FLORA AND FAUNA SPECIALIST ASSESSMENT REPORT FOR THE PROPOSED DE AAR 2 SOUTH GRID CONNECTION AND SWTICHING STATION NEAR DE AAR, NORTHERN CAPE PROVINCE

On behalf of

Mulilo De Aar 2 South (Pty) Ltd

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(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*Attached*
(c) an indication of the scope of, and the purpose for which, the report was prepared;	*1.3*
(cA) an indication of the quality and age of base data used for the specialist report;	*Appendix I*
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(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	*2, 3*
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(g) an identification of any areas to be avoided, including buffers;	*3*
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(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	*5*
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	*6, 7*
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(p) any other information requested by the competent authority	
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	*Appendix I*

1 INTRODUCTION

1.1 Background

Mulilo De Aar 2 South (Pty) Ltd is proposing the construction of one up to 400 kV grid connection route from the approved wind farm to the Eskom Hydra substation, 10 km south-east of De Aar (Figure 1).

Two routes were assessed and environmental authorisation is being sought for one route. Route 1 is 23 km in length, to connect the authorised De Aar 2 South Wind Energy Facility (DA2S WEF) to the Eskom Hydra Substation. Route 2 deviates from this to connect the authorised De Aar 2 South Wind Energy Facility (DA2S WEF) to the Eskom Hydra Substation via an approved solar substation. The grid connection is for up to 400 kV. The proposed project will include an up to 400 kV switching station (100m x 100m in extent) which will be located within the DA2S WEF. The proposed transmission line would consist of the following infrastructures:

- Grid line infrastructure including foundations and insulators;
- Existing access roads and tracks; and
- Line and servitude clearances to meet the statutory requirements.

The objectives of this study are to identify and assess all potential impacts of the proposed development on the flora, fauna and ecological processes in the area and to provide recommended mitigation measures and rehabilitation guidelines for all identified impacts.

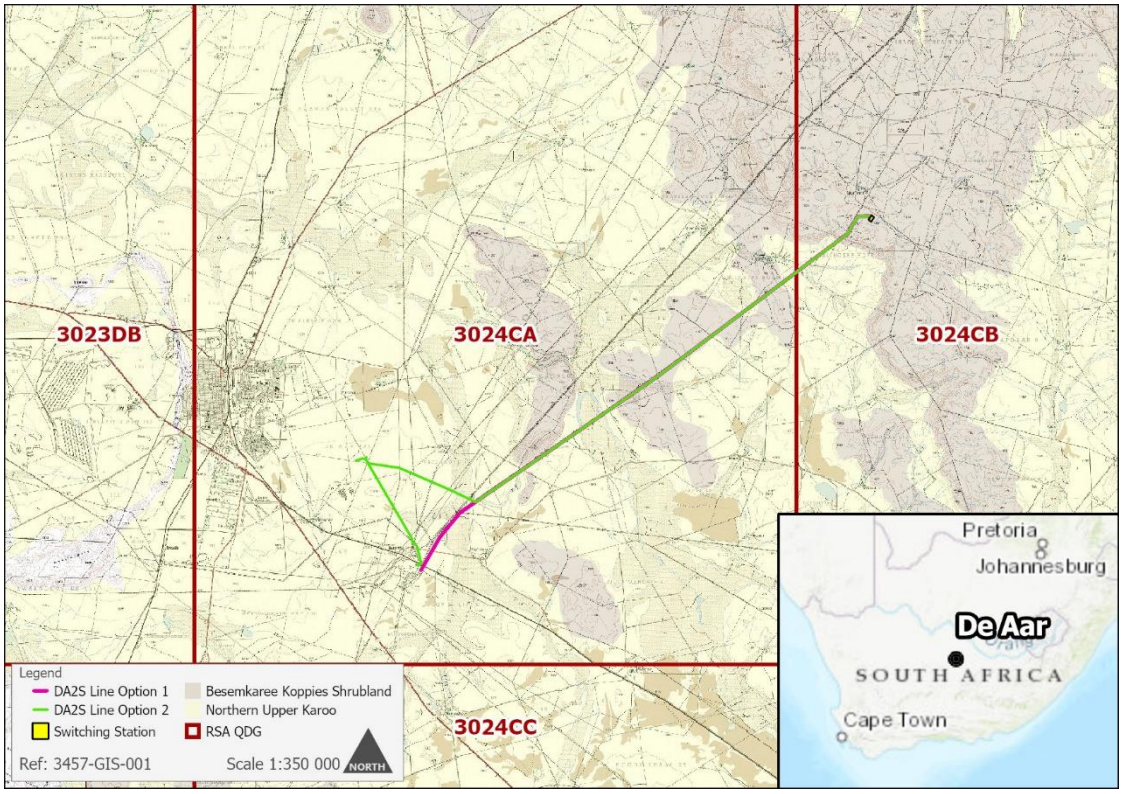


Figure 1: The location of grid connection infrastructure associated with the current assessment displayed with relevant quarter degree grid squares used in database queries. The purple and green lines represent the proposed components.

1.2 Assessment Philosophy

It is not the intention to provide comprehensive lists of all species that occur on the project site but rather to provide a predicted list of important/key species (e.g.

rare/threatened/protected/endemic etc.) that may possibly occur and to identify critical biodiversity features that may be at risk of significant negative impact due to development of an area. Biodiversity of a site can be considered from the species level (rare, threatened or protected species), ecosystem level (threatened or protected ecosystems and biodiversity areas) and the process level (ecological corridors, conservancy networks, rivers and wetlands, watersheds and topographical features).

1.3 Scope of Study

The scope of the study included the following activities:

A desktop study and site screening to broadly describe and characterise the project site in terms of:

- Vegetation and habitat types;
- National conservation status of major vegetation types;
- Red Data (threatened or endangered) species of flora and fauna; and
- Species of flora and fauna offered legislative protection.

A site walk-through and ecological survey to describe the project site at finer detail in terms of:

- The status of the vegetation and habitat types; and
- Potential impacts on biodiversity, habitats, processes and ecosystem functioning.

1.4 Assumptions and Limitations

The resolution and reliability of distribution records and available databases is largely dependent on the sampling effort conducted in the area. Private property is often poorly sampled and therefore database queries may not adequately represent the actual flora and fauna present on the site. To reduce the effect of this limitation the database search is expanded beyond the immediate project site to cover a larger area with similar vegetation and habitat types. This complies with the precautionary approach prescribed in the National Environmental Management Act, Act No. 107 of 1998 (NEMA).

2 METHODOLOGY

Various databases of distribution records were consulted to determine the potential species of flora and fauna that could occur on the site, these are described in more detail in Appendix I. The applicable legislation is outlined in Appendix II. The methodology used to assess the impacts follows Hacking (2001)[1] outlined in Appendix III. In addition to the desk-top study a five-day site walkthrough was conducted between 10 and 14 February 2020.

3 RESULTS

The conditions during the site visit were excellent for the field assessment as the area had received a good amount of rainfall allowing for a thorough assessment of features such as temporary wetlands, vleis, drainage lines, seeps and water-filled depressions to be conducted. Plant species such as grasses and herbs were flourishing during the site visit. The different habitats, biodiversity features and landscape units were investigated and their position and sensitivity were mapped in the field. Active searches for reptiles and amphibians were also conducted within habitats likely to be important for such species such as around rocky outcrops and wetlands.

[1] Hacking, T. 2001. An innovative approach to structuring environmental impact assessment reports; Part 2: Ranking the significance of environmental aspects and impacts. 19. 56-59.

3.1 Vegetation

Two broad vegetation types occur in the study area[2], namely the Northern Upper Karoo (NKu3) and Besemkaree Koppies Shrubland (Gh4, Figure 1). The first of these units (Northern Upper Karoo) occurs in the lowland areas of the study site while the second (Besemkaree Koppies Shrubland) occurs on the slopes of koppies and covering the tops of tafelbergs.

3.1.1 Northern Upper Karoo

Vegetation Type		Northern Upper Karoo (Nku 3)
Distribution		Northern Cape and Free State Provinces: Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. Bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. The study site is near a transition zone between the Northern Upper Karoo vegetation type and the Eastern Upper Karoo vegetation type towards the south and the east. The vegetation type mostly occurs at an altitude between 1000 – 1500 m.
Vegetation & Landscape Features		This vegetation type occurs on flats and gently sloping plains with isolated hills of Upper Karoo Hardeveld and interspersed with many pans. It is dominated by dwarf karoo shrublands, grasses and occasional low trees.
Geology & Soils		Shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites form the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms.
Climate		Rainfall peaks in autumn (March). Mean annual precipitation ranges for this vegetation type are from about 190 mm in the west to 400 mm in the northeast. The mean annual precipitation for De Aar is about 300 mm. Mean maximum and minimum monthly temperatures for De Aar are 37.1°C and -4.8°C for January and July, respectively.
Important taxa	Small Trees	*Acacia mellifera* subsp. *detinens, Boscia albitrunca.*
	Succulent Shrubs	*Hertia pallens, Salsola calluna, S. glabrescens, S. rabieana, S. tuberculata, Zygophyllum flexuosum.*
	Tall Shrubs	*Lycium cinereum* (d), *L. horridum, L. oxycarpum, L. schizocalyx, Rhigozum trichotomum, Gymnosporia szyszylowiczii* subsp. *namibiensis.*
	Low Shrubs	*Chrysocoma ciliata* (d), *Gnidia polycephala* (d), *Pentzia calcarea* (d), *P. globosa* (d), *P. incana* (d), *P. spinescens* (d), *Rosenia humilis* (d), *Amphiglossa triflora, Aptosimum marlothii, A. spinescens, Asparagus glaucus, Barleria rigida, Berkheya annectens, Eriocephalus ericoides subsp. ericoides, E. glandulosus, E. spinescens, Euryops asparagoides. Felicia muricata, Helichrysum lucilioides, Hermannia spinosa, Leucas capensis, Limeum aethiopicum, Melolobium candicans, Microloma armatum, Osteospermum leptolobum, O. spinescens, Pegolettia retrofracta, Pentzia lanata, Phyllanthus maderaspatensis, Plinthus karooicus, Pteronia glauca, P. sordida, Selago geniculata, S. saxatilis, Tetragonia arbuscula, Zygophyllum lichtensteinianum.*
	Herbs	*Chamaesyce inaequilatera, Convolvulus sagittatus, Dicoma ca¬pensis, Gazania krebsiana, Hermannia comosa, Indigofera alternans, Lessertia pauciflora, Radyera urens, Sesamum capense, Sutera pinnatifida, Tribulus terrestris, Vahlia capensis, Convolvulus boedeckerianus.*
	Geophytic Herbs	*Moraea pallida.*
	Succulent Herbs	*Psilocaulon coriarium.*

[2] Mucina, L. and Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland, in Strelitzia 19. South African National Biodiversity Institute, Pretoria.

	Graminoids	*Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *E. truncata* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Eragrostis bicolor, E. porosa, Fingerhuthia africana, Heteropogon contortus, Stipagrostis ciliata, Themeda triandra, Tragus berteronianus, T. koelerioides, T. racemosus.*		
Endemic Taxa	Succulent Shrubs	Hooker's Pebble Plant *(Lithops hookeri), Stomatium pluridens.*		
	Low Shrubs	*Atriplex spongiosa, Galenia exigua.*		
	Herb	*Manulea deserticola.*		
Conservation	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Status**
	21	0	4	Least Threatened
Remarks	This vegetatin type dominates the low lying areas of the project site. As this vegetation type is fairly widespread throughout the region and largely untransformed the floral species found on the site are not at significant risk of negative impact from the development.			

3.1.2 Besemkaree Koppies Shrubland

Vegetation Type		Besemkaree Koppies Shrubland (Gh 4)
Distribution		Northern Cape, Free State and Eastern Cape Provinces: On plains of Eastern Upper Karoo (between Richmond and Middelburg in the south and the Orange River) and within dry grasslands of the southern and central Free State. Extensive dolerite-dominated landscapes along the upper Orange River belong to this unit as well. Extends northwards to around Fauresmith in the northwest and to the Wepener District in the northeast. Altitude 1120–1680 m.
Vegetation & Landscape Features		Slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower closed-canopy layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-rich years, also by abundant grasses, while the upper loose canopy layer is dominated by tall shrubs, namely *Rhus erosa, R. burchellii, R. ciliata, Euclea crispa* subsp. *ovata, Diospyros austro-africana* and *Olea europaea* subsp. *africana.*
Geology & Soils		Dolerite koppies and sills embedded within Karoo Supergroup sediments. The dolerite dykes and sills are igneous intrusions that are the result of extensive volcanic activity, which accompanied the break-up of Gondwana in the Jurassic. In places the slopes of mesas and butts carrying this vegetation type have a mixed geology where dolerites occur together with sandstones and mudstones of the Ecca and Beaufort Groups.
Climate		Due to the large extent of the area, the rainfall pattern differs slightly from west to east. Seasonal summer rainfall prevails when the patches are found embedded within other units of the Grassland Biome, but the southern and southwestern regions show hints of bimodal climate patterns typical of the Nama-Karoo. This vegetation type occupies areas with a mean annual precipitation as low as 280 mm (such as in De Aar in the west), to more than double that approximately 200 km in the north-east (near Edenburg).
Important taxa	Small Trees	*Cussonia paniculata, Ziziphus mucronata.*
	Succulent Shrubs	*Aloe broomii, Chasmatophyllum musculinum, C. verdoorniae, Cotyledon orbiculata var. dactylopsis, Pachypodium succulentum.*
	Tall Shrubs	*Diospyros austro-africana* (d), *Euclea crispa subsp. ovata* (d), *Olea europaea subsp. africana* (d), *Rhus burchellii* (d), *R. ciliata* (d), *R. erosa* (d), *Buddleja saligna, Diospyros lycioides* subsp. *lycioides, Ehretia rigida, Grewia occidentalis, Gymnosporia polyacantha, Tarchonanthus minor.*
	Low Shrubs	*Asparagus suaveolens* (d), *Chrysocoma ciliata* (d), *Amphiglossa triflora, Aptosimum elongatum, Asparagus striatus, Diospyros pallens, Eriocephalus ericoides, E. spinescens, Euryops empetrifolius, Felicia filifolia subsp. filifolia, F. muricata, Helichrysum dregeanum, H. lucilioides, Hermannia multiflora, H. vestita, Lantana rugosa, Limeum aethiopicum, Lycium cinereum, Melolobium candicans, M. microphyllum, Nenax microphylla, Pegolettia retro¬fracta, Pentzia globosa, Rhigozum obovatum, Selago saxatilis, Stachys linearis, S. rugosa, Sutera halimifolia, Wahlenbergia albens.*
	Herbs	*Argyrolobium lanceolatum. Convolvulus sagittatus, Dianthus caespitosus subsp. caespitosus, Gazania krebsiana subsp. krebsiana, Hibiscus pusillus, Indigofera alternans, I. rhytidocarpa, Lepidium africanum subsp. africanum, Pollichia campestris.*

	Geophytic Herbs	*Albuca setosa, Asplenium cordatum, Cheilanthes bergiana, C. eckloniana, Freesia andersoniae, Haemanthus humilis subsp. humilis, Oxalis depressa, Pellaea calomelanos.*		
	Succulent Herbs	*Aloe grandidentata, Crassula nudicaulis, Duvalia caespitosa, Euphorbia pulvinata, Huernia piersii, Stapelia grandiflora, S. olivacea, Tridentea gemmiflora.*		
	Graminoids	*Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Cenchrus ciliaris* (d), *Cymbopogon caesius* (d), *Cynodon incompletus* (d), *Digitaria eriantha* (d), *Eragrostis curvula* (d), *E. lehmanniana* (d), *Heteropogon contortus* (d), *Setaria lindenbergiana* (d), *Themeda triandra* (d), *Tragus koelerioides* (d), *Cymbopogon pospischilii, Enneapogon scoparius, Eragrostis chloromelas, E. obtusa, Eustachys paspaloides, Fingerhuthia africana, Hyparrhenia hirta, Sporobolus fimbriatus.*		
Endemic Taxa	Small Tree	*Cussonia* sp. nov. (P.J. du Preez 3666 BLFU).		
	Succulent Shrubs	Kleinvingerpol *(Euphorbia crassipes),* Coral Plant *(Neohenricia sibbettii), N. spiculata.*		
Conservation	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Status**
	28	5	3	Least Threatened
Remarks	This karoo unit occurs on the slopes and plateau areas on tafelbergs. As this vegetation type is fairly widespread and largely untransformed the floral species found on the site are not at significant risk of negative impact from the development.			

3.2 Biodiversity Conservation

3.2.1 Vegetation types

Both of the broad vegetation types present in the study area and described above are listed as *Least Threatened*[2] and neither are listed in the National List of Ecosystems that are Threatened and in Need of Protection (GN 1002 2012) published under NEM:BA which lists national vegetation types that are afforded protection based on transformation rates.

3.2.2 Biodiversity Planning

3.2.2.1 Existing Biodiversity Areas

The Northern Cape Critical Biodiversity Area (CBA) Map was published in 2016[3] and it "updates, revises and replaces all older systematic biodiversity plans and associated products for the province". This includes the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008), from which the Northern Cape CBA Map derived identified CBA1 and CBA2 areas (and added additional CBA1 and CBA2 areas). The rationale for defining the recent CBA areas is derived from the earlier (2008) conservation plan. CBA1 and CBA2 areas in the 2016 map include the following areas:

- Important Bird Areas (IBAs);
- Succulent Karoo Ecosystem Plan (SKEP) expert identified areas;
- Threatened species locations;
- Features from previous conservation plans (including CBA1 and CBA2 areas from the Namakwa District Biodiversity Sector Plan);
- Areas supporting climate change resilience, e.g. areas of high diversity, topographic diversity, strong biophysical gradients, climate refugia, including kloofs, south-facing slopes and river corridors;
- Conservation Plans from adjacent provinces; and
- Landscape structural elements, e.g. rocky outcrops, koppies, dolerite dykes, boulder fields, woody vegetation on outwash plains.

[3] Oosthuysen, E. & Holness, S. 2016. Northern Cape Critical Biodiversity Areas (CBA) Map. Department of Environment and Nature Conservation & Nelson Mandela Metropolitan University.

The Northern Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

- Protected Areas;
- Critical Biodiversity Area 1 (Irreplaceable Areas);
- Critical Biodiversity Area 2 (Important Areas);
- Ecological Support Areas; and
- Other Natural Area.

This map shows features within the study area (Figure 3) within three of these classes, as follows:

- Critical Biodiversity Area (CBA): The study area crosses a small section of CBA2 area and a small patch of CBA1 area;
- Ecological Support Area (ESA): The whole study area falls within an ESA mostly due to the presence of the large IBA surrounding De Aar.

In CBA1 areas, the land management objective is to maintain the area in a natural state with no biodiversity loss and no biodiversity offsets are possible for developments that result in the transformation of natural habitat. It is interpreted here that large footprint developments would not be desirable within CBA1 areas, but that linear infrastructure could be constructed if impacts are comprehensively managed to avoid habitat loss or degradation.

In CBA2 areas the land management objective is to maintain the landscape in a near natural state, possibly allowing some loss in ecosystem integrity and functioning. Biodiversity compatible land uses are strongly encouraged, and industries encouraged to adopt and implement acceptable biodiversity management plans. It is further recommended to restrict expansion of any activity that would cause the loss of natural habitat and where possible utilise existing transformation or degraded areas for hard development. Biodiversity offsets are required where development impacts on land management objectives.

Several existing power lines traverse these areas, the proposed power line is adjacent to existing power lines for most of the route (Figures 2 and 3). The proposed power line will not negatively impact the conservation objectives beyond what has already occurred from the placement of the existing power lines in the area if mitigation measures are adhered to.

Figure 2: Several existing power lines traverse the area (with associated disturbed areas such as access track and cleared servitudes already existing below the lines). The proposed power line route considered in this proposal follows existing power lines for the majority of its route.

3.2.2.2 Important, Proposed and Protected Areas

According to the National Parks Area Expansion Strategy (NPAES), there is only a small area in the northeast of the study area that has been identified as priority areas for inclusion in future protected areas (Figure 3). Multiple existing power lines already cross this area and a large portion of the land is covered by the existing Longyuan Mulilo De Aar 2 North

(D2N WEF, Figure 3). As medium to long term lease agreements are in place between land owners and developers it is unlikely that this area will be incorporated into National Parks in the foreseeable future. The proposed development is therefore unlikely to have a negative impact on the conservation objectives in the area.

The De Aar Region Strategic Water Source Area (SWSA) covers a broad region from De Aar extending some 70 km towards Hanover. While not formally protected, these areas are important for sustained supplies of groundwater, critical for towns and agriculture in this area and significant alterations to runoff and recharge rate of underground aquifers should be avoided. Mitigation measures such as the maximal use of existing access roads and servitudes, as well as erosion control measures will reduce the impact of the development on moisture regimes, erosion, runoff, recharge rates and therefore the SWSA. This, combined with the placement of the switching station on the plateau, makes it unlikely that the proposed development will have a significant negative impact on the integrity of the De Aar Region SWSA. The proposed switching station footprint is not located near any National Freshwater Ecosystem Priority Areas (NFEPAs).

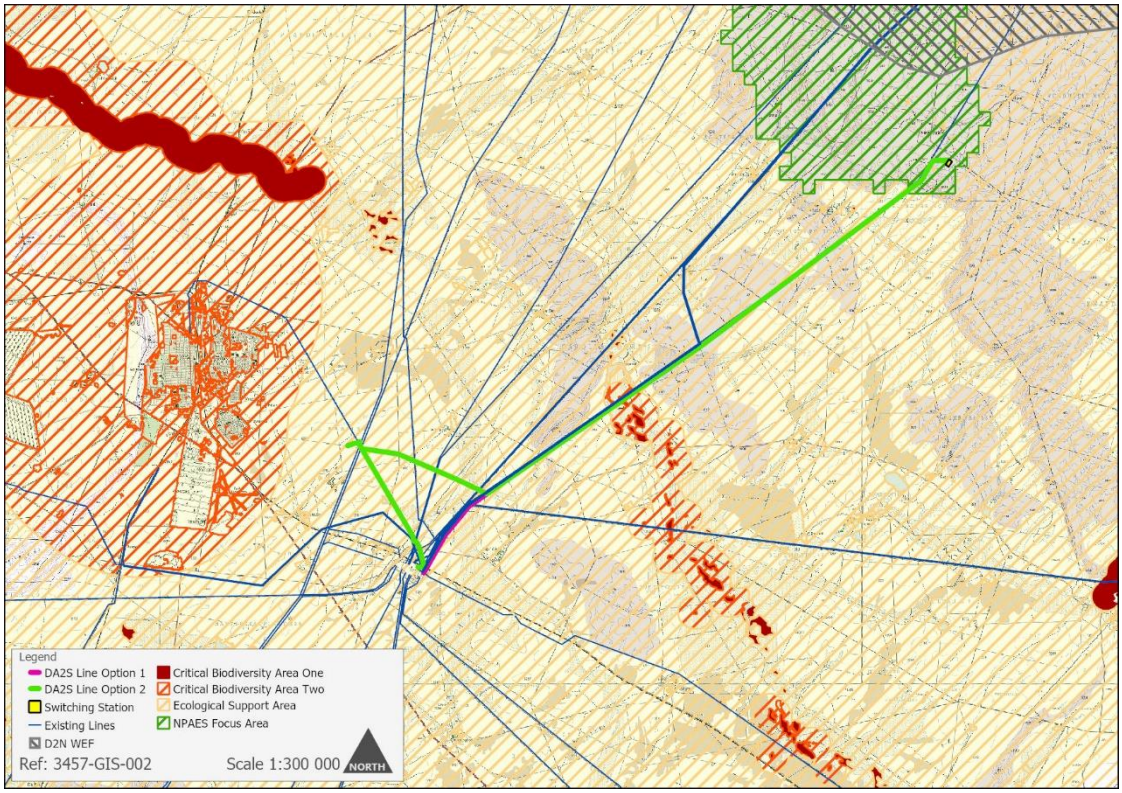


Figure 3: The location of grid connection infrastructure in relation to biodiversity areas. The majority of the site is classified as an ESA (yellow hatching) due to the large IBA that surrounds De Aar. The proposed lines cross small sections of CBA1, CBA2 and National Parks Area Expansion Strategy (NPAES) Focus areas. The purple and lime green lines indicate the proposed components while the blue lines indicate existing power lines. The existing Longyuan Mulilo De Aar 2 North wind energy facility (grey hatching) is displayed to the north and covers a large area of an area identified by the NPAES (green hatching).

3.2.3 Plant Species

3.2.3.1 Red List plant species of the study area

An area of roughly 50 km around the project site (centred on -30.662761; 24.165841) was searched for potential species of concern. Despite this broad search, there are very few species that were evaluated to be of conservation concern that could potentially occur in the project area. Only a single species, Transkei Medusa's Head *(Euphorbia flanaganii,*

Vulnerable), was evaluated to be of conservation concern on the BODATSA database search for the area, however it is the specialist's opinion that this record may have been a misidentification of the similar looking Karoo Spiny Milkweed *(E. arida, Least Concern)* given the distribution of the former species[4]. The potentially endemic *Chasmatophyllum maninum* was listed as Data Deficient. None of the plant species observed on site were listed in any threat category.

3.2.3.2 Protected plants (NEMBA)

None of the plant species listed on the BODATSA database for the study area or recorded on site were listed as protected by NEMBA.

3.2.3.3 Protected plants (Northern Cape Nature Conservation Act)

Fifty-one plant species that were listed on the BODATSA database for the study area (Appendix IV) and could potentially occur in the study site are protected under the Northern Cape Nature Conservation Act (Appendix V). A number of species were found on site that are protected according to the Northern Cape Nature Conservation Act. From the field survey, the following species were particularly abundant on the project site: Steekvy *(Ruschia intricata)*, Eastern Candelabra *(Brunsvigia radulosa),* Narrow-leaf Cotton Bush *(Gomphocarpus fruticosus),* Krimpsiektebos *(Lessertia annularis),* Sorrel *(Oxalis depressa)* and Cape Saffron *(Jamesbrittenia aurantiaca).*

Figure 4: Several plant species observed on the project site are protected under the Northern Cape Nature Conservation Act such as Eastern Candelabra (top left), Krimpsiektebos (top right), Steekvy (lower left) and Narrow-leaf Cotton Bush (lower right).

Despite not being threatened, they are protected and any impacts on these species requires a permit from the relevant authorities. Note that many of these species are widespread and not of any conservation concern, but protected due to the fact that the Northern Cape Nature Conservation Act protects entire families of flowering plants irrespective of whether some members are rare or common. The implication is that a comprehensive list of species occurring within the footprint of the proposed infrastructure is required and a permit application submitted for any of those listed as protected. A walk-through survey is therefore required once the final pylon positions and layout have been decided in order to obtain the number of applicable plants for which permits are required for their destruction.

[4] http://redlist.sanbi.org/species.php?species=574-126

This is a permitting requirement rather than a requirement needed to effectively assess the impacts.

3.2.3.4 Protected trees

One tree species, the Shepherd's Tree *(Boscia albitrunca)* is listed to occur in both habitat types present on the study site and is protected under the National Forest Act. However, this species was not recorded to be present on the study site during the ecological survey.

3.2.3.5 Plant Sensitivity

Overall, the plant sensitivity of the project site is LOW.

3.2.4 Vertebrate Species

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix VI, VII and VIII. All threatened (*Critically Endangered, Endangered* or *Vulnerable*), near threatened[5] or important vertebrate species that could occur in the study area and have habitat preferences that include habitats available in the study area, are discussed further below.

3.2.4.1 Mammal Species

There are 61 mammal species that could occur in the study area, 12 of which are listed as threatened or near threatened (Appendix VI). Based on the natural state of the study area and surrounding areas, it is considered likely that some of these species could occur on site. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on site.

Riverine Rabbit (Bunolagus monticularis, Critically Endangered)

Subpopulations of Riverine Rabbit in the northern part of their distribution are associated with alluvial floodplains and narrow belts of riverine vegetation adjacent to seasonal rivers. However, they are not restricted to the alluvial floodplains in the southern Cape and can also occur in old lands not associated with riverine vegetation[6]. The potential habitat utilisation and distribution range of this species are not fully understood. As alluvial habitats and preferred forage plants, such as Rivierdraaibos *(Osteospermum spinescens*) of riverine rabbit occur on the project site, and that the type locality (Deelfontein) of the species is less than 50 km to the southwest, this species could potentially occur on the project site and precautions must be taken to mitigate the impact on these habitats. The sensitivity of drainage lines, rivers and wash areas have been assessed and mapped in Figure 14.

Southern Mountain Reedbuck (Redunca fulvorufula fulvorufula, Endangered)

This species is widely but patchily distributed and restricted to rocky and grassy hillsides. Populations seem to have declined dramatically in the recent past. Major threats include increased rates of poaching, disturbance by human presence such as cattle herders and illegal hunting by dogs[7].This species may occur on the project site but as a mobile species it would move away from disturbance and would unlikely be negatively affected by the project.

Black-footed Cat (Felis nigripes, Vulnerable)

[5] As listed in Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The 2016 Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[6] Collins K, Bragg C, Birss C, Child MF. 2016. A conservation assessment of *Bunolagus monticularis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[7] Taylor A, Avenant N, Schulze E, Viljoen P, Child MF. 2016. A conservation assessment of the *Redunca fulvorufula fulvorufula*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

The Black-footed Cat is endemic to the arid grasslands, dwarf shrub, and savannah of the Karoo and Kalahari in southern Africa. They have the most restricted distribution of any of the African felid species with the majority of the range occurring within the boundaries of South Africa[8]. The proposed project is located within the core of their range, a study site approximately 20 km to the southwest (Nuwejaarsfontein) of the project site may represent an area of exceptionally high densities of Black-footed Cat due to favourable climate and other factors such as habitat quality[8]. They are specialists of open, short grassy areas with an abundance of small rodents and ground roosting birds. They inhabit dry, open savannah, grasslands and Karoo semi-desert with sparse shrub and tree cover as found on the project site. It is therefore highly likely that this species occurs on the project site. Perhaps the most serious long-term threat for Black-footed Cats is the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation. They are unable to create or maintain their own dens or burrows and rely on those made by other species such as Springhare[8]. As it is highly likely that this species occurs on the project site and the impact on the preferred habitat of Black-footed Cats and Springhare must therefore be mitigated against.

Springhare (Pedetes capensis, Least Concern)

While Springhare are listed as Least Concern the *Vulnerable* Black-footed Cat (as detailed above) is to some degree dependent on the burrow systems created by Springhare for refuge and the conservation of these species is considered to be linked[8]. Springhare prefer relatively flat and open habitats with short grass (in particular *Cynodon* spp.) usually where there is little or no woody vegetation and are generally absent from areas of tall grass[9]. Areas such as pan fringes can be considered optimum habitat**.** It is highly likely that this species occurs on the project site and burrow systems must be avoided. Several active burrow systems were observed on the project site, however no tracks were visible to confirm the species occupying the burrows due to the recent heavy rainfall. Burrow systems or areas where burrows could occur (i.e. areas with similar soil and vegetative characteristics of active burrows) have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

White-tailed Rat (Mystromys albicaudatus, Vulnerable)

Very little is known about this rare species in the wild and although conservationists have been concerned with it for over forty years, it still persists at low densities. While no empirical population estimates or trends are available, they are consistently one of the rarest species encountered[10]. The habitat requirements and ecology of White-tailed Rats merits further research. They are often associated with calcrete soils within grasslands. They are never found on soft, sandy substrate, rocks, wetlands or river banks. However, they have been found on open areas between dolerite slopes and ridges as well as on burned patches suggesting that a fire mosaic habitat with both burned and unburned patches in an area may be an important habitat feature for this species. The project site covers areas of grassland vegetation associated with dolerite sills and calcrete deposits and may therefore represent areas of suitable habitat for this species. It is therefore considered likely that it could occur on the project site and individuals could be affected by construction

[8] Wilson B, Sliwa A, Drouilly M. 2016. A conservation assessment of *Felis nigripes*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[9] Peinke D, Wilson B, Anderson C. 2016. A conservation assessment of *Pedetes capensis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[10] Avenant N, Wilson B, Power RJ, Palmer G, Child MF. 2016. A conservation assessment of *Mystromys albicaudatus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

activities if suitable habitat is damaged. Such areas have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

Grey Rhebok (Pelea capreolus, Near Threatened)

This species is endemic to South Africa and Lesotho, occurring in rocky hills, grassy, mountain slopes, and plateau grasslands. The population has had an estimated decline of c. 20% over three generations (1999–2014) in 13 formally protected areas across its range[11]. While listed as Near Threatened it is considered to be close to meeting *Vulnerable* status as subpopulations are suspected to be faring poorly outside of protected areas[11]. The primary threat is suspected to be increased levels of bush-meat and illegal sport hunting with dogs. This species may occur on the project site but as a mobile species it would move away from disturbance and would unlikely be negatively affected by the project.

Vlei Rat (Otomys auratus, Near Threatened)

This species is associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions, typically occurring in dense vegetation in close proximity to water[12]. This species may occur on the project site but as it is restricted to wetland habitats it would unlikely be negatively affected by the project if these areas are avoided. Such areas have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

Spotted-necked Otter (Hydrictis maculicollis, Vulnerable)

Although these otters have a large extent of occurrence, they are restricted to areas of permanent fresh water, such as lakes and larger rivers offering good shoreline cover and an abundant prey base. The Spotted-necked Otter population is inferred to be decreasing throughout its range, mainly as a result of the alteration or degradation of freshwater habitats and natural riparian vegetation, such as from the infestations of alien species in riparian areas[13]. This species may occur on the project site but as it is restricted to large bodies of water it would unlikely be negatively affected by the project if mitigation measures such as erosion and alien plant control are adhered to around drainage lines and water bodies.

Cape Clawless Otter (Aonyx capensis, Near Threatened)

This is the most widely distributed otter species in Africa, they are predominantly aquatic and seldom found far from permanent fresh water and can be found in seasonal or episodic rivers provided suitable-sized pools persist[14]. This species may occur on the project site but as it is restricted to riverine habitats it would unlikely be negatively affected by the project if these areas are avoided and mitigation measures are adhered to. Such areas have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

South African Hedgehog (Atelerix frontalis, Near Threatened)

The distribution of this species mainly falls within savannah and grassland vegetation types, within which it is found in a wide variety of semi-arid and sub-temperate habitats, including scrub brush, western Karoo, grassland and suburban gardens. The Northern Upper Karoo

[11] Taylor A, Cowell C, Drouilly M, Schulze E, Avenant N, Birss C, Child MF. 2016. A conservation assessment of *Pelea capreolus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

[12] Taylor P, Baxter R, Child MF. 2016. A conservation assessment of *Otomys auratus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[13] Ponsonby DW, Rowe-Rowe D, Power RJ, Somers MJ. 2016. A conservation assessment of *Hydrictis maculicollis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[14] Okes N, Ponsonby DW, Rowe-Rowe D, Avenant NL, Somers MJ. 2016. A conservation assessment of *Aonyx capensis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

vegetation as found on the project site is one of the important vegetation types for the species. On a local scale, the species appears to prefer dense vegetation habitats and rocky outcrops that may provide food, cover and nesting materials[15]. The most severe threats currently are habitat loss, degradation and fragmentation from urban sprawl and agriculture, roads are also suspected to be a threat to hedgehogs. This species is highly likely to occur on the project site and would be negatively affected by the project if suitable habitat is damaged or if roads are frequently travelled, particularly at night. The impacts to this species can be reduced to acceptable levels if mitigation measures are adhered to, such as no night-driving and avoidance of sensitive rocky habitats. Ridges with particularly suitable habitat have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

Spectacled Dormouse (Graphiurus ocularis, Near Threatened)

This species is endemic to South Africa, where it occurs widely in the Northern Cape, Eastern Cape, and Western Cape provinces. It is associated with rock piles, outcrops, crevices and stone kraals[16]. In the Northern Cape Province, three specimens were caught in *Setaria lindenbergiana* grassland community, a grass species that occurs on the project site mostly growing around rocks. This dormouse is confined to rocky outcrops and its habitat is mostly well protected. This species could potentially occur on the project site and individuals could be affected if suitable habitat is damaged. Rocky outcrops with particularly suitable habitat have been classified as HIGH sensitivity in the sensitivity map (Figure 14).

African Striped Weasel (Poecilogale albinucha, Near Threatened)

This species is rare to uncommon throughout South Africa, in the Northern Cape, there are two historical records (from the Kalahari and from Schmidtsdrif) and only three other records added in the last eight years. However, this may be an artefact of increased research effort as well as increased awareness around the species in the farming communities. As such, the status of the species in the Northern Cape remains unclear[17]. The highest densities of African Striped Weasel are reached in moist high rainfall grasslands in the east of the country, although this species may have a wide habitat tolerance as the few records from arid southwestern Africa are associated with semi-desert grassland. In the dry, western-most range of the species, it appears to lead an increasingly subterranean existence. This may be a behavioural response to avoid extreme temperatures and reduce water requirements. Almost without exception, the few records that have been reported from this region indicate the presence of mole-rats, loss of any habitat for mole-rats is therefore likely to result in the loss of habitat and available prey base for the weasels in arid areas. This species could potentially occur on the project site and individuals could be affected by the project if suitable habitats (such as mole-rat colonies) are damaged. No mole-rat colonies were observed along the proposed development corridor, however some were observed nearby while commuting to the project site. Patches of deeper, less compact soil, similar to those observed at the colonies outside the project area were considered areas where where colonies or burrow systems could occur and were classified as HIGH sensitivity on the sensitivity map (Figure 14).

[15] Light J, Pillay N, Avenant NL, Child MF 2016. A conservation assessment of *Atelerix frontalis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[16] Wilson B, MacFadyen D, Palmer G, Child MF. 2016. A conservation assessment of *Graphiurus ocularis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[17] Child MF, Rowe-Rowe D, Birss C, Wilson B, Palmer G, Stuart C, Stuart M, West S, Do Linh San E. 2016. A conservation assessment of *Poecilogale albinucha*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

3.2.4.2 Amphibian Species

There are 13 amphibian species (Appendix VII) that have a geographical distribution that includes the project site. The Giant Bullfrog *(Pyxicephalus adspersus)* is listed by NEMBA as a *Protected Species*. This species was located on the project site (Figure 5). They can tolerate habitat alteration, but not urbanization[18]. The potential impacts of the development to this species are therefore considered to be low despite their presence on the project site if sensitive areas (Figure 14) and associated mitigation measures are adhered to.

Figure 5: The Giant Bullfrog (left) and Common Caco *(Cacosternum boettgeri)* (right) were observed on site near temporary vleis and wetland habitats. These pictures were taken in the proposed development corridor, Common Caco were observed calling at most of the temporary vleis while only a single observation of Giant Bullfrog was recorded during the site-walkthrough. This nevertheless confirms their presence on the project site.

3.2.4.3 Reptiles Species

There are 23 reptile species (Appendix VIII) recorded in various databases or observed from in or around the area project site that could occur in the area. The Karoo Padloper (*Chersobius [Homopus] boulengeri*) is listed as *Near Threatened* in the Regional Red List[19], however a more recent assessment[20] lists the species as *Endangered* as most localities where populations previously occurred no longer harbour viable populations and that the species is no longer being found by farmers. The Karoo Padloper is associated with dolerite ridges and rocky-outcrops in dwarf shrubland containing succulent and grassy elements. Such habitat is present on the project site and it could potentially occur in the area, albeit with a low probability. The development therefore has a low probability of having a negative impact on this species. Rocky outcrops with particularly suitable habitat have been classified as HIGH sensitivity in the sensitivity map (Figure 14). More common reptile species, such as the Namaqua Sand Lizard (*Pedioplanis namaquensis, Least Concern*) observed most frequently in the lowland plains, and Western Rock Skink *(Trachylepis sulcata, Least Concern)* observed amongst the rocky outcrops and on the plateaux, were encountered throughout the proposed development corridor. As these species are widespread through the area and their habitats are largely contiguous and undisturbed it is unlikely that the proposed development will have a significant negative impact on these, and other common reptile species on the project site.

[18] IUCN (International Union for Conservation of Nature), Conservation International. 2013. Pyxicephalus adspersus. The IUCN Red List of Threatened Species. Version 2019-3.

[19] Boycott, R.C. 2014. *Homopus boulengeri* (Duerden, 1906), In M.F. Bates, W.R. Branch, A.M. Bauer, J. Marais., G.J. Alexander & M.S. de Villiers (eds.) Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. Pg. 73. South African National Biodiversity Institute, Pretoria.

[20] Hofmeyr, M.D., Loehr, V.J.T., Baard, E.H.W. & Juvik, J.O. 2018. *Chersobius boulengeri*. The IUCN Red List of Threatened Species 2018: e.T170521A115656360. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T170521A115656360.en.

Figure 6: Namaqua Sand Lizard (left) and Western Rock Skink (right) were regularly encountered on the project site.

3.2.4.4 Vertebrate Sensitivity

The overall sensitivity of the vertebrate species that could potentially occur in the project area is considered to be HIGH. However, these species are not likely to be uniformly distributed across the project site and the sensitivity of the majority of the site for vertebrates is considered to be LOW when the project site is taken in context of the broader area and surrounds. The habitats and microhabitats present on the project site are largely widespread in the area and the localised impact associated wih the footprint of the proposed development would therefore be negligible to these species and reduced to acceptable levels if mitigation actions are adhered to. Habitats that may be particularly sensitive to impacts from the development have nevertheless been identified and assigned elevated sensitivity such as rocky outcrops, slopes, drainage lines and wetlands (see Section 3.2.6).

Active burrows (utilised by multiple different species) were observed in close proximity to power line towers and the presence of these structures did not exclude burrowing animals (Figure 7).

Figure 7: Active burrows in close proximity to power line infrastructure, indicating that the presence of these structures did not deter burrowing animals from the site. Springhare potentially take advantage of the disturbed soil and short grasses surrounding the pylons.

3.2.5 Invertebrate Species

There are 159 invertebrate species recorded from various databases that could occur on the project site (Appendix IX). While this list cannot be considered to be complete, a single species with a distribution range that potentially overlaps the project site is listed by the IUCN as *Vulnerable*, namely the Harlequin Sprite *(Pseudagrion newtoni).* This damselfly is currently known from only a single location in Mpumalanga, the probability for this species to occur on site is low, however the impact on this species would nevertheless be low as it has a preference for wetland habitats and these areas have been classified as HIGH sensitivity in the sensitivity map (Figure 14), and would be largely excluded from development.

3.2.5.1 Invertebrate Sensitivity

The overall sensitivity of the invertebrate species that could occur in the project area is considered to be LOW.

3.2.6 Habitats

The two broad vegetation types that occur in the study area represent the Nama-Karoo and Grassland biomes. The Nama-Karoo flora is not particularly species rich with a very low local endemism, it is dominated by low dwarf shrubs intermixed with grasses, succulents, geophytes and annual forbs on extensive plains. Grasslands are structurally simple and strongly dominated by grasses, canopy cover is moisture-dependent and decreases with lower mean annual rainfall and influenced by the nature of grazing activities and the local fire regime. Both of these biomes are fairly structurally homogenous, with few notable different habitat categories.

3.2.6.1 Lowland Plains Vegetation

The lowland areas are dominated by dwarf karoo shrubs scattered grasses and occasional large shrubs typical of the Northern Upper Karoo vegetation type. This vegetation type was the most widespread and was fairly uniform across the project site, occurring on all the flat plain areas. The floral species most commonly associated with this vegetation type included Three-awn *(Aristida)* and Lovegrasses *(Eragrostis)* grasses, with low Sheepbush *(Pentzia)* shrubs and the occasional tall shrub *Lycium cinereum* scattered in clumps. Faunal species such as Aardvark *(Orycteropus afer)*, African Mole Rat *(Cryptomys hottentotus)*, Bat-eared Fox *(Otocyon megalotis)*, Cape Fox *(Vulpes chama)*, Black-footed Cat, Yellow Mongoose *(Cynictis penicillata)*, Meerkat *(Suricata suricatta)*, Aardwolf *(Proteles cristata),* Scrub Hare *(Lepus saxatilis)*, Springhare and South African Ground Squirrel *(Xerus inauris)* are among those species which show preference to the lowland plains.

Figure 8: Large flat areas of shrubs and scattered grasses dominate the lowland areas of the project site.

Several small wetlands, depressions, temporary pools, vleis and dams are scattered throughout the lowland plains and act as important habitat for numerous species, particularly during the wet season (Figure 9). Most of the amphibian species listed in Appendix VII could potentially utilise seasonally inundated areas in these areas. These habitats and microhabitats are widespread in the area and the localised impact associated with the footprint would be negligible if mitigation measures are adhered to.

Figure 9: Scattered wetland areas and dams exist in the lowland plains along the proposed power line route.

3.2.6.2 Plateau Vegetation

The slopes and flat areas at higher elevations on the project site are dominated by abundant grasses, dwarf small-leaved shrubs and taller shrubs typical of Besemkaree Koppies Shrubland (Figure 10). The increased structure provided by woody species such as *Searsia* and *Euclea* bush clumps as well as scattered rocks offer habitats for a different suite of animal species to those in the lowland plains. Similarly, an increase in topological complexity introduces variation in slope and aspect and therefore the available microhabitats for different species. Species such as Grey Rhebock *(Near Threatened)* and Greater Kudu show preference for these areas, and the scattered rocks provide refuge for many of the species outlined in section *3.2.6.3* below. These habitats and microhabitats are widespread in the area and the localised impact associated with the footprint would be negligible if mitigation measures are adhered to.

Figure 10: Plateau vegetation with increased structural complexity and available microhabitats for a different suite of flora and fauna compared to the lowland vegetation.

3.2.6.3 Rocky Ridges and Outcrops

Cliffs and rocky outcrops are associated with sediment layers more resistant to weathering and are associated with outcrops in the low lying plains and slopes of butts and tafelbergs (Figure 11). They are characterised by the presence of boulders and loose rocks with an open canopy of medium to tall woody shrubs above a sparse layer of grasses. The common woody shrubs include *Searsia*, *Euclea* and *Diospyros* species. These features provide potential habitat for animals such as Spectacled Dormouse, Hewitt's Red Rock Hare, Cape Elephant Shrew, Eastern Rock Elephant Shrew, Round-Eared Elephant Shrew, Western Rock Elephant Shrew, Cape Dassie, Southern Rock Agama, Western Rock Skink, Karoo Girdled Lizard and Common Banded Gecko amongst others. These habitats and microhabitats are widespread in the area and the localised impact associated with the footprint would be negligible if mitigation measures are adhered to.

Figure 11: Cliffs, ridges and rocky outcrops provide habitat to reptiles and mammals between the cracks and boulders created by the weathering nature of the rocks.

3.2.6.4 Washes & Drainage Lines

The project site includes a number of drainage areas where water is channelled during rainfall events and includes areas with woody shrubs, grass cover, bare areas and erosion gulleys. The drainage lines are an important habitat for many animals in such an arid landscape as they provide refuge, shelter, palatable vegetation for extended periods, softer soils for burrows and water when it is available. Drainage lines with deeper, looser soils are considered to have a higher sensitivity than those on shallow soils. The areas in and adjacent to drainage lines is particularly important for important species listed above such as Springhare, Black-footed Cat, Giant Bullfrog and potentially Riverine Rabbit. Some small farm dams are scattered around the project site and together with various erosion control berms provide additional habitat for species that require somewhat deeper soil deposits to construct burrows (Figure 12). These habitats are susceptible to impacts associated with erosion and the invasion of alien plant species, however the impact can be reduced to acceptable levels if mitigation measures are adhered to.

Figure 12: Wash and drainage lines cross the proposed route in multiple places, these areas not only channel runoff after rainfall and are susceptible to erosion, but are also areas of deeper soil utilised by many burrowing animals.

3.2.7 Habitat Sensitivity

Drainage lines, stream beds and associated riparian zones and adjacent floodplains as well as farm dams represent areas of HIGH to MEDIUM sensitivity to flora and fauna. Slopes and rocky ridges have a higher sensitivity than the surrounding lowland or plateau plains. The footprint of the power lines would be relatively low and no highly significant impacts to habitats are likely to result from the development if mitigation measures are adhered to.

Erosion poses a significant threat to these ecosystems, with both terrestrial and aquatic habitats being susceptible to the removal, transportation and deposition of topsoil and silt following rainfall events (Figure 13). It is critical that erosion control measures are implemented.

Figure 13: Erosion is occurring in multiple areas along the existing power line servitude, the existing servitudes that are to be utilised must be upgraded with effective erosion control measures to prevent further degradation of habitat.

3.3 Sensitivity Assessment

An ecological sensitivity map was produced through the integration of the information collected during the site visit with the available biodiversity data in the literature and resources listed in Appendix I. Sensitive features such as rivers, dams, wetlands, vleis, temporary pans, drainage lines, rocky outcrops and other important habitat features such as animal burrows were mapped and rated. The ecological sensitivity rating of landscape features were categorised as follows:

- **Low** – Areas with a low sensitivity where there is likely to be a low impact on terrestrial biodiversity and ecological processes. The impact of development is likely to be local in extent and of low significance with the implementation of mitigation measures.
- **Medium** – Areas with a medium sensitivity where there is likely to be a medium impact on terrestrial biodiversity and ecological processes. The impact of development in these areas is likely to be largely local in extent but of medium significance as there exists a risk of secondary impact such as erosion which could potentially degrade surrounding areas. Development within these areas can proceed provided that appropriate mitigation measures are adhered to.
- **High** – Areas with a high sensitivity where there is likely to be a high impact on terrestrial biodiversity and ecological processes. The impact of development in these areas is likely to extend beyond the local scale and be of high significance as there exists a direct risk of impact to ecological processes and critical or unique habitats for species of conservation concern. These areas are essentially no-go areas from a development perspective in terms of the construction of new infrastructure such as towers or pylons. Spans may cross these areas. Existing infrastructure such as access roads and servitudes must be used when traversing these areas.

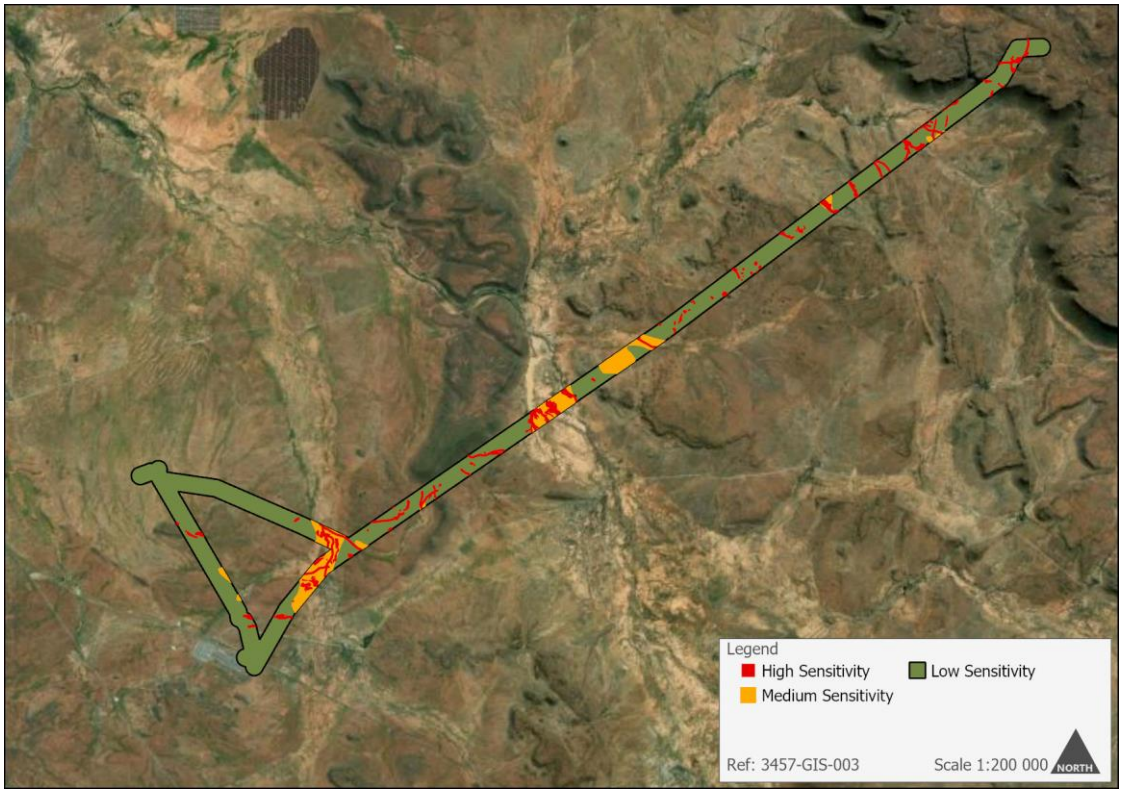


Figure 14: Ecological sensitivity map indicates that the project corridor assessed is mostly of LOW ecological sensitivity, with a few areas of MEDIUM sensitivity (mostly washes in drainage lines) and scattered areas of HIGH sensitivity (wetlands, select ridges and other important habitat features).

4 IMPACT ASSESSMENT

4.1 Identification of Potential Impacts

Potential impacts on the ecology of the study area include the following (issues assessed by other specialists, e.g. on birds and on hydrological function are not included here):

- Impacts on biodiversity: Any impacts on populations of species of concern (flora and fauna) and on overall species richness, genetic variability, population dynamics and habitats important for species of concern;
- Impacts on sensitive habitats: Impacts on any sensitive or protected habitats, including indigenous grassland and wetland vegetation that leads to direct or indirect loss of such habitat;
- Impacts on threatened ecosystems: Any impacts on threatened or protected ecosystems, critical biodiversity areas, areas of high biodiversity and centres of endemism;
- Impacts on ecosystem functions: Any impacts on processes or factors that maintain ecosystem health and character, including the following:
    - Habitat fragmentation;
    - Disruption to ecological corridors;
    - Changes to abiotic environmental conditions;
    - Changes to disturbance regimes, e.g. increased or decreased incidence of fire;
    - Disruption to nutrient-flow dynamics;
    - Impedance of movement of material or water;
    - Changes to successional processes;
    - Effects on pollinators; and
    - Increased invasion by alien plants.

- Cumulative impacts: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.

4.1.1 Construction Phase Impacts

Construction phase impacts for this project will include the following:

- Loss and/or fragmentation of indigenous natural vegetation due to clearing;
- Loss of individuals of plant species of conservation concern and/or protected plants;
- Loss of faunal habitat and refugia;
- Direct mortality of fauna due to machinery, construction and increased traffic;
- Displacement and/or disturbance of fauna due to increased activity and noise levels;
- Increased poaching and/or illegal collecting due to increased access to the area; and
- Contamination of the environment by construction vehicles and machinery.

4.1.2 Operational Phase Impacts

Ongoing operational impacts for this project will include the following:

- Direct impact of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure;
- Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance; and
- Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

4.1.3 Cumulative Impacts

Impacts on broad-scale ecological processes and cumulative habitat loss, connectivity or potential for the area to meet long-term conservation objectives (such as CBAs, ESAs, IBAs and NPAES areas).

5 ASSESSMENT OF IMPACTS

The assessment of impacts takes into account both the position of the switching station on the plateau and the fact that the proposed overhead power lines will be adjacent to existing overhead power lines along the majority of the proposed route. The specialist's assessment of the significance of an impact therefore differs to those indicated by the methodology in some instances due to site specific factors. These instances have been elaborated upon in the relevant impact section below. There are no alternative route options to assess.

5.1 Construction Phase Impacts

5.1.1 Impact 1: Loss or fragmentation of indigenous natural vegetation

As the two vegetation types on the project site classified nationally as *Least Threatened*, are largely contiguous and cover extensive areas, the probability that the clearing associated with the proposed development will contribute to fragmentation or have a negative impact on the long-term viability and persistence in the area is low, and therefore the impact significance is low following mitigation measures such as the avoidance of areas of elevated sensitivity and maximized utilisation of existing servitudes.

Impact Phase: Construction
Potential impact description: Impact on vegetation through the destruction of plants from construction activities, some areas cleared for permanent infrastructure will persist for the long-term. Power line tower structures will affect relatively small, localised areas of vegetation. Access roads may affect slightly larger areas, however as the proposed route is immediately adjacent to an existing powerline the existing access road infrastructure can be utilised to reduce this impact. The switching station will result in the clearing of an area of up to 100mx100m.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	H	Negative	M	L	H
With Mitigation	L	H	M	Negative	L	L	H
Can the impact be reversed?			No. Some long-term loss of vegetation is likely.				
Will impact cause irreplaceable loss or resources?			No. The vegetation is widespread in the area and the size of the project footprint is comparatively low.				
Can impact be avoided, managed or mitigated?			Partly. Some residual impact is likely, however the intensity of the impact can be reduced through mitigation.				

Mitigation measures to reduce residual risk or enhance opportunities:

- Pylon tower footprints to be constructed outside of HIGH sensitivity areas (although the line spans may cross these areas);
- Preconstruction walk-though of the power line development footprints (pylon bases, new servitudes, lay-down areas and temporary infrastructure) once finalised for micrositing to ensure that sensitive habitats are avoided where possible;
- Ensure that lay-down and other temporary infrastructure are within MEDIUM or LOW sensitivity areas;
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are not required by the operational phase of the development;
- Utilize existing servitudes and access roads wherever possible, any new roads or the upgrading of roads should be minimized as far as possible and not be larger than required;
- All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed;
- Ensure that sufficient erosion control measures are constructed on all servitudes and access roads in the project area;
- Rehabilitate existing servitude and access roads in the project area with sufficient erosion control measures to prevent the loss of soil and the degradation of vegetation;
- An environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as avoiding fire hazards, no littering, appropriate handling of pollution and chemical spills, minimizing wildlife interactions, remaining within demarcated construction areas, avoidance of no-go areas and sensitive habitats (i.e. wetlands);
- Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly marked as no-go areas;
- No open fires should be permitted outside of designated areas;
- Construction activities in or near drainage lines, washes or temporary inundated depressions (as indicated by MEDIUM sensitivity areas on the map) must only take place during the dry season;
- An environmental management programme (EMPr) must be implemented, and must provide a detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat.

Impact to be addressed/ further investigated	Yes. Micrositing of infrastructure is required after finalization of locations and prior to construction to ensure sensitive areas are avoided where possible.

5.1.2 Impact 2: Loss of individuals of threatened or protected plant species

None of the plant species recorded on site were listed as protected by NEMBA. However several species identified on the project site are protected under the Northern Cape Nature Conservation Act. One tree species, the Shepherd's Tree is protected under the National Forest Act. However, this species was not recorded to be present on the study site during the ecological survey. While the loss of some individuals of protected plants is possible, the probability that the loss of some individuals will have a negative impact on the viability or persistence of species in the area is low given that many of the species are locally common and widespread and the vegetation types in the area are largely intact, therefore this impact is considered to be of low significance following the implementation of mitigation measures such as maximizing the utilisation of existing servitudes.

Impact Phase: Construction

Potential impact description: Loss or damage of threatened or protected plant species through construction activities. The illegal collecting of plant species may increase if access to the site is increased during construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	M	L	H
With Mitigation	L	H	M	Negative	L	L	H
Can the impact be reversed?			No. Some permanent loss of plants is likely.				
Will impact cause irreplaceable loss or resources?			No. The species are widespread in the area and the size of the project footprint is comparatively low.				
Can impact be avoided, managed or mitigated?			Yes.				
Mitigation measures to reduce residual risk or enhance opportunities: • Preconstruction walk-though of the power line development footprints (pylon bases, new servitudes, lay-down areas and temporary infrastructure) once finalised for micrositing to ensure that protected species are avoided where possible; • Compile a comprehensive species list of plants that may be cut, chopped, uprooted, broken, damaged or destroyed and obtain relevant permits for these restricted activities; • Utilize existing servitudes and access roads wherever possible, any new roads or the upgrading of roads should be minimized as far as possible and not be larger than required; • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; • Site access should be controlled and no unauthorised persons should be allowed onto the site; • The collection or harvesting of any plants at the site should be strictly forbidden; • Personnel should not be allowed to wander off the demarcated construction site; and • An environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to.							
Impact to be addressed/ further investigated			Yes. Micrositing of infrastructure is required after finalization of locations and prior to construction to compile a list of species that may be damaged during construction.				

5.1.3 Impact 3: Loss of faunal habitat and refugia

This impact includes the temporary loss of faunal habitat and refugia associated with laydown areas and temporary contractor's facilities as well as the permanent loss associated with the construction of permanent structures such as the switching station. The risk to habitats also includes pollution and contamination, particularly wetland and aquatic environments, from construction activities (e.g. oil leaks or chemical spills). While the loss of some habitat during construction is inevitable, the probability that the clearing associated with the proposed development will have a negative impact on the faunal populations in terms of their long-term viability and persistence in the area is low, and therefore the impact significance is low. These impacts can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: Loss or damage of faunal habitat and refugia such as burrow systems and temporary vleis/wetlands due to construction activities. The damage to faunal habitat (especially aquatic environments) due to increased erosion and contamination form chemical leaks/spills. Some of these potential impacts can persist into the long-term if not appropriately mitigated against.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	M	L	H
With Mitigation	L	H	M	Negative	L	L	H

Can the impact be reversed?	Partially. Some habitats such as temporary vleis can be artificially constructed, however loss due to contamination is more difficult to reverse.
Will impact cause irreplaceable loss or resources?	No. Habitats available on the project site are widespread in the area.
Can impact be avoided, managed or mitigated?	Yes. The probability and intensity of this impact can be reduced through mitigation.
Mitigation measures to reduce residual risk or enhance opportunities: • Preconstruction walk-though of the power line development footprints (pylon bases, new servitudes, lay-down areas and temporary infrastructure) once finalised for micrositing to ensure that temporary vleis/wetlands and burrow systems are avoided where possible; • No construction of pylon towers in HIGH sensitivity areas; • Ensure that lay-down and other temporary infrastructure are within MEDIUM or LOW sensitivity areas; • No-go areas around sensitive habitats such as wetlands or burrow systems should be clearly marked; • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; • Ensure that sufficient erosion control measures are constructed on all servitudes and access roads in the project area; • Rehabilitate existing servitude and access roads in the project area with sufficient erosion control measures to prevent the loss of soil and the degradation of vegetation; • 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; • Utilize existing servitudes and access roads wherever possible, any new roads or the upgrading of roads should be minimized as far as possible and not be larger than required; and • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed.	
Impact to be addressed/ further investigated	Yes. Micrositing of infrastructure is required after finalization of locations and prior to construction to ensure that no active burrow systems are destroyed.

5.1.4 Impact 4: Direct impact to fauna due to construction

Sensitive and shy fauna are likely to move away from the affected areas during construction, while some slow-moving species would not be able to avoid the construction activities and might be killed. Increased traffic during construction will pose a risk of collisions with susceptible fauna. Tortoises, snakes and amphibians are particularly susceptible to collisions, however many other species are also at risk such as Aardwolf, Bat-eared Foxes, rabbits/hares, steenbok and porcupine, particularly at night. Black-footed Cats, African Striped Weasel, Riverine Rabbits and South African Hedgehog may also potentially be at risk to nocturnal vehicle collisions. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. Many of these impacts can however be effectively managed or mitigated against.

The probability of direct faunal mortalities associated with construction activities having a negative impact on the viability of terrestrial animal populations persisting in the area over the long term is low given the small scale of the development footprint relative to the largely undisturbed habitat available in the surrounding area, therefore this impact is considered to be of low significance. The impact can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: Direct impact to fauna caused by construction activities, such as increased risk of injury or mortality from collision with vehicles due to increased traffic, the increased possibility of illegal hunting, poaching, persecution or harvesting of fauna.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**

Without Mitigation	L	L	H	Negative	L	L	H
With Mitigation	L	L	M	Negative	L	L	H
Can the impact be reversed?			No.				
Will impact cause irreplaceable loss or resources?			Potentially. If rare or threatened species suffer direct mortality.				
Can impact be avoided, managed or mitigated?			Yes. The probability and intensity of this impact can be reduced through mitigation.				
Mitigation measures to reduce residual risk or enhance opportunities: • Construction of infrastructure in or near aquatic environments (as indicated by MEDIUM sensitivity on the map) must be conducted during the dry season; • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; • All construction vehicles should adhere to a low speed limit (30km/h) to avoid collisions with susceptible species; • Speed limits must apply within the project site as well as on the public gravel access roads to the site; • Night driving must be avoided where possible; • Any holes dug e.g. for foundations of pylons should not be left open for extended periods of time to prevent entrapment of ground dwelling fauna a and only be dug when required and filled in soon thereafter; • Site access should be controlled and no unauthorised persons should be allowed onto the site; • All personnel should undergo an initial environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes or tortoises; • The illegal collection, hunting or harvesting of animals at the site should be strictly forbidden; • No animals such as dogs or cats to be allowed on site other than those of the landowners; • Personnel should not be allowed to wander off the construction site; • No open fires should be permitted outside of designated areas; • Any fauna directly threatened by the construction activities should be removed to a safe location by the environmental control officer or other suitably qualified person.							
Impact to be addressed/ further investigated			No.				

5.1.5 Impact 5: Displacement or disturbance of fauna due to increased activity and noise levels

Increased levels of noise and disturbance by vehicles, machinery and human presence during construction will likely impact sensitive species causing them to move away from the project site potentially influencing movement, foraging activity, breeding and impacting energy budgets. As large areas of contiguous natural habitat are available, the displacement distance would not be excessively far and as the impact is only for a relatively short period of time. Therefore probability that disturbance or displacement of fauna associated with the construction of the proposed development will have a negative impact on the faunal populations in terms of their long-term persistence and viability in the area is low, and therefore the impact significance is low. These impacts can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: The displacement or disturbance of fauna due to construction activities. Species sensitive to human activity such as Reedbuck would likely move away from construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	L	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H

Can the impact be reversed?	Yes. The disturbance resulting from construction activities will be transient in nature.
Will impact cause irreplaceable loss or resources?	No. Most species would be able to move away from disturbance, large areas of natural habitat available means displacement distance would not be excessively far.
Can impact be avoided, managed or mitigated?	Partly, noise and activity cannot be entirely avoided or mitigated against.
Mitigation measures to reduce residual risk or enhance opportunities: • Construction camps should be lit with as little light as practically possible, with the lights directed downwards where appropriate to reduce the disturbance and foraging activities of nocturnal species; • The movement of construction personnel should be restricted to the construction areas on the project site; • Speed limits should be strictly enforced to reduce unnecessary noise and dust; and • No dogs or cats other than those of the landowners should be allowed on site as these animals cause unnecessary disturbance such as chasing fauna.	
Impact to be addressed/ further investigated	No.

5.2 Operational Phase Impacts

5.2.1 Impact 6: Direct faunal impacts due to operation

Direct mortality through road fatalities is a risk to many animal species during routine operational activities. The position of the proposed grid connection adjacent to existing power lines makes it unlikely that the proposed development will significantly increase the probability of collisions for species of conservation concern beyond that which already exists on the site. Following the implementation of mitigation measures the impacts of direct mortality from the proposed development during the operation phase can be reduced to acceptable levels and the development is unlikely to threaten the long-term viability or persistence of species in the area. The post-mitigation impact significance is therefore likely to be low.

Impact Phase: Operational							
Potential impact description: Disturbance, direct mortality through collision and illegal collecting or poaching of fauna.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	H	Negative	L	L	H
With Mitigation	L	M	M	Negative	L	L	H
Can the impact be reversed?			No.				
Will impact cause irreplaceable loss or resources?			Potentially. If rare or threatened species suffer direct mortality.				
Can impact be avoided, managed or mitigated?			Yes. The probability and intensity of this impact can be reduced through mitigation.				
Mitigation measures to reduce residual risk or enhance opportunities: • All vehicles should adhere to a low speed limit (30km/h) to avoid collisions with susceptible species; • General maintenance should be conducted during the dry season where possible; • Speed limits must apply within the project site as well as on the public gravel access roads to the site; • Night driving must be avoided where possible; • Site access should be controlled and no unauthorised persons should be allowed onto the site; • All personnel should undergo an initial environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes or tortoises; • The illegal collection, hunting or harvesting of animals at the site should be strictly forbidden; and							

• No animals such as dogs or cats to be allowed on site other than those of the landowners.	
Impact to be addressed/ further investigated	No.

5.2.2 Impact 7: Alien Plant Invasion

The clearing and disturbance of areas during the construction phase of the project can result in an increased and ongoing risk of invasion of alien plant species, particularly pioneer species, along the power line route and underneath pylon towers during the operational phase. Regular alien clearing activities would be required, particularly during the initial stages of the operational phase to limit the spread of alien species. Once the natural vegetation has re-established in previously disturbed areas then the level of alien control required would likely be reduced.

Impact Phase: Operational							
Potential impact description: Clearing and disturbance from construction activities leaves areas along the power line route susceptible to invasion by alien plant species.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Yes.						
Mitigation measures to reduce residual risk or enhance opportunities: • Disturbed areas such as road verges, lay-down areas and areas utilised by temporary construction facilities must be regularly monitored to detect the establishment of alien species and those species should be eradicated before they spread; • Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned, the use of herbicides should be avoided as far as possible; and • The use of herbicides (if absolutely required) for the control and eradication of alien grasses should be done in accordance with the alien eradication programme in the EMPr to reduce unintended ecological impacts.							
Impact to be addressed/ further investigated	No.						

5.2.3 Impact 8: Soil Erosion Risk

Disturbance created during construction would leave the disturbed areas vulnerable to soil erosion. Consequently, specific measures such as erosion berms and water dispersion features will be required along the power line access roads and servitudes. Although this impact has a moderate significance before mitigation, it can be effectively mitigated against through the maximum use of existing access roads and servitudes and the implementation of erosion control measures. The significance of this impact after the implementation of mitigation measures is therefore considered to be low.

Impact Phase: Operational							
Potential impact description: Following construction, the site will be vulnerable to soil erosion.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H

With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	No. Once erosion takes place some irreversible damage occurs.						
Will impact cause irreplaceable loss or resources?	Yes. Without mitigation the loss of topsoil would result in an irreversible loss of resources.						
Can impact be avoided, managed or mitigated?	Yes. Erosion control measures can be very effective.						
Mitigation measures to reduce residual risk or enhance opportunities: • Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan included in the EMPr; • All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate energy in the water stream which may pose an erosion risk; • Existing servitudes and access roads along the existing, adjacent power line must be utilised wherever possible; • Existing servitudes and access roads along the existing, adjacent power line must be upgraded with appropriate and effective erosion control measures; and • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.							
Impact to be addressed/ further investigated	Yes. Existing servitude and access roads to be surveyed with problem areas identified for erosion restoration and additional erosion control.						

5.3 Cumulative Impacts

5.3.1 Impact 9: Impacts on Broad-Scale Ecological Processes

Multiple existing power lines traverse the broader area. As the proposed power lines considered in this assessment run adjacent to existing power lines for the large majority of their route the cumulative impact is considered to be lower than if they were following novel routes across undisturbed vegetation. Ecological corridors allow for the dispersal and movement of plants and animals across the landscape. This is a vital ecosystem process as it allows for pollination and gene flow. At the large scale the connectivity of the site is excellent. The proposed development would not have a significant impact on gene flow of flora or fauna. The use of existing access roads and servitudes, combined with the use of erosion control measures and the position of the switching station footprint on the plateau, the proposed development is unlikely to significantly increase any negative impact on the De Aar Region SWSA or freshwater ecosystem priority areas. The cumulative impact on ecological processes such as moisture-, soil/sedimentation-, fire regimes and ecological corridors is considered to be of low significance if mitigation measures are adhered to.

Impact Phase: Cumulative							
Potential impact description: Disruption of dispersal and gene flow of flora and fauna across the landscape, disruption of moisture-, soil/sedimentation- and fire regimes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Yes.						

Mitigation measures to reduce residual risk or enhance opportunities: • The various mitigation and management plans associated with the development should be followed and implemented effectively to reduce the cumulative contribution of the current development.	
Impact to be addressed/ further investigated	No.

5.3.2 Impact 10: Impact on Conservation Objectives

Multiple power lines exist in the area, and the proposed route is adjacent to an existing power line. An additional line will not negatively impact the conservation objectives beyond what has already occurred from the placement of the existing power lines in the area if mitigation measures are adhered to. Most of the proposed power line route is within an ESA area, and crosses small sections of CBAs. The ESA area is largely due to the presence of a large IBA around De Aar and also effectively functions to buffer CBAs from development. The north-eastern portion of the line that crosses into a NPAES focus area will not significantly reduce the potential future conservation value of the area as the proposed route runs adjacent to an existing power line. The presence of existing infrastructure in this area, as well as medium to long term agreements with the landowners in this area and the Longyuan Mulilo De Aar 2 North wind energy facility makes it unlikely that this area will be incorporated into National Protected Areas in the foreseeable future. The vegetation types and habitats available on the project site are widespread and remain largely untransformed across their extent. The relatively low rainfall in the area, low agricultural potential and low grazing capacity (20 ha/large stock unit)[21] associated with the vegetation units found on the project site suggest that they will not be under significant threat of wide-scale transformation in the foreseeable future. As the footprint area of the power line and switching station is relatively small, and the power line follows the route of existing power lines, the proposed development not likely to compromise future conservation objectives, ecological functioning or the biodiversity value of these areas if mitigation measures are adhered to.

Impact Phase: Cumulative							
Potential impact description: Cumulative impact on CBAs and Conservation Objectives							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?			No.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes.				
Mitigation measures to reduce residual risk or enhance opportunities: • The final position of new servitudes and pylons should be identified in the field through a reconstruction walk-through to microsite these features and avoid impact on sensitive species and habitats. • The various mitigation and management plans associated with the development should be followed and implemented effectively to reduce the cumulative contribution of the current development.							
Impact to be addressed/ further investigated			No.				

[21] Gazette Notice Of The Long-Term Grazing Capacity Map For South Africa 2017, For Implementation As Guided By Regulation 10 Of The Conservation Of Agricultural Resources Act (Act43 Of 1983). National Gazette No. 41870, 31 August 2018.

6 OPPORTUNITIES

Significant opportunity exists to upgrade the existing servitude to include more effective erosion control measures, as several areas are experiencing ongoing significant soil loss and habitat degradation due to uncontrolled erosion resulting from improperly constructed servitudes and access roads. There are large portions of the area that offer opportunity for the development of the power lines.

7 CONCLUSIONS AND RECOMMENDATIONS

The low overall footprint of the development within the ESAs, CBAs and NPAES Focus Areas, combined with the fact that the proposed route runs adjacent to existing power lines for most of the route, means that the development would not compromise the ecological functioning or the long-term conservation value of the area. Both vegetation types are largely intact with very little prospect of long-term transformation through agricultural practices, the species and habitats found within them are therefore fairly widespread and not unique to the project site. The impact of the proposed power lines is considered to be low and acceptable following mitigation.

Impact Statement

The power line and switching station are unlikely to generate significant impacts on flora and fauna after mitigation. No highly significant negative impacts that cannot be adequately mitigated against were observed, therefore from a terrestrial flora and fauna perspective there are no reasons to oppose the development. It is the specialist opinion that the proposed development will have a low potential impact to the terrestrial ecology of the area.

APPENDICES

APPENDIX I: METHODOLOGY

Data Sources

Data sources consulted to compile this study are detailed below.

Site Screening

Following the protocol listed in National Gazette, No. 43110 of 20 March, 2020: "National Environmental Management Act (107/1998) Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24 (5) (a) and (h) and 44 of the Act, when applying for Environmental Authorisation", the information presented by the online screening tool[22] was consulted to determine the sensitivity of the project site prior to the field site visit and ground-truthing.

While the commissioning of the specialist assessment occurred prior to the publication of The National Gazette, No. 43110 of 20 March 2020, the assessment was conducted to align with the Terrestrial Biodiversity Protocol prescribed therein to assist the Competent Authority in the decision making process as the protocol was largely materially unchanged from the minimum assessment and reporting requirements described in The National Gazette No. 42451 of 10 May 2019 and the specialist assessment was concluded prior to the publication of The National Gazette, No 43855 of 30 October 2020.

Existing Studies

Several existing ecological studies in the area were consulted in the formulation of this assessment report, including the Proposed 132kV Power line associated with the Castle Wind Energy Facility on a site near De Aar, Northern Cape Province (Savannah Environmental, 2015), the Environmental Impact Assessment for the Proposed Castle Wind Energy Facility and Associated Infrastructure near De Aar, Northern Cape. DEFF Ref No. 14/12/16/3/3/2/278 Fauna & Flora Specialist Impact Assessment Report compiled by Todd (2014) for Savannah Environmental, as well as Appendix F: Assessment of Potential Impacts And Possible Mitigation Measures for the Proposed 132 kV transmission line corridor adjacent to the existing Eskom transmission line from Longyuan Mulilo De Aar 2 North Wind Energy Facility (WEF) to the Hydra Substation in De Aar, Northern Cape (Aurecon 2013).

Site Visit

A five-day site walkthrough was conducted between 10 and 14 February 2020. The objective of the site visit was to assess the ecological sensitivity of the receiving environment along the route of the proposed development and to verify the site sensitivity identified by the desktop study. Important habitats and species present or potentially present (i.e. suitable habitat was identified) within approximately 200 m of the proposed line were assessed through a site walk-through. A significant amount of time spent on site allowed for coverage of the majority of the route and the timing of the site visit coincided with the wet-season to increase the probability of temporary habitats such as seasonal vleis and wetlands being identified. The site visit followed a significant rainfall event which allowed for the assessment of these features.

[22] https://screening.environment.gov.za/screeningtool/

Species

The list of plant species previously recorded in the wider area were obtained from the Database of Southern Africa (BODATSA) database[23] on the SANBI website[24]. An area of roughly 50 km around the project site (centred on -30.655040, 24.169673) was searched for potential species of concern. The lists of fauna were collated from interrogating multiple databases and sources including the various atlassing projects of the Virtual Museum[25] and the GBIF[26] network as well as direct observation during the site walk-through. Road mortality records were obtained from the Endangered Wildlife Trust (EWT) Wildlife and Roads Project[27].

Vegetation

Broad vegetation types were mapped using the updated National Vegetation Map 2018 (NVM 2018) database[28] and the vegetation descriptions were obtained from Mucina & Rutherford (2006)[2].

Ecosystems

Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment[29]. Important catchments and protected expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES). Critical Biodiversity Areas were extracted from the SANBI BGIS Database[30]. These data incorporate biodiversity features (both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation. Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

Species of Concern

Species of concern were considered to be those listed by conservation authorities as being on a 'Red List' and at risk of extinction and those listed by National or Regional legislation as being protected. Red List plant species were obtained from the SANBI[31] website, it must be noted however that the conservation status listed by SANBI considers only the populations of species within South Africa's geopolitical borders and does not take into account the global population size for non-endemic species. The regional or national assessment of a species may therefore differ to the global status on the IUCN Red List. National and regional legislation was evaluated to determine which species that may occur

[23] South African National Biodiversity Institute. 2016. Botanical Database of Southern Africa (BODATSA) [dataset]. doi: to be assigned.

[24] http://newposa.sanbi.org/ accessed January 20 2020.

[25] http://vmus.adu.org.za/vm_projects.php (QDS 3024C) accessed January 20 2020.

[26] http://gbif.org accessed January 20 2020.

[27] https://www.ewt.org.za/resources/resources-biodiversity-data/ accessed 04 March 2020.

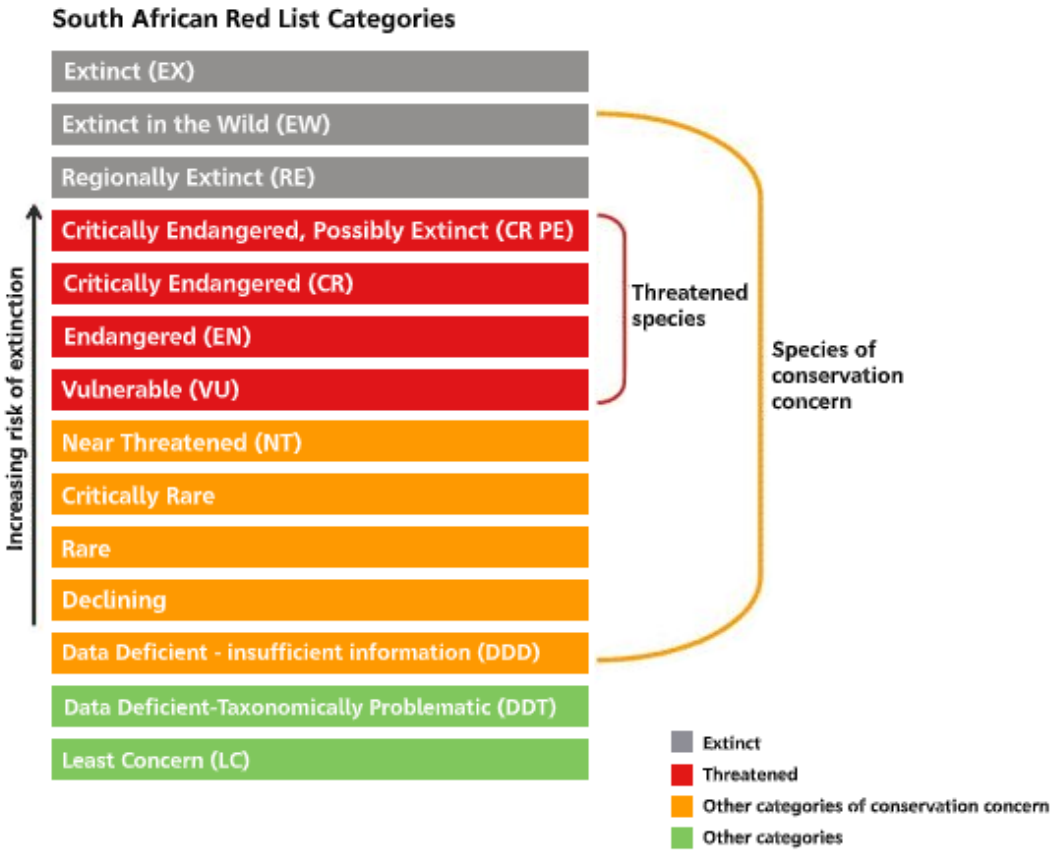
[28] South African National Biodiversity Institute (2006-2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018 accessed January 20 2020.

[29] 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., Nienaber, S. (2011). Technical Report for the National Freshwater Eosystem Priority Areas project. WRC Report No. K5/1801.

[30] Northern Cape Department of Environment and Nature Conservation. 2016 Northern Cape Critical Biodiversity Areas. http://bgis.sanbi.org/SpatialDataset/Detail/658 accessed January 20 2020.

[31] http://redlist.sanbi.org accessed January 20 2020.

on site are protected species. Regional threat status was obtained for mammals[32], reptiles[33], frogs[34], dragonflies[35] and butterflies[36]. The IUCN[37] threat status was used for species where no regional assessment was available.



APPENDIX II: LEGISLATIVE REQUIREMENTS

Relevant legislation is provided below to provide a description of the applicable legal considerations of relevance to the proposed project.

Convention on Biodiversity (CBD)

The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. South Africa became a signatory to the CBD in 1993, which was ratified in 1995. Article 14 (a) of the CBD states that *"Each Contracting Party, as far as possible and as appropriate, shall: (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects*

[32] Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
[33] Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. 2014. Edited by Michael F. Bates, William R. Branch, Aaron M. Bauer, Marius Burger, Johan Marais, Graham J. Alexander & Marienne S. de Villiers. SANBI, Pretoria.
[34] Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.
[35] Samways, M.J. & Simaika, J.P. 2016. Manual of Freshwater Assessment for South Africa: Dragonfly Biotic Index. Suricata 2. South African National Biodiversity Institute, Pretoria.
[36] Mecenero, S., J.B. Ball, D.A. Edge, M.L. Hamer, G.A. Hening, M. Krüger, E.L. Pringle, R.F. Terblanche & M.C. Williams (eds). 2013. Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and atlas. Saftronics (Pty) Ltd., Johannesburg and Animal Demography Unit, Cape Town.
[37] http://iucnredlist.org accessed 24 November 2019.

that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures".

National Environmental Management Act (Act No. 107 of 1998, NEMA)

Section 24 of the Constitution of the Republic of South Africa provides the right to every person for a non-harmful environment and simultaneously mandates the government to protect the environment. NEMA is the framework to enforce Section 24 of the Constitution.

NEMA requires, amongst others, that:

- Development must be socially, environmentally, and economically sustainable;
- Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; and
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.

Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy published under NEMA is to ensure that significant residual impacts of developments are remedied, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the mitigation has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact.

The National Gazette, No. 43110 of 20 March, 2020: "National Environmental Management Act (107/1998) Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24 (5) (a) and (h) and 44 of the Act, when applying for Environmental Authorisation" lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity. The assessment and minimum reporting requirements are associated with a level of environmental sensitivity identified by the national web-based screening tool[22]. The proposed project site falls within an area identified by the screening tool as 'very high sensitivity' in the Terrestrial Biodiversity Theme due to the proposed route crossing a small section delineated as critical biodiversity areas as well as an ecological support area. The ecological support area is, however, a result of the Important Bird Area surrounding De Aar. Furthermore, this legislation makes provision for linear activities such as power lines such as the proposed development by stating that the assessment and reporting requirements for 'very high sensitivity' need not apply as impacts on terrestrial biodiversity are temporary. The land disturbed by the power line development, in the specialist's opinion can be returned to the current state within two years of the completion of the construction phase, and as such a Terrestrial Biodiversity Compliance Statement applies. This document exceeds the minimum requirements prescribed by this legislation for linear activities.

National Environmental Management: Biodiversity Act (Act No. 10 of 2004, NEMBA)

NEMBA is the principal national act that regulates biodiversity protection, and is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. Section 57 (1) states that a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 (2) The Minister may, by notice in the Gazette, prohibit the carrying out of any activity- (a) which is of a nature that may negatively impact on the survival of a listed threatened or protected species. Restricted activities include damaging, uprooting or destroying specimens of listed threatened or

protected species as well as movement and possession of these species. NEMBA also aims to, inter alia, (a) prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur; (b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular and (c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

National Forests Act (Act No. 84 of 1998)

This act lists protected tree species and prohibits certain activities. The prohibitions provide that "*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".*

National Water Act (Act No. 36 of 1998)

This act defines a watercourse as: "*a river or spring; natural channel in which water flows regularly or intermittently; wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks".* This act regulates certain activities in and around a watercourse and aims, amongst others to protect aquatic and associated ecosystems and their biological diversity and reduce and prevent pollution of water resources.

Conservation of Agricultural Resources Act (Act No. 43 of 1983 as amended in 2001)

This act lists declared weed and invader species of plants and prescribes the required actions to combat their spread depending on their listed category, the three categories are:

- Category 1 plants: prohibited and must be controlled;
- Category 2 plants: may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread; and
- Category 3 plants: may not be planted; existing plants may remain as long as reasonable steps are taken to prevent their spread, except within the flood line of watercourses and wetlands.

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

The purpose of the National Veld and Forest Fire Act, as amended by the National Fire Laws Amendment Act, is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act applies to the open countryside beyond the urban limit and puts in place a range of requirements. It also specifies the responsibilities of land owners. The term 'owners' includes lessees, people in control of land, the executive body of a community, the manager of State land, and the chief executive officer of any local authority. The requirements include, but are not limited to, the maintenance of firebreaks and availability of firefighting equipment to reasonably prevent the spread of fires to neighbouring properties.

Northern Cape Nature Conservation Act (Act No. 9 of 2009)

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: Aquatic habitats may not be destroyed or damaged restricted activities involving protected animals and plants, including

the uprooting, breaking, damage or destruction of listed plant species. The Act provides lists of species offered protection in the Province.

APPENDIX III: IMPACT SIGNIFICANCE RATING SYSTEM

The impact significance rating system used in this assessment follows Hacking (2001)[1]. The significance of the impacts associated with the significant aspects can be determined by considering the risk:

Significance of Environmental Impact (Risk) = Probability x Consequence

The consequence of impacts can be described by considering the severity, spatial extent and duration of the impact.

Table 1: Ranking the Duration and Spatial Scale of impacts

	Ranking Criteria		
	L	**M**	**H**
Duration	Quickly reversible Less than the project life Short-term	Reversible over time Life of the project Medium-term	Permanent Beyond closure Long-term
Spatial Scale	Localised	Fairly widespread Beyond site boundary Local	Widespread
	Within site boundary Site		Far beyond site boundary Regional/national

Table 2: Criteria for ranking the Severity of negative impacts on the bio-physical environment

Environment	**Ranking Criteria**		
	L-	**M-**	**H-**
Soils and land capability	Minor deterioration in land capability. Soil alteration resulting in a low negative impact on one of the other environments (e.g. ecology).	Partial loss of land capability. Soil alteration resulting in a moderate negative impact on one of the other environments (e.g. ecology).	Complete loss of land capability. Soil alteration resulting in a high negative impact on one of the other environments (e.g. ecology).
Ecology (Plant and animal life)	Disturbance of areas that are degraded, have little conservation value or are unimportant to humans as a resource. Minor change in species variety or prevalence.	Disturbance of areas that have some conservation value or are of some potential use to humans. Complete change in species variety or prevalence.	Disturbance of areas that are pristine, have conservation value or are an important resource to humans. Destruction of rare or endangered species.
Surface and Groundwater	Quality deterioration resulting in a low negative impact on one of the other environments (ecology, community health etc.)	Quality deterioration resulting in a moderate negative impact on one of the other environments (ecology, community health etc.).	Quality deterioration resulting in a high negative impact on one of the other environments (ecology, community health etc.).

<u>Consequence of Impacts</u>

Having ranked the severity, duration and spatial extent, the overall consequence of impacts can be determined using the following qualitative guidelines:

Table 3: Ranking the Consequence of an impact

SEVERITY = L					
DURATION	Long-term	**H**			
	Medium-term	**M**			**MODERATE**
	Short-term	**L**	**LOW**		
SEVERITY = M					
DURATION	Long-term	**H**			**HIGH**
	Medium-term	**M**		**MODERATE**	
	Short-term	**L**	**LOW**		
SEVERITY = H					
DURATION	Long-term	**H**			
	Medium-term	**M**			**HIGH**
	Short-term	**L**	**MODERATE**		
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
			SPATIAL SCALE		

Significance of Impacts

Combining the consequence of the impact and the probability of occurrence, as shown by Table 4, provides the overall significance (risk) of impacts.

Table 4: Ranking the Overall Significance of impacts

PROBABILITY	Definite Continuous	**H**	**MODERATE**		**HIGH**
	Possible Frequent	**M**		**MODERATE**	
	Unlikely Seldom	**L**	**LOW**		**MODERATE**
			L	**M**	**H**
			CONSEQUENCE (from Table 3)		

APPENDIX IV: POTENTIAL PLANT SPECIES ON THE PROJECT SITE

This list was compiled by extracting a list of species from the BODATSA database that have been recorded within an area that includes the study area as well as similar habitats in surrounding areas, as obtained from http://newposa.sanbi.org/ accessed on January 20, 2020.

Family	Species	Family	Species	Family	Species
Acanthaceae	*Barleria rigida*	Colchicaceae	*Ornithoglossum vulgare*	Poaceae	*Eragrostis bergiana*
	Dicliptera clinopodia	Commelinaceae	*Commelina africana*		*Eragrostis bicolor*
Aizoaceae	*Chasmatophyllum maninum*	Crassulaceae	*Adromischus caryophyllaceus*		*Eragrostis chloromelas*
	Delosperma sp.		*Crassula corallina*		*Eragrostis curvula*
	Galenia pubescens		*Tylecodon ventricosus*		*Eragrostis homomalla*
	Galenia sarcophylla	Cucurbitaceae	*Cucumis africanus*		*Eragrostis lehmanniana*
	Galenia secunda		*Cucumis heptadactylus*		*Eragrostis mexicana*
	Mesembryanthemum coriarium		*Cucumis myriocarpus*		*Eragrostis nindensis*
	Oscularia deltoides	Cyperaceae	*Bulbostylis humilis*		*Eragrostis obtusa*
	Ruschia sp.		*Cyperus congestus*		*Eragrostis pilosastate*
	Tetragonia fruticosa		*Cyperus marginatus*		*Eragrostis procumbens*
Amaranthaceae	*Atriplex vestita*	Dryopteridaceae	*Arachniodes webbiana*		*Eragrostis tef*
	Bassia salsoloides	Ebenaceae	*Euclea crispa*		*Eragrostis truncata*
	Salsola calluna	Euphorbiaceae	*Euphorbia arida*		*Festuca costata*
	Salsola dealata		*Euphorbia flanaganii*		*Fingerhuthia africana*
	Salsola glabrescens		*Euphorbia juttae*		*Heteropogon contortus*
	Salsola humifusa	Fabaceae	*Amphithalea muraltioides*		*Hyparrhenia hirta*
Amaryllidaceae	*Brunsvigia radulosa*		*Argyrolobium sp.*		*Leptochloa fusca*
	Cyrtanthus huttonii		*Calobota spinescens*		*Melica decumbens*
Anacardiaceae	*Searsia ciliata*		*Cullen tomentosum*		*Melinis repens*
Apiaceae	*Apium graveolens*		*Indigastrum niveum*		*Oropetium capense*
Apocynaceae	*Asclepias gibba*		*Indigofera alternans*		*Panicum coloratum*
	Brachystelma rubellum		*Indigofera hedyantha*		*Panicum impeditum*
	Ceropegia multiflora		*Leobordea platycarpa*		*Panicum sp.*
	Gomphocarpus fruticosus		*Lessertia annularis*		*Panicum stapfianum*
	Microloma armatum		*Lotononis laxa*		*Pennisetum villosum*
	Pachypodium succulentum		*Lotononis pungens*		*Pentameris airoides*
	Stapelia grandiflora		*Medicago sativa*		*Pentameris setifolia*
	Stenostelma eustegioides		*Melolobium calycinum*		*Puccinellia acroxantha*
Asparagaceae	*Asparagus striatus*		*Melolobium candicans*		*Puccinellia distans*
	Asparagus suaveolens		*Rhynchosia adenodes*		*Setaria lindenbergiana*
Asphodelaceae	*Bulbine frutescens*	Funariaceae	*Goniomitrium africanum*		*Sorghum halepense*

Family	Species	Family	Species	Family	Species
	Haworthia bolusii	Gentianaceae	*Sebaea pentandra*		*Sporobolus albicans*
	Haworthiopsis tessellata	Geraniaceae	*Erodium cicutarium*		*Sporobolus coromandelianus*
	Haworthiopsis tessellata		*Pelargonium aestivale*		*Sporobolus discosporus*
	Kniphofia ensifolia		*Pelargonium althaeoides*		*Sporobolus fimbriatus*
Aspleniaceae	*Asplenium cordatum*		*Pelargonium pseudofumarioides*		*Sporobolus ioclados*
Asteraceae	*Arctotis leiocarpa*		*Pelargonium tragacanthoides*		*Sporobolus sp.*
	Athanasia minuta	Gisekiaceae	*Gisekia pharnaceoides*		*Sporobolus tenellus*
	Berkheya eriobasis	Grimmiaceae	*Grimmia pulvinata*		*Stipagrostis ciliata*
	Berkheya pinnatifida	Hyacinthaceae	*Daubenya comata*		*Stipagrostis namaquensis*
	Berkheya sp.		*Dipcadi viride*		*Stipagrostis obtusa*
	Brachylaena glabra		*Lachenalia ensifolia*		*Stipagrostis uniplumis*
	Chrysocoma ciliata		*Lachenalia sp.*		*Themeda triandra*
	Dicoma capensis		*Ledebouria apertiflora*		*Tragus berteronianus*
	Dimorphotheca cuneata		*Ornithogalum nanodes*		*Tragus koelerioides*
	Dimorphotheca sp.	Hypericaceae	*Hypericum lalandii*		*Tragus racemosus*
	Dimorphotheca zeyheri	Hypoxidaceae	*Empodium elongatum*		*Urochloa panicoides*
	Eriocephalus ericoides		*Hypoxis rigidula*	Polygalaceae	*Polygala asbestina*
	Felicia burkei	Iridaceae	*Gladiolus dalenii*		*Polygala ephedroides*
	Felicia filifolia		*Gladiolus ecklonii*		*Polygala hispida*
	Felicia muricata		*Gladiolus permeabilis*	Polygonaceae	*Rumex lanceolatus*
	Gazania jurineifolia		*Moraea falcifolia*	Pottiaceae	*Didymodon tophaceopsis*
	Gazania krebsiana		*Moraea pallida*		*Didymodon tophaceus*
	Geigeria filifolia		*Moraea sp.*		*Didymodon umbrosus*
	Geigeria ornativa		*Syringodea concolor*		*Gymnostomum aeruginosum*
	Gnaphalium filagopsis	Lamiaceae	*Leonotis ocymifolia*		*Gymnostomum sp.*
	Helichrysum asperum		*Salvia verbenaca*		*Hymenostylium recurvirostre*
	Helichrysum dregeanum		*Stachys cuneata*		*Pseudocrossidium crinitum*
	Helichrysum lineare		*Stachys linearis*		*Tortula atrovirens*
	Helichrysum lucilioides	Leucobryaceae	*Campylopus robillardei*		*Trichostomum brachydontium*
	Helichrysum micropoides	Limeaceae	*Limeum sulcatum*	Pteridaceae	*Cheilanthes eckloniana*
	Helichrysum zeyheri	Lobeliaceae	*Lobelia flaccida*		*Cheilanthes hirta*
	Hertia kraussii		*Lobelia thermalis*	Ptychomitriaceae	*Ptychomitrium cucullatifolium*
	Hertia pallens		*Monopsis scabra*	Ranunculaceae	*Anemone tenuifolia*
	Ifloga glomerata	Malvaceae	*Grewia flava*		*Ranunculus multifidus*
	Lepidostephium denticulatum		*Hermannia burkei*		*Ranunculus trichophyllus*
	Leysera tenella		*Hermannia cuneifolia*	Resedaceae	*Oligomeris dipetala*
	Oedera humilis		*Hermannia erodioides*	Rhamnaceae	*Rhamnus prinoides*
	Oedera oppositifolia		*Hermannia pulchella*		*Ziziphus mucronata*

Family	Species	Family	Species	Family	Species
	Osteospermum leptolobum		*Hibiscus pusillus*	Ricciaceae	*Riccia albornata*
	Osteospermum scariosum		*Malva parviflora*		*Riccia nigrella*
	Osteospermum spinescens		*Radyera urens*	Rubiaceae	*Nenax microphylla*
	Othonna pavonia	Melianthaceae	*Melianthus comosus*	Ruscaceae	*Sansevieria aethiopica*
	Pegolettia retrofracta		*Melianthus dregeanus*	Santalaceae	*Osyris lanceolata*
	Pentzia calcarea	Orchidaceae	*Disa pulchra*		*Thesium congestum*
	Pentzia elegans		*Orthochilus foliosus*	Sapindaceae	*Allophylus decipiens*
	Pentzia globosa		*Satyrium longicauda*	Scrophulariaceae	*Aptosimum procumbens*
	Pentzia incana		*Satyrium membranaceum*		*Aptosimum spinescens*
	Pentzia lanata	Oxalidaceae	*Oxalis depressa*		*Chaenostoma halimifolium*
	Pentzia quinquefida	Pedaliaceae	*Pterodiscus luridus*		*Chaenostoma rotundifolium*
	Pentzia sp.		*Sesamum capense*		*Hebenstretia dura*
	Pentzia spinescens	Peraceae	*Clutia thunbergii*		*Jamesbrittenia aurantiaca*
	Phymaspermum aciculare	Phyllanthaceae	*Phyllanthus maderaspatensis*		*Jamesbrittenia filicaulis*
	Phymaspermum parvifolium	Pittosporaceae	*Pittosporum viridiflorum*		*Limosella africana*
	Printzia huttoni	Plantaginaceae	*Plantago major*		*Limosella sp.*
	Pteronia erythrochaeta	Poaceae	*Alloteropsis semialata*		*Manulea fragrans*
	Pteronia glauca		*Aristida adscensionis*		*Nemesia linearis*
	Pteronia glaucescens		*Aristida congesta*		*Nemesia sp.*
	Pteronia sordida		*Aristida congesta*		*Peliostomum leucorrhizum*
	Schistostephium flabelliforme		*Aristida diffusa*		*Peliostomum origanoides*
	Senecio isatideus		*Aristida diffusa*		*Selago albida*
	Senecio leptophyllus		*Aristida vestita*		*Selago geniculata*
	Senecio niveus		*Brachiaria eruciformis*		*Selago paniculata*
Boraginaceae	*Heliotropium ciliatum*		*Cenchrus ciliaris*		*Selago saxatilis*
	Heliotropium curassavicum		*Chloris virgata*		*Zaluzianskya karrooica*
	Heliotropium lineare		*Cymbopogon pospischilii*	Solanaceae	*Lycium horridum*
	Lithospermum papillosum		*Cynodon incompletus*		*Lycium pumilum*
Brassicaceae	*Erucastrum strigosum*		*Cynodon polevansii*		*Solanum humile*
	Heliophila minima		*Digitaria eriantha*		*Solanum retroflexum*
	Rorippa fluviatilis		*Digitaria sp.*	Tecophilaeaceae	*Cyanella lutea*
Bryaceae	*Bryum argenteum*		*Elionurus muticus*	Thymelaeaceae	*Lasiosiphon polycephalus*
	Bryum sp.		*Enneapogon desvauxii*	Verbenaceae	*Chascanum cuneifolium*
Campanulaceae	*Wahlenbergia nodosa*		*Enneapogon scaber*	Zygophyllaceae	*Roepera lichtensteiniana*
Caryophyllaceae	*Dianthus micropetalus*		*Enneapogon scoparius*		*Tetraena microcarpa*
	Spergularia bocconei		*Eragrostis barrelieri*		*Tribulus terrestris*
Colchicaceae	*Colchicum asteroides*				

APPENDIX V: POTENTIAL PROTECTED PLANT SPECIES ON THE PROJECT SITE

Plant species listed by BODATSA database that have been recorded within an area that includes the study area as well as similar habitats in surrounding areas and offered protection by the Northern Cape Conservation Act.

Family	Species	Family	Species
Aizoaceae	*Chasmatophyllum maninum*	Fabaceae	*Lessertia annularis*
	Delosperma sp.	Geraniaceae	*Pelargonium aestivale*
	Galenia pubescens		*Pelargonium althaeoides*
	Galenia sarcophylla		*Pelargonium pseudofumarioides*
	Galenia secunda		*Pelargonium tragacanthoides*
	Mesembryanthemum coriarium	Hyacinthaceae	*Daubenya comata*
	Oscularia deltoides		*Lachenalia ensifolia*
	Ruschia sp.		*Ornithogalum nanodes*
	Tetragonia fruticosa	Iridaceae	*Gladiolus dalenii*
Amaryllidaceae	*Brunsvigia radulosa*		*Gladiolus ecklonii*
	Cyrtanthus huttonii		*Gladiolus permeabilis*
Apiaceae	*Apium graveolens*		*Moraea falcifolia*
Apocynaceae	*Asclepias gibba*		*Moraea pallida*
	Brachystelma rubellum		*Syringodea concolor*
	Ceropegia multiflora	Orchidaceae	*Disa pulchra*
	Gomphocarpus fruticosus		*Orthochilus foliosus*
	Microloma armatum		*Satyrium longicauda*
	Pachypodium succulentum		*Satyrium membranaceum*
	Stapelia grandiflora	Oxalidaceae	*Oxalis depressa*
	Stenostelma eustegioides	Scrophulariaceae	*Jamesbrittenia aurantiaca*
Caryophyllaceae	*Dianthus micropetalus*		*Jamesbrittenia filicaulis*
Crassulaceae	*Adromischus caryophyllaceus*		*Manulea fragrans*
	Crassula corallina		*Nemesia linearis*
	Tylecodon ventricosus	Tecophilaeaceae	*Cyanella lutea*
Euphorbiaceae	*Euphorbia arida*		
	Euphorbia flanaganii		
	Euphorbia juttae		

APPENDIX VI: POTENTIAL MAMMAL SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status	Liklihood
Bathyergidae	*Cryptomys hottentotus*	African Mole Rat	GBIF	LC	High
Bovidae	*Redunca fulvorufula*	Southern Mountain Reedbuck	GBIF	EN	High
	Syncerus caffer	African Buffalo	GBIF	LC	Low
	Pelea capreolus	Grey Rhebok	GBIF	NT	High
	Oryx gazella	Gemsbok	MammalMAP	LC	Low
	Raphicerus campestris	Steenbok	MammalMAP	LC	High
	Antidorcas marsupialis	Springbok	GBIF	LC	Low
	Tragelaphus strepsiceros	Greater Kudu	GBIF	LC	High
	Sylvicapra grimmia	Common Duiker	GBIF	LC	High
	Alcelaphus buselaphus	Bubal Hartebeest	GBIF	LC	Low
	Damaliscus pygargus	Bontebok	GBIF	LC	Low
	Connochaetes gnou	Black Wildebeest	GBIF	LC	Low
Canidae	*Otocyon megalotis*	Bat-eared Fox	MammalMAP	LC	High
	Vulpes chama	Cape Fox	GBIF	LC	High
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	GBIF	LC	High
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	GBIF	NT	High
Felidae	*Felis nigripes*	Black-footed Cat	MammalMAP, GBIF	VU	High
	Leptailurus serval	Serval	GBIF	LC	High
	Felis catus	Domestic Cat	MammalMAP	INT	High
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	GBIF	NT	High
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	MammalMAP, GBIF	LC	High
	Suricata suricatta	Meerkat	GBIF	LC	High
	Atilax paludinosus	Marsh Mongoose	GBIF	LC	High
Hyaenidae	*Proteles cristata*	Aardwolf	MammalMAP	LC	High
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	MammalMAP	LC	High
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	GBIF	CR	High
	Lepus saxatilis	Scrub Hare	MammalMAP, GBIF	LC	High
	Lepus capensis	Cape Hare	GBIF	LC	High
	Pronolagus saundersiae	Hewitt's Red Rock Hare	GBIF	LC	High
Macroscelididae	*Elephantulus edwardii*	Cape Elephant Shrew	GBIF	LC	High
	Elephantulus myurus	Eastern Rock Elephant Shrew	GBIF	LC	High
	Macroscelides proboscideus	Round-Eared Elephant Shrew	GBIF	LC	High
	Elephantulus rupestris	Western Rock Elephant Shrew	GBIF	LC	High
Muridae	*Otomys auratus*	Vlei Rat	GBIF	NT	High
	Otomys sloggetti	Sloggett's Vlei Rat	GBIF	LC	Low
	Aethomys ineptus	Tete Veld Aethomys	GBIF	LC	Low

Family	Scientific Name	Common Name	Data Source	Status	Liklihood
	Otomys karoensis	Robert's Vlei Rat	GBIF	LC	Low
	Desmodillus auricularis	Cape Short Eared Gerbil	GBIF	LC	High
	Micaelamys granti	Grant's Micaelamys	GBIF	LC	High
	Gerbilliscus brantsii	Highveld Gerbil	GBIF	LC	Low
	Parotomys littledalei	Littledale's Whistling Rat	GBIF	NT	Low
	Rattus rattus	Black Rat	GBIF	INT	High
	Gerbilliscus leucogaster	Bushveld Gerbil	GBIF	LC	Low
	Otomys unisulcatus	Bush Vlei Rat	GBIF	LC	High
Mustelidae	*Hydrictis maculicollis*	Spotted Necked Otter	GBIF	NT	Low
	Aonyx capensis	Cape Clawless Otter	GBIF	NT	High
	Ictonyx striatus	Striped Polecat	MammalMAP, GBIF	LC	High
	Poecilogale albinucha	African Striped Weasel	GBIF	NT	High
Nesomyidae	*Mystromys albicaudatus*	White Tailed Rat	GBIF	VU	High
	Saccostomus campestris	Pouched Mouse	GBIF	LC	High
Nycteridae	*Nycteris thebaica*	Egyptian Slit Faced Bat	GBIF	LC	High
Orycteropodidae	*Orycteropus afer*	Aardvark	Site-walkthrough*	LC	High
Pedetidae	*Pedetes capensis*	Springhare	GBIF	LC	High
Pteropodidae	*Eidolon helvum*	Straw Coloured Fruit Bat	GBIF	LC	Low
	Rousettus aegyptiacus	Egyptian Fruit Bat	GBIF	LC	Low
Rhinolophidae	*Rhinolophus darlingi*	Darling's Horseshoe Bat	GBIF	LC	High
Sciuridae	*Xerus inauris*	South African Ground Squirrel	GBIF, MammalMAP	LC	High
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	GBIF	LC	High
Suidae	*Phacochoerus africanus*	Common Warthog	GBIF, MammalMAP	LC	High
Vespertilionidae	*Neoromicia zuluensis*	Zulu Serotine	GBIF	LC	High
	Eptesicus hottentotus	Long-tailed Serotine	GBIF	LC	High

*While no direct observation of this species was made, unmistakeable tracks and burrows were observed on the project site.

APPENDIX VII: POTENTIAL AMPHIBIAN SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	FrogMAP, GBIF	LC
Bufonidae	*Poyntonophrynus vertebralis*	Southern Pygmy Toad	FrogMAP	LC
	Vandijkophrynus gariepensis	Karoo Toad	FrogMAP, GBIF	LC
	Amietophrynus gutturalis	Marbled Toad	GBIF	LC
	Amietophrynus rangeri	Raucous Toad	GBIF	LC
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	FrogMAP, GBIF	LC
Pipidae	*Xenopus laevis*	African Clawed Frog	GBIF	LC

Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	FrogMAP	LC
	Cacosternum boettgeri	Common Caco	FrogMAP, GBIF	LC
	Pyxicephalus adspersus	Giant Bull Frog	FrogMAP	NT
	Tomopterna tandyi	Tandy's Sand Frog	FrogMAP, GBIF	LC
	Strongylopus grayii	Gray's Grass Frog	GBIF	LC
	Tomopterna cryptotis	Striped Pyxie	GBIF	LC

APPENDIX VIII: POTENTIAL REPTILE SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Agamidae	*Agama aculeata aculeata*	Common Ground Agama	ReptileMAP	LC
	Agama atra	Southern Rock Agama	GBIF	LC
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	ReptileMAP, GBIF	LC
Elapidae	*Aspidelaps lubricus*	Cape Coral Snake	GBIF	LC
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Thick-toed Gecko	GBIF	LC
	Pachydactylus mariquensis	Common Banded Gecko	GBIF	LC
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	ReptileMAP, GBIF	LC
	Nucras holubi	Holub's Sandveld Lizard	GBIF	LC
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	ReptileMAP	LC
	Psammophylax rhombeatus	Rhombic Skaapsteker	GBIF	LC
	Psammophis trinasalis	Fork-marked Sand Snake	GBIF	LC
	Lamprophis aurora	Aurora House Snake	GBIF	LC
	Duberria lutrix	Common Slug-Eater	GBIF	LC
Pelomedusidae	*Pelomedusa subrufa*	Marsh Terrapin	GBIF	LC
Scincidae	*Trachylepis sulcata*	Western Rock Skink	Observed	LC
	Acontias gracilicauda	Thin-tailed Legless Skink	GBIF	LC
Testudinidae	*Homopus boulengeri*	Karoo Padloper	GBIF	NT (EN*)
	Psammobates tentorius	Tent Tortoise	GBIF	LC
	Homopus areolatus	Parrot-Beaked Tortoise	GBIF	LC
	Stigmochelys pardalis	Leopard Tortoise	GBIF, ReptileMAP	LC
	Homopus femoralis	Greater Padloper	GBIF	LC
	Psammobates oculiferus	Serrated Tortoise	GBIF	NE
Varanidae	*Varanus albigularis albigularis*	Rock Monitor	ReptileMAP, GBIF	LC

APPENDIX IX: POTENTIAL INVERTEBRATE SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Aeshnidae	*Anax imperator*	Blue Emperor	OdonataMAP	LC
	Zosteraeschna minuscula	Friendly Hawker	GBIF	LC
	Pinheyschna subpupillata	Stream Hawker	GBIF	LC
Apidae	*Amegilla atrocincta*		GBIF	NE
Araneidae	*Argiope australis*	Common Garden Orbweb Spinner	GBIF	NE
	Cyrtophora citricola	Tropical Tent-web Spider	GBIF	NE
Buthidae	*Parabuthus granulatus*	Granulated Thick-tailed Scorpion	GBIF	NE
	Uroplectes carinatus		GBIF	NE

Family	Scientific Name	Common Name	Data Source	Status
Carabidae	*Anthia thoracica*	Gewone Oogpister	GBIF	NE
Coenagrionidae	*Pseudagrion newtoni*	Harlequin Sprite	GBIF	VU
	Africallagma glaucum	Swamp Bluet	OdonataMAP	LC
	Africallagma sapphirinum	Sapphire Bluet	GBIF	LC
	Pseudagrion caffrum	Springwater Sprite	GBIF	LC
	Pseudagrion vaalense	Vaal Sprite	GBIF	LC
	Pseudagrion citricola	Yellow-Faced Sprite	GBIF	LC
Crambidae	*Loxostege frustalis*		LepiMAP, GBIF	NE
Ctenizidae	*Stasimopus unispinosus*		GBIF	NE
Cyrtaucheniidae	*Ancylotrypa pusilla*		GBIF	NE
Daesiidae	*Biton schreineri*		GBIF	NE
Eupterotidae	*Rhabdosia vaninia*		LepiMAP	NE
Gnaphosidae	*Drassodes tesselatus*		GBIF	NE
	Theuma schreineri		GBIF	NE
	Zelotes fuligineus		GBIF	NE
	Zelotes invidus		GBIF	NE
Gomphidae	*Notogomphus praetorius*	Yellowjack Longlegs	GBIF	LC
	Ceratogomphus pictus	Common Thorntail	GBIF	LC
Hesperiidae	*Spialia sataspes*	Boland sandman	LepiMAP	LC
	Spialia agylla	Grassveld Sandman	GBIF	LC
	Metisella malgacha	Grassveld Sylph	GBIF	LC
	Kedestes lepenula	Chequered Ranger	GBIF	LC
	Kedestes barberae	Freckled Ranger	GBIF	LC
	Gomalia elma	Green-marbled Skipper	GBIF	LC
	Eretis umbra	Small Marbled Elf	GBIF	LC
	Spialia spio	Mountain Sandman	GBIF	LC
	Spialia nanus	Dwarf Sandman	GBIF	LC
	Spialia mafa	Mafa Sandman	GBIF	LC
	Spialia diomus	Common Sandman	GBIF	LC
	Spialia asterodia	Star Sandman	GBIF	LC
Idiopidae	*Galeosoma schreineri*		GBIF	NE
	Gorgyrella schreineri		GBIF	NE
Libellulidae	*Crocothemis erythraea*	Broad Scarlet	OdonataMAP	LC
	Sympetrum fonscolombii	Red-veined Darter or Nomad	OdonataMAP	LC
	Trithemis arteriosa	Red-veined Dropwing	OdonataMAP	LC
	Acisoma panorpoides	Grizzled Pintail	GBIF	LC
Liocranidae	*Rhaeboctesis transvaalensis*		GBIF	NE
Lycaenidae	*Argyraspodes argyraspis*	Warrior silver-spotted copper	LepiMAP, GBIF	LC
	Chrysoritis chrysaor	Burnished opal	LepiMAP, GBIF	LC
	Tylopaedia sardonyx	King Copper	GBIF	LC
	Trimenia macmasteri	McMaster's Silver-spotted Copper	GBIF	LC
	Trimenia argyroplaga	Large Silver-spotted Copper	GBIF	LC
	Thestor protumnus	Boland Skolly	GBIF	LC
	Thestor basutus	Basuto Skolly	GBIF	LC
	Oraidium barberae	Dwarf Blue	GBIF	LC
	Lycaena clarki	Eastern Sorrel Copper	GBIF	LC
	Leptotes brevidentatus	Short-toothed Zebra Blue	GBIF	LC
	Lepidochrysops patricia		GBIF	LC
	Lepidochrysops ortygia	Koppie Blue	GBIF	LC
	Lepidochrysops letsea	Free State Blue	GBIF	LC
	Iolaus bowkeri		GBIF	LC

Family	Scientific Name	Common Name	Data Source	Status
	Harpendyreus tsomo	Tsomo Mountain Blue	GBIF	LC
	Harpendyreus notoba	Salvia Mountain Blue	GBIF	LC
	Eicochrysops messapus	Cupreos Blue	GBIF	LC
	Deudorix antalus	Brown Playboy	GBIF	LC
	Crudaria leroma	Silver-spotted Grey	GBIF	LC
	Chrysoritis turneri	Turner's Opal	GBIF	LC
	Chrysoritis chrysantas	Karoo Copper	GBIF	LC
	Brephidium metophis	Tinktinkie Blue	GBIF	LC
	Azanus moriqua	Black-Bordered Babul Blue	GBIF	LC
	Anthene contrastata		GBIF	LC
	Anthene butleri	Pale Hairtail	GBIF	LC
	Aloeides vansoni	Van Son's Copper	GBIF	LC
	Aloeides pierus	Dull Copper	GBIF	LC
	Aloeides pallida	Giant Copper	GBIF	LC
	Aloeides molomo	Molomo Copper	GBIF	LC
	Aloeides macmasteri	McMaster's Copper	GBIF	LC
	Aloeides gowani	Gowan's Copper	GBIF	LC
	Aloeides damarensis	Damara Copper	GBIF	LC
	Aloeides aranda	Aranda Copper	GBIF	LC
	Actizera lucida	Rayed Blue	GBIF	LC
	Azanus jesous	Topaz-Spotted Blue	GBIF	LC
	Zizula hylax	Tiny Grass Blue	GBIF	LC
	Azanus ubaldus	The Bright Babul Blue	GBIF	LC
	Anthene amarah	The Black-Striped Hairtail	GBIF	LC
	Lampides boeticus	Pea Blue	GBIF	LC
	Leptotes pirithous	Lang's Short-Tailed Blue	GBIF	LC
	Chilades trochylus	Grass Jewel	GBIF	LC
	Zizeeria knysna	Dark Grass Blue	GBIF	LC
Lycosidae	*Evippomma squamulatum*		GBIF	NE
	Geolycosa subvittata		GBIF	NE
	Lycosa schreineri		GBIF	NE
	Pardosa schreineri		GBIF	NE
Meloidae	*Hycleus transvaalicus*		GBIF	NE
Nymphalidae	*Junonia hierta cebrene*	Yellow pansy	LepiMAP, GBIF	LC
	Stygionympha robertsoni	Robertson's hillside brown	LepiMAP, GBIF	LC
	Stygionympha irrorata	Karoo Hillside Brown	GBIF	LC
	Acraea stenobea	Suffused Acraea	GBIF	LC
	Acraea neobule	Wandering Donkey Acraea	GBIF	LC
	Vanessa cardui	Painted Lady	GBIF	LC
	Hypolimnas misippus	Common Diadem	GBIF	LC
	Danaus chrysippus	African Monarch	GBIF	LC
	Junonia oenone	Dark Blue Pansy	GBIF	LC
	Ypthima asterope	African Ringlet	GBIF	LC
Papilionidae	*Papilio demodocus*	Citrus Swallowtail	GBIF	LC
Pieridae	*Pontia helice helice*	Common meadow white	LepiMAP, GBIF	LC
	Pinacopteryx eriphia	Zebra White	GBIF	LC
	Colotis agoye	Speckled Sulphur Tip	GBIF	LC
	Colotis euippe	Smoky Orange Tip	GBIF	LC
	Eurema brigitta	No-Brand Grass Yellow	GBIF	LC
	Colotis evenina	Common Orange Tip	GBIF	LC
	Belenois aurota	Brown-Veined Caper White	GBIF	LC
	Colotis eris	Banded Gold Tip	GBIF	LC
	Catopsilia florella	African Emigrant	GBIF	LC

Family	Scientific Name	Common Name	Data Source	Status
	Colias electo	African Clouded Yellow	GBIF	LC
Pyrgomorphidae	*Phymateus morbillosus*	Common Milkweed Locust	GBIF	NE
Scorpionidae	*Opistophthalmus austerus*		GBIF, ScorpionMAP	NE
	Opistophthalmus pictus		GBIF	NE
Segestriidae	*Ariadna karrooica*		GBIF	NE
	Ariadna scabripes		GBIF	NE
Solpugidae	*Solpuga chelicornis*		GBIF	NE
	Zeria venator		GBIF	NE
	Solpuga villosa		GBIF	NE
Sphingidae	*Hippotion rosae*		GBIF	NE
	Agrius convolvuli	Convolvulus Hawk	GBIF	NE
	Acherontia atropos	Death's Head Moth	GBIF	NE
	Daphnis nerii	Oleander Hawkmoth	GBIF	NE
	Hippotion celerio	Silver-Striped Hawk-Moth	GBIF	NE
	Hyles livornica	Striped Hawk-Moth	GBIF	NE
	Afroclanis calcareus		GBIF	NE
	Basiothia charis		GBIF	NE
	Basiothia schenki	Brown Striped Hawkmoth	GBIF	NE
	Batocnema africanus		GBIF	NE
	Rufoclanis numosae	Wavy Polyptychus	GBIF	NE
	Sphingonaepiopsis ansorgei		GBIF	NE
	Sphingonaepiopsis nana		GBIF	NE
	Temnora murina		GBIF	NE
	Temnora namaqua		GBIF	NE
	Temnora pseudopylas		GBIF	NE
	Temnora pylades		GBIF	NE
	Temnora pylas		GBIF	NE
	Theretra cajus		GBIF	NE
	Theretra capensis		GBIF	NE
	Theretra orpheus		GBIF	NE
	Hippotion roseipennis		GBIF	NE
	Hoplistopus butti		GBIF	NE
	Hoplistopus penricei		GBIF	NE
	Lophostethus dumolinii	Arrow Sphinx	GBIF	NE
	Macropoliana natalensis		GBIF	NE
	Microsphinx pumilum		GBIF	NE
	Odontosida magnificum		GBIF	NE
	Odontosida pusillus		GBIF	NE
	Phylloxiphia punctum		GBIF	NE
	Polyptychus grayii		GBIF	NE
	Praedora leucophaea		GBIF	NE
	Pseudoclanis molitor		GBIF	NE
	Pseudoclanis postica	Mulberry Hawkmoth	GBIF	NE
	Rhodafra opheltes		GBIF	NE
Synlestidae	*Chlorolestes fasciatus*	Mountain Malachite	GBIF	LC
Theraphosidae	*Harpactira namaquensis*	Bronze Baboon Spider	SpiderMAP	NE
Theridiidae	*Latrodectus karrooensis*	Karroo Button Spider	GBIF	NE

FLORA AND FAUNA SITE SENSITIVITY VERIFICATION REPORT

The National Gazette, No. 43110 of 20 March, 2020: "National Environmental Management Act (107/1998) Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24 (5) (a) and (h) and 44 of the Act ('the Regulations'), when applying for Environmental Authorisation" lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations.

While the commissioning of the specialist assessment occurred prior to the publication of The National Gazette, No. 43110 of 20 March 2020, the assessment was conducted to align with the Terrestrial Biodiversity Protocol prescribed therein to assist the Competent Authority in the decision making process as the protocol was largely materially unchanged from the minimum assessment and reporting requirements described in The National Gazette No. 42451 of 10 May 2019 and the specialist assessment was concluded prior to the publication of The National Gazette, No 43855 of 30 October 2020.

The Regulations make provision for linear activities such as the proposed development by stating that even the assessment and reporting requirements for areas identified as being of 'very high sensitivity' need not apply as impacts on terrestrial biodiversity are temporary in nature.

The land disturbed by the power line development, in the specialist's opinion can be returned to the current state within two years of the completion of the construction phase, and as such a Terrestrial Biodiversity Compliance Statement applies.

Dr Owen Rhys Davies
Pr. Sci. Nat (Ecology)

CURRICULUM VITAE

Dr Owen Davies

Avifaunal Specialist

Email:OwenD@arcusconsulting.co.za Tel: +27 (0) 21 412 1529

Specialisms

- Avifaunal surveys
- Field research
- Data analysis and assessment of ecological data

Summary of Experience

Extensive field research has given Owen experience in the techniques required for conducting biological surveys on a variety of taxa including observations, physical trapping and identification of small terrestrial birds, raptors, bats, small mammals, rodents, snakes, reptiles, scorpions and fish. He is also qualified to conduct observations and acoustic monitoring of marine mammals in the offshore environment. Data collection in a diversity of habitats and ecosystems, combined with formal training in field skills such as off-road driving, enables Owen to conduct ecological surveys across southern Africa. In addition, his skills in data analysis and scientific writing at the PhD level enable him to assist in the formulation of assessments and reports.

Qualifications and Professional Interests

- **University of Cape Town, Percy FitzPatrick Institute of African Ornithology, 2010 to 2015**
  PhD Zoology
- **University of Cape Town, Percy FitzPatrick Institute of African Ornithology, 2008 to 2010**
  MSc Zoology (upgraded to PhD)
- **University of Cape Town, 2007**
  BSc Zoology (Hons)
- **University of Cape Town, 2003 to 2006**
  BSc Zoology
  BSc Botany

Professional History

2015 (July) to present - Avifaunal Specialist, Ecologist, field team leader, Arcus Consultancy Services, Cape Town
2014 to 2015 - Bat monitoring field assistant, Arcus Consultancy Services, Cape Town
2013 to 2015 - Avifaunal observer, Arcus Consultancy Services, Cape Town
2009 to 2013 - Research Assistant (birds) to Dr J. Fuchs (Curator of Birds at the Muséum national d'Histoire naturelle, Paris), throughout South Africa
2007 to 2013 - Research Assistant (birds) to Prof T. M. Crowe (Percy FitzPatrick Institute of African Ornithology, Department of Zoology, University of Cape Town), throughout South Africa
2011 - Research Assistant (birds) to Dr I. Little, Endangered Wildlife Trust, Uganda
2010 - Research Assistant (bats) to Asst. Prof Hassan Salata, Department of Wildlife (South Sudan), Northern Cape
2010 to 2011 - Research Assistant (small mammals) to Dr B. Smit, University of Pretoria, Northern Cape
2010 - Research Assistant to Dr H. Smit-Robinson, Birdlife SA, Western and Northern Cape

CURRICULUM VITAE

Project Experience

- Confidential WEF near Molteno, Northern Cape Province (bird monitoring data analysis and reporting)
- Confidential Grid Connection near De Aar, Northern Cape Province (Avifaunal assessment, Ecological assessment, site-walkthrough, data analysis and reporting)
- Confidential WEF near Yzerfontein, Western Cape Province (Avifaunal assessment, Ecological assessment, site-walkthrough, data analysis and reporting)
- Metsimatala Solar (Field team leader, bird observations, data analysis and reporting in collaboration with specialists)
- Kolkies WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Karee WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Gouda WEF (Field team leader, bird observations – post construction)
- Hopefield WEF (Field team leader, bird observations, data analysis and reporting in collaboration with specialists – post construction)
- UmSinde Emoyeni WEF (Bird observations)
- Spitzkop West WEF (Bird observations, bat mast commission)
- Pofadder WEF (Bat mast commission)
- Cookhouse WEF (Bat mast commission and decommission)
- Komsberg WEF (Field team leader, bird observations, bat mast commission, data analysis and reporting in collaboration with specialists)
- Bokpoort Solar (Field team leader, bird observations, data analysis and reporting in collaboration with specialists)

Conferences and Seminars

- Biodiversity Southern Africa Conference, Biological Sciences Department, University of Cape Town, 2 to 6 December 2013
- Southern African Society for Systematic Biology (SASSB) Conference 2012: Systematics in the Era of Integrative Biology, Arniston, Western Cape, 16 to 20 July 2012
- The Willi Hennig Society Annual Meeting XXX Conference for Cladistic Research 2011, Sao Jose do Rio Preto, State of Sao Paulo, Brazil, 29 July to 2 August 2011
- Southern African Society for Systematic Biology (SASSB) Conference 2011: Biodiversity Matters!, Rhodes University, Grahamstown, Eastern Cape, 19 to 21 January 2011
- Zoological Society of Southern Africa (ZSSA) 50th Anniversary conference 2009, Natalia Resort, Illovo Beach, Kwa-Zulu Natal South Coast, 21 to 25 July 2009
- Southern African Society for Systematic Biology (SASSB) 10th Anniversary Conference 2009, Natalia Resort, Illovo Beach, Kwa-Zulu Natal South Coast, 25 to 27 July 2009
- Pan-African Ornithological Congress (PAOC 12) South African Conference 2008: Birds and People – Interaction, Utilisation and Conservation, Goudini Spa, Western Cape, 7 to 12 September 2008

Publications

DAVIES, O.R, JUNKER, K, JANSEN, R, CROWE, T.M. & BOOMKER, J. 2008. Age- and sex-based variation in helminth infection of Helmeted Guineafowl (*Numida meleagris*) with comments on Swainson's Spurfowl (*Pternistis swainsonii*) and Orange River Francolin (*Scleroptila levaillantoides*). South African Journal of Wildlife Research 38 (2): 163-170.

JUNKER, K., DAVIES, O.R., JANSEN, R., CROWE, T.M. & BOOMKER, J. 2008. Nematodes of Swainson's Spurfowl *Pternistis swainsonii* and Orange River Francolin *Scleroptila levaillantoides* from the Free State province, South Africa, with a description of *Tetrameres swainsonii*, sp. nov. (Nematoda: Tetrameridae). Journal of Helminthology 82: 365-371.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Construction of the up to 400 kV De Aar 2 South Transmission Line and Switching Station, Northern Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	OWEN RHYS DAVIES			
Specialist Qualifications:	PHD ZOOLOGY (ORNITHOLOGY)			
Professional affiliation/registration:	SACNASP REG NO. 117555			
Physical address:	OFFICE 607 CUBE WORKSPACE ICON BUILDING CRN HANS STRIJDOM CPT			
Postal address:	AS ABOVE			
Postal code:	8001	Cell:	+27725580080	
Telephone:	+27214121529	Fax:		
E-mail:	OWEND@ARCUSCONSULTING.CO.ZA			

2. DECLARATION BY THE SPECIALIST

I, _____OWEN RHYS DAVIES_____, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

Name of Company:

2021-02-26

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, OWEN RHYS DAVIES, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

Name of Company

2021/02/26

Date

Signature of the Commissioner of Oaths

2021/02/26

Date

3Foxes Biodiversity Solutions
ECOLOGICAL SPECIALIST SERVICES
Assessment/Management/Research

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Arcus Consultancy Services South Africa (Pty) Ltd
Office 607 Cube Workspace
Cnr Long Street and Hans Strijdom Ave
Cape Town
8001
Tel. 021 412 1529
Att: **Aneesah Alwie**

03 June 2020

RE: Review of Specialist Report: Flora and Fauna Specialist Assessment Report for the Proposed De Aar 2 South Grid Connection Near De Aar, Northern Cape Province

Arcus Consultancy Services (Arcus) has requested a review from 3Foxes Biodiversity Solutions of the above study to confirm the independence and adequacy of the study. The terms of reference for the review as provided by Arcus includes the following:

- *Confirmation of independence*
- *Acceptability of the terms of reference of the specialist studies*
- *The suitability of the different assessment methodology used for data gathering and analysis*
- *Evaluate the validity of the findings (review data evidence)*
- *Discuss the suitability of the mitigation measures and recommendations*
- *Identify any short comings and mitigation measures to address the mitigation measures*
- *Evaluate the appropriateness of the reference literature and data*
- *A CV clearly showing the expertise of the peer reviewer*
- *Indicate whether a site inspection was carried out as part of the peer review*
- *Indicate whether the article is well written and easy to understand*

In respect of the above, I have reviewed the fauna and flora report and the findings of the review are detailed below.

Acceptability of the terms of reference of the specialist studies

The terms of the reference for the specialist study are repeated below. These are somewhat broad in their formulation, but are considered adequate as they cover the most important baseline components and include both a desktop study as well as a field assessment.

Scope of Study Specialist Study:

- *A desktop study and site screening to broadly describe and characterise the project site in terms of:*
    - *Vegetation and habitat types;*
    - *National conservation status of major vegetation types;*
    - *Red Data (threatened or endangered) species of flora and fauna; and*
    - *Species of flora and fauna offered legislative protection.*
- *A site walk-through and ecological survey to describe the project site at finer detail in terms of:*
    - *The status of the vegetation and habitat types; and*
    - *Potential impacts on biodiversity, habitats, processes and ecosystem functioning.*

The suitability of the different assessment methodology used for data gathering and analysis

The methodology as described in the main section of the report is short, but is well-expanded in the first three Annexes of the report. This includes review and interrogation of the relevant spatial and species-based databases. Although the study references the new legislation regarding the use of the DEA Screening Tool, the outputs of this are not included in the study and as such, it is not possible to easily verify the validity of the claims made in the report regarding these outputs. As a result it is recommended that the main mapping outputs of the Screening Tool are included as an annex in the report.

Evaluation of the validity of the findings

The report does not provide a map of the VegMap vegetation types of the study area. As there are only two vegetation types within the study area, this is not seen as a significant omission, but it would have been preferred to include a vegetation map with rivers and wetlands of the study area. The study reports that *Euphorbia flanaganii* (Vulnerable) is reported by the SANBI POSA database as being present in the area but that this is likely an error or mistaken identity with *Euphorbia arida*, which is not a threatened species. This conclusion is supported by this review as *Euphorbia flanaganii* is a coastal species restricted to the Eastern Cape and southern Kwa-Zulu Natal coastline and does not occur in the Northern Cape.

In terms of fauna, the study provides a reasonable account of the characteristic and species of concern that may be present within the affected area. The study provides a short account of each species of concern and the degree to which they would be sensitive to the development and the likely degree of impact on each species. The report also includes a description and images of each habitat type within the study area and a description of fauna likely to be associated with each habitat and its resultant sensitivity. The sensitivity map produced in the study indicates that the base sensitivity of the area is considered to be low, while the drainage lines and washes are mapped as medium or high sensitivity. The plains and the rocky slopes and plateaus are mapped as similarly low sensitivity. However, the rocky hills and slopes have significantly higher faunal and botanical diversity and as such it could be motivated to classify these areas as higher sensitivity than the adjacent plains. In addition, the report states that "*The overall vertebrate sensitivity of the project area is considered to be HIGH*", this seems to be in conflict with the low mapped sensitivity of the majority of the power line corridor. Although some of the fauna species of concern are associated with the drainage lines of the area, many are also associated with the rocky hills and slopes of the area and as such, this again relates to the higher potential sensitivity of these habitats.

Identification of short comings and appropriateness of mitigation measures

The reports assessed numerous impacts for the construction and operational phases of the development as well as cumulative impacts. The mitigation measures included in the study are considered appropriate and comprehensive. No additional mitigation or avoidance measures are recommended and as such, there are no major short-comings associated with this section of the report.

Evaluate the appropriateness of the reference literature and data

The study includes review of previous studies from the area as well as interrogation of the relevant species, spatial databases and red lists. The literature and information sources used are considered to be appropriate and current. There are no additional sources that are considered important to consider and as such, the sources used are appropriate and adequate.

A CV clearly showing the expertise of the peer reviewer

A CV is attached at the end of this review.

Indicate whether a site inspection was carried out as part of the peer review

No site visit was carried out as part of this review.

Indicate whether the article is well written and easy to understand

The study was generally clear and well-written and it should not be difficult for a layperson to follow and understand the major results and outcomes of the study.

Conclusions & Recommendations:

The recommendations of this review are as follows:

- The main mapping outputs of the DEA Screening Tool should be included as an annex in the report, along with a discussion of the validity of these outputs as validated by the field assessment and other ancillary data.
- Despite considering the faunal sensitivity of the site to be high, the sensitivity map of the study area has a base sensitivity of low. This appears to be inconsistent and if the faunal sensitivity of the area is high, then either the base sensitivity of the study area should be elevated to medium, or alternatively, the habitats where the fauna species of concern are likely to occur should be mapped in more detail and mapped as medium or high sensitivity. In addition, the rocky hills and slopes generally have significantly higher faunal and botanical diversity than the adjacent plains and this is not borne out in the sensitivity mapping. As such, it is recommended that the sensitivity map is improved to include more detail around areas of faunal sensitivity.

The major findings of this review are as follows:

- The study is considered to be adequate with regards to both the data sources consulted and the field assessment.
- The assessment of impacts is considered appropriate with regards to both the impacts identified as well as the assessed significance.
- The recommended mitigation and avoidance measures are considered appropriate and relevant and no additional measures are considered warranted.
- The conclusion of the study includes the impact statement which finds that "*No highly significant negative impacts that cannot be adequately mitigated against were observed, therefore from a terrestrial flora and fauna perspective there are no reasons to oppose the development. The development can be supported in terms of its low potential impact to terrestrial ecology*." Based on the baseline site description as provided in the study, this conclusion appears to be warranted and is thus supported by this review.
- Overall, the study is considered to meet the basic requirements for specialist fauna and flora studies and the assessment of impacts and conclusions reached are considered consistent with the baseline data presented. The findings of the specialist are therefore considered to be consistent with the data and the study can therefore be considered to be adequate and independent.

Prepared by Simon Todd
15 May 2020

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