GAROB TO KRONOS POWER LINE -

FAUNA & FLORA SPECIALIST REPORT FOR BASIC ASSESMENT

PRODUCED FOR

JUWI RENEWABLE ENERGIES (PTY) LTD

SIMON TODD CONSULTING
Simon.Todd@3foxes.co.za

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DECLARATION OF CONSULTANTS' INDEPENDENCE

The author of this report, Simon Todd, does hereby declare that he is an independent consultant appointed by the Client and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of the specialist performing such work. All opinions expressed in this report are his own.

Simon Todd Pr.Sci.Nat

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EXECUTIVE SUMMARY

This report details the terrestrial ecology impacts likely to be associated with the development of the proposed JUWI Garob - Kronos power line near Copperton in the Northern Cape Province. The development would consist of up to 58 wind turbines distributed across the 5500 ha site, with associated infrastructure such as roads, underground cabling and a transmission line to link the facility to the ESKOM network.

A site visit and desktop study were conducted to assess the presence and distribution of ecologically sensitive, species, habitats and vegetation units at the site. A detailed vegetation map for the site was produced which illustrated that the site contains a far greater variety of vegetation types than is depicted by the national vegetation map. Of significance is the presence of quartzitic rocky hills at the site which contained relatively greater species richness of fauna and flora as compared to the adjacent habitats on sandy soils or calcrete. The sensitivity map generated for the site is depicted below and illustrates the sensitive nature of the drainage features of the site as well as the higher sensitivity of the rocky hills.

Six major impacts were identified as being associated with the development of the site and were assessed:

- Impacts on vegetation and listed plant species
- Increased alien plant invasion risk
- Loss of habitat for fauna
- Reduced landscape connectivity
- Direct faunal impacts
- Increased soil erosion risk

All of the impacts assessed can be reduced to a low or moderate level through mitigation and there are no impacts present which are likely to represent a red-flag for the development. Some impacts such as habitat loss for fauna and flora cannot be avoided. However, this would amount to only about 100 ha, which is not highly significant when considered in the light of the surrounding landscape which is almost entirely intact. Furthemore, the site does not appear to contain any specific features that are not widely available in the surrounding landscape. As a result, the impacts of the development are likely to be largely local in nature and there do not appear to be any impacts which would be of wider significance. Four different overhead power line options to link the facility to the ESKOM grid are also considered. The preferred option would be Alternative 1 which is a loop in loop out connection from the on-site substation to the ESKOM Burchell/Ferrum power line which runs through the site. This option would result in significantly lower impact than the other alternatives. If this is not possible, then Option B, Alternative 1A which aligns with the existing ESKOM transmission line which traverses the site is identified as the next preferred option. In the long-term, erosion is one of the major risks associated with the development and should the development go ahead, specific precautions to reduce, manage and monitor erosion at the site should be implemented. Provided that suitable measures to control erosion and other potential impacts are implemented, the development of the site is not likely to result in significant degradation or biodiversity loss within the receiving environment.

1 INTRODUCTION

Juwi Renewable Energies (Pty) Ltd proposes to develop a wind energy facility on the farm Nelspoortjie 5/103 near to Copperton in the Northern Cape Province - Garob Wind Energy Facility which was subject to a separate EIA process (DEA ref: 14/12/16/3/3/2/279).. The development is currently being reviewed by the Department of Environemntal Affairs -, however, the facility requires a grid connection to the Eskom network which was not covered in the original EIA process and is now being covered separately under a Basic Assessment. Savannah Environmental are conducting the Basic Assessment process for the grid connection and have appointed Simon Todd Consulting to perform a specialist fauna and flora assessment of the required infrastructure as part of the BA process. The purpose of the study is to characterize the receiving environment and provide an assessment of the likely impact of the development on the terrestrial fauna and flora of the site. The scope of the study is detailed below and further details of the development thereafter.

The detailed terms of reference for the project are detailed 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 the activity and the manner in which the environ mint may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (incl. using 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 in terms of the following criteria :
    - the nature of the impact, which shall include a description of what causes the effect, what will be affected and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent
    - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)

  - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
  - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
  - the status which will be described as either positive, negative or neutral
  - the degree to which the impact can be reversed
  - the degree to which the impact may cause irreplaceable loss of resources
  - the degree to which the impact can be mitigated
- a description and comparative assessment of all alternatives
- 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
- 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;
  - a comparative assessment of the positive and negative implications of identified alternatives

General Considerations:

- Disclose any gaps in information or assumptions made.
- Recommendations for mitigatory measures to minimise impacts identified.
- An outline of additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP) for faunal related issues.

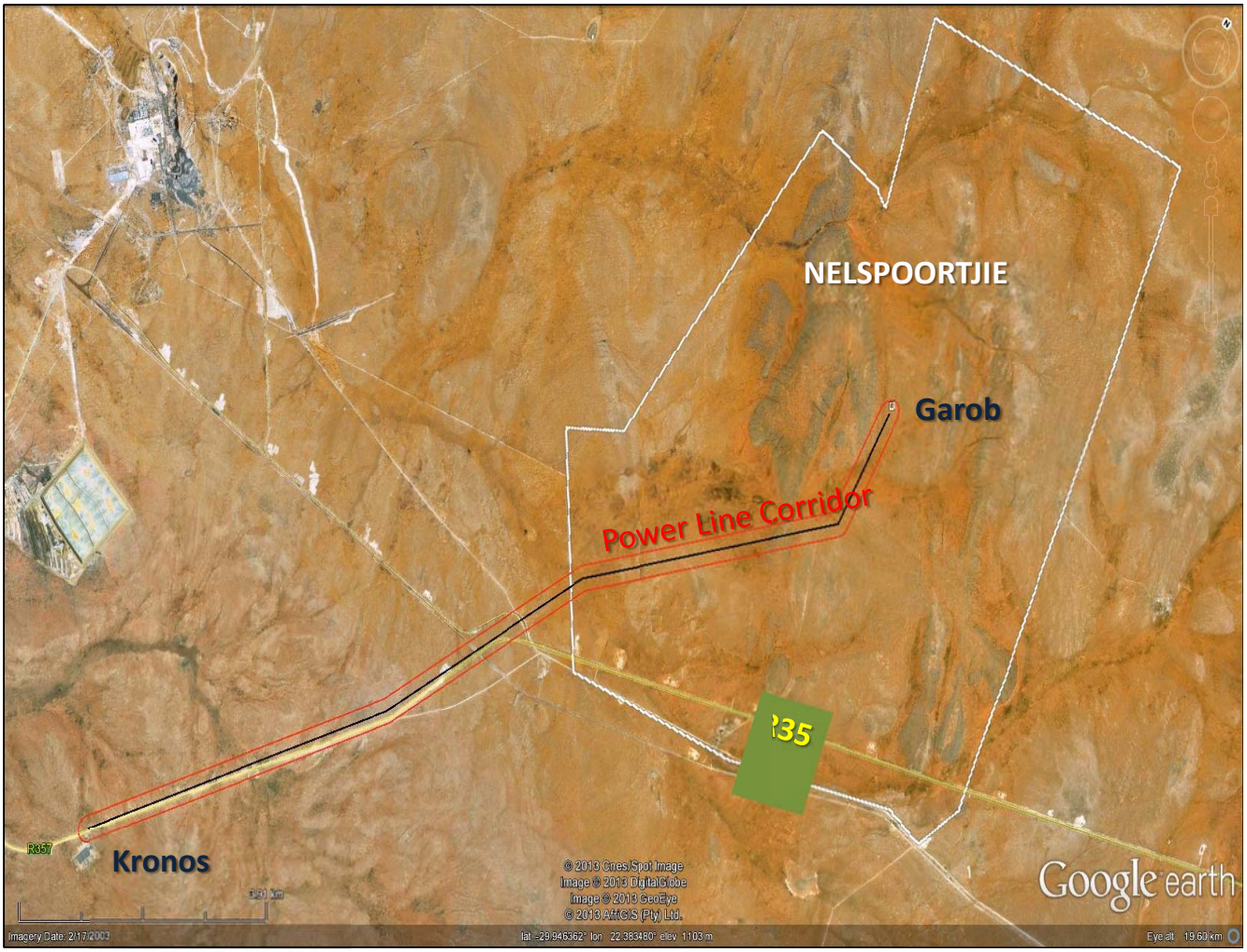
A description of the potential impacts of the development and recommended mitigation measures are to be provided which will be separated into the following project phases:

- Pre-construction
- Construction
- Operational phase

1.2 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed wind farm is situated approximately 10 km east of Copperton on Farm 103, portion 5 (Nelspoortjie farm). The wind farm development consists of up to 58 wind turbines

distributed across the site. The reader is referred to the original EIA study for the layout of the facility itself, as the current study is restricted to the grid connection infrastructure. The infrastructure which forms part of this assessment includes the proposed on-site substation and the overhead power line which runs from the on-site substation to the Eskom Kronos substation approximately 14 km to the south west. The first half of the line traverses Nelspoortjie farm and the second half runs parallel to the R357 until it reaches the Kronos substation. The grid connection layout of the facility is depicted below in Figure 1.



2 REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Environment Conservation Act (ECA) (No 73 of 1989 Amendment Notice No. R1183 of 1997)

This Act provides for the effective protection and controlled utilisation of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments. The ECA requires that developers must undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations.

National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004):

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category

include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

Certain activities, known as Restricted Activities, are regulated by a set of permit regulations published under the Act. These activities may not proceed without environmental authorization. Those relevant to the current study are listed below.

Under the **Environmental Impact Assessment Regulations Listing Notice 1 of 2010** (No. R.544) the following activities are likely to be triggered:

Activity 1: The construction of facilities or infrastructure for the generation of electricity where:

ii. the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.

Under the **Environmental Impact Assessment Regulations Listing Notice 2 of 2010** (No. R.387) the following activities are likely to be triggered:

Activity 1: The construction of facilities or infrastructure, including associated structures or infrastructure, for -

(a) the generation of electricity where –
(i) the electricity output is 20 megawatts or more; or
(ii) the elements of the facility cover a combined area in excess of 1 hectare;

And, under **Environmental Impact Assessment Regulations Listing Notice 3** of 2010 (*R.546):*

Activity 14. The clearing of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.

Activity 16 IV: The construction of infrastructure covering 10 square meters of more where such construction occurs within a watercourse of within 32 metres of a watercourse measured from the edge of the watercourse, excluding where such construction will occur behind the development setback line.

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".*

The only listed tree species observed at the site was *Boscia albitrunca*, which was abundant across most parts of the site. This species is however not rare and the potential loss of some individuals from the area as a result of the development is not a significant concern.

Conservation of Agricultural Resources Act (Act 43 of 1983):

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well be sufficiently prepared to combat veld fires.

The site is however arid and given the low plant cover, it is highly unlikely that fires are a normal occurrence in the area but may occasionally occur following years of exceptional rainfall

Northern Cape Nature Conservation Act, No. 9 of 2009:

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences

19. No Person may –

(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. Of relevance for the current development is the fact that several plant families and genera are listed in their entirety as protected, this includes, inter alia *Mesembryanthemaceae*, *Amaryllidaceae*, *Apocyanceae*, *Asphodeliaceae*, *Crassulaceae*, *Iridaceae* and *Euphorbia*. Although there are few species of conservation concern within these families and genera at the site, the species present within the development footprint will need to be listed with the permit application. A permit obtainable from the DENC permit

office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single integrated permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.

3 METHODOLOGY

3.1 DATA SOURCING AND REVIEW

Apart from the data collected on-site, other data sources consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status was extracted from the South African National Vegetation Map (Mucina and Rutherford 2006).
- Information on plant and animal species recorded for the Quarter Degree Squares (QDS) 2922 CD and DC, 3022 AB and BA was extracted from the SABIF/SIBIS database hosted by SANBI.
- The IUCN conservation status (Table 1) 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 (2011).
- Threatened Ecosystem data was extracted from the National List of Threatened Ecosystems 2010.
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

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 various spatial databases (SANBI's SIBIS and BGIS databases).
- 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 reptile list derived from the literature was also supplemented with species known to occur in the area extracted from the SARCA web portal, hosted by the ADU, http://vmus.adu.org.za
- 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. For each species, the likelihood that it occurs at the site was rated according to the following scale:

- **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
- **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
- **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
- **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.

- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2012) (See Table 1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Table 1. The IUCN Red List Categories for fauna and flora. Species which fall within the categories in red and orange below, are of conservation concern.

IUCN Red List Category
Critically Endangered (CR)
Endangered (EN)
Vulnerable (VU)
Near Threatened (NT)
Critically Rare
Rare
Declining
Data Deficient - Insufficient Information (DDD)
Data Deficient - Taxonomically Problematic (DDT)
Least Concern

3.2 SITE VISIT

The site visit took place on the 5th of February 2013. During the site visit the power line route and substation were investigated, including a 300m buffer on either side of the power

line. A walk-through survey of the substation site was conducted and a full plant species list of the area collected. Along the power line route additional walk through surveys were conducted and the presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site. The information collected earlier during the site visit for the EIA phase of the development was also used to supplement the field data for the site where possible and appropriate.

3.3 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. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern. For those parts of the power line route within the wind farm development, the ecological sensitivity map previously developed for the wind farm development was used and for those parts outside the Nelspoortjie property, new sensitivity mapping was conducted. It is however important to note that even within the wind farm property, the power line route was specifically investigated during the site visit to identify any sensitive features that may be present within the route that may have been previously overlooked. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following potential scale:

- **Low** – Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed. In the current study mining activities are the major agent of transformation, but may also result from intensive agriculture. Most types of development can proceed within these areas with little ecological impact. As there is no intensive agriculture in the area, there were no transformed areas within the development area and so there were no areas classified as Low sensitivity.
- **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. These areas usually comprise the bulk of faunal habitats within an area. 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 may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is 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.

3.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

The site has been visited twice, for the EIA of the wind farm development and for the current study. However, it was relatively dry on both occasions and ideally a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated. As there were relatively few forbs and annuals present during the sampling events, the plant species list of the site can be considered to be representative of the shrubs, trees and perennial grasses and reasonably representative of geophytes, but not adequate for forbs and annuals. The implications of this for the study are however not highly significant as the absence of annuals and forbs is not likely to influence the sensitivity of the different landscape units identified. In addition, there are no listed species known to occur in the area which would not have been visible during one of the site visits. Active small mammal and reptile trapping was not conducted as trap success within low-rainfall areas under dry conditions is very low and several weeks of trapping would be required to generate a reliable species list for the site. Searches for fauna were conducted at the site within habitats likely to be important for fauna and the lists of species directly or indirectly observed were augmented with those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

4.1 VEGETATION

4.1.1 Broad-Scale Vegetation Types

According to the national vegetation map (Mucina & Rutherford 2006), the proposed power line traverses two vegetation types, Bushmanland Arid Grassland and Bushmanland Basin Shrubland (Figure 2). These are both extensive vegetation types that have not been impacted to a large degree by transformation. Bushmanland Arid Grassland is the second most extensive vegetation type in South Africa and occupies an area of 45478 km^2 and extends from around Aggeneys in the east to Prieska in the west. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300 mm deep. Due the arid nature of the unit which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact and its' conservation status is classified as Least Threatened. Mucina & Rutherford (2006) list 6 endemic species for the vegetation type which is relatively few given the extensive nature of

the vegetation type. Bushmanland Basin Shrubland is also among the most extensive vegetation types in South Africa with an extent of 34 690 km^2. Bushmanland Basin Shrubland occurs on the extensive basin centered on Brandvlei and Van Wyksvlei, spanning Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to around Williston in the south. The area is characterized by slightly irregular plains dominated by dwarf woody shrubs, with succulent shrubs or perennial grasses in places. The geology consists largely of mudstones and shales of the Ecca group and Dwyka tillites with occasional dolerite intrusions. Soils are largely shallow to non-existent, with calcrete present in most areas. Rainfall ranges from 100-200mm and falls mostly during the summer months as thunder storms. As a result of the arid nature of the area, very little of this vegetation type has been affected by intensive agriculture and it is classified as Least Threatened. There are few endemic and biogeographically important species present at the site and only *Tridentea dwequensis* is listed by Mucina and Rutherford as biogeographically important while *Cromidon minimum*, *Ornithogalum bicornutum* and *O.ovatum* subsp *oliverorum* are listed as being endemic to the vegetation type.

The only other vegetation type which occurs in the vicinity is Lower Gariep Broken Veld. The field assessment of the site suggests that although this vegetation type is not mapped by Mucina and Rutherford (2006) as occurring within the study area, the vegetation of some parts of the site have more in common with this vegetation type than either of the two mapped units. This can be related to the location of the site along the boundary of several vegetation types as well as the presence of a variety of landscape units within the study area. Indeed, Mucina & Rutherford (2006), recognized that along the eastern border of the Bushmanland Arid Grassland vegetation type it often intermingles with Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Such intermingling of vegetation types is a conspicuous feature of the site, which also contains extensive elements of Lower Gariep Broken Veld and Bushmanland Basin Shrubland.

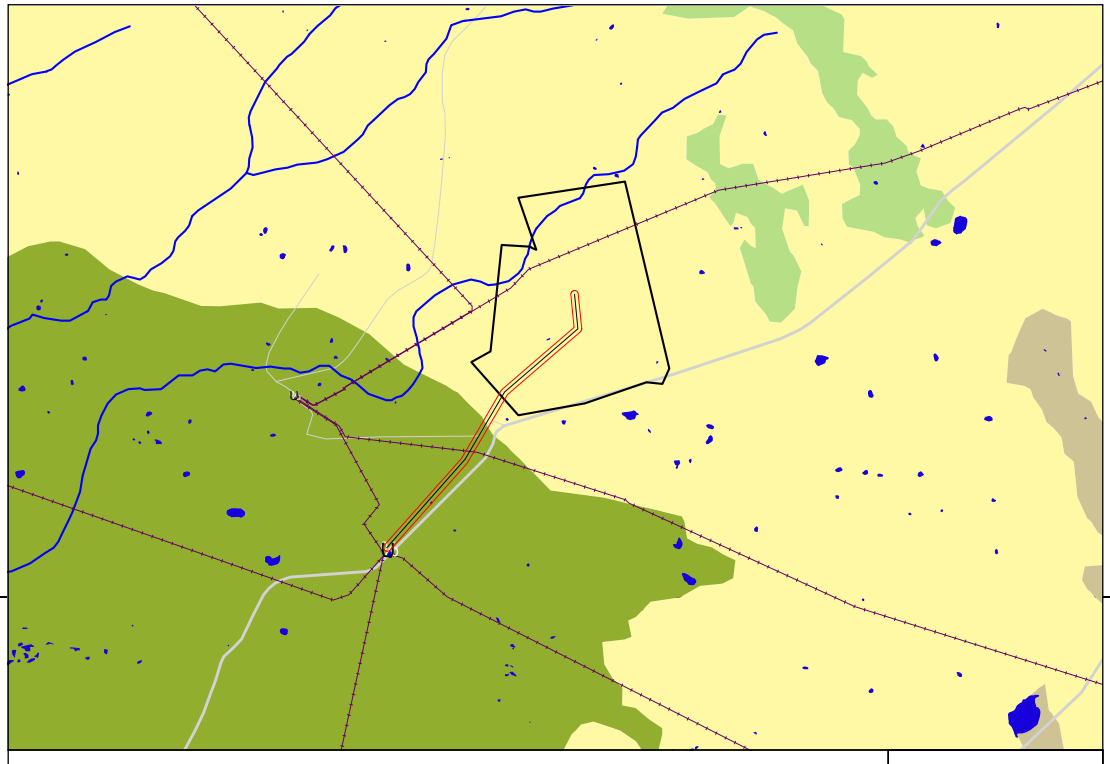


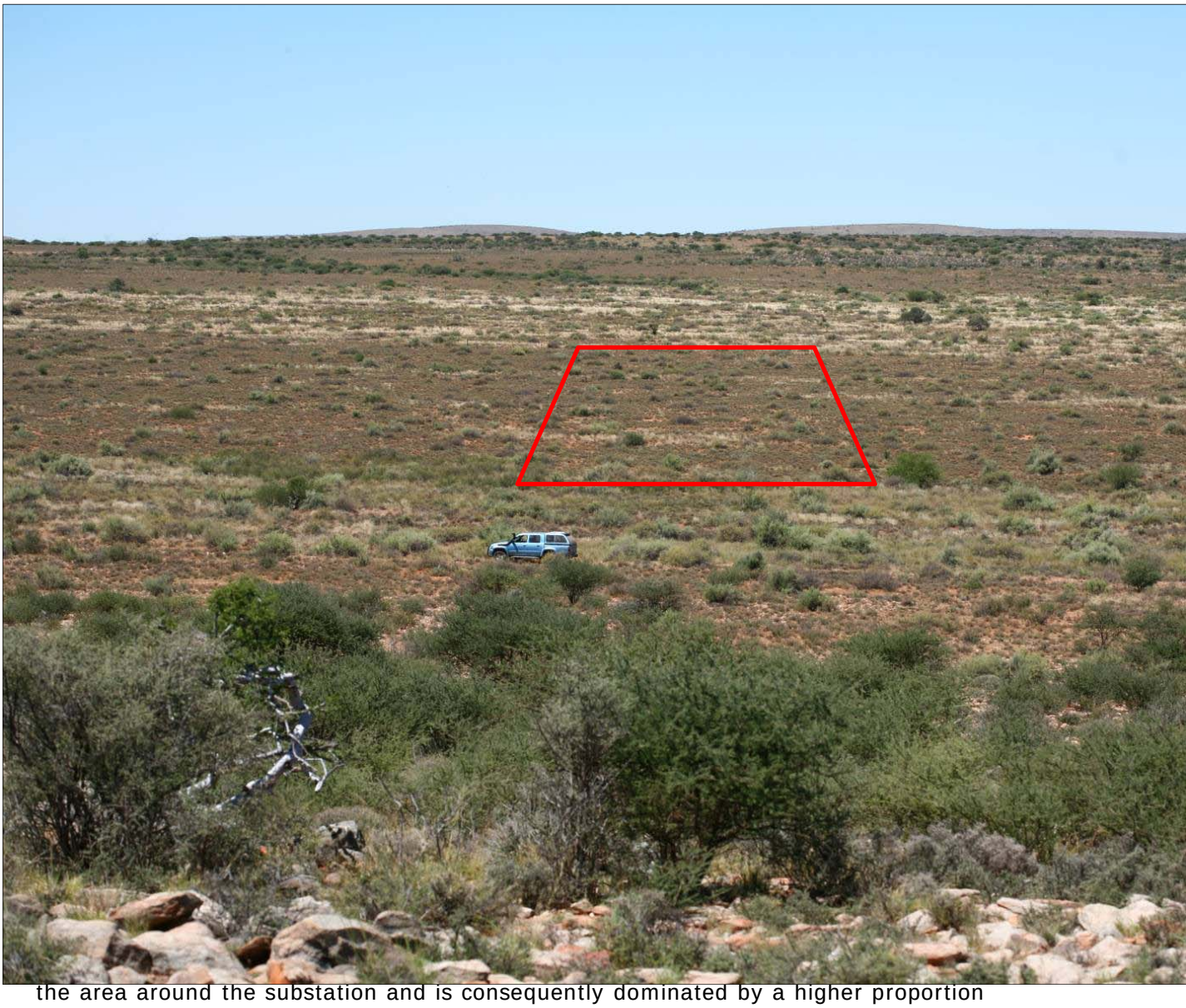
Figure 2. Broad-scale overview of the vegetation in and around the proposed Garob - Kronos power line. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers, pans and wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011).

4.1.2 Fine-Scale Vegetation Patterns

The fine scale vegetation patterns within the Nelpoortjie section of the site are discussed and mapped within the EIA report for the wind farm development and the reader is referred to that report for a full discussion of these plant communities. A brief discussion of the different communities potentially impacted by the power line route is provided below with reference to the different sections of the power line route.

Garob Substation

The proposed power line runs from the on-site Garob substation located roughly in the center of the wind farm property, southwest towards the R357. The substation site is depicted below in Figure 3. The site consists of an open shrubland dominated largely by low woody shrubs such as *Pentzia incana*, *Ruschia spinosa*, *Aptosimum marlothii*, *Rosenia humilis* and *Pegolettia retrofracta*. Grasses are also present, often distributed in a patchy manner due to subtle differences in soil depth and texture, typically consisting of *Stipgrostis obtusa*, *Enneapogon desvauxii*, *Stipagrostis ciliata* and *Eragrostis lehmanianna*. Larger shrubs are more common in areas receiving run-off and typically consist of *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Lycium pumilium*. No listed or protected species were observed within the substation footprint and it is very unlikely that any such species were not observed within the affected area. The substation location is not considered sensitive and within the context of the site is a favourable location for the infrastructure. The initial section of the overhead line runs through a similar area before traversing a short section of the quartzitic hills.



the area around the substation and is consequently dominated by a higher proportion of grasses, largely *Stipagrostis ciliata* and *Stipagrostis obtusa*. Woody species common on the plain includes *Salsola tuberculata*, *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Lycium bosciifolium*. There are also scattered individuals of the alien tree *Prosopis glandulosa* on the plain. Along the ridge itself the density of large woody plants increases significantly with species such as *Acacia mellifera*, *Boscia albitrunca* and *Rhus burchellii*. The species richness of the ridge areas is higher than the adjacent plains and is considered relatively sensitive. Species of significance which were observed on the ridges include *Lithops hallii, Pachypodium succulentum*, *Mestoklema tuberosum*, *Tritonia laxifolia*, *Aloe claviflora* and *Avonia ustulata*. The extent of the line across the ridge habitat is however short and the power line //traverses the rocky ridge for less than 500m.

Figure 4. Looking southwest down the power line corridor towards the rocky ridge which can be seen in the distance.

Quartzitic Ridge to R357

From the ridge the line traverses a flat open plain towards the R357. The area near the ridge has fairly deep sandy soils and is dominated by similar species to the plain on the other side of the ridge. Away from the ridge the soils are a lot more silty and contain a larger proportion of woody shrubs such as *Salsola tuberculata*, *Eriocephalus ericoides* subsp. *ericoides, Pentzia incana* and *Rosenia humilis*. This is not a sensitive community and no listed plant species were observed or are likely to occur in this area. The community is lightly invaded by *Prosopis glandulosa*. This community occupies about 3.5km of the power line route and as such is one of the more extensive communities occupied by the route.

Figure 5 Looking northeast from the boundary of the Nelspoortjie farm. This section of the power line route is very flat and there are not likely to be any major impacts resulting from the power line through this area.

R357 to Kronos Substation

The final section of the power line route from where it meets the R357 to the Kronos substation occurs on shallow stony soils dominated by woody and succulent shrubs. Typical species include *Zygophyllum lichtensteinianum, Lycium cinereum, Hermannia spinosa, Pteronia sordida, Pteronia inflexa, Osteospermum armatum and Aristida adscensionis*. This is a low and open vegetation type and there are few trees or larger woody elements present. The distribution of this community type at the site coincides with the distribution of Bushmanland Basin Shrubland and the composition is typical for that which has been described for this vegetation type. Although there may be listed species present within this community type such as Hoodia gordonii, no such species were observed and it is unlikely that they are present within the potentially affected area. This is not considered a sensitive community type and there are not likely to be any major impacts associated with this section of the route. In terms of the extent, this is largest community present along the route as it occupies the last 7 km of the route indicating that is forms more than half the route.

Figure 6. Looking along the final section of the route which runs adjacent to the R357 to the Kronos substation which can be seen in the distance on top of the distant ridge on the left of the R357.

Drainage Lines

The drainage lines at the site are generally poorly developed on account of the low rainfall and flat topography. There are no major drainage lines within the power line corridor. Between the substation and the first deviation in the line, the route traverses a large drainage basin through which water occasionally moves, there is however no clearly defined drainage channel and the area is characterized by deeper sandy soils and the predominance of large shrubs such as *Rhigozum trichotomum*, *Phaeoptilum spinosum and Lycium oxycarpum*. Towards the Kronos substation the route traverses a depression with an open drainage course at the bottom. In this area the vegetation is characterized by species such as *Lycium horridum*, *Rhigozum trichotomum* and *Osteospermum armatum*. These areas are considered more sensitive than the surrounding landscape and disturbance within these

habitats should be kept to a minimum as they are vulnerable to erosion on account of the water which moves these areas on occasion.

4.1.3 Plant Species of Conservation Concern

Only two listed plant species are known from the area, *Hoodia gordonii* which is listed as DDD (data deficient, insufficient information) and *Salsola apiciflora* which is listed DDT (Data Deficient – Taxonomically Problematic). Niether of these species were observed at the site and although *Hoodia gordonii* may be present, this species is widespread across the karoo and Kalahari and is not a significant conservation concern. As *Hoodia gordonii* is usually quite conspicuous it is not likely that it occurs at the site and if it does then it is certainly not abundant.

Other species of conservation concern that were observed at the site includes *Boscia albitrunca* which was common across the site, but within the current study is likely to be encountered only in the section in and near the rocky ridge. Given the limited extent of the development in relation to the distribution of this speces, few if any individuals would be impacted. A few notable edaphic specialists were observed at the site such as *Titanopsis calcarea* which is restricted to areas of exposed calcrete gravel and was not observed within the development footprint; *Lithops hallii* which was observed on several of the quartzitic hills at the site and may occur in the vicinity of the power line. Both these species are currently listed as Least Concern, but as they are edaphic specialists they should be avoided where possible. A number of other species protected under provincial legislation were also observed at the site including *Pachypodium succulentum*, *Mestoklema tuberosum*, *Tritonia laxifolia*, *Aloe claviflora* and *Avonia ustulata*, all of which are associated with the rocky hills. None of these species are however very rare and most of them are suitable candidates for search and rescue and so any affected individuals within the development footprint could be translocated to safety.

4.2 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

No fine-scale conservation planning has been done in the district and as a result, no Critical Biodiversity Areas have been defined. The site also does not fall within an area that has identified as focus areas under the National Protected Areas Expansion Strategy, suggesting that the site does not fall within an area that has been identified as being important for biodersity maintenance at a landscape scale. There is however a small NPAES focus area approximately 5 km southeast of the site. There is however no evidence to suggest that the site lies within an area that is likely to be highly significant as faunal movement or migration pathway. The area is generally homogenous and given the extensive amount of intact vegetation in the area, there is likely to be little disruption to the broad-scale connectivity of the landscape as a result of the development.

4.3 FAUNAL COMMUNITIES

The faunal communities at the site are described in full in the EIA study for the site and the reader is referred to that study for geater detail on the faunal communities than that which is provided here. In this section a brief summary of the faunal communities is provided highlighting the species of conservation concern which may be present.

Terrestrial Mammals

The site falls within the distribution range of 43 terrestrial mammal species, indicating that the potentially has quite high mammalian diversity. However, only two species of conservation concern may occur at the site, the Black-footed cat *Felis nigripes* (Vulnerable) and the Honey Badger *Mellivora capensis* (SA RDB Endangered). Both these species are widely distributed across the arid and semi-arid areas of South Africa, and the development would not amount to a significant amount of habitat loss for either of these two species.

Reptiles

The site falls within the distribution of range of 39 reptile species and an additional four species have been recorded from the area by SARCA, which are outside their published distribution range. No listed reptiles are known from the area, which when considered in light of the low footprint of the current development suggests that significant impacts on reptiles is not likely to occur as a result of the development of the power line and substation. It is likely that the structure provided by the substation will attract species such as geckos and agamas which utilize such man-made habitats.

Amphibians

The site lies within the distribution range of 10 frog species. Of these, only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened. This species is associated with temporary pans and as there were no temporary or permanent water bodies within the site, it is not likely that it is an important area for the Giant Bullfrog. Given the paucity of temporary or permanent water at the site, and especially within the power line corridor, the potentially affected area is not likely to have a very diverse amphibian population and impacts on amphibians are not likely to be of much consequence.

4.4 SITE SENSITIVITY ASSESSMENT

The ecological sensitivity map for the site is depicted below (Figure 7). The rocky hill and the drainage areas are the only major features of a sensitive nature which occur along the power line route. There are no perennial drainage channels present or other sensitive habitats of features that would require specific attention or avoidance from the development. Given that the line traverses the rocky hills for less than 500m it is not likely that the line would have a highly significant impact on this environment. Similarly, the impact on the ephemeral drainage areas can also be kept to a minimum through the considered placement of the pylons. Any listed species present within the footprint could probably be avoided through small adjustment to the final placement of the pylons which

could be achieved through a preconstruction walk-through of the final layout of the facility. It would be preferable for the power line through the rocky hill area to be built without a formal access road as this is likely to be quite steep in the places and would require additional measures to prevent erosion.

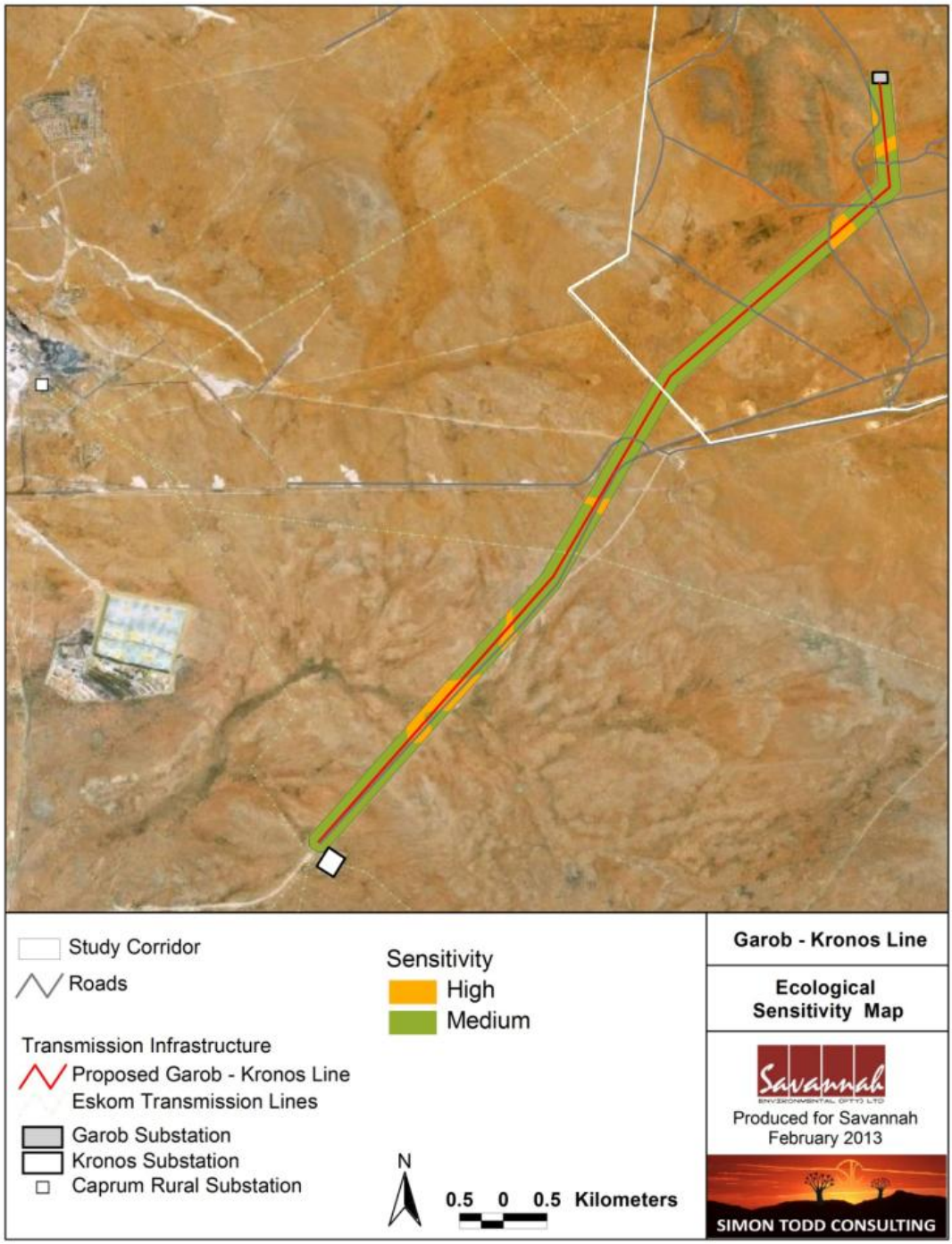


Figure 7. Ecological Sensitivity map of the proposed Garob - Kronos power line corridor.

5 IMPACT ASSESSMENT

5.1 ASSESSMENT & SIGNIFICANCE CRITERIA

Direct, indirect and cumulative impacts of the issues identified in this report are assessed in terms of the following criteria:

- The **nature** which includes a description of what causes the effect what will be affected and how it will be affected.

- The **extent** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high):

- The **duration** wherein it is indicated whether:

    - the lifetime of the impact will be of a very short du ration (0- 1 years) - assigned a score of 1.
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2.
    - medium-term (5-15 years) - assigned a score of 3
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5

- The **magnitude** quantified on a scale from 0-10 where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

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

The **significance** which shall be determined through a syntheses of the characteristics described above and can be assessed as low, medium or high;
and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:
S = (E + D + M)P
Where

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

The significance weightings for each potential impact are as follows:

- **<30** points : **Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- **30-60** points : **Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- **>60** points : **High** (i.e. where the impact must have an influence on the decision process to develop in the area).

6 IDENTIFICATION & NATURE OF IMPACTS

6.1.1 Impact Risk Factors

Potential ecological impacts resulting from the development of the Garob-Kronos power line and on-site substation would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase

- Vegetation clearing & site preparation
- Operation of heavy machinery at the site
- Human presence

Operational Phase

- Site maintenance activities
- Human presence

The above activities are likely to manifest themselves as the following impacts:

- Impacts on vegetation and listed plant species
- Direct and indirect faunal impacts
- Increased ecological degradation

6.1.2 Impact Nature

Impacts on vegetation and listed plant species

Some loss of vegetation is an inevitable consequence of the development. The vegetation will have to be cleared for the substation and possibly along parts of the power line route to create access. No listed species were observed at the substation site, but a variety of protected species are likely to be present along the power line route, especially the section over the rocky hills.

Faunal Impacts

The substation and power line will result in some habitat loss for fauna. The activity and noise generated during the construction phase will also deter many fauna from the area and there will also be secondary risks such as poaching, illegal collection and collision with construction vehicles.

Habitat Loss and Ecological Degradation

Disturbance created at the site during construction would leave the site vulnerable to alien plant invasion, erosion and would potentially result in the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in local climate or other conditions. The woody invasive *Prosopis glandulosa* is already present at the site and is likely to invade disturbed areas if not controlled.

6.2 ASSESSMENT OF IMPACTS – CONSTRUCTION PHASE

The three major impacts identified above which are likely to be associated with the development of the Garob-Kronos power line are assessed below with reference to the construction phase of the development.

Impact 1: *Impacts on vegetation and protected plant species*

Impact Nature: Impacts on vegetation and protected plant species would occur due to construction activities such as site clearing.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (2)
Magnitude	Medium-Low (3)	Low (2)
Probability	Highly Likely (4)	Probable (3)
Significance	Medium (32)	Low (15)
Status	Negative	Negative

Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To a large extent	
Mitigation	• Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. • The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction. • No collection of plants or plant parts to be allowed by construction personnel. The ECO should provide environmental induction to all construction staff to ensure that they are aware of this and other environmental sensitivities at the site. • No fuelwood collection should be allowed on-site. • No fires allowed on-site.	
Cumulative Impacts	The potential for cumulative impacts is quite low on account of the small development footprint of power line and substation in relation to the overwhelmingly intact nature of the surrounding landscape.	
Residual Impacts	Some loss of vegetation is inevitable and cannot be avoided	

Impact 2. *Faunal Impacts*

Impact Nature: Fauna will be directly and indirectly impacted by the development as a result of construction activities and human presence at the site.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (3)	Short-term (3)
Magnitude	Medium (4)	Medium-Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (32)	Low (21)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To some extent	
Mitigation	• Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.	

	• The 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. • No dogs should be allowed on site. • If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. • 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. • No unauthorized persons should be allowed onto the site. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
Cumulative Impacts	The potential for cumulative impacts is relatively low as there are few other developments currently underway in the area which might generate similar impacts.
Residual Impacts	Residual impacts for fauna can be mitigated to a large degree, although some mortality of a few immobile species can be expected.

Impact 3: *Habitat Loss and Ecological Degradation.*

Impact Nature: Disturbance and the construction activities are likely to result in habitat degradation, impact biodiversity as well as deter fauna from moving through the area.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Medium (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (18)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No

Can impacts be mitigated?	Disturbance related impacts can be mitigated but not the impacts related to the presence of the permanent infrastructure.
Mitigation	• Hardened surfaces should be kept to a minimum • Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road, except in very steep areas where it would be difficult to prevent erosion of natural surfaces. • Should a service road beneath the power line be required, this should be restricted to a track and a formal cleared road should not be necessary, especially through the rocky hills and drainage lines. • Vegetation should be allowed to remain alongside or encroach on the roads as much as possible. • Temporary lay-down areas should be in previously transformed areas or areas that will be used by the development. • Regular monitoring for erosion during construction to ensure that no erosion problems have developing as result of the construction disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
Cumulative Impacts	The development would contribute a small amount to the cumulative loss of landscape connectivity, but this is not likely to be highly significant when considered at the landscape scale.
Residual Impacts	Although the construction phase itself will be transient and is not likely to result in any long-term impacts, the infrastructure will remain and it may take many years for the disturbance created during construction to recover. The extent of the development is however limited and this is not likely to be highly significant.

6.3 ASSESSMENT OF IMPACTS – OPERATIONAL PHASE

The three major impacts likely to be associated with the development of the Garob-Kronos power line are assessed below with reference to the operational phase of the development.

Impact 1: *Impacts on vegetation and protected plant species*

Impact Nature: Maintenance or repair activities could impact intact vegetation and individuals of listed or protected plant species.		
	Without Mitigation	**With Mitigation**

Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (2)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Unlikely (2)
Significance	Low (24)	Low (12)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	• Site access should be controlled and only authorized staff and contractors should be allowed on-site. • Notice boards stating that fauna and flora may not be collected, harvested etc should be placed at the entrances to the site. • Any maintenance activities should avoid listed plant species and strive to keep the footprint as low as possible. • No herbicides should be used and if vegetation clearing needs to take place, this should be done by hand. • Although it is not likely to be required, if any taller vegetation needs to be cleared beneath the power line to comply with the Eskom requirements, this should be done by hand and protected species should be avoided where possible. Alternatively, it may be possible to reduce the height of some species by cutting the trees back and allowing them to resprout without killing them. As the growth rate of important species is very slow, this would not need to be occur very often.	
Cumulative Impacts	The contribution of the current infrastructure to the overall cumulative impact in the area would be low as the footprint is very low in comparison to the wind farm development itself.	
Residual Impacts	The area is not highly sensitive and with mitigation, there will be very little residual impacts on the terrestrial environment.	

Impact 2. *Faunal Impacts.*

Impact Nature: The presence of the powerline, substation and associated infrastructure will impact fauna as a result of some permanent habitat loss as well as from increased levels of human activity likely to be associated with the operation and maintenance of the infrastructure.

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-Low (4)	Low (3)
Probability	Probable (3)	Unlikely (2)
Significance	Low (27)	Low (16)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Some aspects such as those relating to human activity can be mitigated, but habitat loss cannot be mitigated as it is a long-term impact	
Mitigation	• The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • No dogs should be allowed on site. • If the substation buildings must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution. • 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. • No unauthorized persons should be allowed onto the site. • All maintenance vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	
Cumulative Impacts	The operation of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.	
Residual Impacts	Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated, but is not very large or significant.	

Impact 3: *Habitat loss and ecological degradation*

Impact Nature: The presence of the infrastructure and the alterations to the habitat will disrupt the connectivity of the landscape for some fauna which may avoid passing through the area and the residual disturbance from the construction phase will leave the site vulnerable to alien plant invasion and erosion.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium-low (4)	Low (3)
Probability	Probable (3)	Unlikely (2)
Significance	Medium (30)	Low (14)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Disturbance related impacts can be mitigated, but not those elements related to the presence of the permanent infrastructure.	
Mitigation	• The security fencing around the substation should not contain electrified wires within 30cm of the ground. • Hardened surfaces should be kept to a minimum • Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road. • Vegetation should be allowed to remain alongside or encroach on the roads as much as possible. • Regular monitoring for erosion post-construction to ensure that no erosion problems have developed as result of the past disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • Regular monitoring for alien plant invasion, which is likely to occur in previously disturbed areas or in areas receiving runoff from the hardened surfaces of the infrastructure.	
Cumulative Impacts	The development would contribute a small amount to the cumulative loss of landscape connectivity and habitat degradation, but this is not likely to be highly significant after mitigation when considered at the landscape scale.	
Residual Impacts	Provided with regular monitoring with associated intervention where necessary to prevent alien plant invasion	

	and erosion, there would be very little residual impact.

Summary Assessment

The summary assessment for the Garob - Kronos power line is provided below in Table 2. All of the impacts assessed can be reduced to a low level through mitigation and there are no impacts present which are likely to represent a red-flag for the development. The major contributing factors to the low post-mitigation impacts is the low sensitivity of the majority of the receiving environment and the low footprint of the development itself.

Table 2. Summary assessment of the pre- and post-mitigation impacts associated with the construction and operation phases of the project.

Impact	**Construction**		**Operation**	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Impacts on vegetation and listed or protected plant species	Medium (32)	Low (15)	Low (24)	Low (12)
Direct and Indirect Faunal impacts	Medium (32)	Low (21)	Low (27)	Low (16)
Habitat degradation and loss if landscape integrity	Low (27)	Low (18)	Medium (30)	Low (14)

7 CONCLUSION & RECOMMENDATIONS

The development of the Garob substation and connection to the Kronos substation is unlikely to generate any highly significant ecological impacts. The receiving environment is not highly sensitive and apart from a short section where the line traverses the rocky hills and some similarly short sections across ephemeral drainage channels there are not highly sensitive plant communities of faunal habitats that are likely to be significantly impacted by the development. The substation is located within a favourable location from an ecological perspective and no listed were observed within the footprint of the substation. Along the power line some listed species are likely to be encountered, particularly within the section along the rocky hills. This section is however short and number of affected individuals is likely to be very low. Minor adjustment of the pylon positions would most likely to be sufficient to avoid damage to such species. As the rocky hills are considered sensitive both from a fauna and flora perspective, it is recommended that a formal road is not constructed through this area unless the power line cannot be built without it. This is not likely to be the case as the majority of Eskom power lines are serviced by simple uncleared tracks, which would also be ecologically acceptable in the current situation. The major impact resulting from the development is likely to occur during the construction phase, but this

would be transient and in the long-term the operational phase of the power line and substation are not likely to generate significant terrestrial ecological impact.

8 ACTIVITIES FOR INCLUSION THE DRAFT EMP

Below are the measures that should be implemented as part of the EMP for the development. The measures below do not exactly match with the impacts that have been identified above, as certain mitigation measures, such as limiting the loss of vegetation may be effective at combating several different impacts, such as erosion, faunal impact etc.

Objective: Limit disturbance of vegetation and loss of protected flora during construction		
Project component/s	All infrastructure and activities which result in vegetation loss or clearing including the power line support structures; substation, operations and maintenance buildings, access and maintenance roads.	
Potential Impact	Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants.	
Activity/risk source	Construction activities	
Mitigation: Target/Objective	Minimal impact on biodiversity & terrestrial environment. Low impact on protected species	
Mitigation: Action/control	Responsibility	Timeframe
(1) Preconstruction walk-through of power line route and support structure positions and use micro-siting to reduce local impact. (2) Affected individuals of protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. (3) Erosion control measures should be implemented in areas where slopes have been disturbed. (4) Revegetation of cleared areas or monitoring to ensure that recovery is taking place (5) Alien plant clearing where necessary.	Management/ECO	Construction & Operation
Performance	Vegetation loss restricted to infrastructure footprint. Protected species avoided by flexible infrastructure such as power	

Indicator	line.
Monitoring	• Vegetation is cleared only within essential areas. • Monitor alien plant abundance along the route on an annual basis. • Document revegetation actions taken and their success • Document erosion problems and the control measures implemented

Objective: Limit direct and indirect terrestrial faunal impacts		
Project component/s	Construction activities, operational activities and human presence	
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.	
Activity/risk source	Habitat transformation during construction; site fencing, presence of construction and operation personnel.	
Mitigation: Target/Objective	Low faunal impact, during construction and operation.	
Mitigation: Action/control	Responsibility	Timeframe
(1) Environmental induction for all staff (2) ECO to monitor and enforce ban on hunting, collecting etc of all plants and animals or their products. (3) Any fauna encountered during construction should be removed to safety by the ECO or other suitably qualified person, (4) All vehicles to adhere to low speed limits (40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust. (5) All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution. (6) Access to the site should be	Management/ECO	Construction & Operation

	controlled and spot checks on vehicles if necessary.		
Performance Indicator	Low number of incidents with fauna during construction No removal of vegetation/plants during construction		
Monitoring	Monitoring for compliance during the construction phase. All incidents to be noted.		

9 REFERENCES

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

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

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

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

IUCN 2012. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 19 January 2012.

Marais, J. 2004. *Complete Guide to the Snakes of Southern Africa*. Struik Nature, Cape Town.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

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

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

Sowler, S & Stoffberg,S. 2011. South African Good Practice Guidelines for surveying bats in wind farm developments. Endangered Wildlife Trust.

10 ANNEX 2. LIST OF TERRESTRIAL MAMMALS

List of mammals which are known to occur and are likely to occur in the vicinity of the Garob - Kronos power line. Habitat notes and distribution records are based on Skinner & Chimimba (2005), while conservation status is from the IUCN Red Lists 2012. IUCN-listed species are highlighted.

Scientific Name	Common Name	Status	Habitat	Likelihood
Macroscledidea (Elephant Shrews):				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Species of open country, with preference for shrub bush and sparse grass cover, also occur on hard gravel plains with sparse boulders for shelter, and on loose sandy soil provided there is some bush cover	High
Elephantulus rupestris	Western Rock Elephant Shrew	LC	Rocky koppies, rocky outcrops or piles of boulders where these offer sufficient holes and crannies for refuge.	High
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	Confirmed
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	Confirmed
Lagomorpha (Hares and Rabbits):				
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	Confirmed
Lepus saxatilis	Scrub Hare	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	Confirmed
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Confirmed
Pedetes capensis	Springhare	LC	Occur widely on open sandy ground or sandy scrub, on overgrazed grassland, on the fringes of vleis and dry river beds.	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	Confirmed

Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High
Rhabdomys pumilio	Four-striped Grass Mouse	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Mastomys coucha	Southern Multimammate Mouse	LC	Wide habitat tolerance.	High
Aethomys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	Confirmed
Parotomys brantsii	Brants' Whistling Rat	LC	Associated with a dry sandy substrate in more arid parts of the Nama-karoo and Succulent Karoo. Species selects areas of low percentage of plant cover and areas with deep sands.	High
Parotomys littledalei	Littledale's Whistling Rat	LC	Riverine associations or associated with Lycium bushes or Psilocaulon absimile	High
Otomys unisulcatus	Bush Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Low
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Gerbilliscus leucogaster	Bushveld Gerbil	LC	Predominantly associated with light sandy soils or sandy alluvium	Low
Gerbilliscus brantsii	Higheld Gerbil	LC	Sandy soils or sandy alluvium with some cover of grass, scrub or open woodland	Low
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Primates:				
Papio ursinus	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	High

Eulipotyphla (Shrews):				
Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Erinaceomorpha (Hedgehog)				
Atelerix frontalis	South African Hedgehog	LC	Generally found in semi-arid and subtemperate environments with ample ground cover	Low
Carnivora:				
Proteles cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	High
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	**High**
Genetta genetta	Small-spotted genet	LC	Occur in open arid associations	High
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	High
Cynictis penicillata	Yellow Mongoose	LC	Semi-arid country on a sandy substrate	Confirmed
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance	High
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	High
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	High
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	Confirmed
Mellivora capensis	Ratel/Honey Badger	IUCN LC/SA RDB EN	Catholic habitat requirements	High
Rumanantia (Antelope):				
Oryx gazella	Gemsbok	LC	Open arid country	Confirmed
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	High

Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Confirmed
Raphicerus campestris	Steenbok	LC	Inhabits open country,	Confirmed

11 ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur at the proposed Garob - Kronos power line. The list is based on those which may occur at the site according to distribution maps in Branch (1998) and Alexander and Marais (2007), as well as those known from the quarter degree squares 2922 CD and DC, 3022 AB and BA according to the SARCA database (http://vmus.adu.org.za)

Scientific Name	Common Name	Distribution	Status	Habitat	Likelihood	SARCA
Tortoises and Terrapins:						
Geochelone pardalis	Leopard Tortoise	Widespread	Not Assessed	Varied: not restricted to montane grassland, also occurring in fynbos, valley bushveld, and arid & mesic savannah	High	SARCA
Psammobates tentorius verroxii	Bushmanland Tent Tortoise	Endemic	Not Assessed	Varied: usually arid karroid areas or rocky sandveld	High	SARCA
Snakes:						
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	Endemic	Not Assessed	Varied: semi-desert, coastal bush, fynbos & savannah	High	SARCA
Lamprophis capensis	Brown House Snake	Widespread	Not Assessed	Common in highveld grassland & arid karroid regions, but found everywhere & tolerant of urban sprawl	High	SARCA
Lycophidion capense	Common Wolf Snake	Widespread	Not Assessed	Lowland forest and fynbos to moist savanna, grassland and karoo scrub	Low	
Pseudaspis cana	Mole Snake	Widespread	Not Assessed	Sandy scrubland in SW Cape, highveld grassland & mountainous & desert regions	High	
Psammophis notostictus	Karoo Sand or Whip Snake	Widespread	Not Assessed	Arid scrubland & karroid regions	High	SARCA
Psammophis trinasalis	Kalahari Sand Snake	Widespread	Not Assessed	Mainly Kalahari thornveld but may also occur in savanna and grassland	High	
Dasypeltis scabra	Common/Rhombic Egg Eater	Widespread	LC	Absent only from true desert & closed-canopy forest	High	SARCA
Telescopus beetzii	Namib Tiger Snake	Endemic	Not Assessed	Rocky, arid regions	High	SARCA
Dispholidus typus	Boomslang	Widespread	Not Assessed	Widespread arboreal species	Low	
Elapsoidea sundervalli	Sundevall's Garter Snake	Endemic	Not Assessed	Coastal forest, sanannah, highveld grassland	Low	
Naja nivea	Cape Cobra	Widespread	Not Assessed	Arid karroid regions, particularly along river courses, entering well drained open areas along the southern	High	

				coast		
Hemachatus haemachatus	Rinkhals	Endemic	LC	Grassland from the coast up to 2500 m	High	
Bitis arietans	Puff Adder	Widespread	Not Assessed	Absent only from desert & mnt tops	High	SARCA
Bitis caudalis	Horned Adder	Widespread	Not Assessed	Sandy regions, throughout Karoo	High	
Worm Lizards						
Monopeltis infuscata	Dusky Spade-snouted Worm Lizard	Endemic	Not Assessed	Dry and moist savannah	High	
Lizard and Skinks:						
Acontias lineatus	Striped Legless Skink	Endemic	Not Assessed	Sandy, arid soils	High	SARCA
Mabuya capensis	Cape Skink	Widespread	Not Assessed	Very varied: arid karroid veld, moist coastal bush, montane grassland, etc	High	SARCA
Mabuya occidentalis	Western Three-Striped Skink	Widespread	Not Assessed	Arid Savanna karroid veld and desert	High	SARCA
Mabuya spilogaster	Kalahari Tree Skink	Widespread	Not Assessed	Arid Savannah	Low	SARCA
Mabuya sulcata	Western Rock Skink	Widespread	Not Assessed	Karroid areas	High	SARCA
Mabuya striata	Striped Skink	Widespread	Not Assessed	Varied, except desert areas, succulent karoo and fynbos	High	
Mabuya variegata	Variegated Skink	Widespread	Not Assessed	Extremely varied; desert, karroid veld, montane grassland, savanna, coastal bush & valley bushveld	Definite	SARCA
Heliobolus lugubris	Bushveld Lizard	Widespread	Not Assessed	Arid and mesic savannah	Low	SARCA
Meroles suborbitalis	Spotted Desert Lizard	Endemic	Not Assessed	Varied, arid savanna to desert	High	
Nucras tessellata	Western Sandveld Lizard		Not Assessed	Rocky ground in arid savanna and karroid veld		SARCA
Pedioplanis laticeps	Cape Sand Lizard	Endemic	LC	Coastal dunes and succulent karroid veld	High	
Pedioplanis lineoocellata	Spotted Sand Lizard	Endemic	Not Assessed	Very varied: karroid veld, valley bushveld & arid & mesic savannah	Definite	SARCA
Pedioplanis namaquensis	Namaqua Sand Lizard	Widespread	Not Assessed	Karroid veld	Definite	SARCA
Pedioplanis inornata	Plain Sand Lizard	Endemic	Not Assessed	Bedrock flats in semi-desert		SARCA
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	Widespread	Not Assessed	Montane grassland, savanna, bushveld and low open coastal forest	High	

Cordylus polyzonus	Karoo Girdled Lizard	Endemic	Not Assessed	Karroid regions, coastal renosterveld and succulent karoo	High	SARCA
Agama aculeata	Ground Agama	Widespread	Not Assessed	Semi desert and savanna	Definite	SARCA
Agama anchietae	Anchieta's Agama	Widespread	Not Assessed	Semi desert and arid savanna	High	SARCA
Agama atra	Southern Rock Agama	Endemic	Not Assessed	Semi-desert to fynbos, from sea level to mountain tops	High	
Geckos:				Not Assessed		
Chondrodactylus angulifer	Giant Ground Gecko	Endemic	LC	Gravel plains, interdune spaces & sandy flats	High	SARCA
Chondrodactylus bibronii	Bibron's Tubercled Gecko	Endemic	Not Assessed	Rocky outcrops, cliffs and large trees	High	SARCA
Pachydactylus capensis	Cape Thick-toed Gecko	Widespread	Not Assessed	Karroid veld, grassland and mesic savannah	High	SARCA
Pachydactylus latirostris	Quartz Gecko	Endemic	Not Evaluated	Central Northern Cape on rocky ground		SARCA
Pachydactylus mariquensis	Marico Thick-toed Gecko	Endemic	Not Assessed	Flat sandy plains with sparse vegetation	High	
Pachydactylus rugosus	Rough Thick-toed Gecko	Endemic	Not Assessed	Semi-desert and succulent karroid veld		SARCA
Ptenopus garrulus	Common Barking Gecko	Endemic	Not Assessed	Desert and semi-desert on various soil types, preferring flat stable sandy soils with sparse vegetation cover	High	SARCA

12 ANNEX 4. LIST OF AMPHIBIANS

List of amphibians which are likely to occur at the Garob - Kronos power line. Habitat notes and distribution records are based on Du Preez and Carruthers (2009), while conservation status is from the IUCN Red Lists 2012.

Scientific Name	Common Name	Status	Habitat	Distribution	Likelihood
Amietophrynus gutturalis	Guttural Toad	Not Threatened	Around open pools, dams, vleis and other semi-permanent or permenent water	Widespread	High
Poyntonophrynus vertebralis	Southern Pygmy Toad	Not Threatened	Nama karroo shrubland, grassland, dry savannah and pastureland. Breeds in temporary shallow pans, pools or depressions containing rainwater, quarries, and rock pools along rivers.	Endemic	High
Vandijkophrynus gariepensis	Karoo Toad	Not Threatened	Karoo Scrub	Widespread	High
Kassinia senegalensis	Bubbling Kassinia	Not Threatened	Grassland around vleis and pands	Widespread	Low
Pyxicephalus adspersus	Giant Bullfrog	Near Threatened	Breed in shallow margins of rain-filled depressions.	Widespread	Low
Xenopus laevis	Common Platanna	Not Threatened	Any more or less permanent water	Widespread	High
Cacosternum boettgeri	Common Caco	Not Threatened	Marshy areas, vleis and shallow pans	Widespread	High
Amietia angolensis	Common River Frog	Not Threatened	Banks of slow-flowing streams or permanent bodies of water	Widespread	High
Tomopterna cryptotis	Tremelo Sand Frog	Not Threatened	Savanna and grassland	Widespread	High
Tomopterna tandyi	Tandy's Sand Frog	Not Threatened	Nama karoo grassland and savanna	Widespread	High

SHORT CV OF CONSULTANT:

P.O.Box 71
Nieuwoudtville
8180
Simon.Todd@3foxes.co.za
H: 027 218 1276
C: 082 3326 502

SUMMARY OF EXPERTISE:

SIMON TODD

- Profession: Ecological Consultant
- Specialisation: Plant & Animal Ecology
- Years of Experience: 15 Years

Skills & Primary Competencies

- Research & description of ecological patterns & processes in Fynbos, Succulent Karoo, Nama Karoo, Thicket, Arid Grassland and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

Tertiary Education:

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

Employment History

- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute
- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2007 Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.

General Experience & Expertise

- Conducted a large number of fauna and flora specialist assessments distributed widely across South Africa. Projects have ranged in extent from <50 ha to more then 50 000 ha.
- Extensive experience in the field and exceptional level of technical expertise, particularly with regards to GIS capabilities which is essential with regards to producing high-quality sensitivity maps for use in the design of final project layouts.
- Strong research background which has proved invaluable when working on several ecologically sensitive and potentially controversial sites containing some of the most threatened fauna in South Africa.
- Published numerous research reports as well as two book chapters and a large number of papers in leading scientific journals dealing primarily with human impacts on the vegetation and ecology of South Africa.
- Maintain several long-term vegetation monitoring projects distributed across Namaqualand and the karoo.
- Guest lecturer at two universities and have also served as an external examiner.
- Reviewed papers for more than 10 international ecological journals.
- Past chairman and current committee member of the Arid Zone Ecological Forum.
- SACNASP registered as a Professional Natural Scientist, (Ecology) No. 400425/11.

A selection of recent work is as follows:

Specialist Assessments:

ESKOM 300MW Kleinsee Wind Energy Facility. Fauna Specialist Report For Impact Assessment. Savannah Environmental. 2012.

Karoshoek Solar Valley Development, Near Upington: Fauna & Flora Specialist Impact Assessment Report. Savannah Environmental. 2012.

Project Blue Wind And Solar Energy Facility, Near Kliensee. Fauna Specialist Report For Impact Assessment. Savannah Environmental. 2012.

O'Kiep 3 PV Solar Energy Facility on a Site In O'kiep Near Springbok, Northern Cape Province. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Photovoltaic Solar Energy Facility on Voëlklip, South of Springbok. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Namaqua Photovoltaic Solar Energy Facility on a Site North of Kamieskroon. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Rare Earth Separation Plant Near Vredendal, Western Cape Province. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Inca Graafwater Photovoltaic Solar Energy Facility, Graafwater, Western Cape Province. Faunal Ecology Specialist Report for Impact Assessment. Savannah Environmental 2012.

Aberdeen Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Venetia Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Southern Cross Solar Energy Facility: Southern Farm 425. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Tutwa Solar Energy Facility: Portion 4 of Narries 7. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Karoshoek Grid Integration Infrastructure. Fauna & Flora Specialist Report For Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Valleydora Photovolataic Solar Power Plant, Free State. Fauna & Flora Specialist Report. CSIR, 2012.

Reddersburg Solar Facility - Fauna & Flora Specialist Assessment. CSIR, 2012.

Melkvlei Photovolataic Solar Power Plant. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Ruinte Photovolataic Solar Power Plant. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Genoegsaam Solar Park. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Genoegsaam Solar Park. Fauna & Flora Specialist EIA Report. Specialist report for ERM. 2012.

Graspan Solar Facility. Fauna & Flora Specialist Report for Impact Assessment. Specialist report for ERM. 2012.

Olyven Kolk Solar Power Plant, Northern Cape: Botanical and Faunal Specialist Assessment. Specialist Report for Environmental Resources Management (ERM). 2011.

Klawer Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Lambert's Bay Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Richtersveld Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Roggeveld Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Witberg Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Skuitdrift Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Cape EAPrac. 2012.

Khoi-Sun Solar Facility. Fauna & Flora Specialist Scoping Report. Specialist Report for Cape EAPrac. 2012.

Boesmanland Solar Farm. Fauna & Flora Specialist Scoping Study. Specialist Report for Cape EAPrac. 2012.

Bitterfontein Solar Plant - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Beaufort West Solar Facility, Erf 7388 - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Improvements to the Ou Kaapse Weg / Silvermine Road Intersection. Specialist Faunal Study For Basic Assessment. Khula Environmental Consultants, 2012.

Upgrading of Tourism Facilities at Goegap Nature Reserve. Specialist Ecological Assesment. Van Zyl Environmental Consultants. 2012.

The Proposed Commercial Concentrated Solar Power Tower Facility and Concentrated Photovoltaic Facility at Van Roois Vley Near Upington. Specialist Vegetation Assessment for EIA. WSP Environmental 2012.

Plant Sweeps on Portion 2 of the Farm Demaneng 546, Kuruman District, Northern Cape Province for SA Manganese. 2011.

Research Reports & Peer Reviewed Publications:

Todd, S.W. 2010. Vegetation and Plant Communities Associated with the Tillite and Dolerite Renosterveld Types of the Avontuur Conservation Area, Nieuwoudtville, South Africa. DRYNET.

Todd, S.W., Milton, S.J., Dean, W.R.J. Carrick, P.J. & Meyer, A. 2009. Ecological best Practice Guidelines for the Namakwa District. The Botanical Society of South Africa.

Todd, S.W. 2009. Field-Based Assessment of Degradation in the Namakwa District. Final Report. Mapping Degradation in the Arid Subregions of the BIOTA South Transect. SANBI.

Todd, S.W. 2009. A fence-line in time demonstrates grazing-induced vegetation shifts and dynamics in the semi-arid Succulent Karoo. *Ecological Applications*, 19: 1897–1908.

Todd, S.W. 2007. Characterisation of Riparian Ecosystems. D14 of The WADE Project. Floodwater Recharge of Alluvial Aquifers in Dryland Environments. *GOCE-CT-2003-506680- WADE.* Sixth Framework Programme Priority 1.1.6.3 Global Change and Ecosystems.

Todd, S.W. 2006. Gradients in vegetation cover, structure and species richness of Nama-Karoo shrublands in relation to distance from livestock watering points. *Journal of Applied Ecology* 43: 293-304.

Benito, G., Rohde, R., Seely, M., Külls, C., Dahan, O., Enzel, Y., **Todd, S**. Botero, B., Morin, E., Grodek, T., Roberts, C. 2010. Management of Alluvial Aquifers in Two Southern African Ephemeral Rivers: Implications for IWRM. *Water Resources Management*, 24:641–667.

Hahn, B.D., Richardson, F.D., Hoffman, M.T., Roberts, R., **Todd, S.W.** and Carrick, P.J. 2005. A simulation model of long-term climate, livestock and vegetation interactions on communal rangelands in the semi-arid Succulent Karoo, Namaqualand, South Africa*. Ecological Modelling* 183, 211–230.

Malgas, R.R., Potts, A.J., Oettlé, N.M., Koelle, B., **Todd, S.W.**, Verboom G.A. & Hoffman M.T.. 2010. Distribution, quantitative morphological variation and preliminary molecular analysis of different growth forms of wild rooibos (*Aspalathus linearis*) in the northern Cederberg and on the Bokkeveld Plateau. *South African Journal of Botany*, 76, 72-81.

Mills, A., Fey, M., Donaldson, J.D., **Todd, S.W**. & Theron, L.J. 2009. Soil infiltrability as a driver of plant cover and species richness in the semi-arid Karoo, South Africa. *Plant and Soil* 320: 321–332.

Rahlao, J.S., Hoffman M.T., **Todd, S.W**. & McGrath, K. 2008. Long-term vegetation change in the Succulent Karoo, South Africa following 67 years of rest from grazing. *Journal of Arid Environments*, 72, 808-819.

Hoffman, M.T. & **Todd, S.W.** 2010. Using Fixed-Point Photography, Field Surveys, And Gis To Monitor Environmental Change: An Example From Riemvasmaak, South Africa. Chapter In *Repeat Photography: Methods And Applications In The Natural Sciences.* R.H. Webb, Editor. Island Press.