ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED 132KV GRID CONNECTION INFRASTRUCTURE FOR THE PROPOSED MARALLA EAST AND WEST WIND ENERGY FACILITIES:

FAUNA & FLORA SPECIALIST STUDY FOR BASIC ASSESSMENT

PRODUCED FOR WSP

ON BEHALF OF BIOTHERM ENERGY (PTY) LTD

BY

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CONTENTS

NEMA 2014 CHECKLIST

Section		*NEMA 2014 Regulations for Specialist Studies*	Position in report (pg.)	check
1	1	A specialist report prepared in terms of these Regulations must contain—		
	(a)	details of-		
		(i) the specialist who prepared the report; and	See Main Report	
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	See Main Report	
	(b)	a declaration that the person is independent in a form as may be specified by the competent authority;		✓
	(c)	an indication of the scope of, and the purpose for which, the report was prepared;	4	✓
	(d)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	5-6	✓
	(e)	a description of any assumptions made and any uncertainties or gaps in knowledge;	6	✓
	(f)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;	10-26	✓
	(g)	recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;	26-34	✓
	(h)	a description of any consultation process that was undertaken during the course of carrying out the specialist report;	See main EIA report	✓
	(i)	a summary and copies of any comments that were received during any consultation process; and	See main EIA report	✓
	(j)	any other information requested by the competent authority.		
	2	Where a proposed development and the geographical area within which it is located has been subjected to a pre-assessment using a spatial development tool, and the output of the pre-assessment in the form of a site specific development protocol has been adopted in the prescribed manner, the content of a specialist report may be determined by the adopted site specific development protocol applicable to the specific proposed development in the specific geographical area it is proposed in.	N/A	✓

PROFESSIONAL PROFILE OF CONSULTANT:

Simon Todd Consulting has extensive experience in the assessment of renewable energy developments and grid connection infrastructure, having provided ecological assessments for more than 100 different developments. This includes a large number of developments in the immediate vicinity of the current site as well as in the broader Northern and Western Cape provinces. Simon Todd is a recognised ecological expert and is a past chairman and current executive committee member of the Arid-Zone Ecology Forum and has 18 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Recent experience and relevant projects in the vicinity of the current site include specialist fauna and flora studies for the following developments in the area:

- Mainstream South Africa Sutherland Wind Farm. EIA. ERM. 2011.
- G7 Roggeveld Wind Farm. EIA. ERM 2011.
- Roggeveld Wind Farm Phase II. EIA. Savannah Environmental 2013.
- Kareebosch Wind Farm. Scoping & EIA. Savannah Environmental. 2014.
- Komsberg East Wind Farm. Scoping & EIA. Arcus. 2015.
- Komsberg West Wind Farm. Scoping & EIA. Arcus 2015.
- Brandvallei Wind Farm. EOH. 2016.
- Rietkloof Wind Farm. EOH. 2016.
- Gunstfontein Wind Farm. Savannah Environmental. 2016.

EXECUTIVE SUMMARY

In order to connect their proposed 140MW Maralla wind energy facility to the Eskom grid, BioTherm Energy (Pty) Ltd is proposing a 132kV power line from an on-site substation to the Eskom grid at the Komsberg substation. This terrestrial fauna and flora specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts associated with the development of the grid connection infrastructure. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A site visit and a desktop review of the available ecological information for the area were used to identify and characterize the ecological features of the site and develop an ecological sensitivity map for the site.

The power line route options are largely within the Central Mountain Shale Renosterveld with a small area around the Komsberg substation of Koedoesberge-Moordenaars Karoo. The development footprint is also located within areas that are classified as CBA and NPAES focus areas. Although this is a potential concern, the total extent of habitat lost to the power line would be low and would not amount to more than a few hectares at most. This would not compromise the ecological functioning or ecological value of the affected CBAs and NPAES focus areas. Similarly, the contribution of the power line to cumulative impact on the area would amount to approximately 5ha at most, which is not considered highly significant, especially as the affected areas are mostly lower elevation habitats with a lower risk of significant cumulative impact.

Both on-site substation options are considered acceptable, but Substation Option 1 near to the R354 is considered preferable as it would result in shorter lines to the Eskom Komsberg Substation and it is also closer to existing disturbance features such as the R354. In terms of the power line options, Option 1 is not considered viable as it traverses an area with little current human activity and also includes some steep slopes where there is a long-term erosion risk. Power line Option 2 is considered preferable as the alignment largely follows the R354 or the existing 400kV lines to the Komsberg substation.

Overall, for the preferred alternatives, there are no impacts associated with the development of the Maralla grid connection and associated infrastructure that cannot be reduced to an acceptable level. As such, there are no reasons to oppose the development of the grid connection on terrestrial ecological grounds.

1 INTRODUCTION

In order to connect their proposed 140MW Maralla East and 140MW Maralla West wind energy facilities to the Eskom grid, BioTherm Energy (Pty) Ltd is proposing a 132kV power line from an on-site substation to the Eskom grid at the Komsberg substation. WSP Environmental are conducting the required environmental authorization process for the project and have appointed Simon Todd Consulting to provide the terrestrial fauna and flora input for the development.

This terrestrial fauna and flora specialist report details the ecological characteristics of the site and provides an assessment of the likely ecological impacts associated with the development of the proposed grid connection. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the EMPr for the development.

2 STUDY APPROACH

2.1 SCOPE OF STUDY

The specific terms of reference for the scoping study includes the following:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project.
- A description and evaluation of environmental issues and potential impacts (including assessment of direct, indirect and cumulative impacts) that have been identified.
- A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.
- An indication of the methodology used in determining the significance of potential environmental impacts.
- An assessment of the significance of direct indirect and cumulative impacts of the development.
- A description and comparative assessment of all alternatives including cumulative impacts
- Recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the environmental management programme (empr).
- An indication of the extent to which the issue could be addressed by the adoption of mitigation measures.
- A description of any assumptions uncertainties and gaps in knowledge.
- 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.

2.2 ASSESSMENT APPROACH & PHILOSOPHY

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

This includes adherence to the following broad principles:

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

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

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

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

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

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

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

Community and ecosystem level

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

Species level

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

Fauna

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

Other pattern issues

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

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

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

2.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed Maralla grid connection would be between 28 and 36 km long depending on which option is utilized. It is anticipated that the facility will comprise the following components:

- Construction of a 132kV transmission line (either single or double circuited) between the Maralla WEF and the Komsberg substation.
- Establishment of the common substation at the solar energy development which includes but not limited to
    - A high voltage substation yard to allow for multiple 132kV feeder bays and transformers.
    - The control building, telecommunication infrastructure, oil dams(s) etc.
    - All the access road infrastructure to and within the substation.

Construction of the 132kV Single or Double Circuit overhead transmission line:

A brief overview of the physical/ technical requirements of the project are as follows:

- 132kV single or double circuit transmission line between Maralla WEF and the Komsberg substation.
- Straight line distance between the WEF and the Komsberg substation is approximately 25km.
- Servitude width for the 132kV transmission line (single and double circuit) is 55m.
- Height of the 132kV transmission line is approximately 48m.
- Minimum conductor clearance is between 8.1 and 12.6m.
- Span length between structures is approximately 450m.

2.4 LIMITATIONS & ASSUMPTIONS

The Maralla site and grid connection corridors were visited twice, in the autumn to gain an initial assessment of the site and identify potentially sensitive areas for additional study in the wet season site visit which took place in early September 2016, during the peak of the spring flowering season at the site. As such, the site has been visited at the most appropriate time and there are consequently few limitations resulting from the timing of the site visit. In addition, the areas adjacent to the Eskom Komsberg substation have been sampled multiple times for a variety of different wind energy developments in the area. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site and on adjacent projects as well as 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.

3 METHODOLOGY

3.1 DATA SOURCING AND REVIEW

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

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.

- Information on plant and animal species recorded for the Quarter Degree Squares (QDS) 3220DB 3220DD 3221CA 3221CC was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has probably not been well sampled in the past.
- The IUCN conservation status (Figure 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 (2013).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011). This includes rivers, wetlands and catchments defined under the study.

Ecosystem

- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).
- Critical Biodiversity Areas for the site and surroundings were extracted from the *Biodiversity Assessment of the Central Karoo District Municipality* (Skowno et al. 2009) as well as the Biodiversity Sector Plan for the Namakwa District (Desmet & Marsh 2008).

Fauna:

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and the ADU databases http://vmus.adu.org.za.
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria 2015 (See Figure 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. 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.

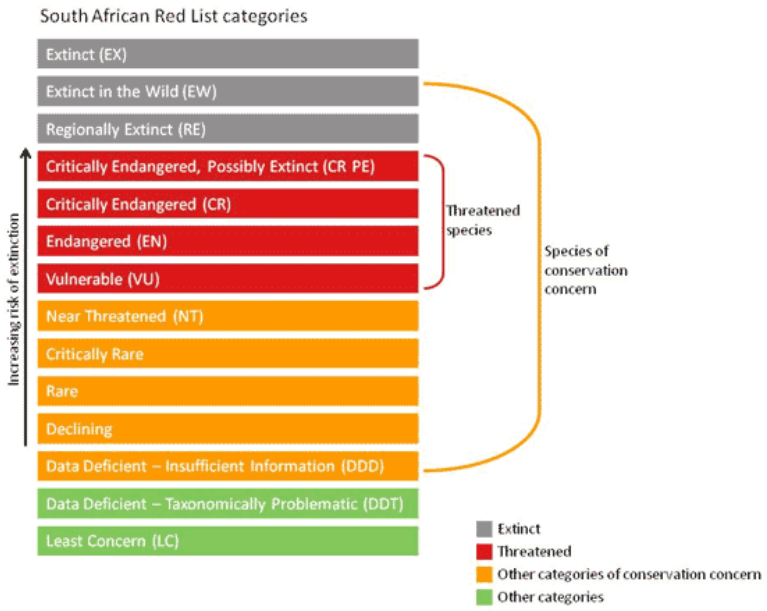


Figure 1. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

3.2 SITE VISIT

A preliminary site visit to the study area was conducted on the 4th of April 2016 and a follow-up site visit on the 8th and 9th of September 2016. The primary purpose of the initial site visit was to investigate and identify sensitive features within the site as well as provide a preliminary characterization of the habitats and ecosystems within the site for the Scoping phase. The follow-up site visit was in the wet season and was used to verify the sensitivity and characteristics of areas identified as potentially sensitive.

Apart from the above site visits, the area has also been visited in the past at different times of the year for a variety of other assessments. The facility lies within the original project area of the Mainstream Sutherland WEF which the consultant sampled in 2011. In addition, it lies adjacent to the ACED Komsberg West WEF which was sampled in 2015. Parts of the grid connection corridors are in common with these other developments and as such have been investigated multiple times as well. This information is used to inform the current study as appropriate and as the area has been sampled numerous times at different seasons, this significantly reduces the uncertainty associated with the current assessment.

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.

The ecological sensitivity of the different units identified in the mapping procedure for the broad-scale sensitivity map was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **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 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 may occur 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 generally undesirable and should proceed with caution as additional specific mitigation and avoidance is usually required to reduce impacts within these areas to acceptable levels. High sensitivity areas are also usually more sensitive to cumulative impact and the total footprint within these areas should be kept low.
- **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. However, in case of linear features such as drainage lines, it may be necessary for access roads and other infrastructure to traverse such features. However no turbines should be located within such areas and other disturbance should be minimized. Excessive disturbance or impact to such areas may be considered to constitute a fatal flaw of the development and as such should be avoided and minimized as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories. There are however no sensitivities that are identified as “Medium to High” or similar ranged categories because this adds uncertainty to the mapping as it is not clear if an area falls at the bottom or top of such a range. As such the sensitivities are specific and do not represent a range of sensitivity based on uncertainty or poor sampling.

4 BASELINE DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map, two vegetation types occur within the study area (Figure 2) along the power line route. The higher-lying sections of the power line route options are within the Central Mountain Shale Renosterveld vegetation type, while the valleys and lower-lying areas are within the Koedoesberge-Moordenaars Karoo vegetation type.

Central Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and southeastern slopes of the Klein Roggeveldberge and Komsberg below the Komsberg section of the Great Escarpment as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area. It is associated with clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones with land types mostly Ib and Fc. Although this vegetation type is classified as Least Threatened, it has a very limited extent of 1236km^2 and is not formally conserved anywhere. Levels of transformation are however low and it is considered to be 99% intact. Although no endemic species are known to occur within this vegetation type, little is known about this Renosterveld type and it has been poorly sampled. Experience from this and other projects in the area indicate that this should be considered to be a relatively sensitive vegetation type with a relatively high abundance of species of conservation concern and in context of the site should in fact be considered to have a higher sensitivity than those areas of Koedoesberge-Moordenaars Karoo. Within the site, the sensitivity of the Central Mountain Shale Renosterveld is not homogenous and the abundance of species of concern tends to be concentrated within wet lowland areas as well as high elevation areas, especially above 1300m. The Komsberg area is also a recognized centre of plant diversity and endemism and the majority of this diversity is associated with the high elevation areas of Central Mountain Shale Renosterveld (Clark *et al.* 2011).

According to Mucina & Rutherford (2006) the Koedoesberge-Moordenaars Karoo vegetation type has an extent of 4714km^2. This unit occurs in the Western and Northern Cape on the Koedesberge and Pienaar se Berg low mountain ranges bordering on the southern Tanqua Karoo and separated by the Klein Roggeveld Mountains from the Moordenaars Karoo in the broad area of Laingsburg and Merweville. Koedoesberge-Moordenaars Karoo is associated with slightly undulating to hilly landscape covered by low succulent scrub with scattered tall shrubs. It occurs on mudstones, shale and sandstone of various origins including Adelaide Subgroup, Ecca Group and Dwyka Group diamictites, which give rise to shallow skeletal soils. Land types are mainly Fc and lesser extents of Ib. This vegetation type is classified as Least Threatened and has not been significantly impacted by transformation. Conservation status is however poor and of the target of 19% only a very small proportion is conserved within the Gamkapoort Nature Reserve (<1%). At least 14 endemic species are known from this vegetation type, which is a high number considering that this vegetation unit occupies less than

5000km^2. In addition, the majority of listed species known from the broader area are associated with this vegetation type. It is however very poorly known and little research has been conducted within this unit.

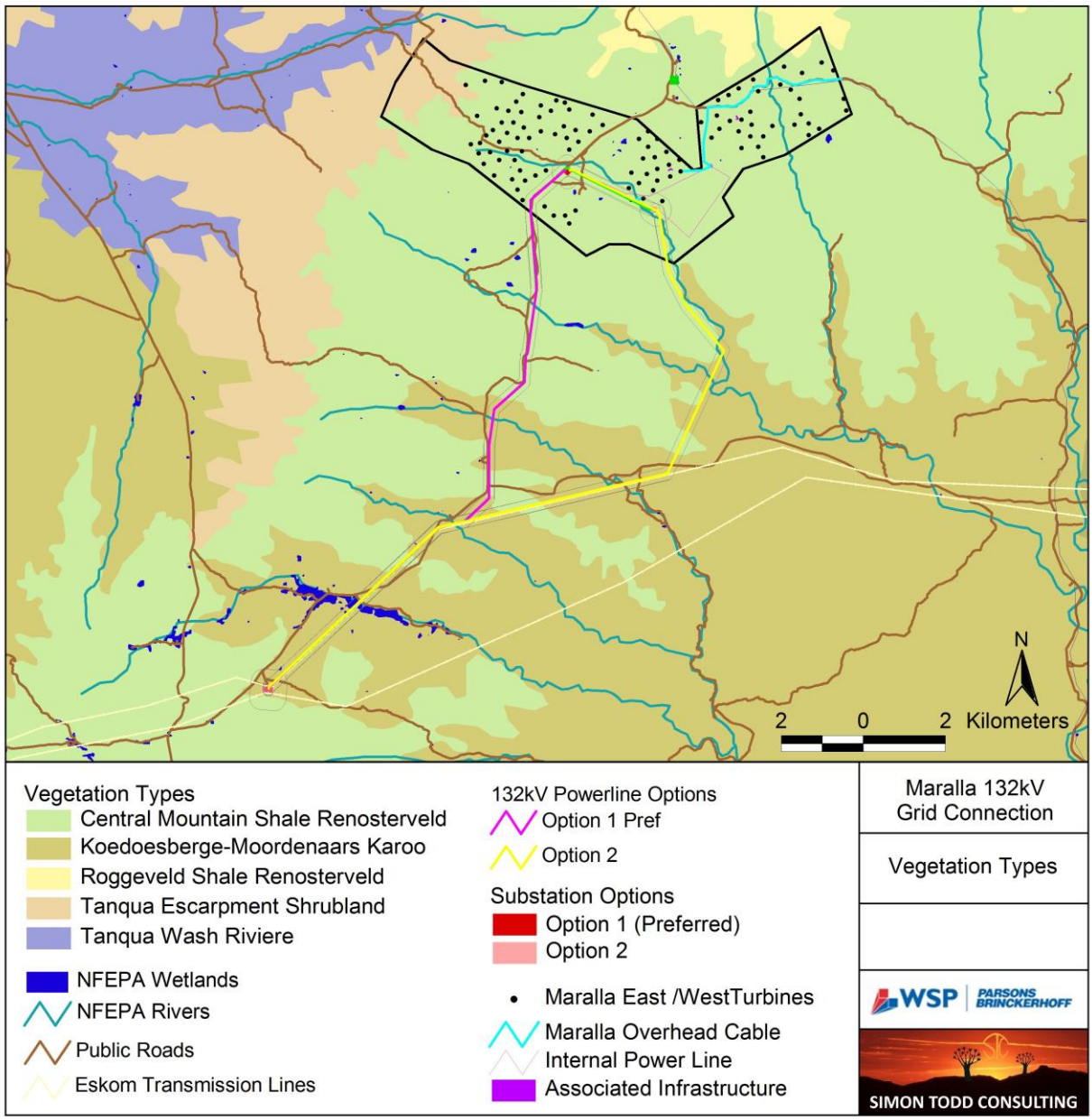


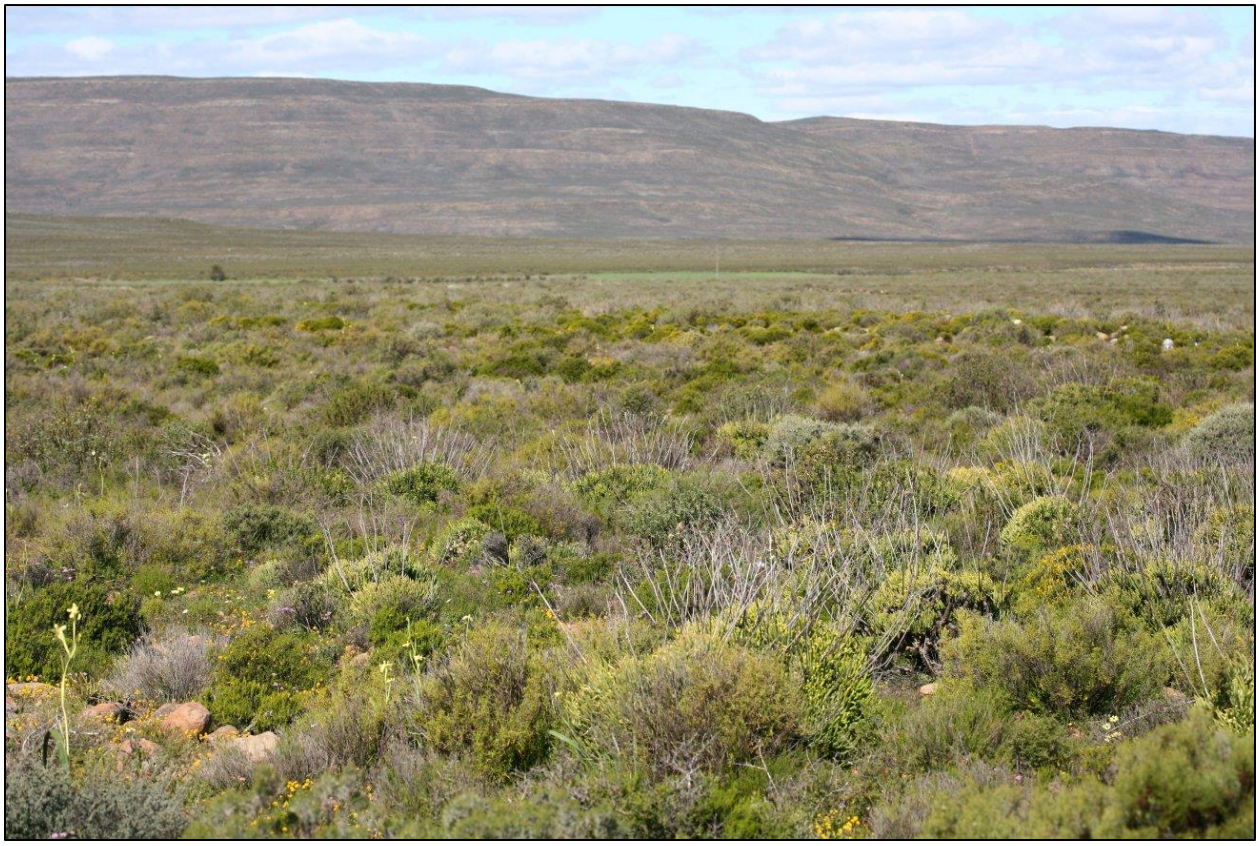
Figure 2. Vegetation map (Mucina and Rutherford 2006) of the Maralla Wind Farm study area, showing the grid connection corridors and the two on-site substation options. The majority of the power line routes fall within the Central Mountain Shale Renosterveld, with a small extent of Koedoesberg-Moordenaars Karoo around the Komsberg substation.

4.2 SITE DESCRIPTION

On-Site Substation Option 1

Substation 1 is located adjacent to the gravel road that passes through the Maralla site. There are no sensitive features within the footprint area, but it is about 150m from a tributary of the Komsberg River to the north. However, this is sufficiently far that it should not be significantly affected by the development. This is considered to be a favourable location for the substation due to the low concentration of species of conservation concern in this area and also because of its' proximity to the public road which would lower the overall extent of disturbance and habitat loss resulting from the development.

Common and dominant shrub species include *Euryops lateriflorus*, *Eriocephalus microphyllus* var. *microphyllus*, *Eriocephalus purpureus*, *Chrysocoma ciliata*, *Dimorphotheca cuneata*, *Hirpicium alienatum*, *Asparagus capensis*, *Tripteris sinuata*, *Tripteris aghillana* var. *integrifolia*, *Ursinia pilifera*, *Amphiglossa tomentosa*, *Ruschia intricata*, *Pteronia ciliata*, *Pteronia sordida*, *Pteronia glauca*, *Pentzia incana*, *Tetragonia fruticosa*, *Wiborgia sericea*, *Elytropappus rhinocerotis* and *Oedera genistifolia* with occasional grasses *Ehrharta calycina* and *Merxmeullera stricta* and succulents such as *Tylecodon wallachii* and *Crassula tetragona* subsp. *connivens*. Geophytes are also common and include species such as *Hesperantha cucullata*, *Moraea pallida*, *Moraea ciliata*, *Moraea miniata*, *Gladiolus venustus*, *Ixia rapunculoides*, Bulbinella elegans, *Bulbinella cauda-felis*, *Oxalis obtusa*, *Babiana cuneata* and *Romulea tortuosa* subsp*. tortuosa*.



Looking south over the area around Substation 1, the preferred substation option. Dominant species include *Elytropappus rhinocerotis*, *Merxmeullera stricta*, *Pteronia ciliata*, *Pteronia glauca* and *Tylecodon wallachii*.

On-Site Substation Option 2

The substation 2 site is located in the south of the Maralla East/West site on a sparsely vegetated gravel plain above the Komsberg River. Due to the proximity of the site to the Komsberg River it is not considered to be favourable location for the substation. As such, the preferred option, Option 1 is confirmed as the preferred option from an ecological perspective.

The vegetation in this area is dominated by low shrubland consisting of species such as *Pteronia glomerata*, *Pteronia ciliata*, *Ruschia spinosa*, Euryops *lateriflorus*, *Oedera genistifolia*, *Lycium cinereum*, *Felicia filifolia* subsp. *filifolia*, *Chrysocoma ciliata* and *Rosenia spinescens*, with occasional areas of *Elytropappus rhinocerotis* and *Merxmeullera stricta*. Diversity in this area is relatively low and there are few species of concern present within the gravel plain environment which is transitional between Central Mountains Shale Renosterveld and Koedoesberge-Moordenaars Karoo.

Looking towards the proposed location of Substation 2 in the middle distance, illustrating the landscape in the affected area. The vegetation of the substation site is dominated by *Pteronia glomerata*, *Pteronia ciliata*, *Ruschia spinosa* and *Euryops lateriflorus*. The Komsberg River is just out of view below the rise of the land on which the substation is located on. The area in the foreground is the area affected by the power line sections between Substation Option 1 and Substation Option 2.

Grid Connection Option 1

Maralla Grid connection Option 1 is the western alignment which follows the gravel road towards Komsberg Substation before meeting Option 2 at the existing 400kV power line. This option is shorter than Option 2 and in addition, the proximity of the route to the existing gravel road is seen as a positive aspect of the route. There are no highly significant features along the route apart from some drainage lines and associated wetlands. The rivers are however relatively narrow and can easily be spanned by the power line.

Looking north-east back along route Option 1 towards the preferred substation location adjacent to the gravel road. There are no highly sensitive features in this section of the route.

Looking south-west along the mid-section of Grid Connection Option 1 before it meets the existing Eskom 400kV line. The line crisscrosses the road several times and there are no notable features along this section apart from some drainage lines.

The common middle section of the power line route shared by Option 1 and Option 2, where it runs adjacent to the existing Eskom 400kV line.

Grid Connection Option 2

Grid Connection Option 2, is the eastern alignment and goes through a currently undisturbed area before meeting the existing Eskom 400kV line route to the Komsberg substation. Although the part of the line which runs adjacent to the Eskom line is not considered highly sensitive, the initial section from the on-site substation to the Eskom line traverses an undisturbed area. As there is currently no infrastructure in this area, the route would generate significant new disturbance and as a result, this is not considered a favourable alignment.

Looking south along the initial alignment of Option 2, which runs adjacent to the drainage line in the foreground until it meets the existing Eskom 400kV line.

Looking back towards the Maralla site along the Option 2 alignment from near to where it joins the Eskom 400kV line.

The final shared section towards the Komsberg Substation, common to all the routes. Although there are drainage features in this section, it is considered generally relatively low sensitivity as it is fairly arid and there are few species of concern present.

Drainage Lines & Wetlands

As the main feature of concern with regards to the development of the power line would be the drainage lines, these are specifically described here as some drainage lines would be traversed by all of the route options. Although the main drainage feature of the Maralla site is the Komsberg River and its tributaries, there are also numerous drainage lines along the route to the Komsberg Substation. The drainage lines are ecologically important and the presence of several species of conservation concern such as *Brunsvigia josephinae* (VU) can also be confirmed. Dominant and common species associated with the drainage lines include *Pseudoschoenus inanis*, *Kniphofia sarmentosa*, *Athanasia minuta* subsp. *inermis*, *Felicia filifolia*, *Lycium cinereum*, *Lycium pumilum*, *Euryops imbricatus*, *Dicerothamnus rhinocerotis*, *Phragmites australis*, *Conyza scabrida*, *Euryops oligoglossus* subsp. *racemosus*, *Mentha longifolia* subsp. *capensis* and *Artemisia afra*. Trees are restricted to the larger drainage lines and includes species such as a *Searsia lancea, Salix mucronata*, *Diospyros lycioides* and *Acacia karoo*.

The drainage lines along the initial section of Option 2 are well-treed and dominated by *Acacia karoo*, *Searsia lancea* and *Salix mucronata*.

The drainage lines along Option 1 are generally less well developed, with fewer woody species than Option 2, but there are also some extensive reed beds present which are usually home to *Brunsvigia josephinae* (VU).

4.3 LISTED & PROTECTED PLANT SPECIES

According to the SANBI SIBIS database, nearly 681 indigenous species have been recorded from the four quarter degree squares around the site. This includes 61 threatened species and an additional 101 species of lower conservation concern (Appendix 1). Although this is a considerably larger area than the study area and includes a wide variety of habitats, many of which are not found within the study area, this is an exceptionally high number of listed species for a semi-arid environment. This serves to illustrate the high species richness of the area and high potential impact of the development on plant species of conservation concern.

Species of conservation concern that were observed at the Maralla site and along the power line route include *Eriocephalus grandiflorus* (Rare), *Ehrharta eburnea* (NT), *Pelargonium denticulatum* (Rare), *Drimia altissima* (Declining) and *Adromischus mammillaris* (Endangered). These tend to restricted to specific habitats and the impact of the power line on these species is likely to be low. Any plants within the footprint can likely be avoided through adjustment of the final route alignment and pylon positions with a preconstruction walk-through. Apart from the species of conservation concern, there are many provincially protected species present at the site, which is to be expected, given the broad range of species protected at the provincial level.

4.4 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

Although the east of the broader Maralla site lies within the Western Cape, the Maralla grid connection is restricted largely to the Northern Cape and falls within the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008). This biodiversity assessment identifies Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Once gazetted, and incorporated into municipal SDFs and bioregional plans, such fine-scale plans are recognized under NEMA and the various activities listed under the act as described in Section 2.2 come into effect. The CBA map for the general area surrounding the site is depicted below in Figure 3. There are few identified CBAs along either route and it is only the south-facing slopes that have been identified as CBAs. These are considered important for biodiversity especially in the face of climate change as these are the coolest slopes which represent refuge areas where many species can persist under a drying or warming climate. The footprint of the power line is however low and a significant impact on the CBAs is not likely.

In terms of the NPAES Focus Areas, Option 1 is largely outside of these areas as the road to the Komsbrg substation has been excluded and the route is largely contained within this buffer. The initial section of Option 2 is within an NPAES Focus Area and as already mentioned, this is

an area with little current development and the construction of a power line through this area is not considered favourable.

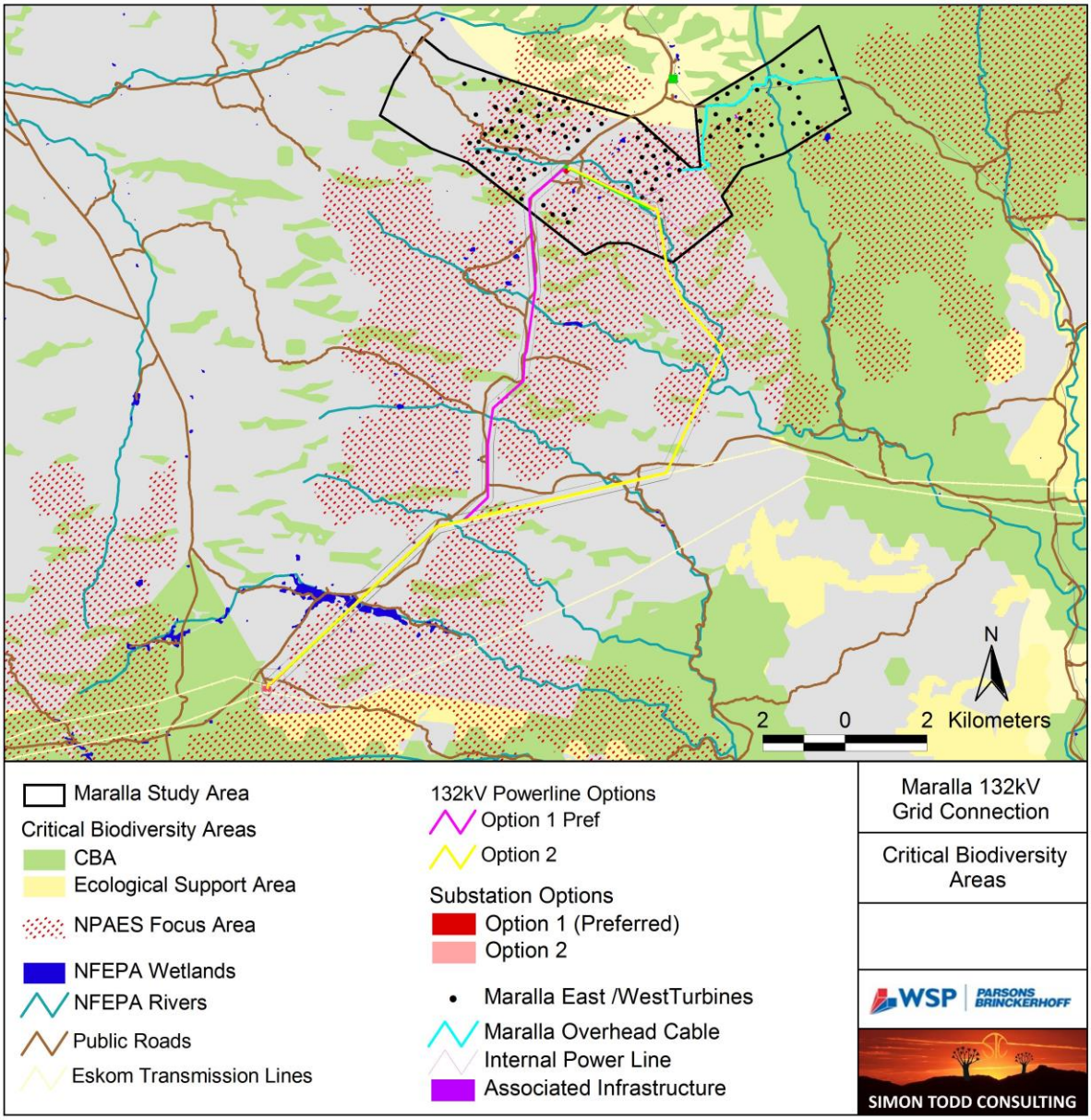


Figure 3. Critical Biodiversity Areas map of the proposed Maralla Wind Farm and the surrounding area, showing the grid connection options and two on-site substation options. The map also shows the NPAES Focus Areas in the area which are part of the Western Karoo Focus Area.

4.5 CUMULATIVE IMPACT

The Roggeveld/Komsberg area has become a focus of wind energy development with numerous wind energy projects in the area. There has been particular impact on the Central

Mountains Shale Renosterveld vegetation type, which occurs on the rugged hills and mountains south of the escarpment and has borne the brunt of most of the approved facilities to date. Cumulative impacts on Central Mountains Shale Renosterveld appear to be a particular concern as this vegetation type has a relatively limited extent and a significant proportion is within renewable energy development application areas.

Currently, there are three preferred bidders in the area; the Karusa 142MW wind farm, Soetwater 142MW and the 138MW Kareebosch Wind Farm which are all west of the site. These are the only farms which at this point are certain to be built. The total extent of direct habitat loss from these developments can be estimated at approximately 60ha each, resulting in 180ha of direct habitat loss in the broad area around the Maralla site. The contribution of the Maralla grid connection to cumulative habitat loss in the area would be low as this would amount to less than 10ha of total habitat loss. A detailed analysis of the cumulative impacts associated with wind energy development in the area is provided in the ecological study for the Maralla wind farm and is not repeated here, but referenced for an indication of the cumulative impacts of the wind farm itself, which is outside of the scope of this study. The major contributor of cumulative impact in the area, stems from the facilities themselves and the contribution of the grid connections is minor in this regard.

4.6 FAUNAL COMMUNITIES

Mammals

At least 50 mammal species potentially occur at the site (Appendix 2). Due to the diversity of habitats available, which includes rocky uplands, densely vegetated kloofs and riparian areas, as well as open plains and low shrublands, a large proportion of species with a distribution that includes the site are likely to be present in at least part of the broader site.

Despite trapping and hunting by the local landowners, medium sized carnivores such as jackal and caracal remain relatively common in the area. The ridges, hills and uplands of the site, with rocky outcrops, rocky bluffs and cliffs provide suitable habitat for species which require or prefer rock cover such as Cape Rock Elephant Shrew, *Elephantulus edwardii*, Hewitt's Red Rock Hare *Pronolagus saundersiae*, Namaqua Rock Mouse *Micaelamys namaquensis* and Rock Hyrax, *Procavia capensis*. Although of limited extent, there are also deeper soils along the Roggeveld River and some of the other smaller drainage lines which support a higher vegetation density and support species associated such as Brants's Whistling Rat *Parotomys brantsii*, the Bush Vlei Rat *Otomys unisulcatus*, Hairy-footed Gerbil *Gerbillurus paeba* and Common Duiker *Sylvicapra grimmia*.

The Riverine Rabbit *Bunolagus monticularis* which is listed as Critically Endangered and is regarded as one of the most threatened mammals in South Africa is known to occur within the broad area. Populations of this species occur between Sutherland and Fraserburg to the northeast as well as in the Tanqua Karoo to the west. The drainage systems within the site do not contain wide flood plains or alluvial terraces which are the known favoured habitat of the Riverine Rabbit. As a result, it is unlikely that this species occurs at the site and an impact on this species is therefore not considered likely.

The major impact of the power line on mammals would be likely to occur during the construction phase when a lot of noise and disturbance would be generated. In the longer term, there would be a small amount of habitat loss, which is not considered significant.

Reptiles

There is a wide range of habitats for reptiles present at the site, including rocky uplands and cliffs, open flat and lowlands and riparian areas. As a result the site is likely to have a rich reptile fauna which is potentially composed of 7 tortoise species, 16 snakes, 15 lizards and skinks, two chameleons and 11 geckos. The only currently listed species which may occur at the site is the Karoo Padloper *Homopus boulengeri* which is listed as Near Threatened.

Species observed in the immediate area or on-site include Karoo Girdled Lizard *Cordylus polyzonus*, Southern Rock Agama *Agama atra*, Cape Skink *Mabuya capensis* and Cape Cobra *Naja nivea*, Marsh Terrapin *Pelomedusa subrufa*, Puff Adder *Bitis arietans*. Tortoises are abundant in the area and consist mostly of Angulate Tortoises, *Chersina angulata* with occasional observations of Karoo Tent Tortoises, *Psammobates tentorius tentorius* as well. Tortoises may be negatively impacted by the development as they are vulnerable to collisions with motor vehicles and predation by avian predators while traversing open areas. Attractive species such as tent tortoises are also vulnerable to collection for use as pets or trade, and the increased accessibility resulting from the new roads that will be constructed as part of the development would raise the risk for these species.

In general, the major impact associated with the development would occur due to disturbance during the construction phase, with minor residual habitat loss in the operational phase.

Amphibians

Amphibian diversity at the site is low, with only 9 species recorded from the broader area. The Roggeveld and other drainage lines and their vicinity are the most important areas for frogs at the site. Some of the larger drainage systems contain rocky, sheltered pools that contain water on a near-perennial basis and some species which depend on permanent water are present. No species of conservation concern are known from the area and all the species which may be present are quite widespread species of low conservation concern.

The Karoo Dainty Frog, *Cacosternum karooicum* is listed as Data Deficient reflecting the little-known distribution and ecology of this species. To date, the Karoo Dainty Frog has been recorded from a few scattered locations across the Karoo in the Western and Northern Cape, but it is likely that it occurs more widely across the karoo in general. The site also falls within the distribution of two other regional endemic species, the Cape Sand Frog, *Tomopterna delalandii* and the Raucous Toad, *Amietophrynus rangeri*. The Cape Sand Frog occurs in lowlands and valleys in fynbos and Succulent Karoo throughout most of the Western Cape and into Namaqualand. The Raucous Toad is more widely distributed and occurs throughout much of South Africa inland and along the east coast into Gauteng and Mpumalanga. There do not therefore appear to be any range-restricted species which occur at the site which would be vulnerable to population-level impacts.

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

4.7 SITE SENSITIVITY ASSESSMENT

The ecological sensitivity map of the site is depicted in Figure 4 below. In terms of identified higher sensitivity areas along the grid connection routes, there are several drainage lines which are considered the most important features along the routes. Apart from the drainage lines, there are some areas of steep slopes which are considered vulnerable to disturbance and where specific precautions to avoid and mitigate erosion would be required. There are few other features of significance along the power line corridors and the major impact associated with the grid connection would be disturbance during construction, especially due to the construction of an access road to build the line. This would be a particular concern along the initial section of Option 2 as this would generate extensive disturbance in an area where there is currently little human activity or access. The western alignment (Option 1), runs adjacent to the gravel road to Komsberg, where there is already disturbance and human activity. As such, this option would generate significantly less impact than Option 2 and is identified as the preferred option.

In terms of the two on-site substation options, Option 1 is considered less sensitive on account of the proximity to the gravel road and the lack of species or habitats of concern within the affected area. As such, Substation Option 1 is considered the preferred substation location from an ecological perspective and the combination of Substation 1 and Grid Connection 1 are identified as the preferred combination for the development that would minimize the overall impact of the development.

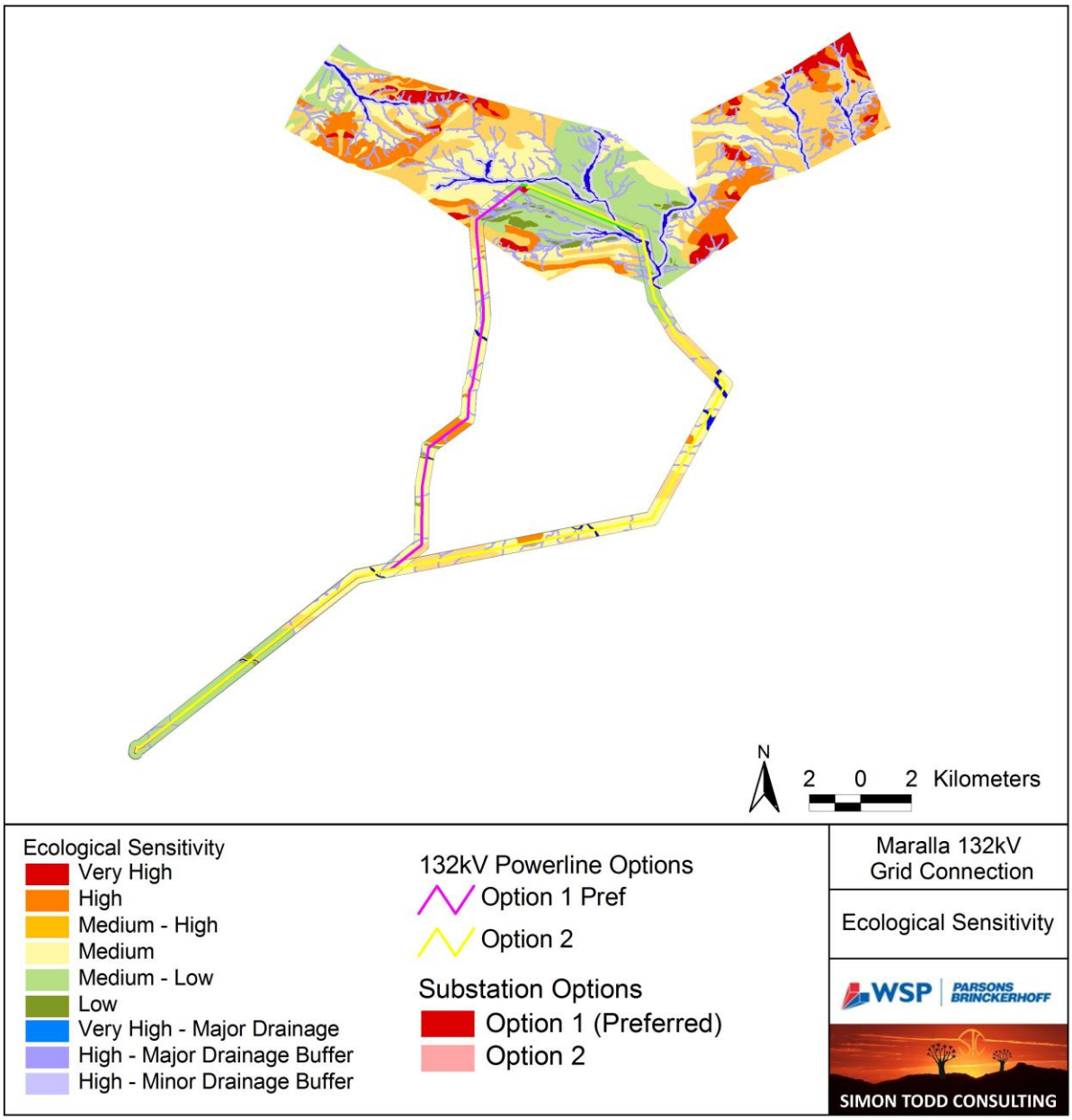


Figure 4. Ecological Sensitivity map of the Maralla 132kV Grid Connection routes.

5 IMPACT ASSESSMENT

The assessment methodology used here is in accordance with the revised 2014 EIA regulations and based on the assessment approach recommended by Hacking (2001). The impacts assessed below are those that were identified in the Scoping Study and are assessed for the Planning and Construction Phase, Operational Phase and Decommissioning Phase of the proposed grid connection, as well as for Cumulative impacts. The assessment is based on the

development footprint as provided by the developer and the distribution of sensitive features and species at the site as identified in the field and mapped in the sensitivity map presented in this report. The assessment provided below is the summary assessment and the detailed assessment is attached in the associated spreadsheet used to calculate the summary sensitivity scores presented below.

5.1 PLANNING & CONSTRUCTION PHASE IMPACTS

Phase & Impact	Before Mitigation	After Mitigation
Planning & Construction Phase Impacts		
***IMPACT 1: Impacts on vegetation and protected plant species*:**		
Maralla 132kV Power Line & Associated Infrastructure		
SS1 & 132kV Option1	Low	Low
SS1 & 132kV Option 2	Medium	Low
SS2 & 132kV Option 1	Low	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Summary of impacts:

Vegetation Impacts:

Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with pylons, substations, access roads etc. Although some mitigation is possible especially with regards to avoidance of sensitive features, the development cannot avoid vegetation clearing within the footprint of infrastructure, with the result that this impact will remain **Medium** after mitigation.

Mitigation Measures:

- Preconstruction walk-though of the approved development footprint to ensure that sensitive habitats and species are be avoided where possible.
- Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.
- All roads built for construction should have water diversion and erosion control structures present, especially in steep areas.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Demarcate all areas to be cleared with construction tape or similar material. However caution should be exercised to avoid using material that might entangle fauna.

IMPACT 2: Faunal impacts due to construction activities		
Maralla 132kV Power Line & Associated Infrastructure		
SS1 & 132kV Option 1	Low	Low
SS1 & 132kV Option2	Medium	Medium
SS2 & 132kV Option 1	Low	Low
SS2 & 132kV Option2	Medium	Medium
No-Go Option	Low	

Faunal Impacts:

Disturbance, transformation and loss of habitat during construction of the power line and associated infrastructure will have a negative effect on resident fauna, with many species moving away from the area and some individuals of smaller species not able to move away likely to be killed by construction activity. Although noise and disturbance cannot be avoided during construction, this will be transient, and disturbance levels during operation will be lower.

Mitigation Measures:

- Preconstruction walk-through of the power line to identify areas of faunal sensitivity.
- During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
- No fires should be allowed within the site as there is a risk of runaway veld fires.
- No fuelwood collection should be allowed on-site.
- No dogs or cats should be allowed on site apart from that of the landowners.
- If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.
- 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 and site access should be strictly controlled and vehicles which need to roam around the site should be accompanied by the ECO or security personnel.
- All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.

IMPACT 3: Increased Soil Erosion risk during construction		
Maralla 132kV Power Line & Associated Infrastructure		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Soil Erosion Risk:

During and immediately after construction, the disturbed areas along the power line route will be vulnerable to erosion, especially on the steep slopes which characterise parts of the route. It is a common misconception that erosion in semi-arid environments is a low risk factor, however, this is false as these areas are often exposed to high intensity rainfall events and the vegetation cover is low, leaving the soils exposed and vulnerable to erosion. Erosion results in soil loss and a decline in biodiversity and productive potential from the affected areas and may also result in the siltation and degradation of aquatic systems which receive the eroded soils. With the implementation of erosion control and avoidance measures, this impact can however be effectively reduced to a **Low** level.

Mitigation Measures:

- Runoff management and erosion control should be integrated into the project design.
- Roads should have runoff control and water management infrastructure present to limit erosion and damage to vegetation.
- Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.
- Regular monitoring for erosion problems along the access roads and other cleared areas.
- Erosion problems should be rectified on a regular basis.
- Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.
- A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

5.2 Operational Phase Impacts

Phase & Impact	Before Mitigation	After Mitigation

Operation Phase Impacts		
IMPACT 1: Previously disturbed areas will remain vulnerable to erosion for some time into the operational phase.		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Soil Erosion during operation:

Areas disturbed during construction will remain vulnerable to disturbance for some time into the operational phase and will require regular maintenance to ensure that erosion is minimised. With mitigation, this impact can however be reduced to a Low level.

Mitigation Measures:

- Erosion management at the site should take place according to the Erosion and Rehabilitation Plan.
- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.

IMPACT 2: Previously disturbed areas will remain vulnerable to alien plant invasion for some time		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Alien Plant Invasion during operation:

Disturbed areas are vulnerable to alien plant invasion and it is likely that road verges, pylon foundation areas and other cleared or disturbed areas will be foci for alien plant invasion. Uncontrolled invasion can result in invasion into the intact rangeland and where woody species are involved, this can result in loss of biodiversity and a decline in ecosystem services. With regular clearing and management, this impact can be reduced to a Low significance level.

Mitigation Measures:

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

5.3 DECOMMISSIONING PHASE IMPACTS

Phase & Impact	Before Mitigation	After Mitigation
Decommissioning Phase Impacts		
IMPACT 1: Faunal impacts due to decommissioning of the wind farm such as noise, and operation of heavy machinery on-site.		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Summary of impacts:

Faunal Impacts During Decommissioning:

Decommissioning will require the use of heavy machinery on-site and will generate a lot of noise and disturbance which would have a negative impact on fauna. This impact would however be relatively short-lived and would ultimately result in the removal of the development and rehabilitation of the site and as such the ultimate impact of decommissioning on fauna would be Low after mitigation. .

Mitigation Measures:

- Any potentially dangerous fauna such snakes or fauna threatened by the decommissioning activities should be removed to a safe location.
- 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.

- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.

IMPACT 2: Following decommissioning, disturbed areas will remain vulnerable to erosion for some time.		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

<u>Soil Erosion following Decommissioning</u>:

Decommissioning will result in a lot of disturbance which will leave the site vulnerable to erosion. As a result the site should be monitored for erosion problems for at least 2 years after decommissioning. With mitigation, this impact can be reduced to a Low significance.

Mitigation Measures:

- Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.

IMPACT 3: Following decommissioning, the site will be highly vulnerable to alien plant invasion		
SS1 & 132kV Option 1	Medium	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Medium	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

<u>Alien Plant Invasion during Decommissioning</u>:

Decommissioning will leave the site vulnerable to alien plant invasion and alien plants should be monitored and managed for at least two years following decommissioning or

until an adequate cover of perennial plants has been established in disturbed areas. With mitigation, this impact can be reduced to a Low significance.

Mitigation Measures:

- Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned.
- Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

5.4 CUMULATIVE IMPACTS

Phase & Impact	Before Mitigation	After Mitigation
Cumulative Impacts		
IMPACT 1: Impact on CBAs and Broad-Scale Ecological Processes due habitat loss and the presence and operation of the power line		
SS1 & 132kV Option 1	Low	Low
SS1 & 132kV Option2	Medium	Low
SS2 & 132kV Option 1	Low	Low
SS2 & 132kV Option2	Medium	Low
No-Go Option	Low	

Summary of impacts:

Cumulative impacts:

Cumulative impacts are a significant concern in the area due to the large amount of wind energy development in the area. Furthermore, large parts of the Maralla site and the power line corridors are within CBAs and the loss of habitat within the CBAs may impact the ecological functioning of the CBAs and result in increased habitat fragmentation and reduced landscape connectivity. However, the footprint of the power line would be low and this impact is considered to be of low significance.

Mitigation Measures:

- Minimise the development footprint within the Higher sensitivity parts of the site.

- The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
- An Open Space Management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent rangeland.

IMPACT 2: Impact on NPAES Focus Areas and future conservation options in the area		
SS1 & 132kV Option 1	Low	Low
SS1 & 132kV Option2	Low	Low
SS2 & 132kV Option 1	Low	Low
SS2 & 132kV Option2	Low	Low
No-Go Option	Low	

Summary of impacts:

Cumulative impacts on Conservation Options:

The majority of the site is within a NPAES Focus Area and the habitat loss resulting from this as well as the other wind energy developments in the area will contribute to cumulative impacts on the NPAES and this may have consequences for future conservation options in the area and the ability of the county to meet its conservation targets. However, the footprint of the power line is low and the impact on future conservation options is not considered significant. .

Mitigation Measures:

- Minimise the development footprint within the Higher sensitivity parts of the site.
- The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
- An Open Space Management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent rangeland.

6 COMPARATIVE ASSESSMENT

A comparative assessment of the four power line and associated substation options is provided below, highlighting the main differences and potential impacts associated with each option.

Alternative	Preference	Reasons (incl. potential issues)
POWER LINE ALTERNATIVES		
Substation 1 OHPL Option 1	Preferred	The substation is in the preferred location and this power line option is the shortest and traverses the least extent of sensitive habitat. In addition the majority of the route is adjacent to the gravel road or existing Eskom 400kV line, which would reduce additional disturbance. This is clearly the preferred option and would generate significantly less impact than the other options.
Substation 1 OHPL Option 2	Not Preferred	This option is not preferred because it traverses an area with little current disturbance and includes several areas of steep slopes vulnerable to disturbance. This option would increase cumulative impacts in the area and is not considered a preferred option.
Substation 2 OHPL Option 1	Acceptable	This option is similar to the first option, but traverses the site before following the same route as Option 1 from substation 1. As such, this is considered an acceptable option, but is less preferred than Option 1 as the substation location is not considered favourable.
Substation 2 OHPL Option 2	Not Preferred	This option is not preferred because it traverses an area with little current disturbance and includes several areas of steep slopes vulnerable to disturbance. This option would increase cumulative impacts in the area and is not considered a preferred option.

7 CONCLUSIONS & RECOMMENDATIONS

The Maralla 132kV grid connection and associated infrastructure is located largely within currently intact ecosystems of moderate to high sensitivity. Substation Option 1 near to the Komsberg road is considered preferable as it would result in shorter lines to the Eskom Komsberg Substation and is also closer to existing disturbance and human activity. In terms of the power line options, Option 2 is not preferred as it traverses an area with little current human activity or access as well as several large drainage features. Power line Option 1 is considered

preferable as the alignment largely follows the gravel road for the vast majority of its length to the Komsberg substation.

There are no major CBAs within the affected areas and as the footprint of the power line would be low, a significant impact on CBAs is not likely. In terms of NPAES focus areas, the impact of Option 1 would be low compared to Option 2. The extent of impact along Option 1 would not compromise the ecological functioning or ecological value of the affected NPAES focus areas. Similarly, the contribution of the power line to cumulative impact on the area would amount to approximately 10-15ha, which is not considered highly significant, especially as the affected areas are mostly lower elevation habitats with a lower risk of significant cumulative impact.

Overall, for the preferred alternatives, there are no impacts associated with the development of the Maralla grid connection and associated infrastructure that cannot be reduced to an acceptable level. As such, there are no reasons to oppose the development of the grid connection on terrestrial ecological grounds.

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9 APPENDICES:

Appendix 1. Listed Plant Species

List of plant species of conservation concern which are known to occur in the vicinity of the Maralla Wind Farm. The list is derived from the SIBIS:SABIF website. Those in red are confirmed present in the immediate area, but not necessarily within the development footprint.

Family	Species	Threat status
AMARYLLIDACEAE	***Brunsvigia josephinae (Redouté) Ker Gawl.***	**VU**
	Strumaria karooica (W.F.Barker) Snijman	**Rare**
	Strumaria pubescens W.F.Barker	**Rare**
ANTHERICACEAE	*Chlorophytum lewisiae Oberm.*	**Rare**
APOCYNACEAE	***Duvalia parviflora N.E.Br.***	**VU**
	Hoodia pilifera (L.f.) Plowes subsp. pilifera	**NT**
ASPHODELACEAE	*Astroloba herrei Uitewaal*	**VU**
	Bulbine torta N.E.Br.	**Rare**
	Haworthia fasciata (Willd.) Haw.	**NT**
	Gasteria disticha	**CR**
	Haworthia serrata	**CR**
	Haworthia pulchella M.B.Bayer var. pulchella	**Rare**
ASTERACEAE	*Cineraria lobata L'Hér. subsp. lasiocaulis Cron*	**Rare**
	Antithrixia flavicoma	**VU**
	Euryops namaquensis	**VU**
	Eriocephalus grandiflorus M.A.N.Müll.	**Rare**
	Phymaspermum schroeteri Compton	**Rare**
	Pteronia hutchinsoniana Compton	**Rare**
	Relhania tricephala (DC.) K.Bremer	**NT**
COLCHICACEA	*Wurmbea capensis*	**VU**
CRASSULACEAE	*Adromischus humilis (Marloth) Poelln.*	**Rare**
	Adromischus phillipsiae (Marloth) Poelln.	**Rare**
	Adromischus mammillaris	**EN**
	Crassula alpestris Thunb. subsp. massonii (Britten & Baker f.) Toelken	**Rare**
EUPHORBIACEAE	*Euphorbia nesemannii R.A.Dyer*	**NT**
FABACEAE	*Amphithalea spinosa (Harv.) A.L.Schutte*	**VU**
	Amphithalea villosa Schltr.	**VU**
	Lotononis comptonii B.-E.van Wyk	**EN**
	Lotononis gracilifolia B.-E.van Wyk	**EN**
	Lotononis venosa B.-E.van Wyk	**VU**
GERANIACEAE	***Pelargonium denticulatum Jacq.***	**Rare**
	Pelargonium torulosum E.M.Marais	**Rare**
HYACINTHACEAE	*Lachenalia maximiliani Schltr. ex W.F.Barker*	**Rare**

IRIDACEAE	*Geissorhiza inaequalis L.Bolus*	**Rare**
	Geissorhiza karooica Goldblatt	**NT**
	Ixia linearifolia Goldblatt & J.C.Manning	**Rare**
	Ixia parva Goldblatt & J.C.Manning	**VU**
	Moraea aspera Goldblatt	**VU**
	Romulea eburnea J.C.Manning & Goldblatt	**VU**
	Romulea syringodeoflora M.P.de Vos	**VU**
MESEMBRYANTHEMACEAE	*Cleretum lyratifolium Ihlenf. & Struck*	**Rare**
	Lampranthus amoenus (Salm-Dyck ex DC.) N.E.Br.	**EN**
OXALIDACEAE	*Oxalis tenuipes T.M.Salter var. tenuipes*	**Rare**
POACEAE	***Ehrharta eburnea Gibbs Russ.***	**NT**
POLYGALACEAE	*Muraltia karroica Levyns*	**VU**
PROTEACEAE	*Leucadendron teretifolium (Andrews) I.Williams*	**NT**
	Protea convexa E.Phillips	**CR**
	Protea lepidocarpodendron (L.) L.	**NT**
RUTACEAE	*Acmadenia argillophila I.Williams*	**NT**
SCROPHULARIACEAE	*Globulariopsis wittebergensis Compton*	**Rare**
	Oftia glabra Compton	**Rare**
	Selago albomontana Hilliard	**Rare**

Appendix 2. List of Mammals

List of Mammals which potentially occur at the Maralla Wind Farm site. Taxonomy and habitat notes are derived from Skinner & Chimimba (2005), while conservation status is according to the IUCN 2016.

Scientific Name	Common Name	Status	Habitat	Likelihood
Afrosoricida (Golden Moles):				
Chlorotalpa sclateri	Sclater's Golden Mole	LC	Montane grasslands, scrub and forested kloofs of the Nama Karoo and grassland biomes	Low
Chrysochloris asiatica	Cape Golden Mole	LC	Coastal parts of the Northern and Western Cape	High
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 edwardii	Cape Rock Elephant Shrew	LC	From rocky slopes, with or without vegetation, from hard sandy ground bearing little vegetation, quite small rocky outcrops	Confirmed
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):				
Bunolagus monticularis	Riverine Rabbit	CR	Confined to riparian bush on the narrow alluvial fringe of seasonally dry watercourses in the Central Karoo.	V.Low
Pronolagus saundersiae	Hewitt's Red Rock Hare	LR/LC	Confined to areas of krantzes, rocky hillsides, boulder-strewn koppies and rocky ravines	Confirmed
Lepus capensis	Cape Hare	LR/LC	Dry, open regions, with palatable bush and grass	Confirmed
Lepus saxatilis	Scrub Hare	LR/LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	Confirmed
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Confirmed

Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High
Acomys subspinosus	Cape Spiny Mouse	LC	Associated with rocky areas on mountain slopes in Fynbos	Low
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
Steatomys krebsii	Kreb's African Fat Mouse	LC		
Micaelamys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	Confirmed
Micaelamys granti	Grant's Rock Mouse	LC	Restricted to the karoo where they are associated with rocky terrain.	High
Parotomys brantsii	Brants's 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	Low
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.	Confirmed
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
Tatera afra	Cape Gerbil	LC	Confined to areas of loose, sandy soils of sandy alluvium. Common on cultivated lands.	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
Dendromus melanotis	Grey Climbing Mouse	LC	Often associated with stands of tall grass especially if thickened with bushes and other vegetation	High
Primates:				
Papio hamadryas	Chacma Baboon	LR/LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Confirmed
Eulipotyphla (Shrews):				
Myosorex varius	Forest Shrew	LC	Prefers moist, densely vegetated habitat	High

Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Carnivora:				
Proteles cristatus	Aardwolf	LR/LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	Confirmed
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	High
Panthera pardus	Leopard	SARDB NT	Wide habitat tolerance, associated with areas of rocky koppies and hills, mountain ranges and forest	Low/Moderate
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LR/LC	Occur in open arid associations	High
Genetta tigrina	Large-spotted genet	LR/LC	Fynbos and savanna particularly along riverine areas	Low
Suricata suricatta	Meerkat	LR/LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	Confirmed
Cynictis penicillata	Yellow Mongoose	LR/LC	Semi-arid country on a sandy substrate	Confirmed
Galerella pulverulenta	Cape Grey Mongoose	LR/LC	Wide habitat tolerance	Confirmed
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.	Confirmed
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	Confirmed
Aonyx capensis	Cape Clawless Otter	LC	Predominantly aquatic and do not occur far from permanenetpermanenet water	Medium
Ictonyx striatus	Striped Polecat	LR/LC	Widely distributed throughout the sub-region	Confirmed
Mellivora capensis	Ratel/Honey Badger	SARDB EN	Catholic habitat requirements	High
Rumanantia (Antelope):				
Sylvicapra grimmia	Common Duiker	LR/LC	Presence of bushes is essential	Confirmed
Pelea capreolus	Grey Rhebok	LC	Associated with rocky hills, rocky mountainsides, mountain plateaux with good grass cover.	Confirmed
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Confirmed
Raphicerus campestris	Steenbok	LR/LC	Inhabits open country,	Confirmed

Raphicerus melanotis	Cape Grysbok	LC	Thick scrub bush, particularly along the lower levels of hills	Medium
Oreotragus oreotragus	Klipspringer	LR/cd	Closely confined to rocky habitat.	Confirmed

Appendix 3. List of Reptiles.

List of reptiles which are known from the broad area around the Maralla Wind Farm site, according to the SARCA database, derived for the degree square 3220CD, DC and 3320AB, BA.

Family	Genus	Species	Subspecies	Common name	Red list category
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern
Agamidae	*Agama*	*hispida*		Spiny Ground Agama	Least Concern
Atractaspididae	*Homoroselaps*	*lacteus*		Spotted Harlequin Snake	Least Concern
Chamaeleonidae	*Bradypodion*	*gutturale*		Little Karoo Dwarf Chameleon	Least Concern
Chamaeleonidae	*Chamaeleo*	*namaquensis*		Namaqua Chameleon	Least Concern
Colubridae	*Psammophis*	*crucifer*		Cross-marked Grass Snake	Least Concern
Colubridae	*Pseudaspis*	*cana*		Mole Snake	Least Concern
Colubridae	Dasypeltis	scabra		Rhombic Egg-eater	Least Concern
Colubridae	*Dipsina*	*multimaculata*		Dwarf Beaked Snake	Least Concern
Cordylidae	*Cordylus*	*minor*		Western Dwarf Girdled Lizard	Least Concern
Cordylidae	*Hemicordylus*	*capensis*		Graceful Crag Lizard	Least Concern
Cordylidae	*Karusasaurus*	*polyzonus*		Karoo Girdled Lizard	Least Concern
Cordylidae	*Pseudocordylus*	*microlepidotus*	*namaquensis*	Nuweveldberg Crag Lizard	Least Concern
Elapidae	*Hemachatus*	*haemachatus*		Rinkhals	Least Concern
Elapidae	*Naja*	*nigricincta*	*woodi*	Black Spitting Cobra	Least Concern
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not Listed
Gekkonidae	*Chondrodactylus*	*angulifer*	*angulifer*	Common Giant Ground Gecko	Least Concern
Gekkonidae	*Chondrodactylus*	*bibronii*		Bibron's Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*capensis*		Cape Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*formosus*		Southern Rough Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*geitje*		Ocellated Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*kladaroderma*		Thin-skinned Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*maculatus*		Spotted Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*mariquensis*		Marico Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*oculatus*		Golden Spotted Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*purcelli*		Purcell's Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*weberi*		Weber's Gecko	Least Concern
Gerrhosauridae	*Cordylosaurus*	*subtessellatus*		Dwarf Plated Lizard	Least Concern
Gerrhosauridae	*Tetradactylus*	*tetradactylus*		Cape Long-tailed Seps	Least Concern
Lacertidae	*Nucras*	*tessellata*		Western Sandveld Lizard	Least Concern
Lacertidae	*Pedioplanis*	*burchelli*		Burchell's Sand Lizard	Least Concern
Lacertidae	*Pedioplanis*	*laticeps*		Karoo Sand Lizard	Least Concern
Lacertidae	*Pedioplanis*	*lineoocellata*	*pulchella*	Common Sand Lizard	Least Concern

Leptotyphlopidae	*Namibiana*	*gracilior*		Slender Thread Snake	Least Concern
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern
Lamprophiidae	*Prosymna*	*sundevallii*		Sundevall's Shovel-snout	Least Concern
Lamprophiidae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern
Lamprophiidae	*Psammophylax*	*rhombeatus*	*rhombeatus*	Spotted Grass Snake	Least Concern
Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern
Scincidae	*Trachylepis*	*sulcata*	*sulcata*	Western Rock Skink	Least Concern
Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern
Testudinidae	*Chersina*	*angulata*		Angulate Tortoise	Least Concern
Testudinidae	*Homopus*	*areolatus*		Parrot-beaked Tortoise	Least Concern
Testudinidae	*Homopus*	*boulengeri*		Karoo Padloper	Near Threatened
Testudinidae	*Homopus*	*femoralis*		Greater Padloper	Least Concern
Testudinidae	*Psammobates*	*tentorius*	*tentorius*	Karoo Tent Tortoise	Not listed
Testudinidae	*Psammobates*	*tentorius*	*verroxii*	Verrox's Tent Tortoise	Not listed
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern

Appendix 4. List of Amphibians

List of amphibians which potentially occur at the Maralla site. Taxonomy and habitat notes are from du Preez and Carruthers (2009) and conservation status from the IUCN 2010. (Status: LC = Least Concern, DD = Data Deficient) and additional data is from the ADU Amphibian Database for Quarter degree squares: 3220CD, 3220DC, 3320AB, 3320BA.

Scientific Name	Common Name	Status	Habitat	Distribution	Likelihood
Amietophrynus rangeri	Raucous Toad	Not Threatened	Rivers and stream in grassland and fynbos	Endemic	High
Vandijkophrynus gariepensis	Karoo Toad	Not Threatened	Karoo Scrub	Widespread	High
Xenopus laevis	Common Platanna	Not Threatened	Any more or less permanent water	Widespread	High
Cacosternum boettgeri	Common Caco	Not Threatened	Marshy areas, vleis and shallow pans	Widespread	High
Amietia fuscigula	Cape River Frog	Not Threatened	Large still bodies of water or permanent streams and rivers.	Widespread	Confirmed
Cacosternum karooicum	Karoo Caco	DD	Dry kloofs and valleys in the Karoo	Endemic	High
Cacosternum karooicum	Karoo Dainty Frog	DD	Arid areas with unpredictable rainfall. Breeds in small streams as well as man-made dams.	Karoo Endemic	High
Tomopterna delalandii	Cape Sand Frog	Not Threatened	Lowlands in fynbos and Succulent Karoo	Endemic	High
Tomopterna tandyi	Tandy's Sand Frog	Not Threatened	Nama karoo grassland and savanna	Widespread	High