Esizayo Wind Energy Facility Expansion - Biodiversity Impact Assessment

Central Karoo District Municipality, Western Cape

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CLIENT

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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

List of Acronyms

ADU	Animal Demography Unit
BI	Biodiversity Importance
CBA	Critical Biodiversity Area
CI	Conservation Importance
CR	Critically Endangered
EOO	Extent of occurrence
EN	Endangered
ESA	Ecological Support Area
FI	Functional Integrity
GBIF	Global Biodiversity Information Facility
IAP	Invasive Alien Plant
IUCN	International Union for Conservation of Nature
LC	Least Concern
MP	Moderately Protected
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management Biodiversity Act
NP	Not Protected
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
ONA	Other Natural Area
POSA	Plants of Southern Africa
PP	Poorly Protected
SACAD	South Africa Conservation Areas Database
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SAPAD	South Africa Protected Areas Database
SCC	Species of Conservation
SEI	Site Ecological Importance
SWSA	Strategic Water Source Area
VU	Vulnerable
WP	Well Protected

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1 Introduction

1.1 Background

The Biodiversity Company (TBC) was appointed to undertake a Biodiversity Impact Assessment for the proposed Esizayo Wind Energy Facility (WEF) Expansion, approximately 30 km northeast of Laingsburg, Central Karoo District Municipality, Western Cape (**Error! Reference source not found.**). The proposed development is located within the following properties:

- Portion 2 of Farm Aanstoot Farm 72; (2/72)
- Portion 1 of Farm Leeuwenfontein 71 (1/71); and
- Remainder of Farm Leeuwenfontein 71 (RE/71).

The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*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 National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). This is contingent of the PV facility providing electricity output of 20 megawatts (MW) or more. See Appendix A for the Protocol Checklist and where they are located in the report.

1.2 Project Description

The total area of the proposed development site is 5 850 ha, which is inclusive of an exclusion area wherein no development is permitted to occur, and the development infrastructure footprint will be approximately 200 ha. The proposed development will incorporate the following infrastructure, to enable the facility to supply a contracted capacity of up to 200 MW:

- Up to 23 wind turbines. Each turbine with a foundation of up to 25 m in diameter and up to 4m in depth, compacted hard standing areas of up to 4.5 ha each;
- Internal roads traversing a length of 30 km with a width of 9m;
- 33 kV underground cables or overhead powerlines;
- 33 and 132 kV substations;
- Fence around the project development area;
- Site offices and maintenance buildings, including workshop areas for maintenance and storage; and
- Laydown areas.

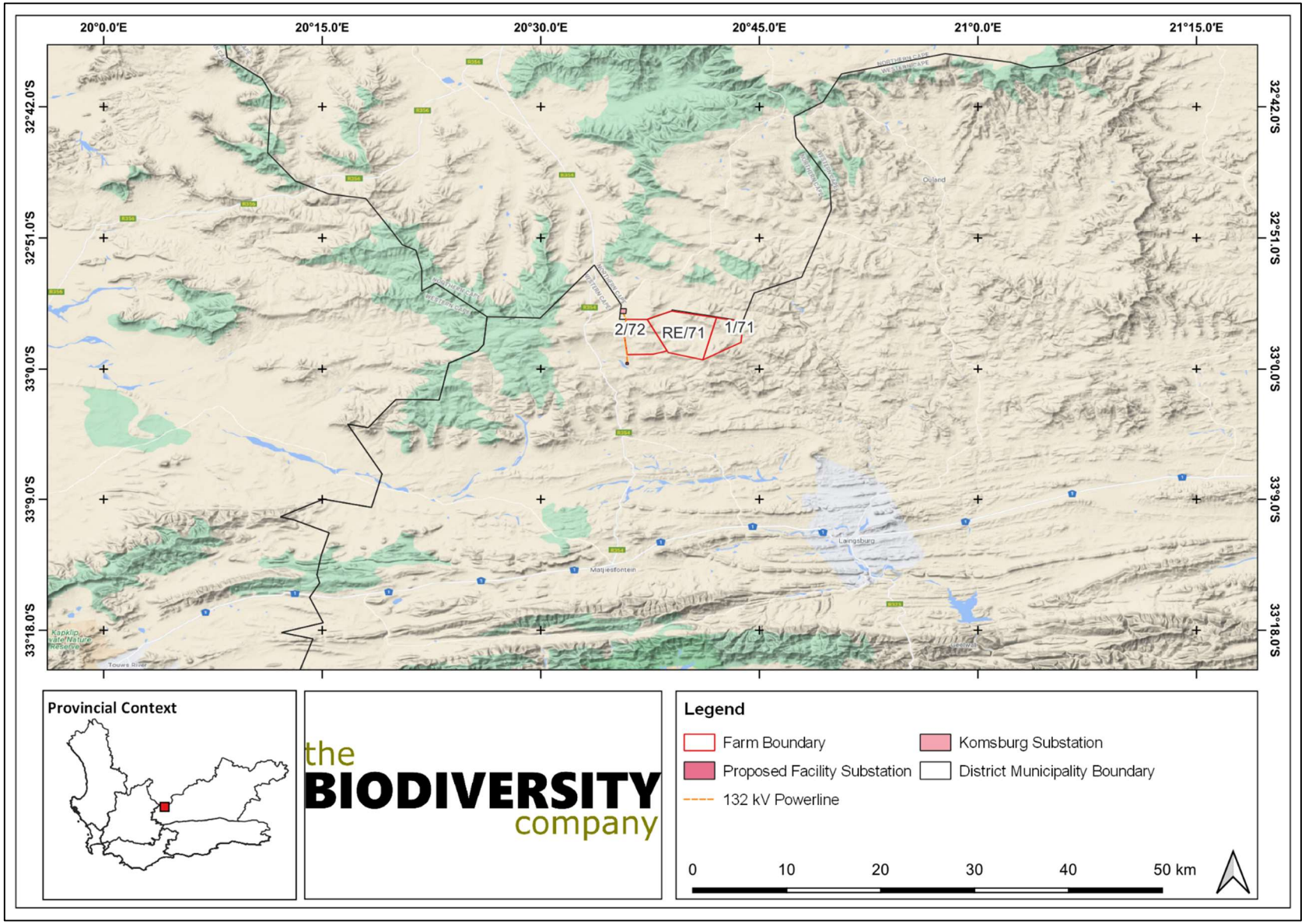


Figure 1-1 Map illustrating the location of the proposed Esizayo Wind Energy Facility Expansion Area, Western Cape

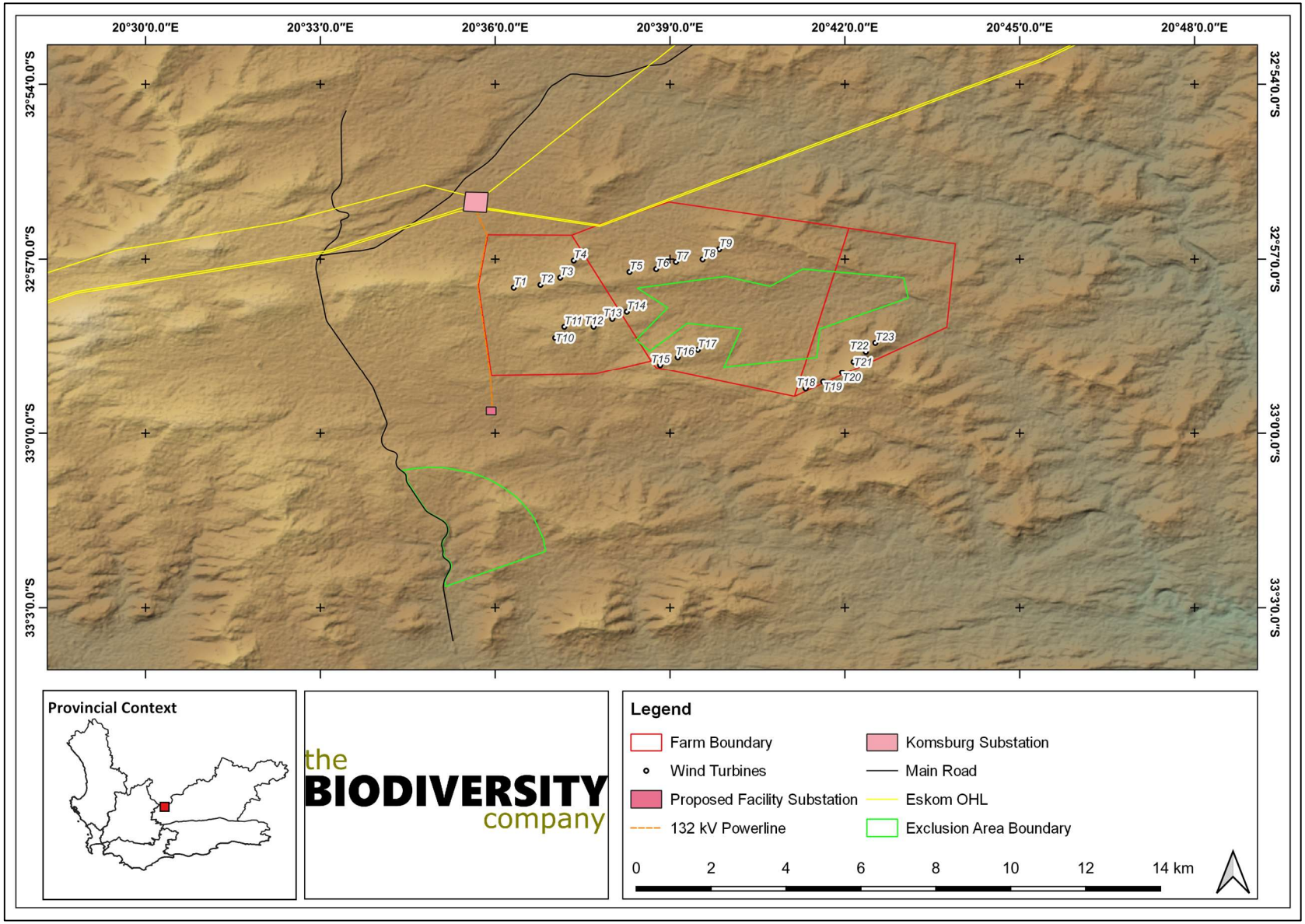


Figure 1-2 Map illustrating the layout of the proposed Esizayo Wind Energy Facility Expansion Area, Western Cape

1.3 Scope of Work

The principal aim of the assessment was to provide information to guide the risk of the proposed development to the flora and fauna communities of the ecosystems associated with the project area. The scope of work for the assessment comprises of the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the proposed mining area and surrounding landscape;
- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the proposed development area;
- Field survey to ascertain the species composition of the present flora and fauna community within the proposed development area;
- Delineate and map the habitats and their respective sensitivities that occur within the proposed development area;
- Identify the manner that the proposed development impacts the flora and fauna community and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The Project Area of Influence (PAOI) for the proposed development was the associated property area and external development footprint;
- A single field survey was undertaken during the dry season and therefore, many of the flora species present will not be recorded as they are dormant during this period;
- The biotic components considered for this assessment consisted of flora, herpetofauna and non-volant mammals. In addition, the Formicidae species assemblage was considered as an important component of this assessment as the group is a reliant indicator of habitat condition;
- Whilst every effort was made to cover as much of the site as possible, it is possible that some flora and fauna species that are present on site were not recorded during the field survey, especially secretive or rare species;
- The bat baseline and impact sections of this report have been completed at a desktop level only. The results from the completed six-month monitoring study will be reported on in June 2022, along with a detailed bat sensitivity map, and a re-assessment of potential impacts of the proposed Esizayo WEF on bats. The turbine curtailment and other mitigation measures will be revised if/where necessary; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 5 m.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in the Western Cape

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA, 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Western Cape Nature Conservation Laws Amendment Act, 2000
	Western Cape Nature Conservation Act No. 9 of 2009

2 Methods

This section details the methods used in the assessment and is divided into the desktop and field components.

2.1 Climate

Climate data available from climate-data.org was used to comprehend the climatic conditions of the proposed development area. The climate here is classified as a cold semi-arid climate (BSk) by the Köppen-Geiger system. BSk areas are located in elevated temperate zones, typically bordering a humid continental climate or a Mediterranean climate. They are typically found in continental interiors distal large bodies of water. Unlike hot semi-arid climates, BSk areas tend to have cold winters and usually experience some degree of snowfall during the winter. During the year, rainfall is limited with a mean annual precipitation of 253 mm recorded in Laingsburg and the average annual temperature recorded at 16.6 °C (Figure 2-1).

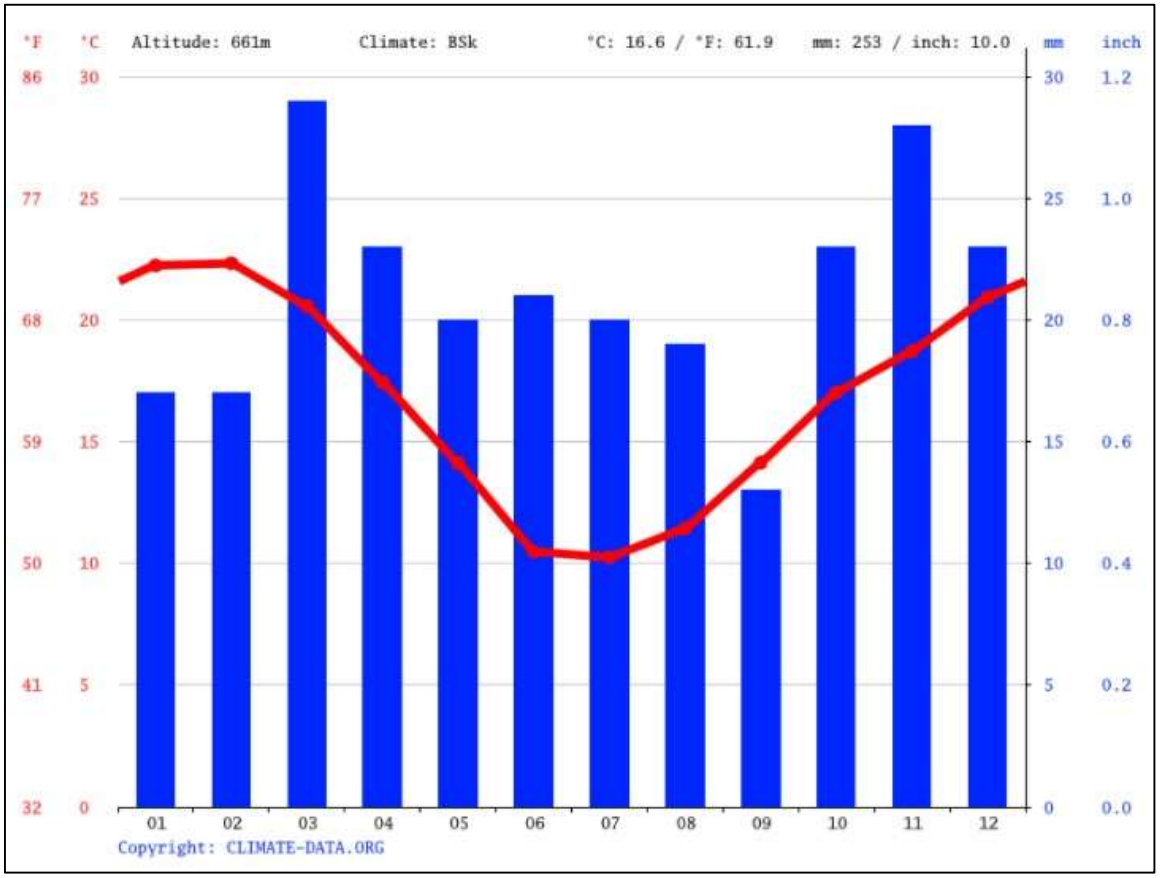


Figure 2-1 ***Column and line plots illustrating the climatic conditions of the Laingsburg area, Western Cape. Source:*** *https://en.climate-data.org/africa/south-africa/western-cape/laingsburg-8467/#climate-graph*

2.2 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets in order to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

2.2.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- National Biodiversity Assessment 2018 (Skowno *et al*, 2019) - The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
    - Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
    - Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:
    - South Africa Conservation Areas Database (SACAD) and South Africa Protected Areas Database (SAPAD) (DFFE, 2021a) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
    - National Protected Areas Expansion Strategy (NPAES) (SANBI, 2021) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Western Cape Biodiversity Spatial Plan (Pool *et al*, 2017) - The Western Cape Biodiversity Spatial Plan (WCBSP) The Western Cape Biodiversity Spatial Plan (WCBSP) is a tool that comprises the Biodiversity Spatial Plan Map of biodiversity

priority areas accompanied by contextual information and land use that make the most recent and best quality biodiversity information available for informing all aspects of sustainable development in the Western Cape; from land use and development planning, to environmental assessment and regulation, and natural resource protection and management more broadly. The BSP Map covers both the terrestrial and freshwater realms, as well as major coastal and estuarine habitats. Developed at a relatively fine spatial scale, the BSP can be used for planning at local, district and provincial levels. BSP categories are based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

  - Critical Biodiversity Area (CBA) – An area that must be maintained in a good ecological condition (natural or near-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types as well as for species and ecological processes that depend on natural or near-natural habitat, that have not already been met in the protected area network (SANBI, 2016).

  - Ecological Support Area (ESA) – An area that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or no necessary to meet them in natural or near-natural areas (SANBI, 2016).

  - Other Natural Area (ONA) – An area in good or fair ecological condition (natural, near-natural or semi-natural) that is not required to meet biodiversity targets for ecosystem types, species or ecological processes (SANBI, 2016).

- Hydrological Setting:

  - South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

  - Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2021) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water SWSAs areas is vital for national security because a lack of water security will compromise national security and human wellbeing.

  - National Freshwater Ecosystem Priority Area (NFEPA) (Nel *et al.,* 2011) – The NFEPA database provides strategic spatial priorities for conserving the country's freshwater ecosystems and associated biodiversity as well as supporting sustainable use of water resources.

2.2.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) was used in order to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the proposed development area and surrounding landscape (Figure 2-2). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2021) was utilized to provide the most current national conservation status of flora species.

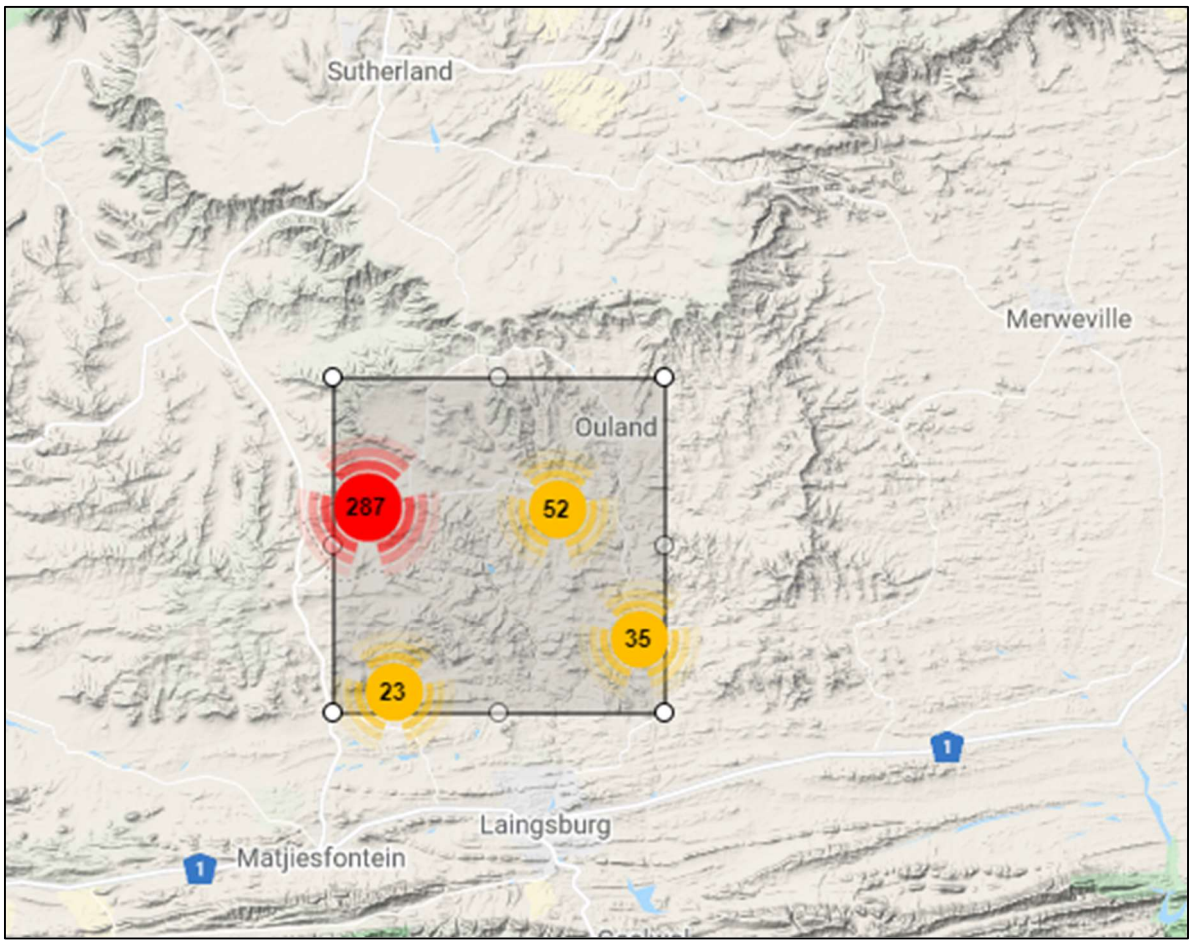


Figure 2-2 Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa database

2.2.3 Desktop Fauna Assessment

The faunal desktop assessment comprised of the following:

- Compiling an expected amphibian list generated from the IUCN spatial dataset (2017 and the FrogMap database (ADU, 2022) using the 3220 quarter degree square;
- Compiling an expected reptile list generated from the IUCN spatial dataset (2017) and the ReptileMap database (ADU, 2022) using the 3220 quarter degree square; and
- Compiling an expected mammal list from the IUCN spatial dataset (2017).

2.2.4 Literature Review

Due to the limitation of a single field survey during the dry season, ecological assessments and walkdowns that were previously undertaken within the landscape for energy generation and distribution were reviewed to consider species that were recorded during these surveys. In addition, the specialist's knowledge and species records from previous surveys within the area were also considered. This was done to obtain a better understanding of the biotic community within the area and the impact of the proposed development on the wellbeing of the biotic community and ecosystem function. The following reports were considered:

- Environmental Impact Assessment for the Proposed Esizayo Wind Energy Facility: Fauna & Flora Specialist Study for EIA. 2016. Report prepared for WSP on behalf of Biotherm Energy (Pty) Ltd;
- Biodiversity Baseline and Impact Assessment for the Proposed Esizayo 132 kV Powerline, Matjiesfontein, Western Cape, South Africa. 2021. Report prepared for WSP by The Biodiversity Company;
- Esiyazo Wind Farm Ecological Walkdown, Matjiesfontein, Western Cape. 2021. Report prepared for WSP by The Biodiversity Company;
- Impact Assessment Report: Specialist Ecological Study on the potential impacts of the proposed Hidden Valley Wind Energy Facility Project near Matjiesfontein, Northern Cape. Report prepared for Savannah Environmental by David Hoare Consulting cc;
- Authorised Soetwater Wind Energy Facility, Sutherland, Northern Cape Province – Pre-construction Commencement Ecological Walk-through Report. Report prepared for Soetwater Wind Farm (Pty) Ltd by Savannah Environmental; and
- Grid Connection Infrastructure, including 132kV Overhead Power Line, Switching Station and Ancillaries, for the Great Karoo Wind Farm, Sutherland, Northern Cape Province – Biodiversity Impact Assessment. 2020. Report prepared for Savannah Environmental by The Biodiversity Company.

2.3 Field Assessment

A single field survey was undertaken in from the 31st January – 4th February 2022 (Summer), which is a dry-season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover the different habitat types within the limits of time and access. The fieldwork was placed within targeted areas perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork.

2.3.1 Flora Survey

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. Suitable habitat for SCC were identified according to and targeted as part of the timed meanders. During the survey, notes were made

regarding current impacts, subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, outcrops etc.). Relevant field guides and websites consulted for identification purposes included the following:

- Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al*, 2015);
- iNaturalist (inaturalist.org);
- Problem Plants and Alien Weeds of South Africa (Bromilow, 2010);
- Field Guide to Succulents in Southern Africa (Smith *et al*, 2017);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013).

2.3.2 Fauna Survey

2.3.2.1 Invertebrate Assessment

To understand the ecological condition of the habitats within the assessment area, the Formicidae (Ants) community was considered in this assessment as they are reliable indicators of habitat condition (Andersen *et al*, 2002; Gollan *et al*, 2011). This is because each species or group differ in their tolerance to anthropogenic drivers. Species were actively searched for in micro-habitats such as under rocks, under and in coarse woody debris, inflorescences, termite mounds and under peeling bark. In addition to being reliable bio-indicators, they are important in maintaining ecosystem functioning as they predate on other invertebrate species, turnover soil, control plant pathogens and distribute of myrmecochorous seeds.

2.3.2.2 Vertebrate Assessment

The vertebrate assessment within this report pertains to herpetofauna, avifauna and mammals. Importantly, because species occupying arid environments tend to have larger home ranges than those in mesic areas (Cardillo, 2003), species that were observed within the proximal landscape were also recorded. The faunal field survey comprised of the following active and passive techniques:

- Visual and auditory searches - This typically comprised of traversing the area and using a camera to view species from a distance without them being disturbed as well as listening to species calls.;
- Active hand-searches – are used for species that shelter in or under particular micro-habitats typically rocks (Figure 2-3A);
- Camera Traps – Five (5) camera traps were deployed for 96 hours, accounting for a total of 480 trap hours. Camera traps were baited with tinned tuna in vegetable oil to improve sampling efficacy;
- Sherman Traps (Figure 2-3B) – Ten (10) Sherman traps were deployed for 108 hours in order to capture small non-volant mammals. This accounts for a total of 1080

trapping hours. Sherman traps were baited with a mixture of peanut butter, oats and honey; and

- Funnel Traps (Figure 2-3c) – Four (4) funnel traps were deployed for 96 hours accounting for a total of 384 trapping hours.

Diagnostic features of the individuals that were captured were photographed at site and released (Figure 2-3D). Relevant field guides and texts consulted for identification purposes included the following:

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al*, 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Field Guide to the Frogs & Other Amphibians of Africa (Channing & Rödel, 2019)
- Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi (Stuart and Stuart, 2015); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

Figure 2-3 ***Photographs illustrating sampling methods utilised in the biodiversity impact assessment for the proposed Esizayo Wind Energy Facility Expansion Area. A) Active hand searches wherein rocks were flipped over to search for fauna using this micro-habitat, B) Sherman trap placed in rocky crevice, C) Funnel trap placed in vertical rock crevice and D) Photographing diagnostic features of specimens***

2.4 Site Ecological Importance

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned Site Ecological Importance (SEI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 2-1 and Table 2-2, respectively.

Table 2-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global extent of occurrence (EOO) of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 2-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches.

Functional Integrity	Fulfilling Criteria
	Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 2-3

Table 2-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	**High**	**Medium**	**Low**	**Very low**
Functional Integrity (FI)	**Very high**	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very low	Medium	Low	Very Low	Very Low	Very Low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 2-4.

Table 2-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 2-5.

Table 2-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance (BI)				
		Very High	High	Medium	Low	Very Low
Receptor Resilience (RR)	Very Low	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 2-6.

Table 2-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

3 Results & Discussion

This section provides the results of the assessment and is divided into the desktop and field assessment components.

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 3-1.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features

Ecological Feature	Relevance	Section
Ecosystem Threat Status (ETS)	Irrelevant – Overlaps with Least Concern ecosystems	3.1.1.1
Ecosystem Protection Level (EPL)	Relevant – Overlaps with a Not Protected ecosystems	3.1.1.2
Protected Areas	Irrelevant – Located approximately 12 km West from the Glen Lyon Nature Reserve	3.1.1.3
National Protected Areas Expansion Strategy (NPAES)	Relevant – Overlaps the Western Karoo NPAES focus area	3.1.1.3
Western Cape Biodiversity Spatial Plan (BSP)	Relevant – Overlaps Critical Biodiversity Area 1 and Ecological Support Areas 1&2	**Error! Reference source not found.**
Hydrological Context	Relevant – Located within an Upstream Management Area	3.1.1.5

3.1.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the PAOI overlaps with LC ecosystems (Figure 3-1).

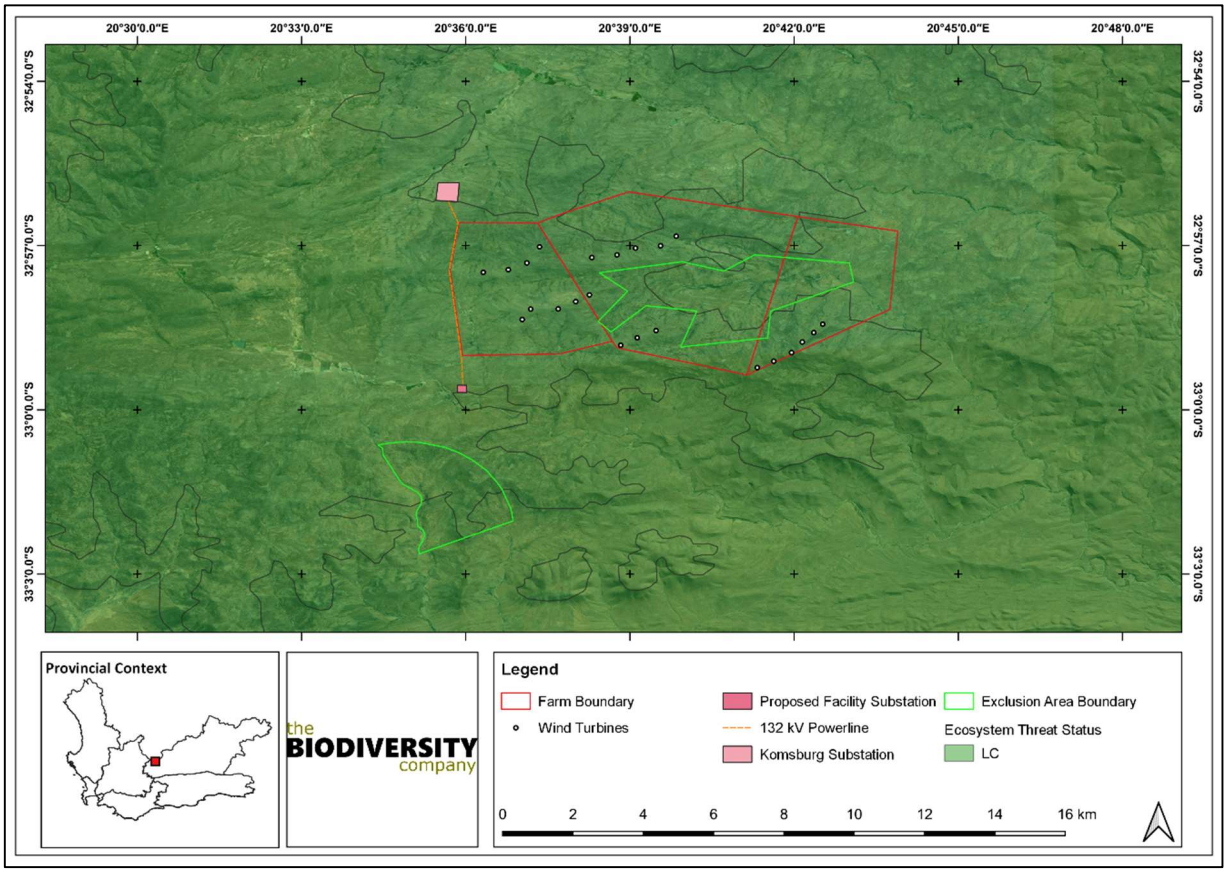


Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed Esizayo Wind Energy Facility Expansion Area PAOI

3.1.1.2 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with NP ecosystems (Figure 3-2).

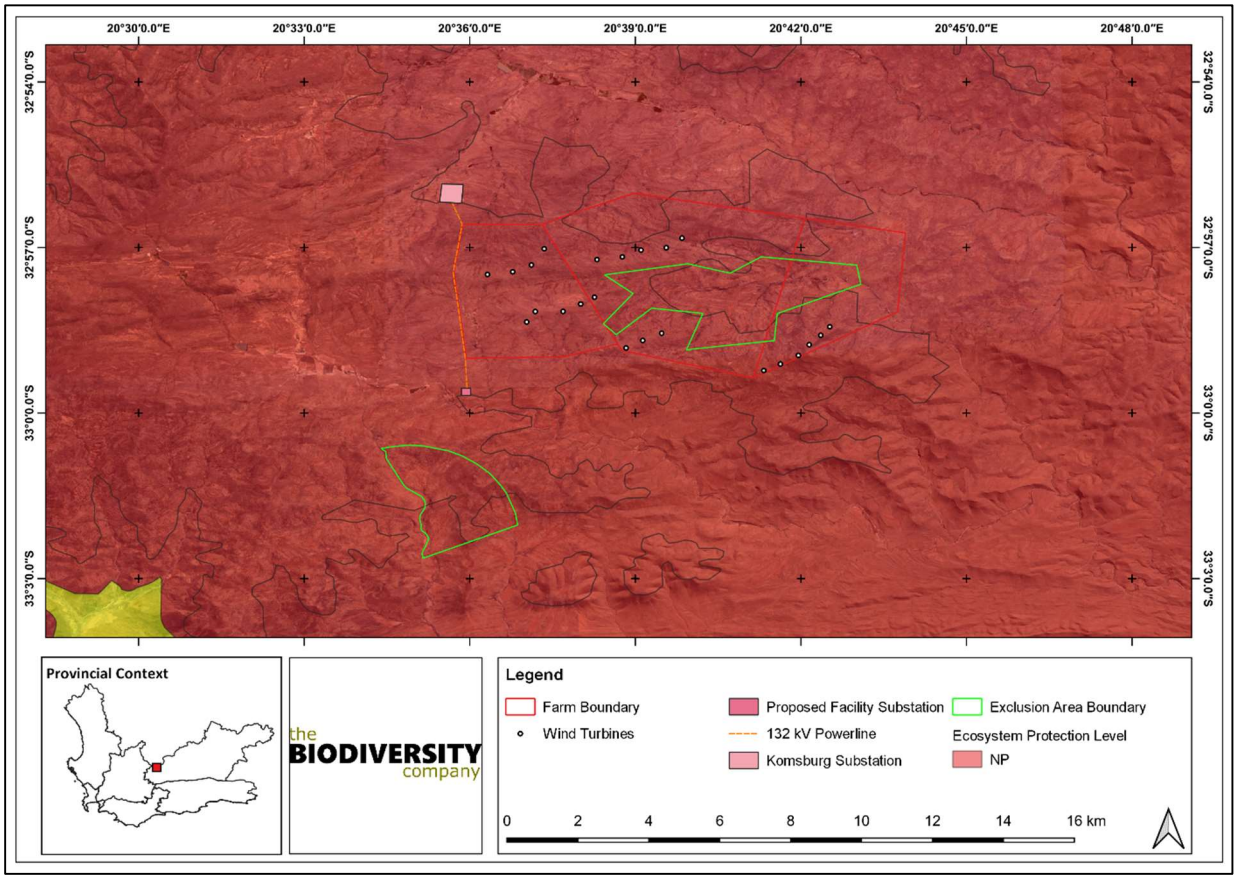


Figure 3-2 Map illustrating the ecosystem protection level associated with the proposed Esizayo Wind Energy Facility Expansion Area PAOI

3.1.1.3 Protected Areas

According to the SACAD and SAPAD dataset (DFFE, 2021a), the proposed development area does not occur within any protected area (Figure 3-3). The Witteberg Nature Reserve, Anysberg Provincial Nature Reserve and Zuurkloof Private Nature Reserve are located approximately 35 km to the south. These are located within the Gouritz Cluster Biosphere Reserve, which is an Internationally recognised conservation area. The proposed development is unlikely to influence these protected areas as they are situated outside of the buffer zone required to maintain the functioning of protected areas. Nevertheless, the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area. In the NPAES, an area is considered important for the expansion of the land-based protected area network if it contributes to one or more of the following:

- meeting biodiversity thresholds for terrestrial or freshwater ecosystems;
- maintaining ecological processes; and
- resilience to climate change.

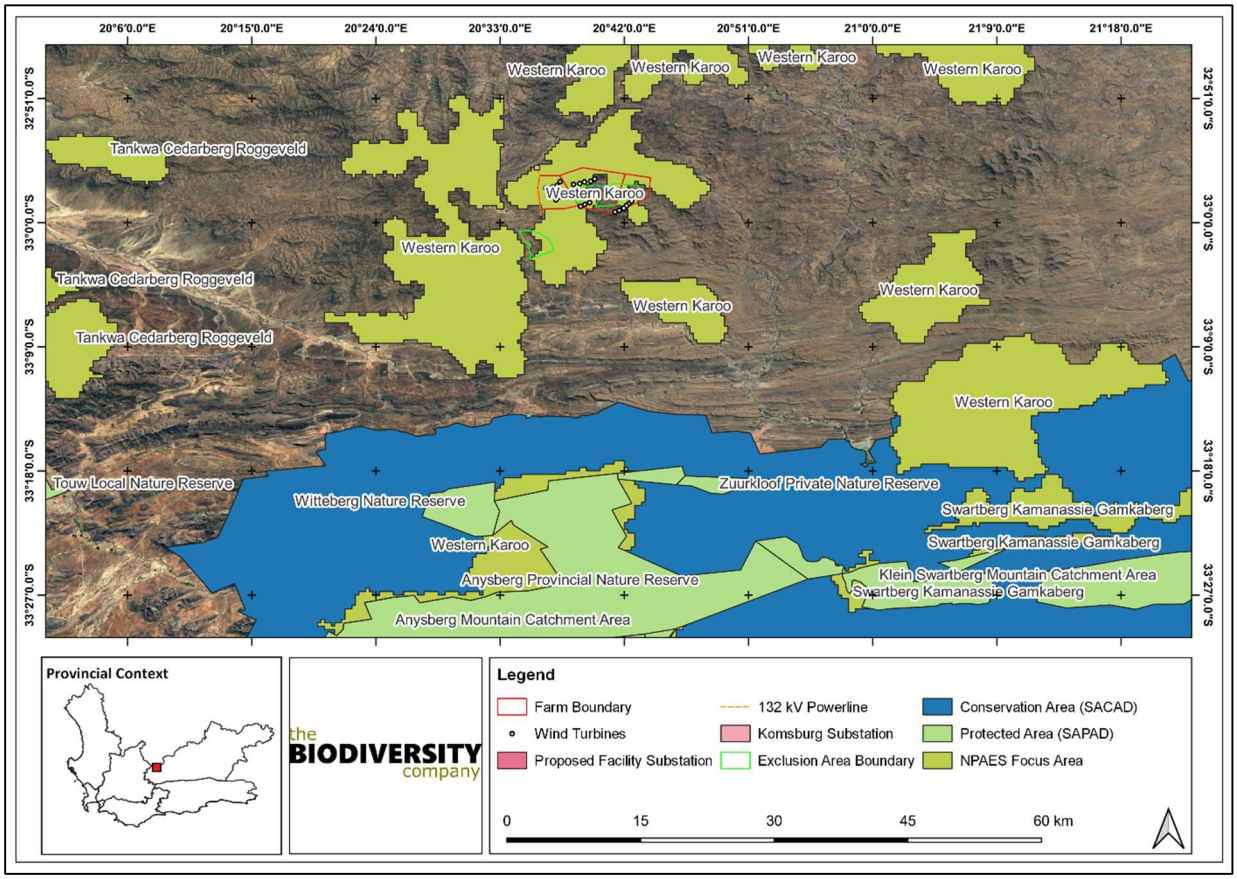


Figure 3-3 Map illustrating the location of protected areas proximal to the proposed Esizayo Wind Energy Facility Expansion Area PAOI

3.1.1.4 Western Cape Biodiversity Spatial Plan

Figure 3-4 illustrates the proposed development overlaid onto the Western Cape BSP spatial file. Figure 3-4 indicates that the PAOI overlaps with a Critical Biodiversity Area 1 (CBA1), Ecological Support Areas 1 and 2 (ESA1 and ESA2) and Other Natural Areas (ONAs). The definition of these categories and their respective management objective as provided in Pool *et al* (2017) are summarised in Table 3-2.

The BSP features that overlap the PAOI were categorised as such due to the presence of threatened vertebrates and watercourse protection. The proposed development will result in the degradation of the ecological condition of the habitats within the PAOI as well as further threaten SCC, and therefore, the area will no longer be regarded as a CBA. Notably, most of the CBA is located external to the exclusion and therefore, this exclusion area is not effective in maintaining the integrity of the CBA.

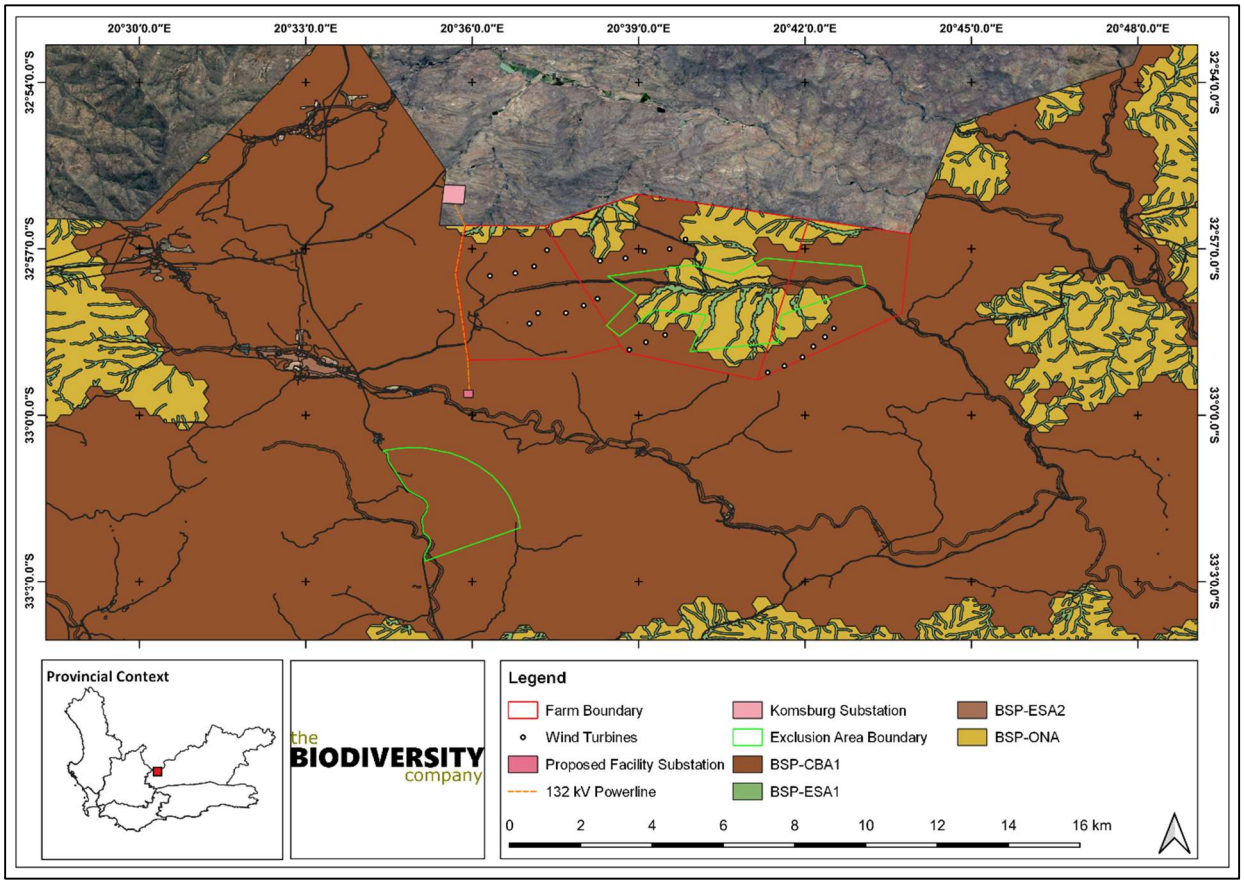


Figure 3-4 Map illustrating the proposed Esizayo Wind Energy Facility Expansion Area PAOI overlaid onto the Western Cape Critical Biodiversity Areas

Table 3-2 Summary of Biodiversity Spatial Plan categories within the context of the Esizayo Wind Energy Facility (Pool et al, 2017)

Category	Definition	Management Objective
CBA1	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
ESA1	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
ESA2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Restore and/or manage to minimise impact on ecological infrastructure functioning, especially soil and water-related services.
ONAs	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.

3.1.1.5 Hydrological Context

The PAOI is located within the Gamka Catchment i.e., secondary catchment J2. The watercourses in the PAOI are characterised as non-perennial system, with an unnamed tributary of the Roggeveld River traversing the PAOI (Figure 3-5).

The ETS is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. The threat status of the unnamed tributary and the associated reach of the Roggeveld River is categorised as LC (Figure 3-5). In addition, the associated wetland systems are also categorised as LC.

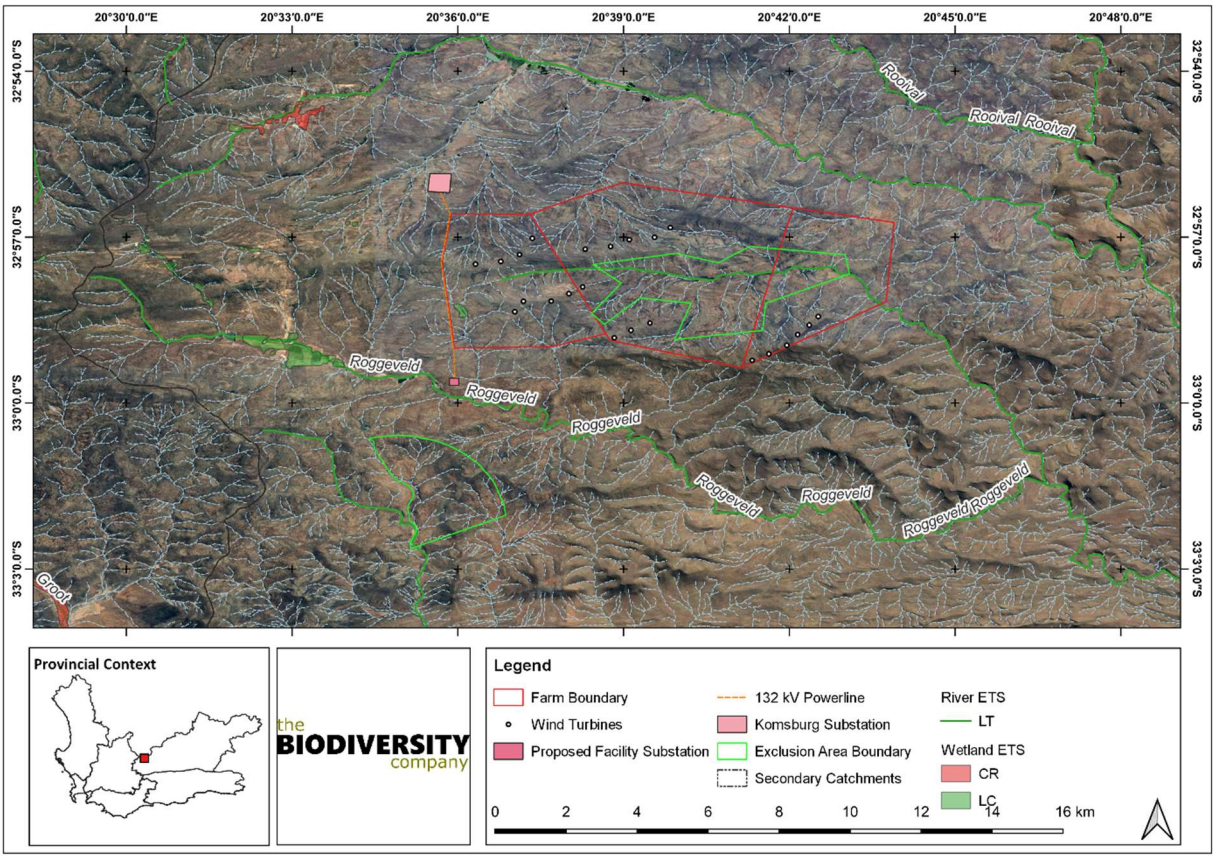


Figure 3-5 Map illustrating the Ecosystem Threat Status of the Orange River reach proximal to the proposed Esizayo Wind Energy Facility Expansion Area PAOI

The National Freshwater Ecosystem Priority Area (NFEPA) database forms part of a comprehensive approach of the sustainable and equitable development of South Africa's scarce water resources. The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.,* 2011). The Roggeveld River and the associated unnamed tributary traversing the PAOI are categorised as Upstream Management Areas. Potential impacts arising from the proposed development such as petrochemical spills from heavy machinery and erosion

will negatively impact the functioning of these systems, thereby impeding their ability as functioning as important upstream resources.

3.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

3.1.2.1 Vegetation Type

The proposed development is situated within the Renosterveld ecosystem of the Fynbos Biome and the Rainshadow Valley Karoo of the Succulent Karoo Biome. Renosterveld typically occurs on nutrient-rich and less-leached shale and granite-derived soils on the lowlands of the coastal plain inland of the acid sand plains and also further inland of the Cape Fold Mountains where there is a transition to Nama and Succulent Karoo. Rensoterveld is an evergreen, fire-prone shrubland dominated by evergreen asteraceous shrubs, principally *Dicerothamnus rhinocerotis*, and possesses a high biomass and diversity of geophytes. The proposed development overlaps with Shale Renosterveld. This broad-scale vegetation type accounts for 86% of the total area of Renosterveld. Rainfall patterns permit a relatively high proportion of grass cover and abundance of non-succulent shrubs, and therefore, the structure of the vegetation is more congruent with proximal karoo types than other Renosterveld types.

A landscape-scale ecosystem process that is important for maintaining the wellbeing of Renosterveld is fire. Fire is a disturbance that creates gaps in plant communities which provide space for plant establishment. Disturbance by fire can contribute to the maintenance of diversity and spatial heterogeneity by impeding competitive exclusion. In addition, the ethylene gas produced from veld fires stimulates flowering and the karrikins within the smoke stimulates seed germination. Regarding the dynamics of Mountain Renosterveld, vegetation cover begins to re-establish within the first nine months following the fire and remains at a relatively high level from years 3 to 10 (van der Merwe & van Rooyen, 2011). There is a distinctive species composition between the first two years (years 1 and 2) following the fire and the remaining years (year 3 to 10).

The Succulent Karoo encompasses an interrupted belt from the coastal regions near Lüderitz, Namaqualand (on and west of the Escarpment), the Hantam, Tanqua and Roggeveld region and the Little Karoo. The Succulent Karoo Biome is biologically distinct on a global scale with a high level of endemism. This vegetation type is characterised by a dominance of succulent species, particularly from the families Aizoaceae, Crassulaceae and Euphorbiaceae. Moreover, there are leaf succulents in families not typically associated with succulent growth forms. The Succulent Karoo is also a recognised global biodiversity hotspot and is considered the most diverse arid region in the world (www.conservation.org). This diversity and endemism of flora in turn support a high diversity and level of endemism of faunal groups.

On a fine-scale vegetation type, the PAOI overlaps with two vegetation types, namely the Central Mountain Shale Renosterveld and Koedoesberge-Moordenaars Karoo (Figure 3-6). Central Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and south-eastern slopes of the Klein Roggeveldberge and Komsberg, below the Komsberg section of the Great Escarpment, as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area.

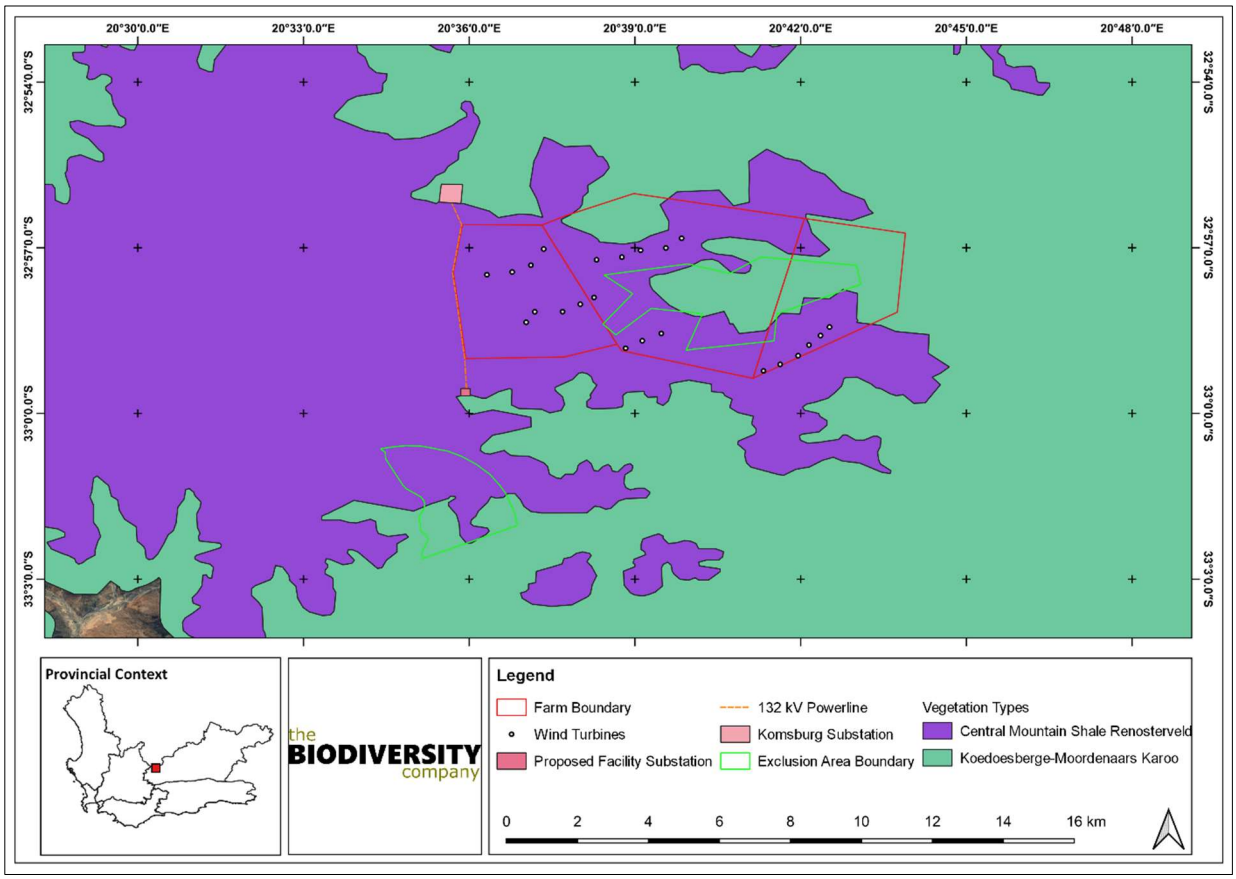


Figure 3-6 Map illustrating the vegetation types within the proposed Esizayo Wind Energy Facility Expansion Area PAOI

The ecology of Central Mountain Shale Renosterveld type is poorly known. This vegetation type is described as follows:

- Topography – Slopes and broad ridges of low mountains and escarpments.
- Geology – Clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones. Glenrosa and Mispah forms are prominent.
- Climate – Arid to semi-arid climate. MAP 180 – 410 mm, with relatively even rainfall throughout the seasons, albeit minimally elevated during Autumn-Winter. Mean daily maximum and minimum temperatures 29.9˚C and 0.9 ˚C for January and July, respectively.
- Important Taxa – Low shrubs: *Elytropappus rhinocerotis, Diospyros austro-africana, Eriocephalus africanus* var. *africanus, E. ericoides* subsp. *ericoides, E. grandifloras, Felicia ovata, Pteronia glauca, P. incana, P. sordida, Zygophyllum spinosum*. Succulent shrubs: *Delosperma subincanum, Drosanthemum lique, Euphorbia stolonifera, Trichodiadema barbatum, Tylecodon reticulatus* subsp. *reticulatus, T. wallichi* subsp. *wallichi*. Geophytic herbs: *Bulbine asphodeloides, Drimia intricate, Othonna auriculifolia, Oxalis obtusa.* Succulent Herbs: *Crassula deceptor, C. muscosa, C. tomentosa* var. *glabrifolia, Senecio radicans.* There does not appear to be any species endemic to this vegetation type.

This Koedoesberge-Moordenaars Karoo vegetation type is described as follows:

- Topography – Slightly undulating to hilly landscape.
- Geology – Mudstone, shale and sandstone of the Adelaide Subgroup, accompanied by sandstone, shale and mudstone of the Permian Waterford Formation and sandstone and shale of other Ecca Group Formations as well as Dwyka Group diamictites. This geology gives rise to shallow, skeletal soils.
- Climate – Mean annual precipitation approximately 200 mm. Mean annual temperature is 16 °C.
- Biogeographically Important Taxa – Succulent Shrubs: *Deilanthe peersii, Hereroa crassa, Pleiospilos nelii, Rhinephyllum graniforme, Ruschia crassa, R. perfoliata*. Low Shrubs: *Felicia lasiocarpa, Sericocoma pungens*. Herbs: *Helichrysum cerastoides* var. *aurosicum, Ifloga molluginoides*. Geophytic Herbs: *Brunsvigia comptonii, Drimia karooica*. Succulent Herbs: *Aloe longistyla, Crassula hemispaerica, Pectinaria comptus, Quaqua parviflora* subsp. *gracilis, Tridentata parvipuncta* subsp. *parvipuncta*.
- Endemic Taxa – Succulent Shrubs: *Antimima karroidea, A. loganii, Calamophyllum teretiusculum, Cerochlamys gemina, Drosanthemum comptonii, Rushcia karrooica, Tanquana archeri, Trichodiadema halii, Tylecodon faucium.* Low Shrub: *Pelargonium stipulaceum* subsp. *ovatostipulatum*. Semiparasitic Shrub: *Thesium marlothii*. Geophytic Herbs: *Lachenalia comptonii, Strumaria undulata.* Succulent Herbs: *Haworthia nortieri* var. *pehlemanniae*.

3.1.2.2 Expected Flora Species of Conservation Concern

The POSA database indicates that 225 species of indigenous plants are expected to occur within the PAOI and surrounding landscape. Appendix B provides the list of species and their respective conservation status and endemism. Based on the POSA database and the reports reviewed, ten (10) flora SCC are expected to occur within the PAOI (Table 3-3). All of these expected SCC are endemic to South Africa. The likelihood of occurrence was determined by considering the species habitat requirements and examining records on the Global Biodiversity Information Facility (GBIF) database.

Table 3-3 Threatened flora species that may occur within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. DD = Data Deficient – Taxonomically Problematic, EN = Endangered, NT = Near Threatened and VU = Vulnerable

Family	Species Name	Conservation Status	Endemism	Habitat	Likelihood of Occurrence
Aizoaceae	*Antimima pumila*	DDT	Endemic	Rocky slopes, possibly favouring south-facing slopes.	Confirmed
Asteraceae	*Eriocephalus grandiflorus*	Rare	Endemic	Lower foothills in quartz patches.	High
Crassulaceae	*Adromischus mammillaris*	EN	Endemic	Lower gravely slopes. EOO 500 km², known only from two locations.	High
Fabaceae	*Lotononis venosa*	EN	Endemic	Open karroid scrub on sandy clay alluvium. Known only from four locations. Extent of occurrence 84 km² and area of occupancy 16 km².	Moderate
Geraniaceae	*Pelargonium denticulatum*	Rare	Endemic	Sandy soils near mountain streams.	High
Hyacinthaceae	*Lachenalia longituba*	VU	Endemic	Stony clay in seasonally wet, boggy sites that bake rock hard in summer. Known from five locations. EOO 350 km², AOO <20 km².	Moderate
Iridaceae	*Geissorhiza karooica*	NT	Endemic	Coarse shale slopes. Known from six locations. EOO 497 km²	High
Iridaceae	*Ixia mollis*	VU	Endemic	Among rocks on seasonally moist south-facing sandy or clay slopes. Known from only five locations in the Olifants River Valley between Clanwilliam and Citrusdal and the western Cederberg. EOO 74 km²	Low
Iridaceae	*Romulea eburnea*	VU	Endemic	Shale soils in the Klein Roggeveld. Rare and localised as it known from only two locations.	High
Poaceae	*Ehrharta eburnea*	NT	Endemic	Rocky places in mountain renosterveld.	High

3.1.3 Fauna Assessment

3.1.3.1 Expected Amphibian Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the FrogMAP database, 8 amphibian species are expected to occur within the area with one of these expected species regarded as of conservation concern on a regional scale (Table 3-4).

Table 3-4 Amphibian Species of Conservation Concern that are expected to occur within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. DD = Data Deficient and LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Pyxicephalidae	*Cacosternum karooicum*	Karoo Caco	DD	LC	High

Cacosternum karooicum (Karoo Caco) is listed as DD on a regional scale. The species occurs on shales of the Karoo sequence and its flattened physiognomy suggests that it is lithophilic, aestivating in rock cracks and crevices during long dry periods. Breeding usually takes place in shallow pools in the rocky beds of small, temporary streams and has also been recorded in a small man-made dam along a stream. The main threat is habitat degradation from anthropogenic land use change.

3.1.3.2 Expected Reptile Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 51 reptile species are expected to occur within the area with two of these species regarded as of conservation concern Table 3-5.

Table 3-5 Reptile Species of Conservation Concern that are expected to occur within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. EN = Endangered and NT = Near Threatened

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Testudinidae	*Chersobius boulengeri*	Karoo Dwarf Tortoise	EN	EN	Confirmed
Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	NT	NT	High

Chersobius boulengeri (Karoo Dwarf Tortoise) is a South African endemic, occurring from Bruintjieshoogte in the Eastern Cape to Touwsrivier in the Western Cape; the range in the Northern Cape extends north of Williston in the northwest and beyond Vosburg in the northeast. *Chersobius boulengeri* is a habitat specialist and population densities are low and are isolated on rocky outcrops with specialized vegetation. There is no estimate of the global population, but surveys have indicated that many populations have disappeared, and population numbers have declined significantly (Hofmeyr *et al*, 2018a). In addition, the total population is severely fragmented. The principal threat is habitat degradation due to agricultural overgrazing and climate change. Shale gas exploration is an emerging serious threat.

Psammobates tentorius verroxii (Verrox's Tent Tortoise) is widely distributed throughout the Nama Karoo in the Northern Cape and penetrates the Western Cape and possibly the Eastern Cape peripherally. The species has been exhibiting declines and is therefore regarded as NT (Hofmeyer *et al*, 2018b). There is no estimate on the total global population. Threats include road mortality, veld fires, electrocution by livestock/game fences, overgrazing from domestic livestock, uncontrolled harvesting of natural products and irresponsible tourism activities in sensitive areas. Available information indicates that Pied Crow (*Corvus albus*) predation on this is increasingly severe, with anthropogenic facilitation of Pied Crow range expansion having led to increased predation rates (Hofmeyr *et al*, 2018b).

3.1.3.3 Expected Mammal Species of Conservation Concern

The IUCN Red List Spatial Data indicates that 47 mammal species are expected to occur within the PAOI. This list excludes larger mammal species that are generally restricted to protected areas and volant mammal species which were not considered in this assessment. Eight (8) mammal SCC could be expected to occur within the PAOI (Table 3-6).

Table 3-6 Mammal Species of Conservation Concern that are expected to occur within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. NT= Near Threatened and VU = Vulnerable

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Bovidae	*Pelea capreolus*	Grey Rhebok	NT	NT	Confirmed
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	Moderate
Felidae	*Leptailurus serval*	Serval	NT	LC	Low
Felidae	*Panthera pardus*	Leopard	VU	VU	Low
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC	Confirmed
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	CR	CR	Low
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT	Low
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	NT	LC	High

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa. This species is predominantly aquatic, and it is seldom found far from water. The main threat to the species is the declining state of freshwater ecosystems in Africa (Jacques *et al*, 2015). In parts of their range, they are killed for skins and other body parts, because they are regarded as competitors for food, particularly in rural areas where fishing is an important source of income, or where they are believed to be responsible for poultry losses, and damage to young maize plants.

Bunolagus monticularis (Riverine Rabbit) is endemic to the central Karoo region of South Africa. It is associated with the dense, discontinuous riparian vegetation fringing the seasonal rivers. It is dependent on soft and deep alluvial soils along the river courses for constructing stable breeding stops. The majority of Riverine Rabbit occupancy lies in the Upper Karoo Bioregion (approximately 80%), with about 12% in the Rainshadow Valley Karoo Bioregion, 4% in the Trans-Escarpment Succulent Karoo Bioregion, 3% the in Western Fynbos-Renosterveld Bioregion and 1% in the Lower Karoo Bioregion. Many of the subpopulations are now extinct and the latest estimated Area of Occupancy is only 2 943 km^2 comprising of 12 sub-populations (Collins *et al*, 2019). The total global population is estimated at 157-207 mature individuals with a continuing decline. Subpopulations are isolated from each other by jackal-proof fencing and severe land transformation through agricultural practices. All these subpopulations are estimated to contain less than 50 mature individuals (8–46 mature individuals, based on independent sightings in each river system). Sub-populations face significant threats from ongoing habitat degradation and fragmentation due to land-use practices, such as livestock farming and new emerging habitat-transforming land uses, such as climate change and energy development (Collins *et al*, 2019). Reduction in streamflow due to the construction of impoundments has presumably also reduced habitat quality.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The estimated number of mature individuals is 9 707, with the population exhibiting a continuing decline (Sliwa *et al*, 2016). The principle long-term threat for the species is the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation (Sliwa *et al*, 2016). An additional threat is indirect persecution, such as accidental poisonings (for example locust spraying, predator control lures/baits) and general predator persecution throughout most of their range. The long-term effects of climate change should not be overlooked and may lead to changes in range, changes in timing of breeding events, increases in severe weather such as flooding and droughts, as well as increased disease patterns or risks of the spread of pathogens from parasites. The likelihood of occurrence for the species within the PAOI was rated as 'High', due to the presence of suitable habitat, burrows and available prey.

Graphiurus ocularis (Spectacled Dormouse) is endemic to South Africa, where it occurs widely in Northern Cape, Eastern Cape, and Western Cape provinces. The species is associated with the sandstone formations, which have many vertical and horizontal cracks and crevices which provide shelter and nesting sites. The current population size is not known, but the species is not regarded as common densities ranging between 1.8 and 3.1 individuals/ha (Wilson *et al*, 2016). While the reporting frequency has been stable over the 10 years (1.2 ± 0.4 records / year) since 2005, it is 53% lower on average (2.5 ± 1.9 records / year) than the 10-year reporting frequency for the previous national assessment. Threats include ongoing habitat loss and habitat fragmentation, because of plantations and vineyards, that may impact immigration and gene flow between isolated habitats (Wilson *et al*, 2016). In addition, climate change may further shrink its range southwards.

Leptailurus serval serval (Southern Serval) is widely distributed throughout sub-Saharan Africa but has specific habitat requirements and therefore restricted to certain areas. Thy typically favour savanna long-grass environments in high rainfall areas and are particularly associated with reedbeds and other riparian vegetation types (Thiel, 2019). The global population number is unknown. *L. serval* specializes in preying on small mammals, particularly rodents. The major threat is wetland habitat loss and degradation. Wetlands harbour comparatively high rodent densities compared with other habitat types and form the core areas of *L. serval* home ranges (Thiel, 2019). Degradation of grasslands through annual burning followed by over-grazing by domestic livestock, leading to reduced abundance of small mammals is a further threat.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (Stein *et al*, 2020). There are few reliable data on changes in the status (distribution or abundance) throughout Africa over the last three generations, although there is compelling evidence that subpopulations have likely declined considerably. Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (Stein *et al*, 2020).

Pelea capreolus (Grey Rhebok) is a South African endemic and is patchily distributed in areas with rocky hills and grassy mountain slopes, as well as plateau grasslands in the eastern extent of their distribution. The species requires good grass cover within their home ranges for shelter and to hide from predators, but often use steep open areas with little cover when feeding. The

global population is estimated to be a minimum of 2 000 individuals in formally protected areas, but further research is needed to determine whether there are over 10 000 individuals across its range (Taylor *et al*, 2017). The largest known subpopulations occur in the Maloti-Drakensberg Park World Heritage Site, where numbers were estimated to be 2 000-3 000 in 1994, but which are thought to have declined by at least 15-20%. The primary threat is suspected to be increased levels of bushmeat and illegal sport hunting with dogs. Habitat degradation is a further threat, either due to climate-change or land-use change (Taylor *et al*, 2017). This species is protected by provincial legislation.

Poecilogale albinucha (African Striped Weasel) is widely distributed throughout sub-saharan Africa and ranges from southwestern Uganda and Kenya to the Western Cape in South Africa. It is regarded as rare to uncommon, with highest densities reached in moist higher rainfall grasslands (Stuart *et al*, 2015). There are no major threats to the species, but it is hunted for use in traditional medicines.

3.2 Field Assessment

The following sections provides the results from the field survey for the proposed development that was undertaken during February 2022.

3.2.1 Flora Assessment

3.2.1.1 Indigenous Flora

The species composition of the PAOI was consistent with typical Central Mountain Shale Renosterveld and Koedesberge-Moordenaars Karoo. Given that the survey was undertaken during the dry season, the species diversity observed was under-represented than during Spring (September-October). Dominant species observed within the PAOI comprised of *Dicerothamnus rhinocerotis, Euryops lateriflorus*, *Pteronia incana* and *Ruschia intricata*. Figure 3-7 provides photographs of the species recorded within the PAOI. Based on the observations made by the specialist during previous surveys and a review of the reports mentioned in section 2.2.4 of this report, geophytes and succulent growth forms are ubiquitous throughout the landscape. However, many of the geophytes were dormant during the field survey. The species protected under Western Cape legislation relevant to the proposed development area comprise of the following:

- All species of Amaryllidaceae;
- All species of Asphodelaceae;
- The following species of Crassulaceae;
    - *Crassula columnaris;*
    - *Crassula falcata;*
    - *Crassula perfoliata;* and
    - *Crassula pyramidalis*.
- All species Iridaceae;

- All species of Aizoaceae;
- All *Colchicum* (Colchicaceae);
- All *Lachenalia* spp. (Hyacinthaceae);
- All species in the genus *Anacampseros;* and
- *Oxalis nutans* (Oxalidaceae).

As aforementioned in section 3.1.2.2 of this report, *Antimima pumila* (Aizoaceae), a species classified as DDT, was confirmed to occur within the PAOI. In addition to this species, a possible flora SCC was recorded within the PAOI. However, identification to species level is presently challenging as all specimens observed were in a dormant state. It is therefore recommended that an additional survey be undertaken during the wet season to confirm the species identification. Furthermore, an additional SCC was recorded within the proximal landscape, but it is uncertain if it occurs within the PAOI (Table 3-7).

Table 3-7 Indigenous flora Species of Conservation Concern recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and surrounding landscape during the survey period

Family	Species Name	Conservation Status	Endemism	Ecology
Aizoaceae	*Antimima cf. leipoldtii*	VU B1ab(ii,iii,iv,v)	Endemic	Presently known from 6 locations. Mainly on loamy flats or on gentle quartzitic slopes.
Amaryllidaceae	*Brunsvigia josephinae*	VU A2c; C2a(i)	Endemic	Geophyte that occurs as widely scattered subpopulations in lowland areas. Herbarium specimens record about 18 subpopulations, and it is estimated that a further 70 unrecorded subpopulations may exist. All subpopulations consist of fewer than 50 adult plants and are declining due to collection on an ongoing basis for medicinal purposes and habitat loss to agriculture. The species is restricted to heavy clay soils and as such was not observed within the PAOI, albeit if these micro-habitats are present (none were observed during the field survey), it is likely to occur at the site.

Figure 3-7 ***Photographs illustrating examples of the flora recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI during the survey period. A) Tylecodon wallichii, B) Antimima pumila, C) Pelargonium carnosum, D) Crassula deltoidea, E) Pelargonium pillansii, F) Cheiridopsis namaquensis, G) Crassula columnaris, H) Pelargonium abrotanifolium, I) Pleiospilos compactus, J) Crassula tomentosa, K) Antimima cf. leipoldtii and L) Afroscirpoides dioeca***

3.2.1.2 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued;
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued;
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones; and
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act.

Five (5) IAP species were recorded within the PAOI (Table 3-8), albeit only in heavily degraded areas around old homesteads and kraals. Moreover, *Erodium moschatum*, although not a listed invasive, was prevalent within the PAOI. Invasive species tend to encroach into disturbed areas and must be considered a possible risk.

Table 3-8 Summary of Invasive Alien Plants (IAPs) recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI

Species	Growth Form	NEMBA Category	Control
Erodium moschatum	Herb	-	Physical removal ensuring root system is removed.
Eucalyptus camaldulensis	Large tree	1b	Physical removal of seedlings or felling and stump herbicide treatment for large specimens
Populus x *canescens*	Large tree	2	Physical removal of seedlings or felling and stump herbicide treatment for large specimens
Schinus terebinthifolius	Large tree	3 (WC)	Physical removal of seedlings ensuring root system is removed. Large specimens to be felled and stump treated with herbicide.
Opuntia ficus indica	Succulent tree	1b	Physical removal of seedlings ensuring root system is removed. Large specimens to be treated with herbicide ensuring all plant material removed from site.

3.2.2 Fauna Assessment

3.2.2.1 Formicidae

Ten (10) species of Formicidae, representing two sub-families, were recorded within the PAOI (Table 3-9). Considering that only active sampling was utilised during the survey period, it is highly likely that there are species present within the PAOI that would have not been recorded during the field survey. The ecological condition of the PAOI was not regarded as natural due to the prevalence of the graminoids *Tenaxia disticha* (Mountain Wire Grass) and *Tenaxia stricta* (Bokbaardgras), sub-climax species that indicate over-grazing. Nevertheless, in consideration that a relatively species rich Formicidae assemblage was recorded using only active methods, and that the community is not dominated by a single or few species, denotes that the ecological condition within the PAOI is near-natural.

The Formicidae community within the PAOI and proximal landscape are vital biotic ecosystem components. A single Myrmicinae species, *Anoplolepis custodiens*, is regarded as possibly critical for maintaining the wellbeing of the vegetation as they are distributors of myrmecochorous seeds. Moreover, significantly more seedlings germinate on *Messor capensis* nest-mounds than in inter-mound spaces. A portion of the species recorded are aggressive predators and therefore, likely aid in control of possible pest species.

Table 3-9 Summary of Formicidae recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI

Sub-family	Scientific Name	Common Name	Ecology
Formicinae	*Anoplolepis custodiens*	Large Pugnacious Ant	An aggressive and voracious predator consuming an array of prey items. Distributor of myrmecochorous seeds. Tend to homopterans.
Formicinae	*Anoplolepis steingroeveri*	Small Pugnacious Ant	An aggressive and voracious predator consuming an array of prey items.
Formicinae	*Camponotus maculatus*	Spotted Sugar Ant	Widely distributed with many subspecies but taxonomy needs to be revised. Nocturnal foragers.
Formicinae	*Camponotus mystaceus*	Moustached Sugar Ant	Found in a range of habitats. Limited ecological information known.
Formicinae	*Lepisiota capensis*	Small Black Sugar Ant	Widely distributed species. Tend to homopterans. There are several known super-colonies in southern Africa and have been known to displace the invasive *Linepithema humile* (Argentinian Ant).
Myrmicinae	*Meranoplus peringueyi*	Furry Cautious Ant	Based on locality and habitat data, it is postulated that this species requires natural habitats and is intolerant to heavily degraded and transformed areas. There is limited ecological information available.
Myrmicinae	*Messor capensis*	Common Harvester Ant	Granivorous species that is a distributor of myrmecochorous seeds. Nests are built directly into the ground with considerable mounds of sand excavated and may thus be important in capturing surface runoff in congruency with termite mounds.
Myrmicinae	*Monomorium* sp.	Timid Ant	The species within this genus are predators and general scavengers. Tend to homopterans.
Myrmicinae	*Pheidole capensis*	Brown House Ant	The genus is widespread and ecologically dominant. *Pheidole* are general scavengers and predatoes, feeding on a wide range of prey. *P. capensis* are harvesters and granivorous and may play a role in the distribution of some small-seeded plants.

Figure 3-8 ***Photographs illustrating a portion of the Formicidae species recorded within the within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. A) Pheidole capensis modestior, B) Messor capensis, C) Lepisiota capensis, D) Anoplolepis steingroeveri, E) Anoplolepis custodiens and F) Meranoplus peringueyi***

3.2.2.2 Amphibians

Four (4) amphibian species were recorded within the PAOI and proximal landscape during the survey period (Table 3-10, Figure 3-9). None of the species recorded are regarded as being of conservation concern, albeit all are protected under provincial legislation. While species such as *Amietia poyntoni* and *Xenopus laevis* are dependent on permanent water sources, they are tolerant of anthropogenic environments and therefore able to occupy the farm dams located within the PAOI. Notably, seasonal rainfall that occurred during the survey period triggered activity of the amphibian species observed. Based on the habitat present within the PAOI, all of the expected species are likely to occur within it.

Table 3-10 Summary of amphibian species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and proximal landscape during the survey period. LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Endemism
			Regional	Global	
Bufonidae	*Vandijkophrynus gariepensis*	Karoo Toad	LC	LC	Endemic
Pipidae	*Xenopus laevis*	Common Platanna	LC	LC	-
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	LC	LC	Endemic
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	LC	LC	Endemic

Figure 3-9 Photographs illustrating individuals of the amphibian species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and proximal landscape during the survey period. A) Xenopus laevis, B) Amietia poyntoni, C) Tomopterna delalandii and D) Vandijkophrynus gariepensis

3.2.2.3 Reptiles

Seven (7) species of reptile were recorded within the assessment area during the survey period, accounting for approximately 12% of the expected species (Table 3-11, Figure 3-10). Based on the extent and diversity of fine-scale habitats within the PAOI, it is likely to support a diverse assemblage of reptiles. The lack of species diversity recorded during the field survey is due to the secretive behaviour of many species and therefore, extensive survey periods are required to obtain an accurate representative sample. This is congruent with the findings of previous ecological assessments within the landscape. A single SCC was recorded during the survey period, namely *Chersobius boulengeri* (Karoo Dwarf Tortoise), as indicated in section 3.1.3.2 of this report. It is important to note that previous reports had indicated the species to be NT but the latest assessment has listed it as EN due to a 50% loss of habitat and previously existing subpopulations are no longer viable or have been extirpated.

Table 3-11 Summary of reptile species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI during the survey period. Species of Conservation Concern are highlighted in bold. EN = Endangered and LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Endemism
			Regional	Global	
Agamidae	*Agama atra*	Southern Rock Agama	LC	LC	
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	LC	LC	Near-endemic
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand Lizard	LC	LC	
Pelomedusidae	*Pelomedusa galeata*	Cape Terrapin	LC	LC	Near-endemic
Scincidae	*Trachylepis variegata*	Variegated Skink	LC	LC	
Testudinidae	*Chersina angulata*	Angulate Tortoise	LC	LC	Near-endemic
Testudinidae	***Chersobius boulengeri***	**Karoo Dwarf Tortoise**	**EN**	**EN**	**Endemic**

C. boulengeri has a limited distribution and can be regarded as a Karoo endemic or near endemic as it peripherally occurs within the Albany Thicket biome within the south-east of its distribution range (Hofmeyer *et al*, 2018a). The species typically occupies dolerite ridges and rocky outcrops at altitudes between 800 and 1 500 m above sea level. They usually take shelter under rocks in vegetated areas or in rock crevices, but few rocky sites over the range offer suitable retreats for the species (Hofmeyr *et al*, 2018a). The elevation data for each turbine within the proposed WEF was plotted against the species' preferred elevation range (Figure 3-12). Elevation data for each turbine was extracted using an Aster Digital Elevation Model (https://earthexplorer.usgs.gov). There is a distinctive overlap between the species' preferred elevation range and the altitudinal position of each wind turbine, thereby postulating a direct impact to the local population. Apart from the concern of direct habitat loss, a further impact observed within the PAOI was the increase in Pied Crow activity due to anthropogenic structures within the surrounding landscape. All individuals of the *C. boulengeri* recorded within the PAOI were observed to have been predated by these crows as evidenced by the manner in which the shells had been broken.

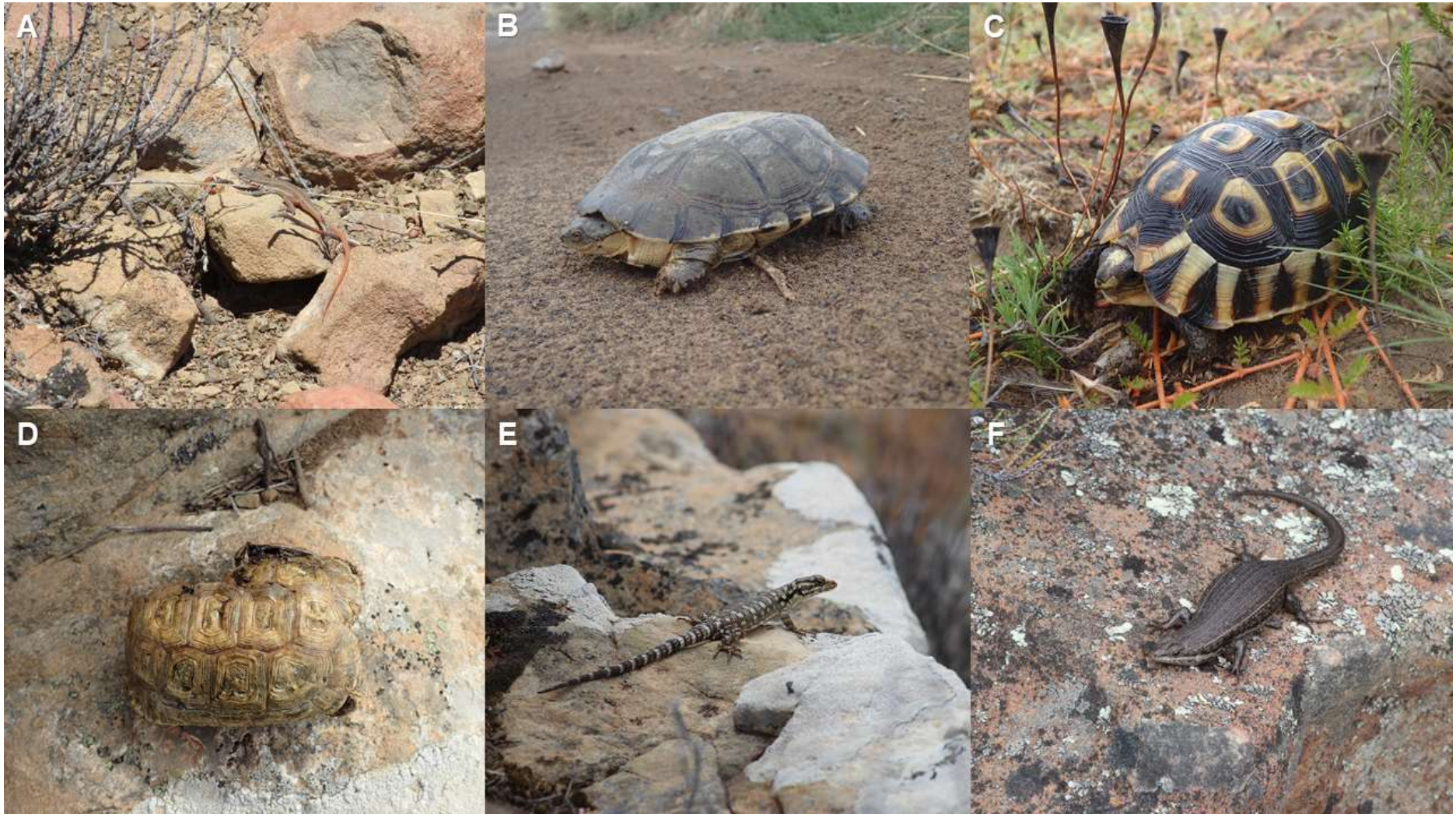


Figure 3-10 ***Photograph illustrating individuals of the reptile species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI during the survey period. A) Naja nivea (Cape Cobra) and B) Pedioplanis inornata (Western Sand Lizard)***

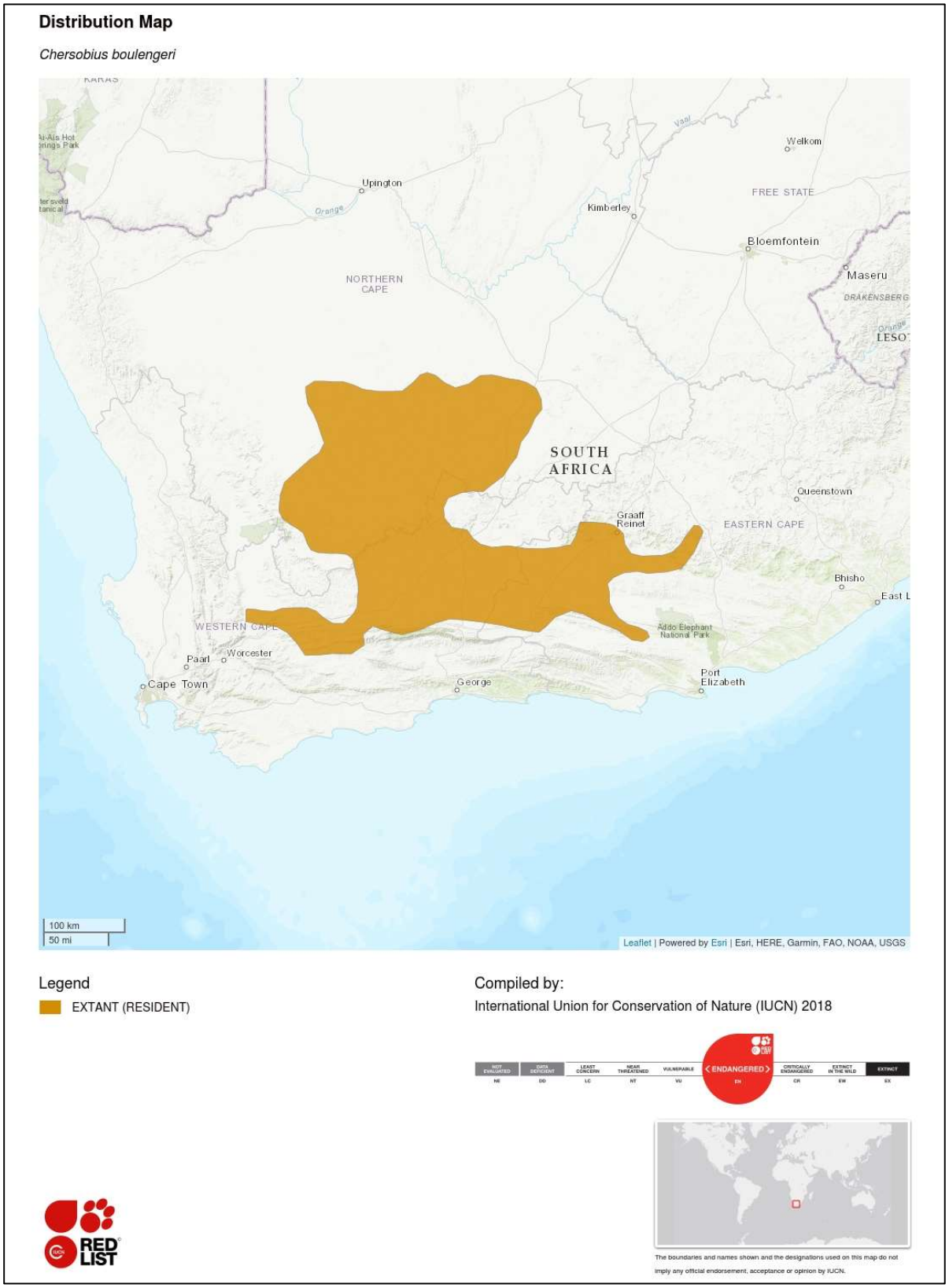


Figure 3-11 Map illustrating the distribution of Chersobius boulengeri (Karoo Dwarf Tortoise). Source: Hofmeyer et al (2018a)

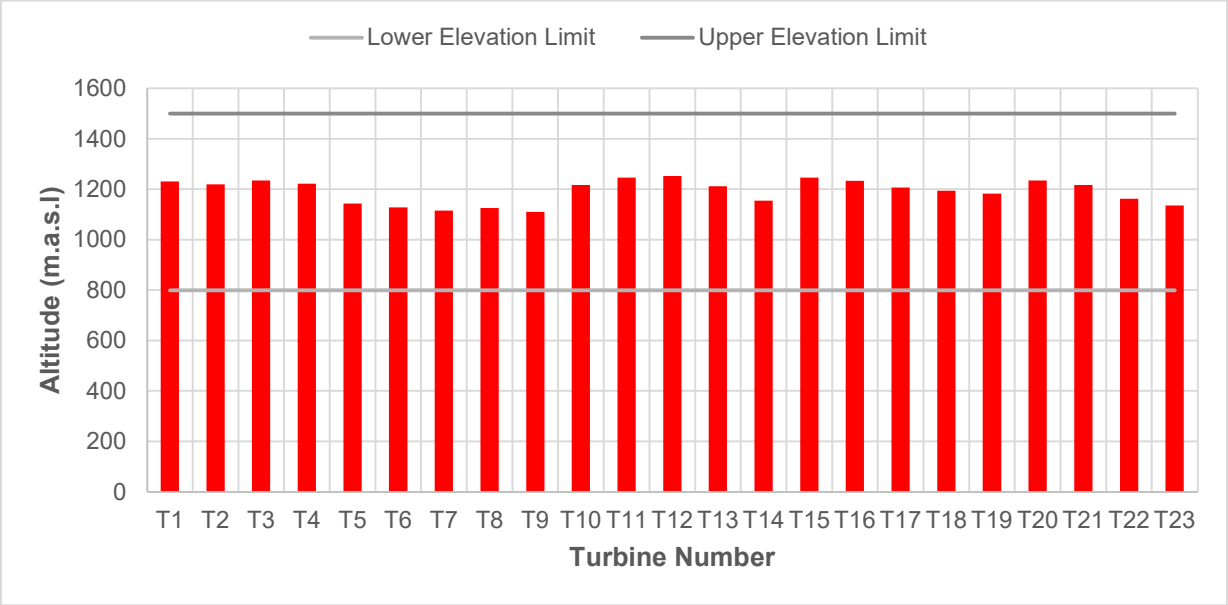


Figure 3-12 ***Line and column plot illustrating the altitude of the proposed Esizayo Wind Energy Facility wind turbines in relation to the lower and upper elevation distribution limits of Chersobius boulengeri (Karoo Dwarf Tortoise). m.a.s.l = meters above sea level***

3.2.2.4 Mammals

Twenty-four (24) non-volant mammal species were recorded during the survey based on either direct observation, capture of specimens by passive sampling techniques or the presence of tracks and other signs (Table 3-12, Figure 3-13). This accounts for approximately 50% of the expected species. Two of the species recorded, *Graphiurus ocularis* (Spectacled Dormouse) and *Pelea capreolus* (Grey Rhebok), are regarded as a SCC as they are listed as NT on either a global or regional scale. See section 3.1.3.3 of this report for further information pertaining to the ecology and conservation of these species. *G. ocularis* were recorded within dolerite outcrops on steep rocky slopes as well as in drainage lines, due to the consolidated nature of the substrate and cavities available. *P. capreolus* tend to occur within higher elevations, albeit it is likely to utilise the entire area in response to seasonal plant growth.

Many are considered important in maintaining biodiversity and ecosystem functioning. *Orycteropus afer afer* (Southern Aardvark) is regarded as an ecosystem engineer and the burrows it creates are also utilised as shelter by an array of faunal species, which is pertinent in the thermally variable and arid environment of the project area (Haussmann *et al*, 2018; Whittington-Jones *et al*, 2011). Typically, maximum temperatures are significantly lower and minimum temperatures and relative humidity values significantly higher inside burrows than outside (Whittington-Jones *et al*, 2011). Active burrows tend to possess a lower species richness of flora in comparison to surrounding areas, due to the constant trampling and excavating, however, flora species richness is higher at disused burrows than surrounding areas (Haussmann *et al*, 2018). This is attributed to the higher seedling survival due to the micro-habitat conditions associated with disused burrows. Therefore, even the areas around the burrows are utilised by many species and can result in a highly diverse arthropod community.

The PAOI and proximal landscape also supports a relatively species rich assemblage of mesocarnivores. Mesocarnivores have strong effects on their prey species, and this especially so in simple ecological communities or in regions where apex predators are lacking (Roemer *et*

al, 2009). Consequently, shifts in the population or diversity of the mesocarnivore community may lead to trophic cascade effects.

Table 3-12 Summary of mammal species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and proximal landscape during the survey period. LC = Least Concern and NT = Near Threatened

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Bathyergidae	*Cryptomys hottentotus*	Common Mole-rat	LC	LC
Bovidae	*Antidorcas marsupialis marsupialis*	Karoo Springbok	LC	LC
Bovidae	*Oreotragus oreotragus oreotragus*	Cape Klipspringer	LC	LC
Bovidae	*Pelea capreolus*	Grey Rhebok	NT	NT
Bovidae	*Raphicerus campestris campestris*	Southern Steenbok	LC	LC
Canidae	*Lupulella mesomelas*	Black-backed Jackal	LC	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox	LC	LC
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC	LC
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC
Herpestidae	*Atilax paludinosus*	Water Mongoose	LC	LC
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC	LC
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	LC	LC
Hystricidae	*Hystrix africaeaustralis africaeaustralis*	Southern Porcupine	LC	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC
Leporidae	*Pronolagus saundersiae*	Hewitt's Red Rock Rabbit	LC	LC
Macroscelididae	*Elephantulus edwardii*	Cape Rock Sengi	LC	LC
Macroscelididae	*Macroscelides proboscideus*	Karoo Round-eared Sengi	LC	LC
Muridae	*Gerbilliscus afra*	Cape Gerbil	LC	LC
Muridae	*Micaelamys namaquensis*	Namaqua Rock Rat	LC	LC
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Mouse	LC	LC
Muridae	*Steatomys krebsii*	Kreb's African Fat Mouse	LC	LC
Nesomyidae	*Malacothrix typica*	Gerbil Mouse	LC	LC
Orycteropodidae	*Orycteropus afer afer*	Southern Aardvark	LC	LC
Procaviidae	*Procavia capensis*	Rock Hyrax	LC	LC

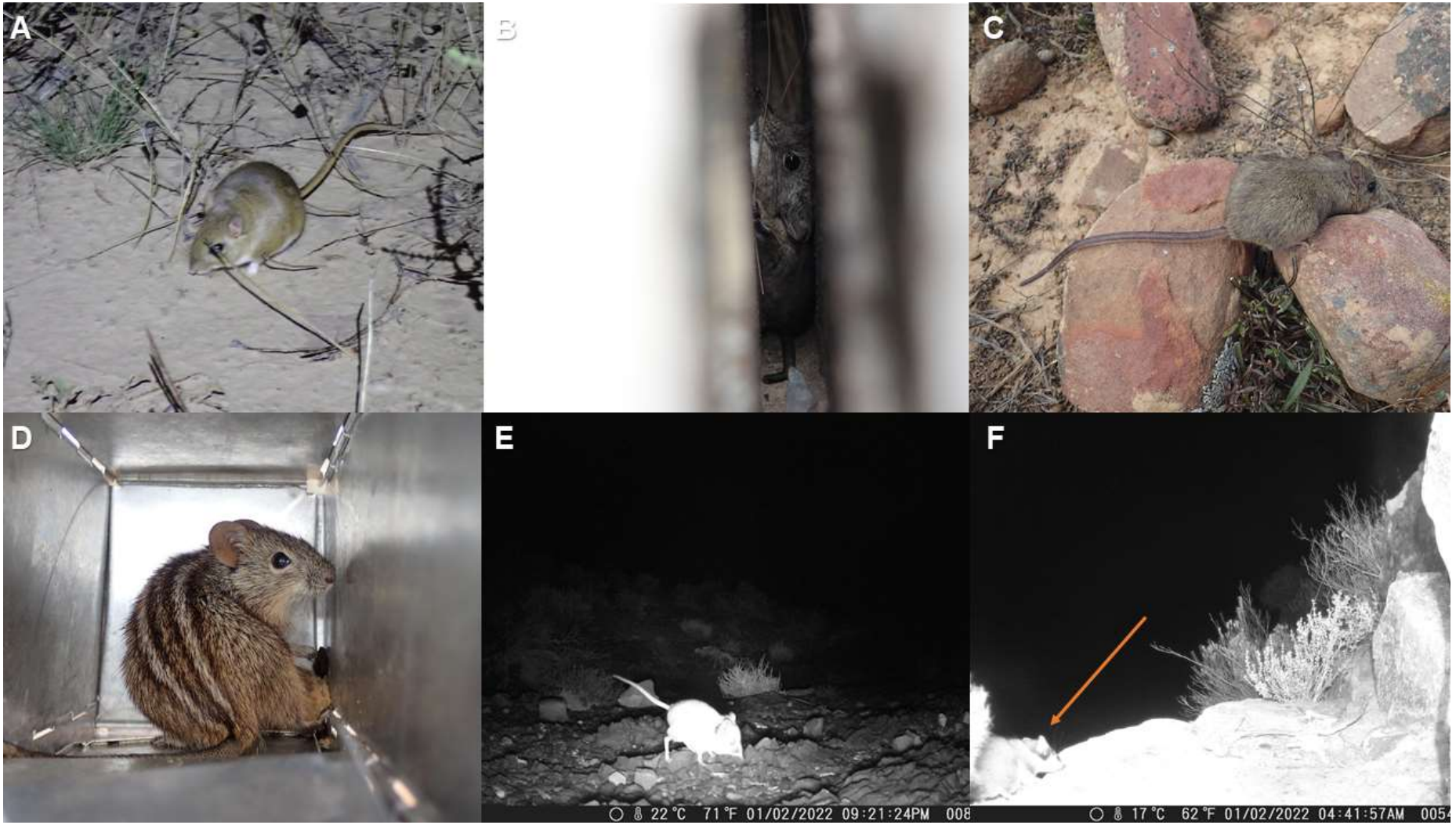


Figure 3-13 ***Photographs illustrating a portion of the mammal species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI during the survey period. A) Gerbilliscus afer (Cape Gerbil), B) Elephantulus edwardii (Cape Rock Sengi), C) Micaelamys namaquensis (Namaqua Rock Rat), D) Rhabdomys pumilio (Xeric Four-striped Mouse), E) Macroscelides proboscideus (Karoo Round-eared Sengi) and F) Graphiurus ocularis (Spectacled Dormouse)***

3.2.2.5 Bats

The original 12-month pre-construction bat monitoring study by Animalia (2016) expired in November 2021, and also did not consider the expansion of the WEF northwards. Additional monitoring is currently being undertaken Inkululeko Wildlife Services (IWS, 2022) to now consider and include the turbine dimensions and expansion area.

Current monitoring (IWS, 2022) has recorded namely the Egyptian Free-tailed Bat (*Tadarida aegyptiaca*), Cape Serotine (*Laephotis capensis*), Long-tailed Serotine (*Eptesicus hottentotus*), and the Natal Long-fingered Bat (*Miniopterus natalensis*), the same four bat species were recorded onsite by Animalia (2016).

The Egyptian Free-tailed Bat was the dominant species in turbine rotor sweep height, with almost 100% of recorded calls made by this species at 80 m a.g.l. Near (at approximately 10 m above) ground level, the Egyptian Free-tailed Bat, Cape Serotine, Long-tailed Serotine, and Natal Long-fingered Bat were recorded in descending order of relative (call) abundance. The same two findings were reported by Animalia (2016).

According to the current monitoring (IWS, 2022), the preliminary results have revealed that although there has been no change in onsite bat diversity, and no major change in the patterns of night-time bat activity in summer, the recently recorded levels of onsite bat activity are above average for the area.

4 Habitat Assessment and Site Ecological Importance (SEI)

4.1 Habitat Assessment

The habitat structure within the PAOI was heterogenous, with distinctive variability. Five habitat types were delineated within the PAOI, namely Valley Bottom Plains, Drainage Lines, Moderately Steep Rocky Slopes, Steep Rocky Slopes, and Plateaus. With the exception of drainage lines, these habitats were delineated based on the interaction between elevation and slope (Table 4-1, Figure 4-1). However, these habitats were not distributed disjointedly within the PAOI, and there is overlap and ecotones between them. It is important to note that dolerite extrusions were prevalent within the PAOI and were a feature of all habitats. These micro-habitats were inhabited by a distinct assemblage of flora in comparison to the surrounding habitats. Key flora are those species that generally exhibited a preference for that habitat type. Photographs illustrating habitat physiognomy are provided in Figure 4-2.

Table 4-1 Summary of habitat descriptions within the proposed Esizayo Wind Energy Facility Expansion Area PAOI

Habitat Name	Slope (degrees)	Elevation (categorical position in landscape)	Key Flora
Plain	0.01 – 19.78	Lowest	*Pentzia incana* *Lycium Schizocalyx* *Hermannia cueneifolia*
Plateau	0.01 – 19.78	Upper	*Ruschia intricata* *Pentzia incana* *Elytropappus rhinocerotis* *Ruschia punctulata*
Moderately Steep Rocky Slope	19.78 – 39.55	Low - Mid	*Euryops lateriflorus* *Ruschia intricata* *Antimima pumila* *Crassula columnaris*

Steep Rocky Slope	39.55 – 59.33	Mid - Upper	*Pentzia incana* *Ruschia intricata* *Antimima* spp.
Drainage Line	Varied	Varied	*Cyperus marginatus* *Gnidia scabra* *Selago fourcadei* *Afroscirpoides dioeca*
Dolerite Extrusion	Varied	Varied	*Felicia filifolia* *Crassula subaphylla* *Crassula deltoidea* *Crassula tomentosa* *Pelargonium carnosum*

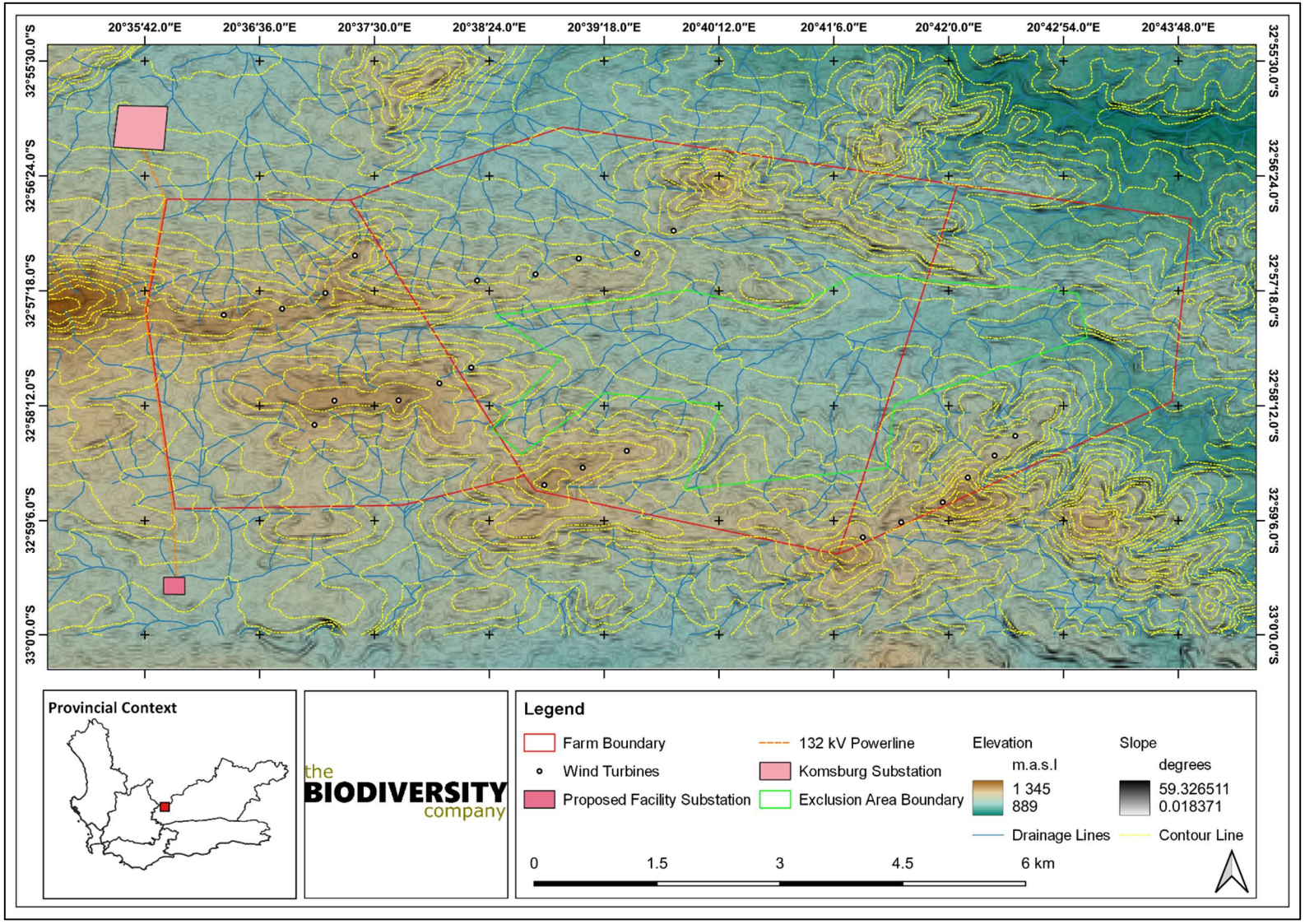
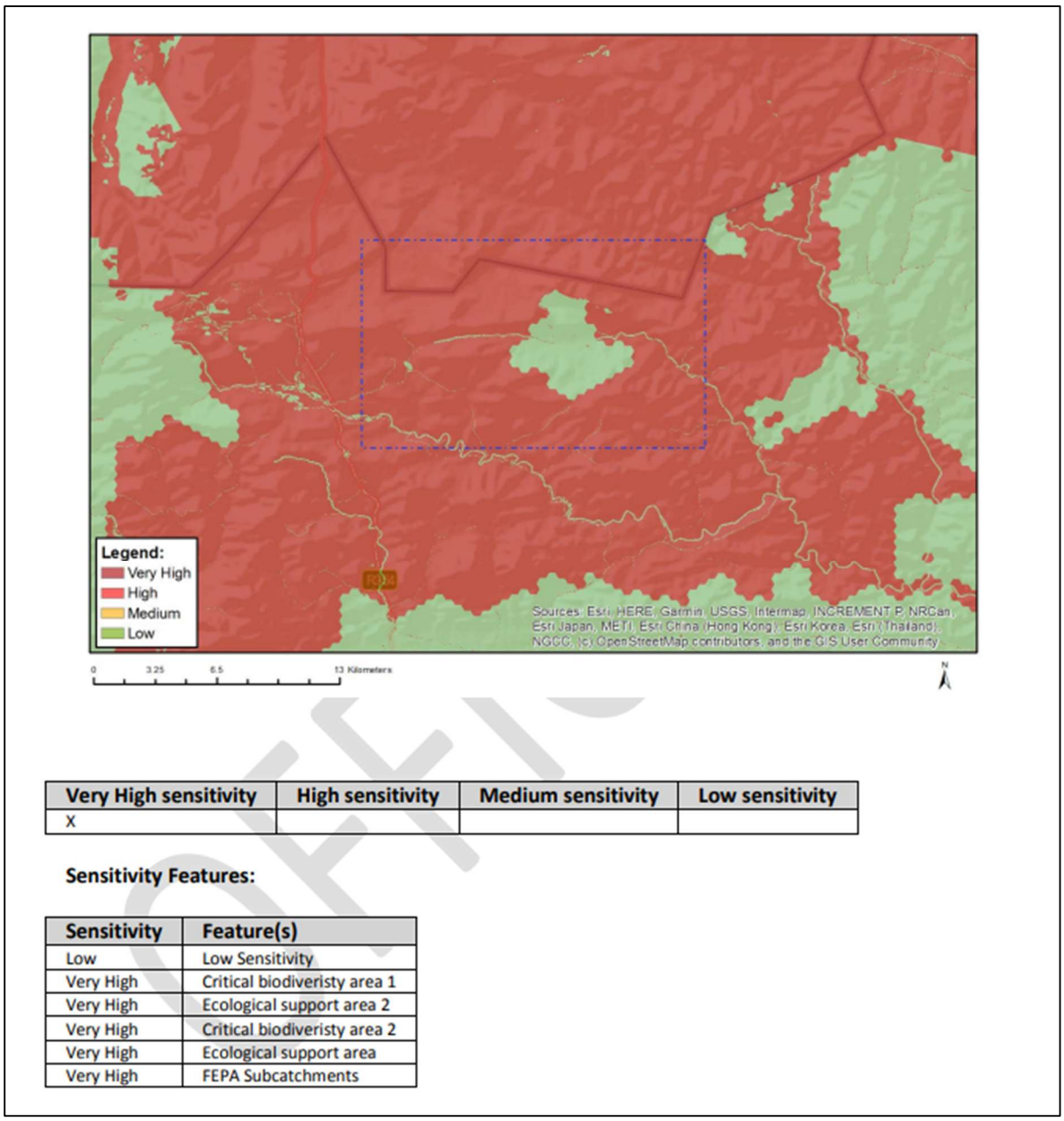


Figure 4-1 ***Map illustrating the location and extent of habitat types delineated within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. Please refer to Table 4-1 in order to interpret the map to differentiate the distinct habitats***

Figure 4-2 ***Photograph illustrating an overview of the habitat physiognomy within the proposed Esizayo Wind Energy Facility Expansion Area PAOI. A) Drainage Line, B) Plateau, C) Plateau (foreground) and a Moderately Steep Rocky Slope leading to a Dolerite Extrusion (Background) and D) Moderately Steep Rocky Slope (foreground) and Steep Rocky Slopes (background)***

4.2 Site Ecological Importance

The Combined Terrestrial Biodiversity Theme Sensitivity for the PAOI as indicated in the screening report was derived to be 'Very High' (Figure 4-3). This is attributed to the area being included in the BSP as a CBA1, ESA1 and ESA2, as well as being a FEPA sub-catchment.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Ecological support area 2
Very High	Critical biodiveristy area 2
Very High	Ecological support area
Very High	FEPA Subcatchments

Figure 4-3 Map illustrating the Combined Terrestrial Biodiversity Theme Sensitivity for the proposed Esizayo Wind Energy Facility Expansion Area PAOI

Based on the criteria provided in Section 0 of this report, all habitats within the assessment area of the proposed development were allocated a sensitivity category, i.e., a SEI category (Table 4-2). The SEI categories provided are based on a multi-taxon (flora, herpetofauna and non-volant mammalia) context. The SEI of the habitat types delineated within the assessment area is illustrated in Figure 4-4.

Table 4-2 Summary of the Site Ecological Importance for the proposed Esizayo Wind Energy Facility Expansion Area PAOI

Habitat	Area (ha)	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Drainage Line[1]	3 296.080	Medium	Very High	High	Medium	High
Moderately Steep Rocky Slope	3 249.495	High	Very High	Very High	Low	Very High
Plain	369.437	Medium	High	Medium	Medium	Medium
Plateau	111.528	High	Very High	Very High	Low	Very High
Steep Rocky Slope	710.836	High	Very High	Very High	Low	Very High

The guidelines for interpreting SEI as provided in the Species Assessment Protocol (SANBI, 2020) in the context of the proposed development is provided in Table 4-3.

Table 4-3 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mit igation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.

[1] Note that for this assessment, a 100 m corridor (50 m buffer) was applied to the drainage lines as provided in Macfarlane *et al* (2009). "The need for wide buffers is supported by a range of other authors, with common buffer widths for maintaining habitat connectivity for general wildlife movement ranging between 50 and 300 m, depending on the landscape context and species concerned" (Macfarlane *et al*, 2009). These corridors are presented in the relevant map.

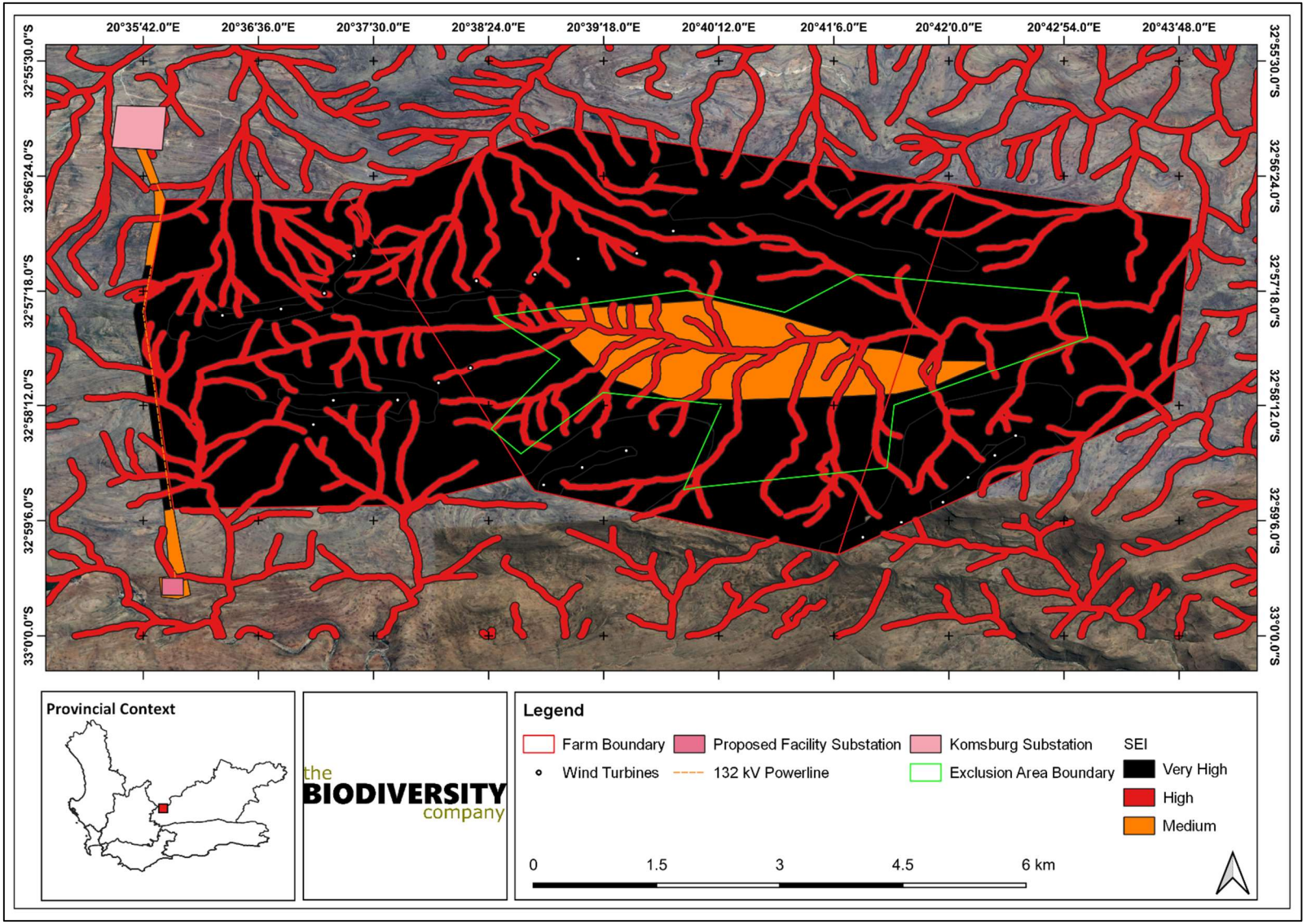


Figure 4-4 ***Map illustrating the Site Ecological Importance (SEI) of the habitats delineated within the proposed Esizayo Wind Energy Facility Expansion Area PAOI***

5 Impact Assessment

5.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the PAOI and the surrounding landscape (Figure 5-1). These include:

- Livestock grazing land-use leading to trampling and exacerbated erosion;
- Persecution of carnivores;
- Roads and associated vehicle traffic leading to road kills;
- Predator-proof fences; and
- Existing Energy Facilities in the surrounding landscape.

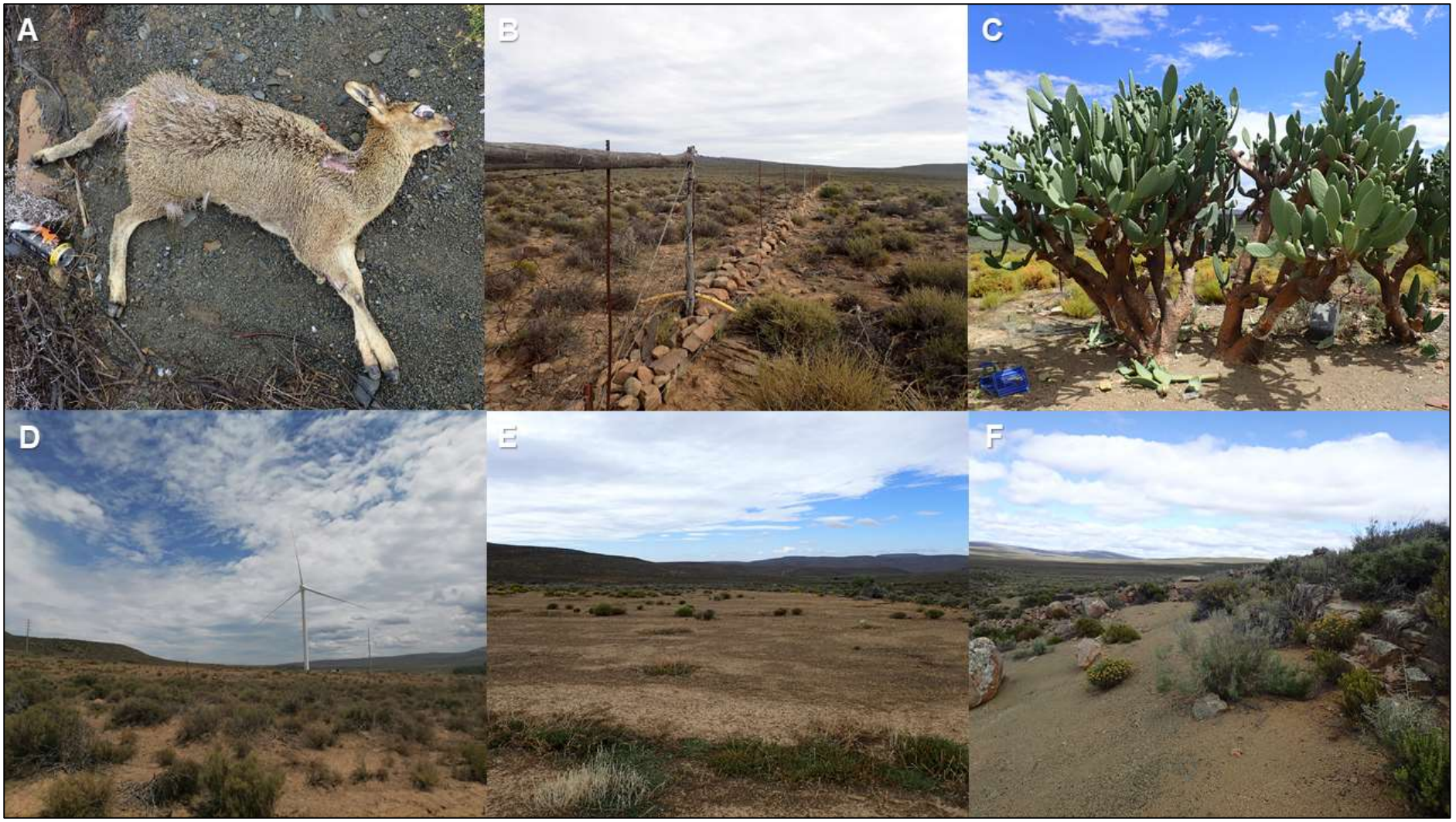


Figure 5-1 ***Photographs illustrating examples of impacts to biodiversity within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and surrounding landscape. A) Roadkill, B) Predator-proof fencing, C) Invasive Alien Plants, D) Existing Wind Energy Facilities, E) Livestock overgrazing and F) Erosion***

5.2 Alternatives considered

No alternatives were considered.

5.3 Loss of Irreplaceable Resources

The current proposed layout of the development will result in the loss of:

- Critical Biodiversity Areas; and
- Possibly Species of Conservation Concern.

5.4 Identification of Additional Potential Impacts

Bennun *et al* (2021) describes three broad types of impacts associated with solar energy development:

- Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat frag- mentation as a result of project infrastructure and species disturbance or mortality as a result of project operations;
- Indirect impacts – Impacts induced by, or 'by-products' of, project activities within a project's area of influence; and
- Cumulative impacts – Impacts that result from the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts.

As aforementioned, fire is a critical ecosystem process that is essential to retain diversity in renosterveld vegetation types. Fire regimes are affected by development due to the protection of infrastructure (O'Connor and Kuyler, 2005). Accordingly, the proposed development will require infrastructure protection and therefore, shift the natural fire regime and consequently, the floral assemblage and ecological wellbeing of the habitat within the PAOI will be negatively affected.

Additional potential impacts during the construction and operation phases of the proposed development are presented in Table 5-1. Photographs illustrating the potential impacts are provided in Figure 5-2. Please note that these impacts were observed by the specialist during previous surveys within nearby WEFs.

Table 5-1 Potential impacts to biodiversity associated with the proposed Esizayo Wind Energy Facility Expansion Area

Main Impact	Project activities that can cause loss of habitat	Secondary impacts anticipated
Habitat Destruction and degradation	Physical removal of vegetation including earthworks for infrastructure construction Physical removal of vegetation including earthworks for road network construction Erosion due to poor stormwater management Dust pollution	• Displacement/loss of flora & fauna (including SCC) • Increased potential for soil erosion • Habitat fragmentation • Increased potential for establishment of invasive vegetation
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
Spread and/or establishment of alien and/or invasive species into disturbed areas	Vegetation removal Vehicles potentially spreading seed Unsanitary conditions surrounding infrastructure promoting the establishment of pest rodents	• Habitat loss for indigenous flora & fauna (including potential SCC) • Spreading of potentially dangerous diseases due to invasive and pest species • Increased potential for soil erosion • Alteration of fauna assemblages due to habitat modification
Main Impact	**Project activities that can cause the direct mortality of fauna**	**Secondary impacts anticipated**
Direct Mortality of fauna	Roadkill due to vehicle collision Intentional killing of fauna for food (hunting and persecution) Blasting Earthworks	• Loss of ecosystem services
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
Reduced dispersal/migration of fauna	Loss of landscape used as corridor Removal of vegetation	• Loss of ecosystem services • Reduced plant seed dispersal • Reduced gene flow
Main Impact	**Project activities that can cause emigration of fauna**	**Secondary impacts anticipated**
Emigration of fauna	Operation of machinery (Large earth moving machinery, generators, blasting) Heavy vehicle use Noise pollution generated during operational phase	• Loss of ecosystem services

Figure 5-2 ***Photographs illustrating potential impacts associated with the construction of Wind Energy Facilities. A) Installation of turbine base into ground achieved through blasting and use of heavy machinery, B) Earthworks using heavy machinery leading to noise and vibration pollution, C) Construction of substation involving clearing of vegetation and reshaping of topography through use of heavy machinery, D) Poor topsoil stockpiling practices leading to reduction in topsoil quality, E) Cement plant and poor stockpiling of source material leading to dust pollution into adjacent natural areas and F) Clearing of vegetation for road network.***

5.5 Assessment of Impact Significance

5.5.1 Method

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[6] presented in Table 5-2.

Table 5-2 Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	0 – 30	31 to 60		61 – 100	

[2] Impacts that arise directly from activities that form an integral part of the Project.
[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[4] Secondary or induced impacts caused by a change in the Project environment.
[5] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[6] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Environmental Significance Rating (Negative (-))	Low (-)		Moderate (-)		High (-)
Environmental Significance Rating (Positive (+))	Low (+)		Moderate (+)		High (+)

5.5.2 Mitigation of Impacts

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan. The mitigation sequence/hierarchy is shown in Figure 5-3 below.

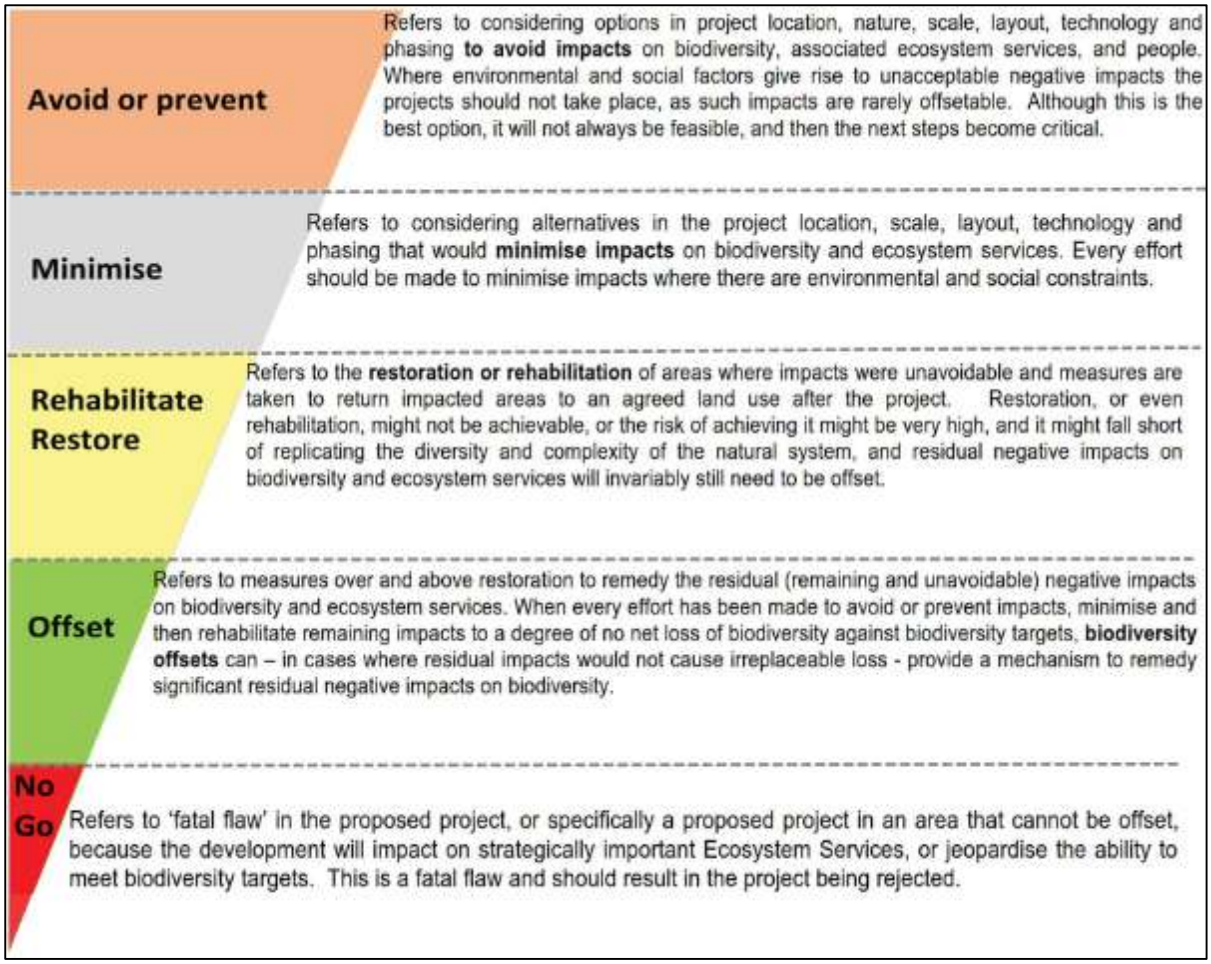


Figure 5-3 Diagram illustrating the Mitigation Hierarchy

5.5.3 Impact Assessment

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Two phases were considered for the impact assessment; Construction Phase and Operational Phase, as the development was assumed to be long-lasting.

5.5.4 Construction Phase

5.5.4.1 Loss of habitat due to infrastructure development

The proposed development will result in the loss of habitat due to associated infrastructure such as turbines, substation, powerlines and internal roads. The proposed infrastructure will result in the loss of approximately 200 ha of habitat. The significance of the impact is provided in Table 5-3.

Table 5-3 Assessment of significance of habitat loss associated with the construction phase of the proposed development

Potential Impact: Habitat loss due to infrastructure development	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	5	5	**75**	**High**	(-)	High
With Mitigation	5	1	3	5	4	**56**	**Moderate**	(-)	High
Mitigation and Management Measures **Only those areas earmarked for development must be intruded upon and be clearly demarcated. The impact is difficult to mitigate and therefore, the significance is regarded as Moderate. Designs capacity must be kept to a minimum feasibility in Very High SEI areas, with set-aside areas created in support of conservation.** **See section 5.9.**									

5.5.4.2 Loss of flora Species of Conservation Concern (SCC)

The vegetation clearance for infrastructure will physically remove vegetation and in areas occupied by flora SCC, will ultimately lead to a loss in the population of these species. In addition, clearing of vegetation will result in exacerbated erosion of working areas This will result in the destruction and fragmentation of habitats, thereby affecting potential SCC The significance of the impact is provided in Table 5-4.

Table 5-4 Assessment of significance of potential impacts on flora species of conservation concern associated with the construction phase of the proposed development

Potential Impact: Loss of Flora SCC due to habitat loss or degradation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	5	5	4	**68**	**High**	(-)	High
With Mitigation	1	1	1	1	2	**8**	**Very Low**	(-)	High
Mitigation and Management Measures **Areas with threatened flora species should be avoided. Search and Rescue is not a suitable mitigation action.** **See section 5.9.**									

5.5.4.3 Direct mortality of fauna including Species of Conservation Concern (SCC) due to roadkill, blasting and earthworks

Direct mortalities may arise from earth moving blasting to install wind turbine bases is also a cause for concern. This impact is particularly pertinent to species that are secretive and tend to inhabit microhabitats such as rock crevices. These tend to be smaller species with limited

dispersal ability. The unregulated movement of local people will also increase the likelihood of poaching of fauna in what was previously secluded habitat. The increased traffic due to construction vehicles and the transportation of staff/materials is also a risk, especially along the major roads within surrounding landscape. The significance of the direct mortality impact is provided in Table 5-5.

Table 5-5 Assessment of significance of direct mortality of fauna including Species of Conservation Concern due to roadkill, blasting and earthworks associated with the construction phase of the proposed development

Potential Impact: Direct mortality of fauna including Species of Conservation Concern due to roadkill, blasting and earthworks	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	5	3	4	**60**	**Moderate**	(-)	High
With Mitigation	1	2	1	3	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures **Areas to be cleared must first be checked thoroughly for all fauna species and be allowed to move off or in the case of more secretive species, these must be relocated to appropriate nearby habitats via a Search and Rescue process.** **Speed control measures must be implemented.** **See section 5.9.**									

5.5.4.4 Encroachment of disturbed areas by Invasive Alien Plants (IAPs)

Clearance of vegetation and movement between areas will increase the potential for the establishment of invasive vegetation. The proposed vegetation clearance for the infrastructure will physically remove indigenous vegetation and potentially create an environment where invasive species can be introduced. The "edge effect" caused by these disturbances will likely result in IAP encroachment. The significance of the invasive species impact is provided in Table 5-6.

Table 5-6 Assessment of significance of Invasive Alien Plant (IAP) encroachment associated with the construction phase of the proposed development

Potential Impact: Encroachment by Invasive Alien Plant species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	3	4	**52**	**Moderate**	(-)	High
With Mitigation	3	2	2	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures **An Invasive Alien Plant Management Programme must be developed and implemented.** **Erosion Control Programme must be developed and implemented.** **All denuded areas to be rehabilitated using local indigenous species.** **See section 5.9.**									

5.5.4.5 Degradation of surrounding habitats due to dust pollution

Construction activity and improperly managed stockpiles of construction material will lead to dust pollution and degradation of surrounding natural habitat. Due to the prevalent windy conditions of the area, this impact will be difficult to mitigate against this. Wetting of road surfaces may aid in control but the wind and dry season conditions will likely lead to rapid evaporation and therefore, not entirely suitable. The significance of the dust pollution impact is provided in Table 5-12.

Table 5-7 Assessment of significance of dust pollution associated with the construction phase of the proposed development

Potential Impact: Degradation of surrounding habitats due to dust pollution	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	1	3	4	**44**	**Moderate**	(-)	High
With Mitigation	1	2	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures **Dust control measures to be implemented such as wetting of road surfaces and properly managed stockpiles.** **See section 5.9.**									

5.5.4.6 Degradation of surrounding habitats due to poor waste management

Construction generates a large quantity of waste material and will lead to degradation of surrounding natural habitat if not properly managed. The significance of the waste impact is provided in Table 5-8Table 5-12.

Table 5-8 Assessment of significance of improper waste management associated with the construction phase of the proposed development

Potential Impact: Degradation of surrounding habitats due to improper waste management	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	5	5	4	**72**	**High**	(-)	High
With Mitigation	1	2	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures **Development and implementation of a Waste Management Plan.** **See section 5.9.**									

5.5.4.7 Behavioural changes and emigration of the fauna community due to disturbance from noise and vibration pollution

The construction-related activity will lead to sound and vibration pollution as well as creating increased presence of people. These impacts will lead to stress, behavioural changes and emigration causing a negative shift in the fauna community wellbeing. The sound and vibration pollution are difficult to mitigate against. The significance of the disturbance impact is provided in Table 5-9.

Table 5-9 Assessment of significance of disturbance associated with the construction phase of the proposed development

Potential Impact: Behavioural changes and emigration of the fauna community due to disturbance from noise and vibration pollution	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	3	4	**52**	**Moderate**	(-)	Medium
With Mitigation	4	2	2	3	4	**44**	**Moderate**	(-)	Medium
Mitigation and Management Measures **All construction related activity must not occur at night to limit impacts to amphibians.** **Unauthorised staff and contractors are not allowed to go beyond their specific demarcated working areas.** **See section 5.9.**									

5.5.4.8 Destruction of bat roosts dueto earthworks and blasting

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Earthworks and blasting close to bat roosts will negatively affect bat populations through high mortality, which in effect will cause a decrease in bat population numbers. Direct impact. The significance of the impact is provided in Table 5-4.

Table 5-10 Assessment of significance of potential impacts on destruction of bat roosts due to earthworks and blasting with the construction phase of the proposed development

Potential Impact: Destruction of bat roosts due to earthworks and blasting	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	2	3	**36**	**Moderate**	(-)	Medium
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)	Medium
Mitigation and Management Measures **Adhere to the sensitivity map during turbine placement. Blasting should be minimised and used only when necessary. If blasting of a rocky area with crevices and cracks is necessary, a Bat Specialist must be consulted before blasting in order to determine whether a bat roost is present in the rocky area. The mitigation measures will reduce the impact blasting and earthworks will have on the environmental parameter, through avoiding sensitive areas.** **See section 5.9.**									

5.5.4.9 Loss of foraging habitat

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Some minimal foraging habitat will be permanently lost by construction of turbines and access roads. Temporary foraging habitat loss will occur during construction due to storage areas and movement of heavy vehicles. The significance of the impact is provided in Table 5-4.

Table 5-11 Assessment of significance of potential impacts on the loss of bat foraging habitat with the construction phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence

Loss of foraging habitat									
Without Mitigation	4	3	5	3	4	**60**	**Moderate**	(-)	Medium
With Mitigation	3	2	3	3	2	**22**	**Low**	(-)	Medium
Mitigation and Management Measures **Adhere to the sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist. The mitigation measures will reduce the degree of habitat loss.** **See section 5.9.**									

5.5.5 Operational Phase

The following potential impacts were considered on biodiversity (fauna and flora) during the operational phase. This phase refers to when construction has been completed and the proposed infrastructure has been built and is functional.

5.5.5.1 Continued encroachment of disturbed areas by Invasive Alien Plants (IAPs)

Areas disturbed during construction will create niches and opportunity for encroachment by IAPs. Due to the vegetation communities that were cleared within infrastructure footprint during the construction phase being entirely transformed, impacts to the surrounding vegetation communities are considered. This will especially be along the edges of the access roads and around the wind turbine base. The significance of the IAP encroachment impact is provided in Table 5-12.

Table 5-12 Assessment of significance of Invasive Alien Plant encroachment associated with the operational phase of the proposed development

Potential Impact: Continued encroachment of disturbed areas by Invasive Alien Plants (IAPs)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	5	4	**60**	**Moderate**	(-)	High
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures **Development and implementation of an Invasive Alien Plant Management Programme** **See section 5.9.**									

5.5.5.2 Continued erosion of surrounding habitat due to poor stormwater management

Due to the increase in stormwater generation from impenetrable surfaces or cleared areas, erosion of surrounding natural vegetation is a possible risk. The significance of the erosion impact is provided in Table 5-13Table 5-12.

Table 5-13 Assessment of significance of erosion associated with the operational phase of the proposed development

Potential Impact: Continued encroachment of disturbed areas by Invasive Alien Plants (IAPs)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	3	5	4	**64**	**High**	(-)	High
With Mitigation	2	1	3	5	1	**11**	**Very Low**	(-)	High
Mitigation and Management Measures **Development and implementation of an Erosion Management Programme** **See section 5.9.**									

5.5.5.3 Continued behavioural changes and emigration of the fauna community due to disturbance from noise and vibration pollution

Although noise and vibration pollution are typically associated with the construction of WEFs, these facilities do also cause noise and vibration pollution during operation from turbine machinery and blade movement (Lovich & Ennen, 2013). The noise pollution associated with operation of a WEF was demonstrated to influence the behaviour of a burrowing mammal species. It is hypothesised that the effects of vibrations on fauna may be similar to those associated with noise but requires further research. More research is required on the subject of operational phase noise and vibration impacts to ascertain which faunal groups are impacted, as well as the intensity and extent of the impact. Testudinidae are typical arid to semi-arid fauna components, including two SCC that are known to occur within the PAOI and surrounding landscape (see sections 3.1.3.2 and 3.2.2.3 of this report). Studies on the Agassiz's Desert Tortoise (*Gopherus agassizii*) within the United States has suggested that there is no significant influence of WEF operation to the species ecology (Agha *et al*, 2015; Jurlin *et al*, 2014). However, this needs to be researched within a South African context. The significance of this impact is provided in Table 5-14

Table 5-14 Assessment of significance of noise and vibration pollution associated with the operational phase of the proposed development

Potential Impact: Behavioural changes and emigration of the fauna community due to disturbance from noise and vibration pollution	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	3	5	4	5	**75**	**High**	(-)	Low
With Mitigation	3	3	5	4	4	**60**	**Moderate**	(-)	Low
Mitigation and Management Measures **Difficult to mitigate and further research is required to ascertain mitigation techniques. Management measures must be amended/implemented as new information becomes available. Compile and implement a species specific management plan for the life of the project, to be initiated during the pre-construction phase.** **See section 5.9.**									

5.5.5.4 Increase in Pied Crow (*Corvus albus*) density due to increase in anthropogenic developments leading to excessive predation of Testudinidae

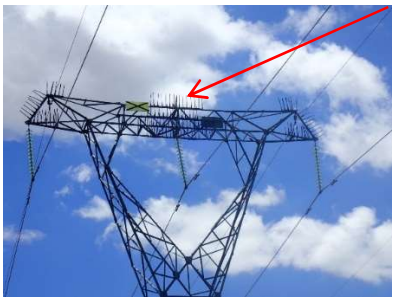
As aforementioned, there has been a substantial increase in the Pied Crow (*Corvus albus*) density in arid to semi-arid regions due to the prevalence of anthropogenic structures, especially road networks and overhead powerlines that act as corridors and nesting sites respectively, as well as the increase in roadkill (Joseph *et al*, 2017). As aforementioned, the increase in Pied Crow density within these areas has resulted in the increase in predation of Testudinidae, including SCC. Therefore, an increase in anthropogenic structures is likely to further increase the density of Pied Crows within the PAOI, thereby leading to elevated levels of predation on these SCC. The significance of this impact is provided in Table 5-15.

Table 5-15 Assessment of significance of the increase in Pied Crow (Corvus albus) density on the Testudinidae fauna associated with the operational phase of the proposed development

Potential Impact: Increase in Pied Crow (*Corvus albus*) density due to increase in anthropogenic developments leading to excessive predation of Testudinidae	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	5	5	4	**72**	**High**	(-)	High
With Mitigation	2	3	3	5	2	**26**	**Low**	(-)	Moderate

Mitigation and Management Measures.

Installation of anti-perching devices as illustrated below may impede the increase in density of Pied Crows due to increase in anthropogenic structures.



See sections 5.6.6

5.5.5.5 Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration)

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration). If the impact is too severe (e.g. in the case of no mitigation) local bat populations may not recover from mortalities. The significance of the impact is provided in Table 5-4.

Table 5-16 Assessment of significance of potential impacts on bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration) with the operational phase of the proposed development

Potential Impact: Destruction of bat roosts due to earthworks and blasting	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	5	4	5	80	High	(-)	Medium
With Mitigation	4	2	3	4	3	39	Moderate	(-)	Medium
Mitigation and Management Measures Adhere to the sensitivity map. Apply mitigation measures (Animalia, 2016) outlined by the Bat Specialist during the operational bat monitoring study See section 5.9.									

5.6 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This section describes the cumulative potential impacts of the project on biodiversity. Cumulative impacts are assessed in context of the extent of the proposed development area and its associated impacts, other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

The proposed Esizayo WEF expansion is located within the Cape Floristic Region (CFR) Biodiversity Hotspot. The CFR is an exceptionally important region for plant biodiversity globally. Approximately 69% of the estimated 9 000 plant species in the CFR are restricted (endemic). Diversity and endemism are also high at the genus and family, as the CFR possesses five families that are endemic to South Africa. The CFR comprises of several vegetation types, and the two overlapping the development area comprise of Renosterveld and Succulent Karoo. In congruency with other Biodiversity Hotspots on a global scale, the wellbeing of the CFR has been negatively affected by climate change, landcover change and invasions by alien species (Bellard *et al*, 2014). Albeit research has focused on avifauna and volant fauna, the influence of WEFs on non-volant herpetofauna and mammals is scarce, especially within southern Africa, but nevertheless have been reported (Lovich & Ennen, 2013).

Presently, the surrounding immediate and broader landscape consists of natural vegetation used for supporting livestock and to a lesser extent game, with energy generation and distribution facilities and infrastructure, as well as a road network. The infrastructure footprint of the proposed development overlaps with the Central Mountain Shale Renosterveld, a vegetation type that is approximately 118 762 ha in extent, as indicated by the remnants spatial file (Skowno *et al*, 2019). The South African Renewable Energy EIA Application Database (DFFEb, 2021) was used to determine the presence and extent of additional energy facilities within the surrounding landscape. This database contains spatial data for renewable energy applications for environmental authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications. Data is captured and managed on a parcels level as

well as aggregated to the project level at the boundary level. Figure 5-4 illustrates the developments within the vegetation type, and the proximal landscape.

The direct impact footprint of WEFs in proportion to area required is typically minimal. Within the landscape, the authorised Esizayo, Karusa, Soetwater and Kareebosch WEFs account for approximately 0.5% of direct habitat loss. However, the cumulative effects of WEF operational activities on fauna are more concerning. Habitat fragmentation is a key driver of species loss and has the potential to contribute to the problems associated with habitat loss and fragmentation even though a matrix of relatively undisturbed habitat can exist among turbines and other infrastructure (Lovich & Ennen, 2013). Donaldson *et al* (2002) demonstrated that the abundance of pollinator species, such as Butterflies (Papilionoidea), Bees (Anthophila) and Monkey Beetles (Scarabaeidae: Hopliini) was significantly affected by fragment size, synergistically with other factors such as vegetation cover. Fragment size and distance to large remnants of vegetation had a significant influence on seed or fruit set in four of the seven plant species that were examined. Furthermore, one of the study species failed to set any seed small- and medium- sized fragments. Consequently, habitat fragmentation will lead to a loss in the floral diversity, potential recovery after fires and resilience to anthropogenic impacts. Several important pollinators were recorded within the PAOI as well as the surrounding landscape, during the present and previous surveys (Figure 5-5), and therefore severe habitat fragmentation is likely to be detrimental to the wellbeing of the vegetation. However, the physical characteristic of the proposed development alone is unlikely to severely fragment habitat, but cumulative impacts within the landscape will lead to fragmentation.

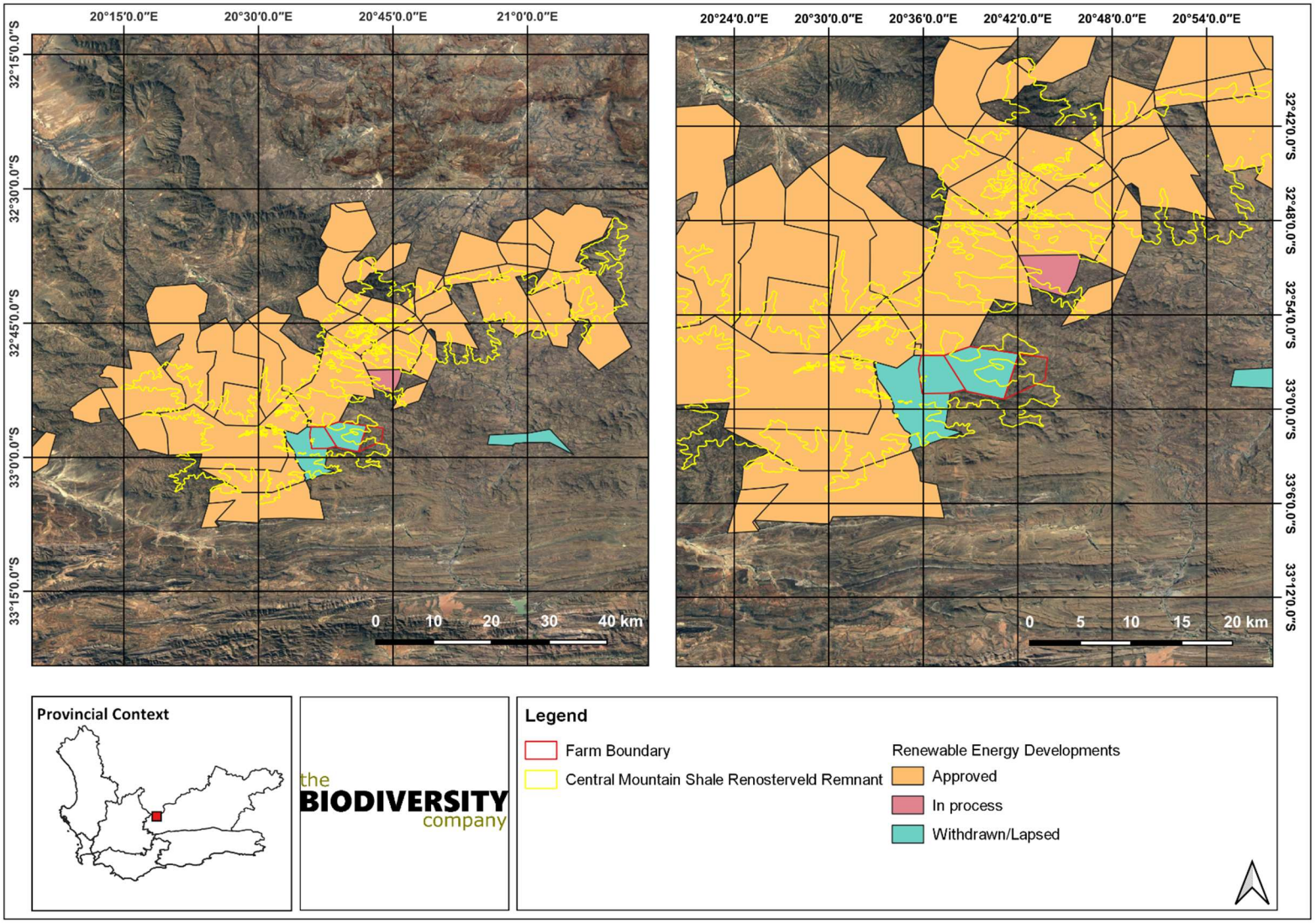


Figure 5-4 ***Map illustrating renewable energy developments overlapping the remnant Central Mountain Shale Renosterveld (left) and renewable energy developments proximal to the proposed Esizayo Wind Energy Facility Expansion Area***

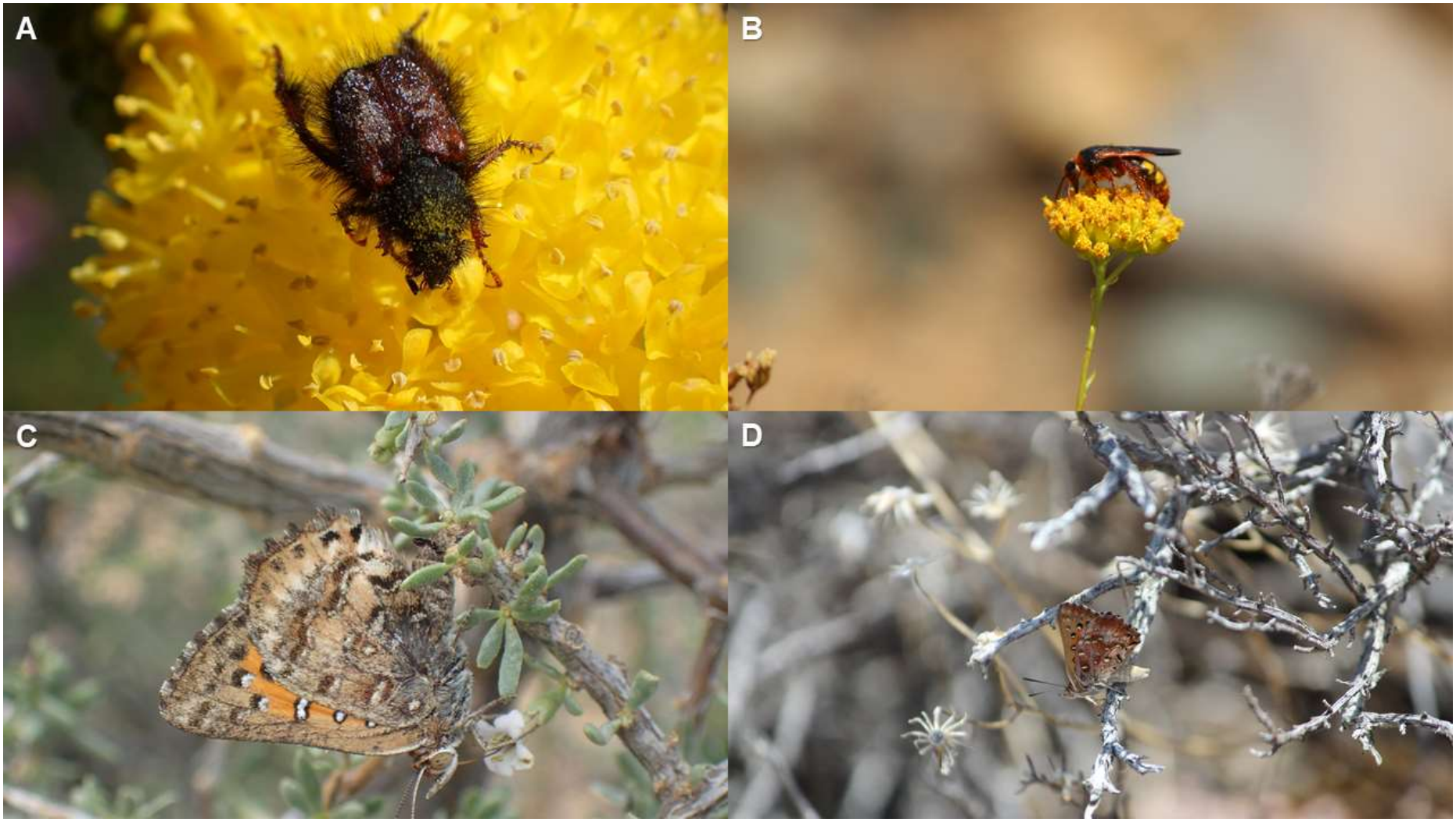


Figure 5-5 ***Photographs illustrating a portion of the pollinator species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and proximal landscape. A) Hopliini (Scarabaeidae) consuming and distributing pollen of Bulbinella latifolia ssp. latifolia, B) Scolia (Scoliidae) nectaring on Chrysocoma ciliata, C) Aloeides vansoni (Lycaenidae) nectaring on Lycium schizocalyx and D) Aloeides pierus (Lycaenidae)***

Wind energy developments on a large scale also influence micro-climate and generally occur downwind of an operating wind farm due to enhanced vertical mixing from rotor turbulence (Roy & Traiteur, 2010). The study determined that near-surface air temperatures can be higher at night and during early morning hours and lower during the day, with the effect exhibited 18–23 km downwind of the facility. Areas downwind of a WEF may experience altered wind, precipitation and evaporation patterns, increased lake temperatures and minor changes in soil moisture (Abbasi & Abbasi, 2000). These changes have the potential to affect fauna, especially herpetofauna species with environmental sex determination and narrow sex determining thresholds (Lovich & Ennen, 2013). In consideration of the aforementioned impacts, the expected cumulative impact is expected to be of a 'High' significance.

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Cumulative Impact from Wind Energy Facilities within the Roggeveld	3	3	3	4	5	65	High	(-)	High

5.7 Unplanned Events

The planned activities will have known impacts as discussed above; however, unplanned events may occur on any project and may have potential impacts which will need mitigation and management.

Table 5-17 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 5-17 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment from heavy machinery during the construction phase	Contamination of soil leading to mortality of flora and fauna.	A spill response kit must always be available. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to surrounding natural habitats that result in habitat destruction and fauna mortality. Although fires are a feature of savannah habitats, incorrect timing of the fire can have considerably negative effects.	Appropriate/Adequate fire management plan needs to be implemented.

5.8 Ecosystem Guidelines

The information provided in this section was extracted from the ecosystem guidelines for environmental assessments in the Western Cape (Fynbos Forum, 2016).

5.8.1 Non-negotiables

- Avoid any further habitat modification in areas with intact renosterveld vegetation that is in good ecological condition. Habitat modification or fragmentation must be avoided in all threatened renosterveld vegetation types.

- It is critical to maintain pollinator-plant associations, which means that pollution by herbicides, fertilisers and insecticide spray must be minimized.
- Avoid disturbances (including grazing and all forms of physical modification) to silcrete, ferricrete and quartz patches.
- Maintain and manage appropriate fire regimes and control managed burns carefully.
- Eradicate invasive alien species using appropriate methods and carry out suitable follow-up procedures.

5.8.2 Landscape Scale Approaches to Minimise Impacts

- Avoid any further fragmentation of renosterveld. These ecosystems are usually already highly fragmented, so connections between patches should be maintained. Wherever possible, habitat links should be rehabilitated;
- Avoid impacts on populations of rare and highly localised renosterveld species (for example, those occurring in wetter areas or on ferricrete patches), by proactive incorporation of spatial biodiversity priorities into land-use planning and environmental assessment;
- There are no acceptable compensation measures or offsets for losing habitat that harbours Critically Endangered and Endangered species in renosterved;
- In all renosterveld ecosystems (regardless of ecological condition) avoidance is preferable to offsetting impacts. However, in those cases where there are no alternatives for locating a proposed land use elsewhere, the mitigation hierarchy should be strictly applied, with offsets being pursued as a last resort, and then only in full compliance with the provincial biodiversity offsets policy;
- Large-scale wind energy facilities in the Roggeveld and Klein Roggeveld should ensure that all remaining natural vegetation is effectively conserved and well managed for the persistence of biodiversity; and
- Search and Rescue is not an adequate mitigation measure for loss or fragmentation of habitat. It is, however, part of good practice when loss or disturbance of habitat is unavoidable (after application of the mitigation hierarchy).

5.9 Biodiversity Impact Management Actions

The purpose of the Biodiversity Impact Management Actions is to inform on the mitigations required to lower the risk of the impacts associated with the proposed development, provide measures for improving the conservation value of the property and to be able to be inserted into the Environmental Management Programme (EMPr) should the proposed development be granted authorisation. The mitigation actions required to reduce the significance of the impacts associated with the development are provided in Table 5-18.

Table 5-18 The Biodiversity Impact Management Actions for the proposed Esizayo Wind Energy Facility Expansion

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
The areas to be developed must be specifically demarcated to prevent movement into surrounding environments. To compensate for the loss in biodiversity, the surrounding areas should be used as set-aside areas in discussion with the landowners and the relevant conservation authority.	Life of Operation	Project Manager Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.	Life of Operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Minimise (preferably avoid) disturbances to rocky habitats, these areas must be managed as no-go areas.	Life of operation	Environmental Officer	Rocky habitats	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Life of Operation	Project Manager Environmental Officer	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to three years after the closure
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of Operation	Environmental Officer Contractor	Spill events, Vehicles dripping.	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of Operation	Environmental Officer Contractor	Leaks and spills	Ongoing
A Fire Management Plan needs to be compiled to restrict the impact of fire. This is especially concerning stochastic fire events such as discarding of lit cigarette butts and/or glowing embers from cooking fires. The fire management plan must ensure that natural fire regimes of the surrounding vegetation is not affected.	Life of Operation	Environmental Officer Contractor	Fire Management	During Phase
Poaching of plants must not be tolerated and made a punishable offence.	Life of Operation	Environmental Officer	Evidence of plant removal and digging of soil outside of demarcated areas	Ongoing

A Walk-through Survey must be undertaken to enable micro-siting of infrastructure so that it does not overlap SCC.	Pre-construction	Project Manager Environmental Officer	Flora SCC and protected flora	August - September
Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas. Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area.	Pre-construction	Project Manager Environmental Officer	Relocated flora	Search and Rescue to occur 1 week monthly from Spring to Summer
Management outcome: Fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas. Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area.	Pre-construction	Project Manager Environmental Officer Ecologist	Relocated fauna	Search and Rescue to occur 1 week monthly from Spring to Summer and prior to vegetation clearing.
Minimise (preferably avoid) disturbances to rocky habitats, these areas must be managed as no-go areas.	Life of operation	Environmental Officer	Rocky habitats	Ongoing
The developer must fund or partially-fund and enable research into the biology and ecology of *Chersobius boulengeri* within their project areas. The research must include pre-construction, construction and operational phase spatial ecology and behaviour. Long-term survivability must also be considered.	Life of operation	Environmental Officer	Research – Vibration, noise	Ongoing
The Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines). The mitigation measures recommended by Animalia (2016) are applicable.	Life of operation	Design Engineer	Bats	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	Construction Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed Signs must be put up to enforce this and must be made a punishable offence.	Life of operation	Environmental Officer	Evidence of trapping, dead animals, etc.	Ongoing

The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna.	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project Manager Environmental Officer	Light pollution and period of light.	Ongoing
Anti-perching devices must be installed on overhead powerlines to prevent increasing density of Pied Crows.	Operational Phase	Project Manager Environmental Officer	Pied Crow Density	Ongoing
Management outcome: Invasive Alien Species				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Compilation of and implementation of an Invasive Alien Plant Management Plan	Life of Operation	Project Manager Environmental Officer	Assess presence and encroachment of alien vegetation	Quarterly monitoring
A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the presence of indigenous fauna.	Life of Operation	Environmental Officer Health and Safety Officer	Evidence or presence of pests	Ongoing
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Reducing the dust generated by construction activities, especially the earth moving machinery, through wetting the soil surface (with "dirty water") and putting up signs to enforce speed limit as well as speed. It is recommended that a wind fence be constructed to prevent excessive dust pollution.	Construction Phase	Project Manager Environmental Officer	Dust pollution levels	Ongoing
Topsoil and construction stockpiles must be kept covered with a suitable material or be bordered by sheets to impede or prevent dust pollution into surrounding vegetation.	Construction Phase	Project Manager Environmental Officer	Dust pollution levels	Ongoing
Management outcome: Waste Management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. Refuse bins must be secured. Temporary storage of domestic waste shall be in covered waste skips.	Life of Operation	Environmental Officer Health and Safety Officer	Presence of waste	Life of operation
The ratio of toilets to staff must be provided as per the requirements in the Health and Safety Act. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of Operation	Environmental Officer Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily

Refuse bins must be secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of Operation	Environmental Officer Contractor Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
All solid waste collected shall be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site	Life of Operation	Environmental Officer Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing

Management outcome: Environmental awareness training

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff on the importance, biology, habitat requirements and management requirements of the Environmental Authorisation.	Life of Operation	Health and Safety Officer Environmental Officer	Compliance to the training.	Ongoing

Management outcome: Erosion

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
An Erosion Management Plan must be developed and implemented.	Life of Operation	Project Manager Design Engineer Environmental Officer	Erosion	Ongoing
Appropriate drainage must be constructed along the access roads in order to slow the flow of water run-off from the road surface.	Operational	Project Manager Design Engineer	Water runoff from road surfaces	Ongoing
Areas that are denuded during construction that do not have infrastructure during the operational phase must be re-vegetated with indigenous vegetation to prevent erosion.	Operational	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for the first 2 years. Thereafter, annually for the life of the project
All areas affected by the development must be re-vegetated with indigenous vegetation to prevent erosion on an extensive temporal scale.	Life of Operation	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for 3 years after decommissioning

6 Conclusion and Impact Statement

6.1 Conclusion

The aim of this Biodiversity Impact Assessment was to provide information to guide the risk of the proposed Esizayo Wind Energy Facility Expansion to the ecosystems and their inherent fauna and flora.

Based on the latest available ecologically relevant spatial data the following information is pertinent to the project area:

- It is recognised as a Critical Biodiversity Area (CBA) as per the Western Cape CBA database;
- The Combined Animal Species Theme Sensitivity was rated as 'Very High' according to the Environmental Screening Tool; and
- The Ecosystem Protection Level for the vegetation types associated with the development footprint are regarded as Not Protected.

The habitats present within the PAOI are diverse and considered to be heterogenous in physiognomy and possesses an array of micro-habitats. Due to the high habitat diversity, the area supports a relatively high diversity of flora and fauna. In addition, the PAOI supports several SCC, including a globally endangered species with a low dispersal ability. Based on the presence of SCC, the functional integrity and its low resilience to change, three of the delineated coarse-scale habitats, i.e., Moderately Steep Rocky Slope, Plateau and Steep Rocky Slope were determined to exhibit a 'Very High' SEI. A 200 m radial buffer is generally associated with drainage features, and designated high sensitivity areas.

Knowledge of impacts to non-volant fauna communities from operational activities, especially noise and vibration pollution, are limited in South Africa. It is recommended that further research in this subject be undertaken, and that the developer plays a role in enabling research.

6.2 Impact Statement

The main expected impact of the proposed Esizayo Wind Energy Facility Expansion will be the loss of habitat and emigration of fauna. Based on the outcomes of the SEI determination, the PAOI possesses a 'Very High' SEI. The overall avoidance and subsequent impact minimisation have resulted in a moderate to low post-mitigation impact significance. This denotes that no destructive activities are to occur within these habitats and that offsetting is not an option, with only avoidance mitigation measures permitted. However, the PAOI has been designated as a REDZ (Renewable Energy Development Zone) with surrounding energy developments and this being a proposed expansion to an already existing WEF. It is the opinion of the specialist that the authorisation of the proposed expansion be carefully considered in discussion/consultation at a forum level with the relevant stakeholders including DFFE, Cape Nature, Endangered Wildlife Trust (EWT) and Western Cape Government.

It is important to consider that as renewable development and associated mining (components require that raw materials be mined) expands, eventually areas of critical biodiversity importance will be encroached upon. Based on the 'Very High' SEI of the project area and the presence of SCC, especially *C. boulengeri*, the following actions must be included as part of the Environmental Authorisation:

- The developer must fund or partially-fund and enable research into the biology and ecology of *Chersobius boulengeri* within their project areas. The research must include pre-construction, construction and operational phase spatial ecology and behaviour. Long-term survivability must also be considered;

- To compensate for the loss in biodiversity, the surrounding areas should be used as set-aside areas in discussion with the landowners and the relevant conservation authority. This will ensure that no further habitat loss occurs within the PAOI; and

- The Search and Rescue is an essential component in order to limit biodiversity loss. Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area (Figure 1-2) to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area. Monitoring of survivability of SCC that have been relocated is essential, especially if relocated within the southern exclusion area. It is further recommended that a qualified Biodiversity specialist is present during all clearance activities.

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8 Appendix Items

8.1 Appendix A – Protocol Checklist

"Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity" gazetted 20 March 2020, published in Government Notice No. 320

Paragraph	Item	Pages	Comment
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	i	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	1-2, 6, 10	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these.	24, 64	
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site	35, 37	
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna.	21, 23,	
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments.	17, 19-22	
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types; (b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified.	23-25, 37, 48-50	
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	-	No "low" sensitivity areas were identified due to the ecological condition of the site.
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: (a) the reasons why an area has been identified as a CBA; (b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; (c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); (d) the impact on ecosystem threat status; (e) the impact on explicit subtypes in the vegetation; (f) the impact on overall species and ecosystem diversity of the site; and (g) the impact on any changes to threat status of populations of species of conservation concern in the CBA.	21, 53, 64	
2.3.7.2	Terrestrial ecological support areas (ESAs), including: (a) the impact on the ecological processes that operate within or across the site; (b) the extent the proposed development will impact on the functionality of the ESA; and (c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna.	21, 53, 64	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- (a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan.	20	
2.3.7.4	Priority areas for protected area expansion, including-	20-21	

	(a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.		
2.3.7.5	SWSAs including: (a) the impact(s) on the terrestrial habitat of a SWSA; and (b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses)	-	Does not overlap a SWSA
2.3.7.6	FEPA sub catchments, including- (a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment	23-24	
2.3.7.7	indigenous forests, including: (a) impact on the ecological integrity of the forest; and (b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	-	No forest habitats within the area
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Cover page i	
3.1.2	A signed statement of independence by the specialist.	92	
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	4, 10	
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant.	6-17	
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations.	4	
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	-	No areas unsuitable for development identified
3.1.7	Additional environmental impacts expected from the proposed development.	53-54	
3.1.8	Any direct, indirect and cumulative impacts of the proposed development.	53-68	
3.1.9	The degree to which impacts and risks can be mitigated.	59-64	
3.1.10	The degree to which the impacts and risks can be reversed.	59-64	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	53	
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	69-73	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate.	-	N/A
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not;	74	
3.1.15	any conditions to which this statement is subjected	74	

8.2 Appendix B – Flora species expected to occur in the project area

Family	Species Name	Conservation Status	Endemism
Aizoaceae	*Antimima pumila*	DD	Endemic
Aizoaceae	*Antimima stayneri*	LC	Endemic
Aizoaceae	*Cleretum lyratifolium*	LC	Endemic
Aizoaceae	*Galenia pubescens*	LC	Endemic
Aizoaceae	*Gibbaeum heathii*	LC	Endemic
Aizoaceae	*Hammeria gracilis*	LC	Endemic
Aizoaceae	*Hereroa joubertii*	LC	Endemic
Aizoaceae	*Mesembryanthemum coriarium*		
Aizoaceae	*Mesembryanthemum dinteri*		
Aizoaceae	*Mesembryanthemum grossum*		Endemic
Aizoaceae	*Mesembryanthemum tetragonum*		
Aizoaceae	*Peersia frithii*	LC	Endemic
Aizoaceae	*Pleiospilos compactus subsp. sororius*	LC	Endemic
Aizoaceae	*Stomatium difforme*	LC	Endemic
Aizoaceae	*Trichodiadema mirabile*	LC	Endemic
Amaranthaceae	*Salsola aphylla*	LC	
Amaranthaceae	*Sericocoma avolans*	LC	
Amaryllidaceae	*Brunsvigia comptonii*	LC	Endemic
Amaryllidaceae	*Gethyllis campanulata*	LC	Endemic
Amaryllidaceae	*Gethyllis villosa*	LC	Endemic
Anacardiaceae	*Laurophyllus capensis*	LC	Endemic
Anacardiaceae	*Searsia lancea*	LC	
Anacardiaceae	*Searsia undulata*	LC	
Apiaceae	*Chamarea longipedicellata*	LC	
Apocynaceae	*Hoodia grandis*	LC	Endemic
Apocynaceae	*Piaranthus parvulus*	LC	Endemic
Araliaceae	*Cussonia spicata*	LC	
Asparagaceae	*Asparagus capensis var. capensis*	LC	
Asparagaceae	*Asparagus fasciculatus*	LC	
Asphodelaceae	*Astroloba foliolosa*	LC	Endemic
Asphodelaceae	*Bulbine abyssinica*	LC	
Asphodelaceae	*Bulbine alooides*	LC	Endemic
Asphodelaceae	*Bulbine capensis*	LC	Endemic
Asphodelaceae	*Bulbine succulenta*	LC	Endemic
Asphodelaceae	*Bulbine torta*	LC	Endemic
Asphodelaceae	*Bulbinella elegans*	LC	Endemic
Asphodelaceae	*Bulbinella latifolia subsp. denticulata*	LC	Endemic
Asphodelaceae	*Bulbinella nutans subsp. nutans*	LC	Endemic
Asphodelaceae	*Gonialoe variegata*	LC	
Asphodelaceae	*Haworthia arachnoidea var. namaquensis*	NE	Endemic
Asphodelaceae	*Haworthia arachnoidea var. scabrispina*	NE	Endemic
Asphodelaceae	*Haworthiopsis viscosa var. viscosa*		Endemic
Asphodelaceae	*Kniphofia sarmentosa*	LC	Endemic
Asphodelaceae	*Trachyandra patens*	LC	Endemic

Family	Species Name	Conservation Status	Endemism
Asphodelaceae	*Trachyandra sanguinorhiza*	LC	Endemic
Asphodelaceae	*Trachyandra thyrsoidea*	LC	Endemic
Aspleniaceae	*Asplenium cordatum*	LC	
Asteraceae	*Arctotis adpressa*	LC	Endemic
Asteraceae	*Berkheya spinosa*	LC	Endemic
Asteraceae	*Caputia tomentosa*	LC	Endemic
Asteraceae	*Cotula coronopifolia*	LC	
Asteraceae	*Cuspidia cernua subsp. annua*	LC	Endemic
Asteraceae	*Dimorphotheca cuneata*	LC	
Asteraceae	*Eriocephalus ericoides subsp. ericoides*	LC	
Asteraceae	*Eriocephalus eximius*	LC	
Asteraceae	*Eriocephalus punctulatus*	LC	
Asteraceae	*Eriocephalus purpureus*	LC	Endemic
Asteraceae	*Eriocephalus racemosus var. affinis*	LC	Endemic
Asteraceae	*Euryops lateriflorus*	LC	
Asteraceae	*Euryops marlothii*	LC	Endemic
Asteraceae	*Euryops oligoglossus subsp. racemosus*	LC	Endemic
Asteraceae	*Felicia australis*	LC	Endemic
Asteraceae	*Felicia dregei*	LC	Endemic
Asteraceae	*Felicia filifolia subsp. filifolia*	LC	
Asteraceae	*Felicia filifolia subsp. schaeferi*	LC	
Asteraceae	*Felicia lasiocarpa*	LC	Endemic
Asteraceae	*Felicia namaquana*	LC	
Asteraceae	*Foveolina dichotoma*	LC	
Asteraceae	*Garuleum bipinnatum*	LC	Endemic
Asteraceae	*Gazania leiopoda*	LC	Endemic
Asteraceae	*Helichrysum leontonyx*	LC	
Asteraceae	*Lasiopogon micropoides*	LC	
Asteraceae	*Lasiospermum pedunculare*	LC	Endemic
Asteraceae	*Leysera tenella*	LC	
Asteraceae	*Oedera humilis*		
Asteraceae	*Osmitopsis osmitoides*	LC	Endemic
Asteraceae	*Osteospermum scariosum*	LC	
Asteraceae	*Osteospermum scariosum var. scariosum*	NE	
Asteraceae	*Osteospermum sinuatum var. sinuatum*	LC	
Asteraceae	*Pteronia cinerea*	LC	Endemic
Asteraceae	*Pteronia empetrifolia*	LC	Endemic
Asteraceae	*Pteronia incana*	LC	Endemic
Asteraceae	*Senecio arenarius*	LC	
Asteraceae	*Steirodiscus capillaceus*	LC	Endemic
Asteraceae	*Ursinia anthemoides subsp. versicolor*	LC	
Asteraceae	*Ursinia nana subsp. nana*	LC	
Boraginaceae	*Anchusa capensis*	LC	
Brassicaceae	*Heliophila carnosa*	LC	
Brassicaceae	*Heliophila cornuta var. squamata*	NE	

Family	Species Name	Conservation Status	Endemism
Brassicaceae	*Heliophila crithmifolia*	LC	
Brassicaceae	*Heliophila seselifolia*	LC	
Brassicaceae	*Heliophila seselifolia var. seselifolia*	NE	
Brassicaceae	*Heliophila suborbicularis*	LC	Endemic
Colchicaceae	*Colchicum coloratum subsp. burchellii*	LC	Endemic
Colchicaceae	*Colchicum eucomoides*	LC	Endemic
Colchicaceae	*Colchicum hantamense*	LC	Endemic
Colchicaceae	*Ornithoglossum undulatum*	LC	
Colchicaceae	*Wurmbea variabilis*	LC	Endemic
Crassulaceae	*Adromischus liebenbergii*		Endemic
Crassulaceae	*Crassula campestris*	LC	
Cyperaceae	*Ficinia argyropa*	LC	Endemic
Cyperaceae	*Pseudoschoenus inanis*	LC	
Dipsacaceae	*Scabiosa columbaria*	LC	
Droseraceae	*Drosera cistiflora*	LC	Endemic
Ebenaceae	*Diospyros glabra*	LC	Endemic
Ebenaceae	*Diospyros lycioides subsp. lycioides*	LC	
Encalyptaceae	*Encalypta vulgaris*		
Fabaceae	*Lessertia falciformis*	LC	
Fabaceae	*Lessertia frutescens subsp. frutescens*	LC	
Fabaceae	*Lotononis leptoloba*	LC	Endemic
Fabaceae	*Lotononis venosa*	VU	Endemic
Fabaceae	*Rafnia capensis subsp. ovata*	LC	Endemic
Fabaceae	*Wiborgia sericea*	LC	Endemic
Geraniaceae	*Pelargonium hystrix*	LC	Endemic
Geraniaceae	*Pelargonium leipoldtii*	LC	Endemic
Geraniaceae	*Pelargonium luteopetalum*		Endemic
Grimmiaceae	*Grimmia pulvinata*		
Hyacinthaceae	*Drimia capensis*	LC	Endemic
Hyacinthaceae	*Lachenalia canaliculata*	LC	Endemic
Hyacinthaceae	*Lachenalia comptonii*	LC	Endemic
Hyacinthaceae	*Lachenalia juncifolia*		Endemic
Hyacinthaceae	*Lachenalia longituba*	VU	Endemic
Hyacinthaceae	*Lachenalia violacea*		Endemic
Hyacinthaceae	*Lachenalia zebrina*		Endemic
Hyacinthaceae	*Ornithogalum hispidum subsp. hispidum*	LC	
Hypoxidaceae	*Pauridia capensis*	LC	Endemic
Iridaceae	*Babiana cuneata*	LC	Endemic
Iridaceae	*Geissorhiza heterostyla*	LC	Endemic
Iridaceae	*Geissorhiza karooica*	NT	Endemic
Iridaceae	*Gladiolus ceresianus*	LC	Endemic
Iridaceae	*Gladiolus splendens*	LC	Endemic
Iridaceae	*Gladiolus uysiae*	LC	Endemic
Iridaceae	*Gladiolus venustus*	LC	Endemic
Iridaceae	*Hesperantha bachmannii*	LC	Endemic

Family	Species Name	Conservation Status	Endemism
Iridaceae	*Hesperantha cucullata*	LC	Endemic
Iridaceae	*Hesperantha humilis*	LC	Endemic
Iridaceae	*Hesperantha marlothii*	LC	Endemic
Iridaceae	*Hesperantha pilosa*	LC	Endemic
Iridaceae	*Ixia capillaris*	LC	Endemic
Iridaceae	*Ixia confusa*	LC	Endemic
Iridaceae	*Ixia lacerata*	LC	Endemic
Iridaceae	*Ixia linearifolia*	LC	Endemic
Iridaceae	*Ixia marginifolia*	LC	Endemic
Iridaceae	*Ixia mollis*	VU	Endemic
Iridaceae	*Ixia namaquana*	LC	Endemic
Iridaceae	*Ixia trifolia*	LC	Endemic
Iridaceae	*Lapeirousia montana*	LC	Endemic
Iridaceae	*Moraea amabilis*	LC	
Iridaceae	*Moraea ciliata*	LC	Endemic
Iridaceae	*Moraea cookii*	LC	
Iridaceae	*Moraea cuspidata*	LC	
Iridaceae	*Moraea flava*		Endemic
Iridaceae	*Moraea karroica*	LC	Endemic
Iridaceae	*Moraea pritzeliana*	LC	Endemic
Iridaceae	*Romulea atrandra var. atrandra*	LC	Endemic
Iridaceae	*Romulea austinii*	LC	Endemic
Iridaceae	*Romulea diversiformis*	LC	Endemic
Iridaceae	*Romulea eburnea*	VU	Endemic
Iridaceae	*Romulea hirta*	LC	Endemic
Iridaceae	*Romulea tortuosa subsp. aurea*	LC	Endemic
Iridaceae	*Syringodea unifolia*		Endemic
Limeaceae	*Limeum aethiopicum var. aethiopicum*	NE	Endemic
Malvaceae	*Anisodontea anomala*	LC	Endemic
Malvaceae	*Anisodontea triloba*	LC	Endemic
Malvaceae	*Hermannia filifolia var. grandicalyx*	NE	Endemic
Malvaceae	*Hermannia grandiflora*	LC	
Molluginaceae	*Pharnaceum aurantium*	LC	
Orchidaceae	*Disperis purpurata*		
Orchidaceae	*Disperis purpurata subsp. purpurata*	LC	Endemic
Orchidaceae	*Holothrix aspera*	LC	Endemic
Orchidaceae	*Pterygodium crispum*	LC	Endemic
Orchidaceae	*Pterygodium deflexum*	LC	Endemic
Orchidaceae	*Pterygodium hallii*	LC	Endemic
Orchidaceae	*Pterygodium pentherianum*	LC	Endemic
Orchidaceae	*Pterygodium schelpei*	LC	Endemic
Orchidaceae	*Pterygodium volucris*	LC	Endemic
Orobanchaceae	*Hyobanche rubra*	LC	
Oxalidaceae	*Oxalis melanosticta*		
Oxalidaceae	*Oxalis obtusa*	LC	

Family	Species Name	Conservation Status	Endemism
Oxalidaceae	*Oxalis palmifrons*	LC	Endemic
Poaceae	*Cynodon dactylon*	LC	
Poaceae	*Ehrharta calycina*	LC	
Poaceae	*Panicum schinzii*	LC	
Poaceae	*Poa bulbosa*	LC	
Polygalaceae	*Polygala scabra*	LC	
Pottiaceae	*Triquetrella tristicha*		
Proteaceae	*Leucospermum reflexum var. reflexum*	NE	Endemic
Proteaceae	*Paranomus dregei*	LC	Endemic
Pteridaceae	*Cheilanthes deltoidea subsp. deltoidea*	LC	
Pteridaceae	*Cheilanthes hastata*	LC	
Pteridaceae	*Cheilanthes induta*	LC	Endemic
Pteridaceae	*Pellaea rufa*	LC	Endemic
Rhamnaceae	*Phylica alba*	LC	Endemic
Rubiaceae	*Nenax cinerea*	LC	
Rubiaceae	*Nenax microphylla*	LC	
Santalaceae	*Lacomucinaea lineata*		
Santalaceae	*Thesium marlothii*	DD	Endemic
Scrophulariaceae	*Alonsoa unilabiata*	LC	Endemic
Scrophulariaceae	*Aptosimum indivisum*	LC	
Scrophulariaceae	*Buddleja salviifolia*	LC	
Scrophulariaceae	*Diascia bicolor*	LC	Endemic
Scrophulariaceae	*Diascia cardiosepala*	LC	Endemic
Scrophulariaceae	*Diascia hexensis*	LC	Endemic
Scrophulariaceae	*Diascia macrophylla*	LC	Endemic
Scrophulariaceae	*Diascia parviflora*	LC	Endemic
Scrophulariaceae	*Diascia sacculata*	LC	Endemic
Scrophulariaceae	*Hebenstretia robusta*	LC	Endemic
Scrophulariaceae	*Lyperia tristis*	LC	
Scrophulariaceae	*Manulea karrooica*	LC	Endemic
Scrophulariaceae	*Manulea pusilla*	LC	Endemic
Scrophulariaceae	*Nemesia azurea*	LC	Endemic
Scrophulariaceae	*Nemesia leipoldtii*	LC	Endemic
Scrophulariaceae	*Oftia africana*	LC	Endemic
Scrophulariaceae	*Polycarena aurea*	LC	Endemic
Scrophulariaceae	*Selago divaricata*	LC	
Scrophulariaceae	*Selago eckloniana*	LC	Endemic
Scrophulariaceae	*Selago glabrata*	LC	Endemic
Scrophulariaceae	*Selago gloiodes*	LC	Endemic
Scrophulariaceae	*Selago rigida*	LC	Endemic
Scrophulariaceae	*Zaluzianskya bella*	LC	Endemic
Scrophulariaceae	*Zaluzianskya mirabilis*	LC	Endemic
Sphaerocarpaceae	*Sphaerocarpos stipitatus*		
Stilbaceae	*Halleria lucida*	LC	
Targioniaceae	*Targionia hypophylla*		

Family	Species Name	Conservation Status	Endemism
Thymelaeaceae	*Lachnaea ruscifolia*	LC	Endemic

8.3 Appendix C – Amphibian species expected to occur in the project area

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	LC	LC
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	LC	LC
Pyxicephalidae	*Cacosternum karooicum*	Karoo Caco	DD	LC
Bufonidae	*Sclerophrys capensis*	Raucous Toad	LC	LC
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	LC	LC
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	LC	LC
Bufonidae	*Vandijkophrynus gariepensis*	Karoo Toad	LC	LC
Pipidae	*Xenopus laevis*	Common Platanna	LC	LC

8.4 Appendix D – Reptile species expected to occur in the project area

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Scincidae	*Acontias lineatus*	Striped Dwarf Legless Skink	LC	LC
Agamidae	*Agama atra*	Southern Rock Agama	LC	LC
Agamidae	*Agama hispida*	Southern Spiny Agama	LC	LC
Elapidae	*Aspidelaps lubricus lubricus*	Cape coral snake	LC	LC
Viperidae	*Bitis arietans arietans*	Puff Adder	LC	Unlisted
Lamprophiidae	*Boaedon capensis*	Brown House Snake	LC	LC
Chamaeleonidae	*Bradypodion gutturale*	Little Karoo Dwarf Chameleon	LC	LC
Chamaeleonidae	*Chamaeleo namaquensis*	Namaqua Chameleon	LC	LC
Testudinidae	*Chersina angulata*	Angulate Tortoise	LC	LC
Testudinidae	*Chersobius boulengeri*	Karoo padloper	EN	EN
Gekkonidae	*Chondrodactylus angulifer*	Common Giant Gecko	LC	LC
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	LC	Unlisted
Gerrhosauridae	*Cordylosaurus subtessellatus*	Dwarf Plated Lizard	LC	LC
Cordylidae	*Cordylus minor*	Western Dwarf Girdled Lizard	LC	LC
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	LC	LC
Elapidae	*Hemachatus haemachatus*	Rinkhals	LC	LC
Cordylidae	*Hemicordylus capensis*	Cape Cliff Lizard	LC	LC
Testudinidae	*Homopus areolatus*	Parrot-beaked Dwarf Tortoise	LC	LC
Testudinidae	*Homopus femoralis*	Greater Dwarf Tortoise	LC	LC
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	LC	LC
Cordylidae	*Karusasaurus polyzonus*	Southern Karusa Lizard	LC	LC

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Lamprophiidae	*Lamprophis fiskii*	Fisk's Snake	LC	LC
Lamprophiidae	*Lamprophis guttatus*	Spotted Rock Snake	LC	LC
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	LC	Unlisted
Elapidae	*Naja nigricincta woodi*	Black Spitting Cobra	LC	Unlisted
Elapidae	*Naja nivea*	Cape Cobra	LC	Unlisted
Leptotyphlopidae	*Namibiana gracilior*	Slender Thread Snake	LC	LC
Lacertidae	*Nucras tessellata*	Western Sandveld Lizard	LC	Unlisted
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	LC	Unlisted
Gekkonidae	*Pachydactylus formosus*	Southern Rough Gecko	LC	LC
Gekkonidae	*Pachydactylus geitje*	Ocellated Gecko	LC	LC
Gekkonidae	*Pachydactylus kladaroderma*	Thin-skinned Gecko	LC	LC
Gekkonidae	*Pachydactylus maculatus*	Spotted Gecko	LC	LC
Gekkonidae	*Pachydactylus mariquensis*	Common Banded Gecko	LC	LC
Gekkonidae	*Pachydactylus oculatus*	Golden Spotted Gecko	LC	LC
Gekkonidae	*Pachydactylus purcelli*	Purcell's Gecko	LC	Unlisted
Gekkonidae	*Pachydactylus weberi*	Weber's Gecko	LC	LC
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	LC	LC
Lacertidae	*Pedioplanis laticeps*	Karoo Sand Lizard	LC	LC
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common sand lizard	LC	LC
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	LC	LC
Testudinidae	*Psammobates tentorius verroxii*	Tent Tortoise	NT	NT
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	LC	LC
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	LC	Unlisted
Pseudaspis	*Pseudaspis cana*	Mole Snake	LC	Unlisted
Cordylidae	*Pseudocordylus microlepidotus namaquensis*	Nuweveldberg Crag Lizard	LC	LC
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	LC	Unlisted
Gerrhosauridae	*Tetradactylus tetradactylus*	Cape Long-tailed Seps	LC	LC
Scincidae	*Trachylepis capensis*	Cape Skink	LC	Unlisted
Scincidae	*Trachylepis sulcata sulcata*	Westren Rock Skink	LC	Unlisted
Scincidae	*Trachylepis variegata*	Variegated Skink	LC	Unlisted

8.5 Appendix E – Mammal species expected to occur within the project area

Family	Species	Common Name	Conservation Status	
			Regional	Global
Muridae	*Aethomys granti*	Grant's rock mouse	Unlisted	LC
Muridae	*Aethomys namaquensis*	Namaqua rock rat	LC	LC
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT
Herpestidae	*Atilax paludinosus*	Water Mongoose	LC	LC
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	EN	CR
Canidae	*Canis mesomelas*	Black-backed Jackal	LC	LC
Felidae	*Caracal caracal*	Caracal	LC	LC
Soricidae	*Crocidura cyanea*	Reddish-grey Musk Shrew	LC	LC
Bathyergidae	*Cryptomys hottentotus*	Common Mole-rat	LC	LC
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC	LC
Muridae	*Desmodillus auricularis*	Short-tailed Gerbil	LC	LC
Macroscelididae	*Elephantulus edwardii*	Cape elephant shrew	Unlisted	LC
Macroscelididae	*Elephantulus rupestris*	Western rock sengi	LC	LC
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU
Felidae	*Felis silvestris*	African Wildcat	LC	LC
Viverridae	*Genetta genetta*	Small-spotted Genet	LC	LC
Viverridae	*Genetta tigrina*	Cape Genet	LC	LC
Muridae	*Gerbilliscus afra*	Cape Gerbil	LC	LC
Muridae	*Gerbillurus paeba*	Hairy-footed Gerbil	LC	LC
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	LC	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC	LC
Mustelidae	*Ictonyx striatus*	Striped Polecat	LC	LC
Felidae	*Leptailurus serval*	Serval	NT	LC
Leporidae	*Lepus capensis*	Cape Hare	LC	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC
Macroscelididae	*Macroscelides proboscideus*	Karoo Round-eared Sengi	LC	LC
Nesomyidae	*Malacothrix typica*	Gerbil Mouse	LC	LC
Mustelidae	*Mellivora capensis*	Honey Badger	LC	LC
Muridae	*Mus minutoides*	Pygmy Mouse	LC	LC
Bovidae	*Oreotragus oreotragus*	Klipspringer	LC	LC
Orycteropodidae	*Orycteropus afer*	Aardvark	LC	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox	LC	LC
Muridae	*Otomys unisulcatus*	Karoo Bush Rat	LC	LC
Felidae	*Panthera pardus*	Leopard	VU	VU
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC	LC

Family	Species	Common Name	Conservation Status	
			Regional	Global
Muridae	*Parotomys brantsii*	Brants' Whistling Rat	LC	LC
Bovidae	*Pelea capreolus*	Grey Rhebok	NT	NT
Muridae	*Petromyscus collinus*	Pygmy Rock Mouse	LC	LC
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	NT	LC
Procaviidae	*Procavia capensis*	Rock Hyrax	LC	LC
Leporidae	*Pronolagus saundersiae*	Hewitt's Red Rock Rabbit	LC	LC
Hyaenidae	*Proteles cristata*	Aardwolf	LC	LC
Bovidae	*Raphicerus campestris*	Steenbok	LC	LC
Bovidae	*Raphicerus melanotis*	Southern grysbok	LC	LC
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Mouse	LC	LC
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	LC	LC
Herpestidae	*Suricata suricatta*	Suricate	LC	LC
Bovidae	*Sylvicapra grimmia*	Common Duiker	LC	LC
Canidae	*Vulpes chama*	Cape Fox	LC	LC

8.6 Appendix F – Specialists Declarations

I, Mahomed Desai, 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 71 and is punishable in terms of Section 24F of the Act.

Mahomed Desai

Biodiversity Specialist

The Biodiversity Company

February 2022