteridaceae	*Cheilanthes*	*eckloniana*
Pteridaceae	*Cheilanthes*	*quadripinnata*	Pteridaceae	*Doryopteris*	*concolor*
Pteridaceae	*Pellaea*	*calomelanos*	Pteridaceae	*Pteris*	*cretica*
Pteridaceae	*Pteris*	*dentata*	Ptychomitriaceae	*Ptychomitrium*	*crispatum*
Ptychomitriaceae	*Ptychomitrium*	*subcrispatum*	Ranunculaceae	*Ranunculus*	*multifidus*
Ranunculaceae	*Ranunculus*	*trichophyllus*	Restionaceae	*Restio*	*gaudichaudianus*
Restionaceae	*Restio*	*sejunctus*	Rhamnaceae	*Phylica*	*paniculata*
Rhamnaceae	*Phylica*	*plumigera*	Rhamnaceae	*Rhamnus*	*prinoides*
Rhamnaceae	*Scutia*	*myrtina*	Rhamnaceae	*Ziziphus*	*mucronata*
Rosaceae	*Cliffortia*	*eriocephalina*	Rosaceae	*Cliffortia*	*linearifolia*
Rosaceae	*Cliffortia*	*nitidula*	Rosaceae	*Cliffortia*	*strobilifera*

Rosaceae	*Leucosidea*	*sericea*	Rosaceae	*Rubus*	*rigidus*
Rubiaceae	*Canthium*	*ciliatum*	Rubiaceae	*Galium*	*capense*
Rubiaceae	*Nenax*	*microphylla*	Rutaceae	*Calodendrum*	*capense*
Rutaceae	*Ptaeroxylon*	*obliquum*	Rutaceae	*Zanthoxylum*	*capense*
Salicaceae	*Dovyalis*	*zeyheri*	Salicaceae	*Salix*	*mucronata*
Salicaceae	*Trimeria*	*trinervis*	Salviniaceae	*Azolla*	*filiculoides*
Santalaceae	*Thesium*	*galioides*	Santalaceae	*Viscum*	*continuum*
Santalaceae	*Viscum*	*crassulae*	Sapindaceae	*Allophylus*	*decipiens*
Sapindaceae	*Hippobromus*	*pauciflorus*	Schizaeaceae	*Schizaea*	*pectinata*
Scrophulariaceae	*Buddleja*	*auriculata*	Scrophulariaceae	*Buddleja*	*glomerata*
Scrophulariaceae	*Buddleja*	*saligna*	Scrophulariaceae	*Buddleja*	*salviifolia*
Scrophulariaceae	*Diascia*	*ramosa*	Scrophulariaceae	*Glekia*	*krebsiana*
Scrophulariaceae	*Hebenstretia*	*dura*	Scrophulariaceae	*Jamesbrittenia*	*foliolosa*
Scrophulariaceae	*Jamesbrittenia*	*microphylla*	Scrophulariaceae	*Jamesbrittenia*	*tysonii*
Scrophulariaceae	*Limosella*	*grandiflora*	Scrophulariaceae	*Manulea*	*bellidifolia*
Scrophulariaceae	*Manulea*	*paniculata*	Scrophulariaceae	*Nemesia*	*fruticans*
Scrophulariaceae	*Selago*	*albida*	Scrophulariaceae	*Selago*	*corymbosa*
Scrophulariaceae	*Selago*	*dolosa*	Scrophulariaceae	*Selago*	*geniculata*
Solanaceae	*Lycium*	*cinereum*	Solanaceae	*Lycium*	*schizocalyx*
Solanaceae	*Solanum*	*africanum*	Solanaceae	*Withania*	*somnifera*
Stilbaceae	*Halleria*	*lucida*	Thelypteridaceae	*Stegnogramma*	*pozoi*
Thymelaeaceae	*Lasiosiphon*	*burchellii*	Thymelaeaceae	*Lasiosiphon*	*capitatus*
Thymelaeaceae	*Passerina*	*obtusifolia*	Ulmaceae	*Celtis*	*africana*
Urticaceae	*Laportea*	*peduncularis*	Vitaceae	*Rhoicissus*	*digitata*
Vitaceae	*Rhoicissus*	*revoilii*	Vitaceae	*Rhoicissus*	*tridentata*
Zamiaceae	*Encephalartos*	*cycadifolius*	Zygophyllaceae	*Roepera*	*lichtensteiniana*
Zygophyllaceae	*Tribulus*	*zeyheri*			

9 APPENDIX 2. LIST OF MAMMALS

List of Mammals which potentially occur at the Highlands Wind Farm site for the grid square 3225. Taxonomy and habitat notes are derived from Skinner & Chimimba (2005), while conservation status is according to the EWT 2016 assessment. Highlighted species are those that are confirmed present at the site.

Family	Scientific name	Common name	Red list category	Number of QDSs	Number of records
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (2016)	6	1362
Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern (2016)	2	89
Bovidae	*Pelea capreolus*	Vaal Rhebok	Near Threatened (2016)	4	280
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (2016)	4	112
Bovidae	*Redunca arundinum*	Southern Reedbuck	Least Concern (2016)	1	1
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	Least Concern	5	1351
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)	3	17
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern (2016)	4	755
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)	4	255
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern (2016)	4	21
Canidae	*Vulpes chama*	Cape Fox	Least Concern (2016)	1	2
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern (2016)	9	35
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern (2016)	3	64
Chrysochloridae	*Amblysomus hottentotus*	Hottentot Golden Mole	Least Concern (2016)	1	1
Equidae	*Equus zebra zebra*	Cape Mountain Zebra	Least Concern (2016)	4	997
Erinaceidae	*Atelerix frontalis frontalis*	South African Hedgehog	Near Threatened (2016)	1	1
Felidae	*Caracal caracal*	Caracal	Least Concern (2016)	2	4
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)	6	10
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	1	2
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern (2016)	3	11
Herpestidae	*Herpestes pulverulentus*	Cape Gray Mongoose	Least Concern (2016)	1	1
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern (2016)	4	8
Hyaenidae	*Hyaena brunnea*	Brown Hyena	Near Threatened	1	1
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern (2016)	2	10
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	3	36
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern	1	1
Muridae	*Aethomys ineptus*	Tete Veld Aethomys	Least Concern (2016)	1	1
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	Least Concern	1	2
Muridae	*Mastomys coucha*	Southern African Mastomys	Least Concern (2016)	1	5
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)	1	2

Muridae	*Mus (Nannomys) minutoides*	Southern African Pygmy Mouse	Least Concern	1	1
Muridae	*Otomys irroratus*	Southern African Vlei Rat	Least Concern (2016)	1	3
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)	2	19
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern (2016)	2	2
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened (2016)	2	2
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (2016)	3	10
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern (2016)	2	4
Sciuridae	*Xerus inauris*	South African Ground Squirrel	Least Concern	3	14
Soricidae	*Crocidura flavescens*	Greater Red Musk Shrew	Least Concern (2016)	1	3
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern (2016)	1	2
Suidae	*Phacochoerus africanus*	Common Warthog	Least Concern (2016)	4	11
Viverridae	*Genetta tigrina*	Cape Genet	Least Concern (2016)	1	1

10 APPENDIX 3. LIST OF REPTILES

List of reptiles which are known from the broad area around the Highlands Wind Farm site, according to the SARCA database, derived for the degree square 3225. Status is according to Bates et al. (2014).

Family	Scientific name	Common name	Red list category	Number of QDSs	Number of records
Agamidae	*Agama aculeata aculeata*	Common Ground Agama	Least Concern	4	4
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern	7	22
Chamaeleonidae	*Bradypodion ventrale*	Eastern Cape Dwarf Chameleon	Least Concern	1	1
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern	2	2
Colubridae	*Dispholidus typus typus*	Boomslang	Least Concern	3	4
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	Least Concern	1	1
Cordylidae	*Cordylus cordylus*	Cape Girdled Lizard	Least Concern	8	22
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	Least Concern	3	3
Cordylidae	*Pseudocordylus microlepidotus fasciatus*	Karoo Crag Lizard	Least Concern	3	4
Elapidae	*Naja nivea*	Cape Cobra	Least Concern	1	2
Gekkonidae	*Afroedura karroica*	Karoo Flat Gecko	Least Concern	4	12
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	Least Concern	3	3
Gekkonidae	*Pachydactylus maculatus*	Spotted Gecko	Least Concern	5	11
Gekkonidae	*Pachydactylus oculatus*	Golden Spotted Gecko	Least Concern	3	12
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern	3	3
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common Sand Lizard	Least Concern	5	10
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	Least Concern	1	3
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern	1	2
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern	1	1
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern	2	2
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern	1	1
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	Least Concern	2	5
Lamprophiidae	*Psammophylax rhombeatus rhombeatus*	Spotted Grass Snake	Least Concern	5	6

Leptotyphlopidae	*Leptotyphlops nigricans*	Black Thread Snake	Least Concern	1	1
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Not evaluated	2	5
Scincidae	*Acontias breviceps*	Short-headed Legless Skink	Least Concern	1	1
Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	Least Concern	1	1
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern	5	6
Scincidae	*Trachylepis homalocephala*	Red-sided Skink	Least Concern	1	5
Scincidae	*Trachylepis sulcata sulcata*	Western Rock Skink	Least Concern	9	19
Scincidae	*Trachylepis variegata*	Variegated Skink	Least Concern	4	5
Testudinidae	*Chersina angulata*	Angulate Tortoise	Least Concern	2	2
Testudinidae	*Homopus areolatus*	Parrot-beaked Tortoise	Least Concern	1	1
Testudinidae	*Homopus femoralis*	Greater Padloper	Least Concern	1	1
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern	3	6
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern	3	5
Varanidae	*Varanus albigularis albigularis*	Rock Monitor	Least Concern	2	5
Varanidae	*Varanus niloticus*	Water Monitor	Least Concern	1	1

11 APPENDIX 4. LIST OF AMPHIBIANS

List of amphibians which potentially occur at the Highlands Wind Farm from the degree square 3225. Taxonomy and habitat notes are from du Preez and Carruthers (2009) and conservation status from the Minter et al. (2004).

Family	Scientific name	Common name	Red list category	Number of QDSs	Number of records
Bufonidae	*Poyntonophrynus vertebralis*	Southern Pygmy Toad	Least Concern	2	4
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	7	8
Bufonidae	*Vandijkophrynus gariepensis gariepensis*	Karoo Toad (subsp. gariepensis)	Least Concern	10	23
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	8	17
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern	10	13
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern	2	2
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern	12	29
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	Not evaluated	1	1
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern	13	58
Pyxicephalidae	*Cacosternum nanum*	Bronze Caco	Least Concern	5	6
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern	4	7
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern	9	19