Montana 2 Solar Energy Facility – Biodiversity Impact Assessment

Central Karoo District Municipality, Western Cape

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CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**Montana 2 Solar Energy Facility – Biodiversity Impact Assessment**
Submitted to	savannah environmental
Report Writer	**Mahomed Desai** 
	Dr. Mahomed Desai is Pr. Nat. Sci. registered (134678) and has extensive experience in assessing estuarine, freshwater, and terrestrial biodiversity. He obtained his M.Sc. in Environmental Engineering and Ph.D. in Ecological Sciences and has over 10 years of experience working with African fauna and flora as a researcher and consultant, through various projects.
Report Writer / Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
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
AOO	Area of Occupancy
BI	Biodiversity Importance
CBA	Critical Biodiversity Area
CI	Conservation Importance
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries, and the Environment
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
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Areas Database
SCC	Species of Conservation
SEI	Site Ecological Importance
SWSA	Strategic Water Source Area
VU	Vulnerable
WP	Well Protected

Executive Summary

Montana 2 Solar Energy Facility (Pty) Ltd. the ("Independent Power Producer") proposes to develop the Montana 2 solar energy facility its and associated electrical infrastructure the ("Project/Facility") approximately 15 km north-west of Nelspoort and 60 km south-west of Beauford West within the Central Karoo District Municipality in the Western Cape Province. The Project site is located within the Beaufort West Renewable Energy Development Zone ("REDZ 11") and the Central Transmission Corridor. The facility is to be developed with a maximum installed capacity of 160 MW and will have a generating capacity of 140 MW. The Project is earmarked for submission into the South African Government's Renewable Independent Power Producer Procurement Programme ("REIPPPP") or for a Private Off-take.

This assessment describes the composition of the floral and faunal (herpetofauna and non-volant mammals) community within the area affected by the proposed development, and the possible impacts on the local biota. In order to achieve this, a review of available desktop information and a field survey for the Project Area of Influence (PAOI) was undertaken. The PAOI comprised of the development boundary.

The PAOI was observed to support keystone fauna, even though there are negative impacts from anthropogenic activities within the PAOI and surrounding landscape. These keystone fauna, which comprise of ecosystem engineers such as *Orycteropus afer* (Aardvark), *Geosciurus inauris* (South African Ground Squirrel) and *Messor capensis*, as well as seed dispersers such as *Stigmochelys pardalis* (Leopard Tortoise), are vital in maintaining ecosystem structure and functioning. In addition to supporting keystone fauna, the PAOI is overlaps an Ecological Support Area 1 and marginally with a Critical Biodiversity Area. The former is important in maintaining connectivity between surrounding Critical Biodiversity Areas. The PAOI is also traversed by ephemeral drainage systems that are connected to an unnamed tributary of the Sout River, with the unnamed tributary categorised as a Freshwater Ecosystem Priority Area. The Site Ecological Importance (SEI) was determined to be 'High' as summarised in the table below.

Area (ha)	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
297.168	Medium Confirmed or highly likely occurrence of populations of NT species	High Very large (> 100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	Medium	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.	High

The expected impacts of the proposed SEF will include the following:

- habitat loss and fragmentation;
- degradation of surrounding habitat;

- disturbance and displacement of fauna caused during the construction and maintenance phases; and
- direct mortality during the construction phase.

In order to reduce the significance of the impacts several mitigation measures can be implemented during the construction and operational phase of the proposed developed. As indicated in the IUCN guidelines, indigenous vegetation must be maintained under the solar panels to ensure biodiversity maintenance. Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity.

During the construction phase, displacement and disturbance of fauna can be reduced by restricting habitat loss and disturbance to within the footprint of the development area. All personnel should undergo environmental induction with regards to the local fauna and in particular awareness about not harming, collecting or hunting terrestrial species.

Rehabilitation of disturbed areas must occur to mitigate against erosion and the encroachment of invasive plants as this will lead to a negative shift in the wellbeing of the biotic community within the landscape. It is important to ensure that regular monitoring for invasive plant encroachment occurs during the operation phase. This should be undertaken quarterly during the first two years of the operation phase and annually for the life of the project. This is to ensure that the area is not degraded further. Monitoring for signs of erosion must be undertaken in parallel and rectified as soon as possible.

Cumulative impacts of energy developments are a concern and based on the extent of energy developments within the Gamka Karoo vegetation type, it was rated as ‘Medium’. As aforementioned, the PAOI possesses a ‘High’ SEI. The SEI was determined to ‘High’ based on the high likelihood of occurrence for Near Threatened species, the extent of the area considered and its connectivity to natural areas within the landscape, as well as the low resilience of the vegetation to anthropogenic impacts.

In order to evaluate the extent of ‘avoidance’ achieved for the project, the following is noteworthy:

- The footprint areas for the four proposed solar facilities amounts to 1 144.645 ha; and
- The total extent of the entire property area comprising 49 337.900 ha, thus approximately 2% of the property area will be developed.

The project area has been designated as a REDZ (Renewable Energy Development Zone) and taking into consideration the extent of ‘avoidance’ achieved for the project, it is the opinion of the specialist that the authorisation of the proposed project may be favourably considered. It is recommended that should any future developments be proposed for the remaining extent of any ‘Very High’ or ‘High’ SEI areas within the associated properties, that offset strategies be required for these authorisations.

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Background

Montana 2 Solar Energy Facility (Pty) Ltd. the ("Independent Power Producer") proposes to develop the Montana 2 solar energy facility its and associated electrical infrastructure the ("Project/Facility") approximately 15 km north-west of Nelspoort and 60 km south-west of Beauford West within the Central Karoo District Municipality in the Western Cape Province. The Project site is located within the Beaufort West Renewable Energy Development Zone ("REDZ 11") and the Central Transmission Corridor. The facility is to be developed with a maximum installed capacity of 160 MW and will have a generating capacity of 140 MW. The Project is earmarked for submission into the South African Government's Renewable Independent Power Producer Procurement Programme ("REIPPPP") or for a Private Off-take.

The Project (Montana 2 Solar Energy Facility) is part of a cluster known as the Poortjie Wes Cluster (the "Cluster"). The Cluster entails the development of four (4) solar energy facilities. All four renewable energy ("RE") facilities will connect to the proposed 132kV Belvedere Collector Switching Station (the "Collector Switching Station") via 132 kV Overhead Lines ("OHLs"). The proposed Collector Switching Station will connect to the new Poortjie Wes 400/132 kV LILO MTS ("Poortjie Wes LILO MTS") via a 132kV OHL. A technically suitable project site of ~415 ha has been identified by Montana 2 Solar Energy Facility (Pty) Ltd for the establishment of the PV facility. The project site is located on the following property:

- The Remainder Portion 3 of the Farm Montana No 123 in the Division of Beaufort West, Western Cape Province.

The Biodiversity Company (TBC) was appointed to undertake a Biodiversity Impact Assessment for the proposed Montana 2 Solar Energy Facility. 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 the checklist items are located in the report.

1.2 Project Description

The development footprint for the facility allowing the facility to generate 190 MWac will be approximately 395 ha and will contain the following infrastructure:

- The Solar Facility:
    - PV modules (mono or bifacial);
    - Single axis tracking structures, Fixed Axis Tracking, or Fixed Panels;
    - Fixed tilt mounting structure (to be considered during the design phase of the facility);
    - Galvanised steel and/or aluminium solar module mounting structures;

  - Solar module substructure foundations. These will likely be drilled into the ground, filled with concrete and then have posts fixed inside them. Alternately, ramming may be used; and
  - 45 to 50 Central Inverter stations.

- Building Infrastructure:
  - Offices;
  - Operational and maintenance control centre;
  - Warehouse/workshop;
  - Panel maintenance and cleaning area;
  - Ablution facilities;
  - A conservancy tank for storage of sewage underground with a capacity of up to 35 m^3; and
  - Guard Houses.

- Associated Infrastructure:
  - On-site substation building - IPP owned (including lightening conductor poles);
  - Eskom switching station, to be handed over to Eskom at Commercial Operation Date ("COD") (this forms part of a separate BA);
  - Battery storage (500 MW/500 MWh);
  - Internal distribution lines of up to 33 kV;
  - Underground low voltage cables or cable trays;
  - Internal gravel roads;
  - Fencing;
  - Stormwater channels;
  - Temporary work area during the construction phase; and
  - An access road to site from an existing gravel road.

Part of the grid infrastructure to be built by each of the four RE facilities will be owned and operated by Eskom Holdings (SOC) Ltd. ("Eskom"). This includes:

- an onsite Switching Station;
- a 132 kV OHL from each onsite Switching Station to the new Collector Switching Station; and
- gravel service road beneath the 132 kV power line.

This forms part of a separate Basic Assessment process.

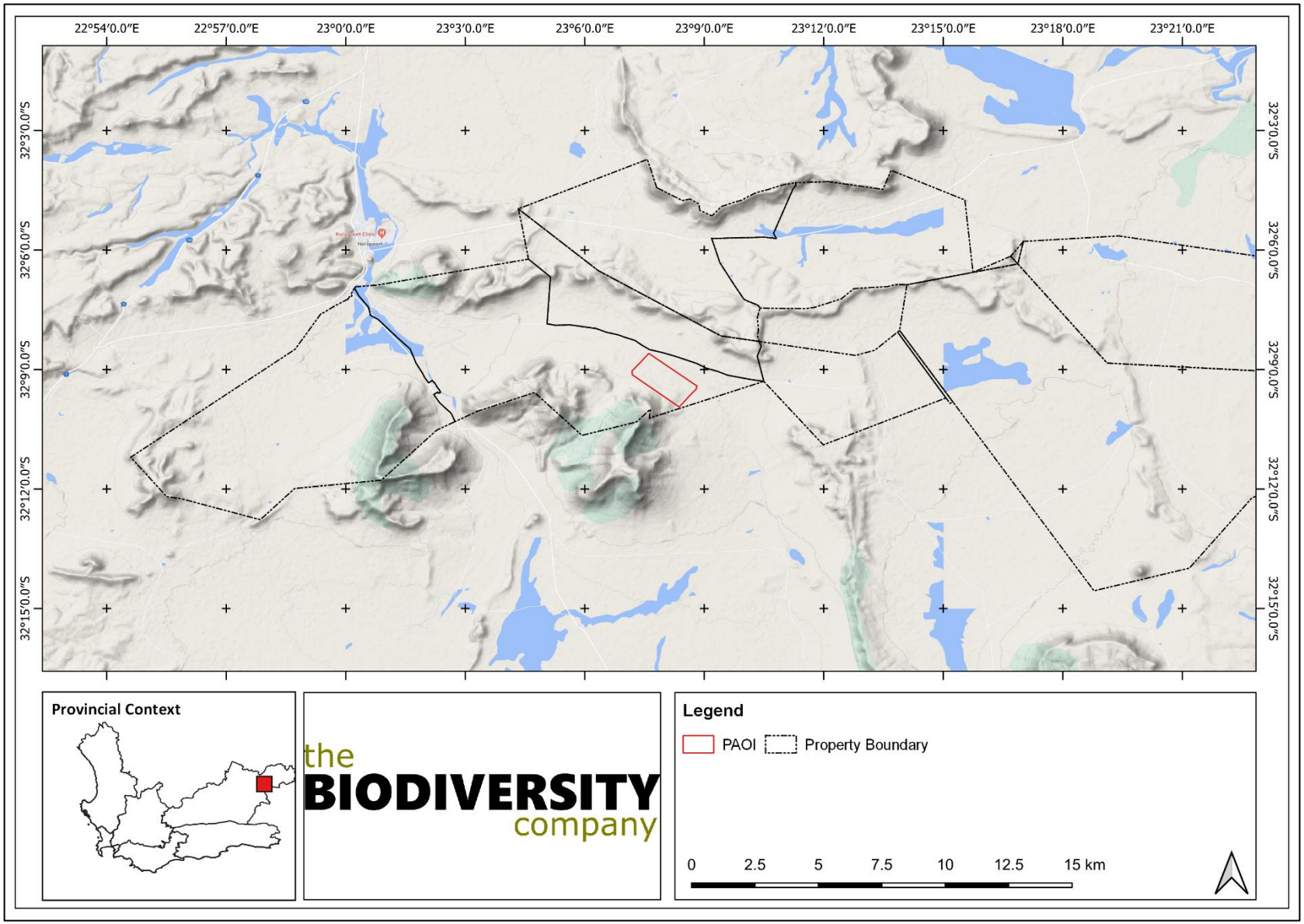


Figure 1-1 Map illustrating the location of the proposed Montana 2 Solar Energy Facility, Western Cape

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 Project Area of Influence (PAOI) and surrounding landscape;
- Desktop assessment to compile an expected species list and possible flora and fauna Species of Conservation Concern (SCC) (Figure 1-2) that potentially occur within the proposed PAOI;
- Field survey to ascertain the species composition of the present flora and fauna community within the PAOI;
- Delineate the Site Ecological Importance (SEI) within the PAOI;
- 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.

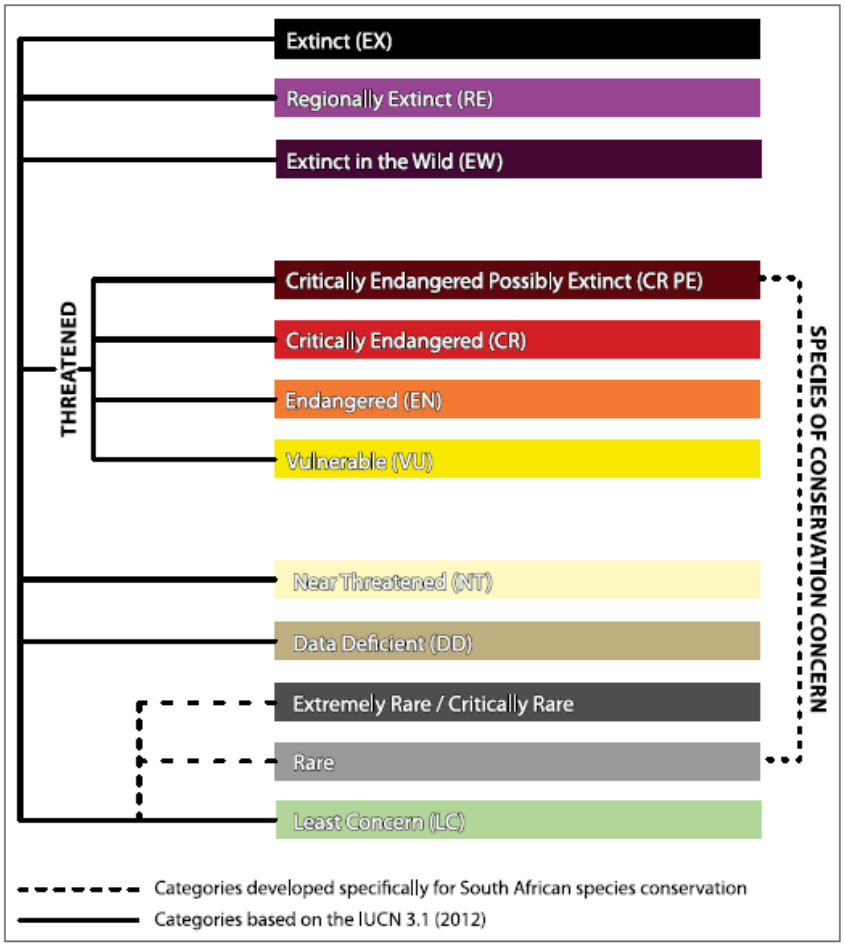


Figure 1-2 The different categories of Species of Conservation Concern modified from the IUCN's extinction risk categories. Source: SANBI (2020)

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the Project Area of Influence (PAOI) provided by the client (the development boundary) and any alterations to the area and/or missing GIS information pertaining to the development layout would have affected the area surveyed;
- 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;
- With regards to the fauna species assessment, only amphibians, reptiles and non-volant mammal species were considered. The avifauna and volant mammal impact assessment were undertaken by separate specialists;
- No passive sampling techniques for small non-volant mammals were utilised within the PAOI due to time constraints;
- Only a single survey was undertaken in November (late Spring) and hence there is a high probability that not all species of flora will be recorded. Due to time constraints no protected flora were geotagged; 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: 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)
	Environmental Conservation Act (Act No. 73 of 1983)
	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 Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 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	Nature Conservation Ordinance No. 19 of 1974
	Western Cape Nature Conservation Laws Amendment Act, 2000
	Central Karoo District Municipal Spatial Development Framework

2 Methods

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

2.1 Project Area

The project area is located predominantly within plain landscapes, termed 'Die Vlakte', which are comprised of Beaufort Shales or Adelaide Group rock types, with areas of Dolerite outcrops (Figure 2-1).

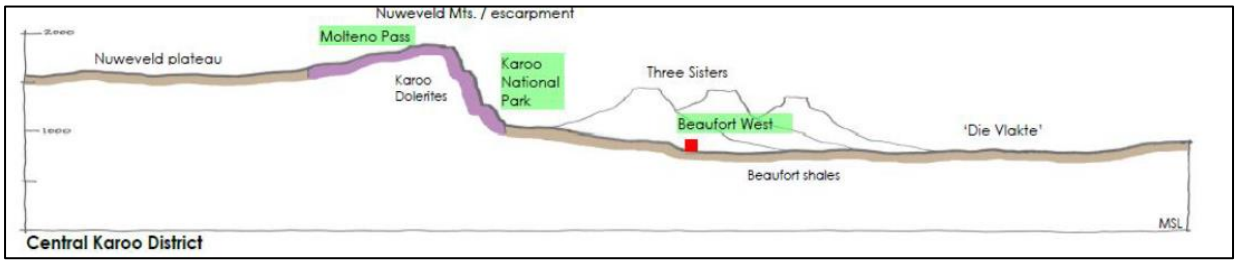


Figure 2-1 Cross-sectional profile of the Central Karoo landscape (Source: Central Karoo SDF)

The project area is located within an arid region, as it is located in the rain shadow of the Cape Fold Mountains, specifically the Groot Swartberg Mountain Range, to the south. Based on the Köppen climate classification, the climate of the project area is classified as Cold desert climate (BWk) and Cold semi-arid climate (BSk). Regions classified as BWk usually feature hot, dry summers, though summers are not typically as hot as hot desert climates. Unlike hot desert climates, cold desert climates tend to feature cold, dry winters. Cold desert climates are typically found at higher altitudes than hot desert climates and are usually drier than hot desert climates. BSk regions tend to be located in elevated portions of temperate zones, typically bordering a humid continental climate or a Mediterranean climate. They are typically found in continental interiors some distance from large bodies of water. Cold semi-arid climates usually feature warm to hot dry summers, though their summers are typically not quite as hot as those of hot semi-arid climates. Unlike hot semi-arid climates, areas with cold semi-arid climates tend to have cold winters. These areas usually see some snowfall during the winter, though snowfall is much lower than at locations at similar latitudes with more humid climates.

Climate data for the project area was obtained from https://en.climate-data.org/. No data was available for the specific region and the data provided for the town of Beaufort West was used. January is the hottest month of the year with a mean temperature of 24.0 °C (Figure 2-2). The lowest mean temperature is recorded in July, at 11.1 °C. Most precipitation occurs during March (early Autumn), with an average of 57 mm (Figure 2-2). Precipitation is the lowest in June, with an average of 15 mm.

The latest available landcover dataset indicates that the majority of the landscape within which the project area is located, is classified as Nama Karoo shrubland, with patches of open bare ground, natural grassland, open woodland and artificial waterbodies.

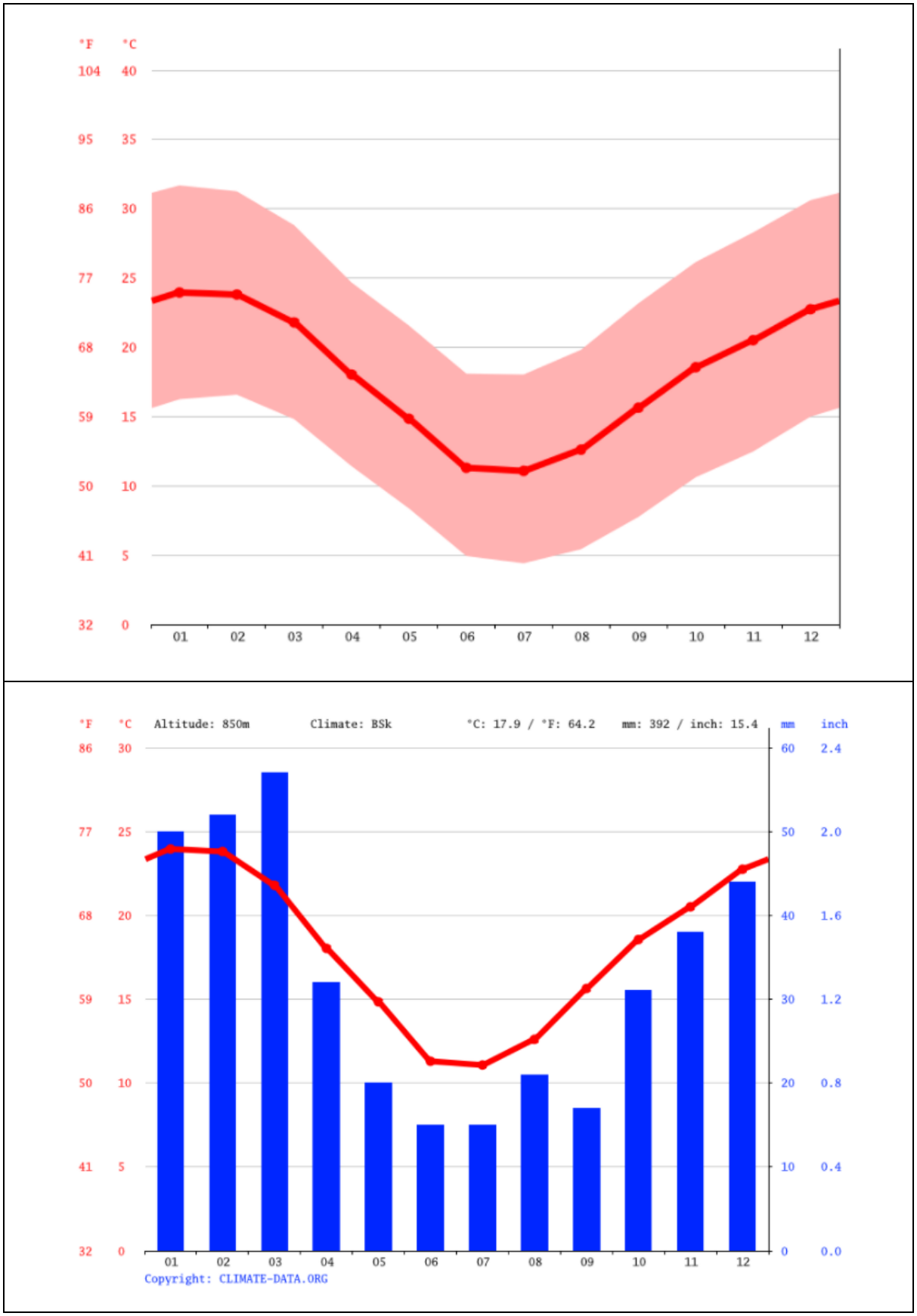


Figure 2-2 Plots illustrating mean monthly temperature (top) and mean monthly precipitation (bottom) for Beaufort West (source: https://en.climate-data.org/)

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 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) (DFFE, 2021b) – 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 (Cape Nature, 2017) – The Western Cape Biodiversity Spatial Plan (WCBSP) is a spatial tool that comprises the Biodiversity Spatial Plan Map (BSP Map) of biodiversity priority areas, accompanied by contextual information and land use guidelines that make the most recent and best quality biodiversity information available for land use and development planning, environmental assessment and regulation, and natural resource management. 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; and

- Hydrological Context

    - 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.

    - 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 2-3). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

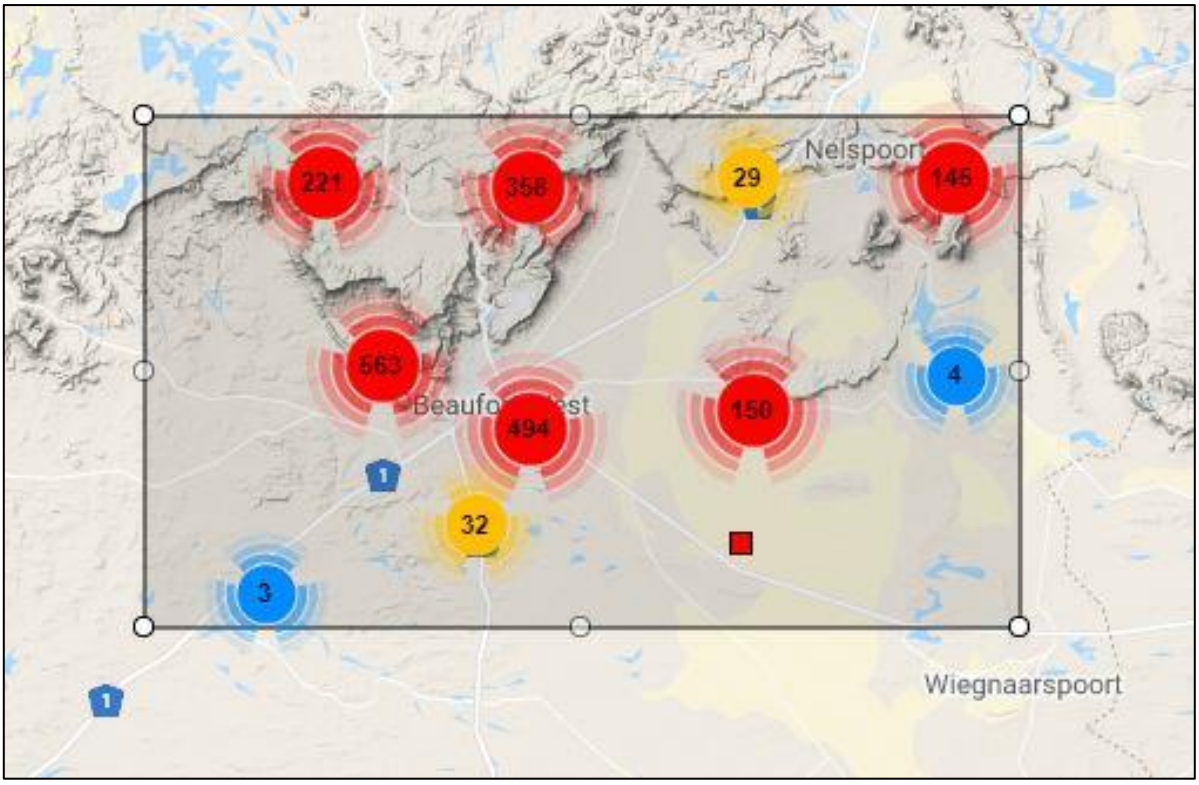


Figure 2-3 ***Map illustrating extent of area used to obtain the expected flora species list for the Poortjies Wes Renewable Energy Facilities project area from the Plants of South Africa (POSA) database***

2.2.3 Desktop Fauna Assessment

The faunal desktop assessment comprised of the following:

- Compiling an expected herpetofauna (amphibians and reptiles) list generated from the IUCN spatial dataset (2017) and the Animal Demography Unit (FitzPatrick Institute of African Ornithology, 2022a; FitzPatrick Institute of African Ornithology, 2022b) using the 3222BB, 3223AA and 3223AB quarter degree squares; and
- Compiling an expected mammal list generated from the IUCN spatial dataset (2017) and the Animal Demography Unit (FitzPatrick Institute of African Ornithology, 2022c) using the 3222BB, 3223AA and 3223AB quarter degree squares.

2.3 Field Assessment

A single field survey was undertaken during the 2nd of November 2021 (Spring), which constitutes a wet-season survey, to determine the presence of Species of Conservation Concern (SCC) and to ascertain an overview of the ecological condition of the PAOI. 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. Fauna specimens observed external to the PAOI were also included in the species list.

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 (Goff *et al*, 1982). 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.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC was conducted through meanders within representative habitat units.

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 texts consulted for identification purposes in the field during the survey included the following:

- Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al,* 2015);
- iNaturalist;
- Flowering Plants of the Southern Kalahari (Van Rooyen and Van Rooyen, 2019);
- 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

The faunal assessment within this report pertains to herpetofauna and non-volant mammals. The faunal field survey comprised of the following active and passive techniques:

- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically in dense shrubs, under rocks and coarse woody debris) (Figure 2-4A);
- Visual and auditory searches - This typically comprised of traversing the PAOI and using a camera to view species from a distance without them being disturbed as well as listening to species calls. Due to the climatic and habitat characteristics of the project area, the use of signs and tracks was vital in recording species (Figure 2-4B); and
- Camera Traps (Figure 2-4C) – Four camera traps were deployed within the surrounding landscape for 60 hours, accounting for a total of 280 trapping hours. The camera traps were baited with tinned sardines to improve sampling efficacy.

Diagnostic features of the individuals that were captured were photographed at site and released (Figure 2-4D).

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);
- Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi (Stuart and Stuart, 2015); and
- Mammals of Southern Africa and their Tracks & Signs (Gutteridge & Liebenberg, 2021).

Figure 2-4 ***Photographs illustrating sampling methods utilised in the biodiversity impact assessment for the proposed Montana 2 Solar Energy Facility. A) Active hand sampling at the base on shrubs, B) Recording tracks and other signs such as scat, C) Camera traps placed at burrows which are imperative for recording fauna in arid or semi-arid regions; and D) Photographing diagnostic features of specimens captured***

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. The determination of the SEI was in accordance with the method described in the Species Environmental Assessment Guideline (SANBI, 2020).

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

Functional Integrity	Fulfilling Criteria
	used road network between intact habitat patches. 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 (SANBI, 2020)

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	Irrelevant – Overlaps with Least Concern ecosystems	3.1.1.1
Ecosystem Protection Level	Relevant – Overlaps with Poorly Protected ecosystems	3.1.1.2
Protected Areas	Irrelevant – Located approximately 37 km north-east from the Steenbokkie Private Nature Reserve	3.1.1.3
National Protected Areas Expansion Strategy	Irrelevant – Does not overlap a NPAES focus area	3.1.1.3
Western Cape Biodiversity Spatial Plan	Relevant – Overlaps Ecological Support Area 1	3.1.1.4
Hydrological Context	Relevant – Drainage lines connect to a Freshwater Ecosystem Priority 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).

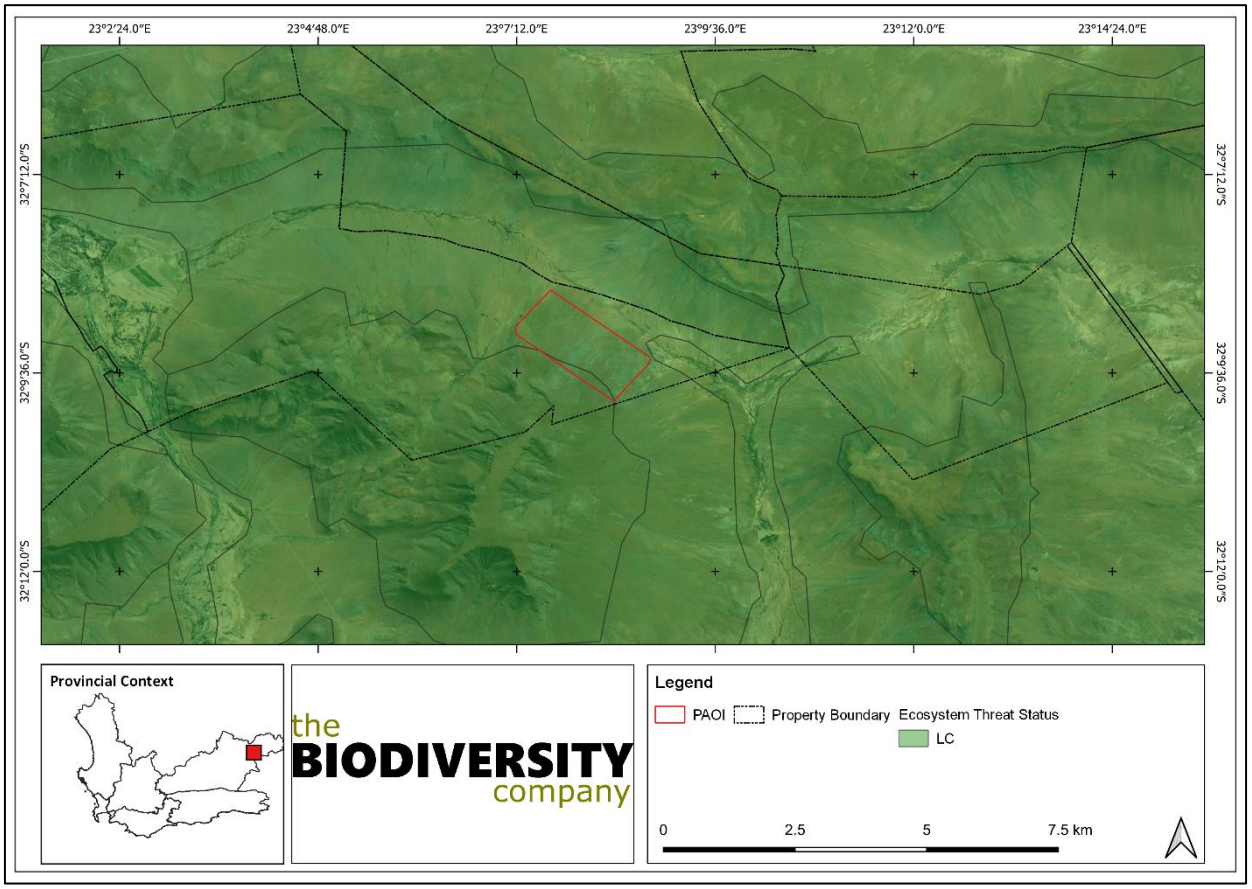


Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed Montana 2 Solar Energy Facility PAOI

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 PP ecosystems (Figure 3-2).

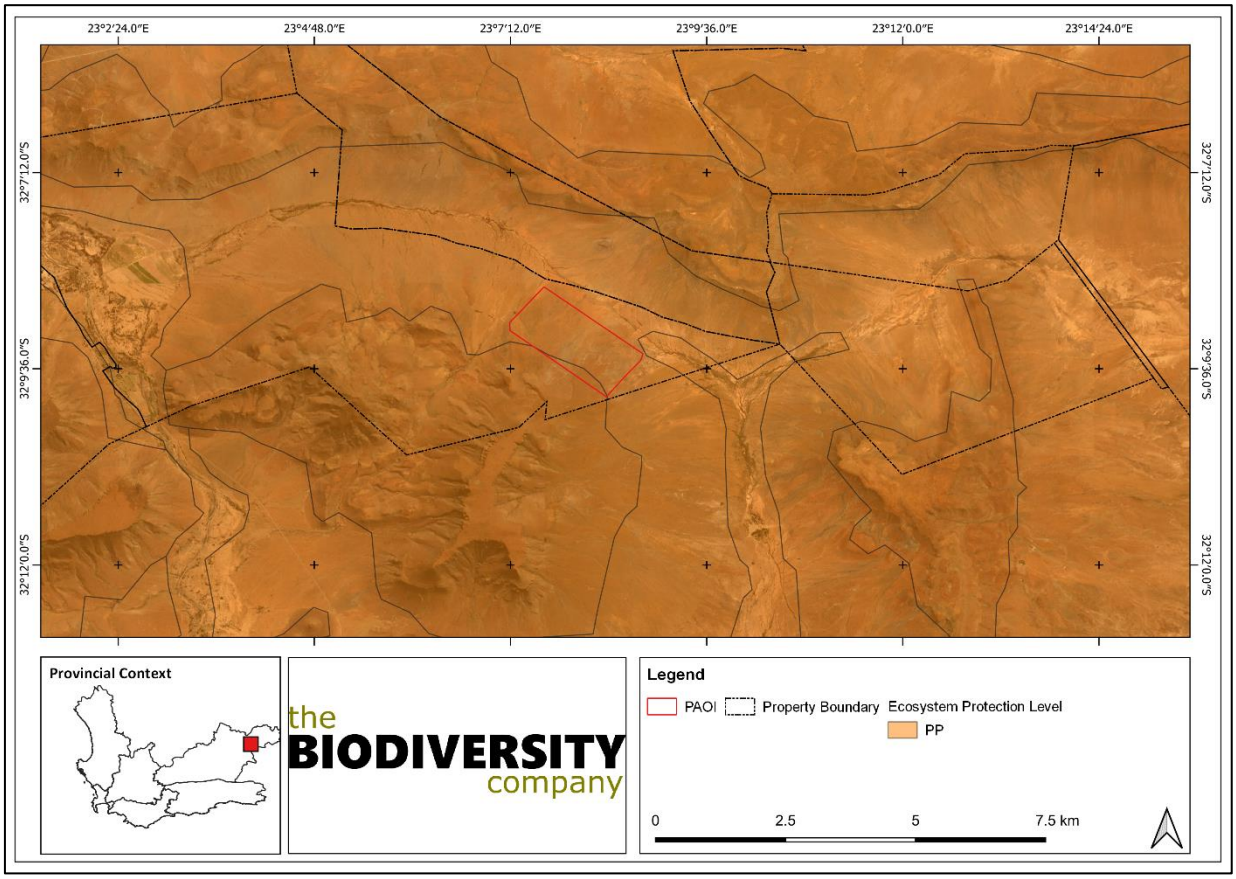


Figure 3-2 Map illustrating the ecosystem protection level associated with the proposed Montana 2 Solar Energy Facility PAOI

3.1.1.3 Protected Areas

According to the SAPAD dataset, the proposed development area does not occur within any protected area (Figure 3-3). The Mountain Zebra-Camdeboo Protected Environment is located approximately 50 km to the east and the Steenbokkie Private Nature Reserve is located approximately 37 km to the south-west. The proposed activity is unlikely to influence surrounding protected areas as they are situated outside of the buffer zone required to maintain the functioning of these protected areas. In addition, the PAOI does not overlap an NPAES focus areas nor is there one within the immediate surrounding landscape (Figure 3-3). The Upper Karoo Focus Area is located approximately 38 km to the west.

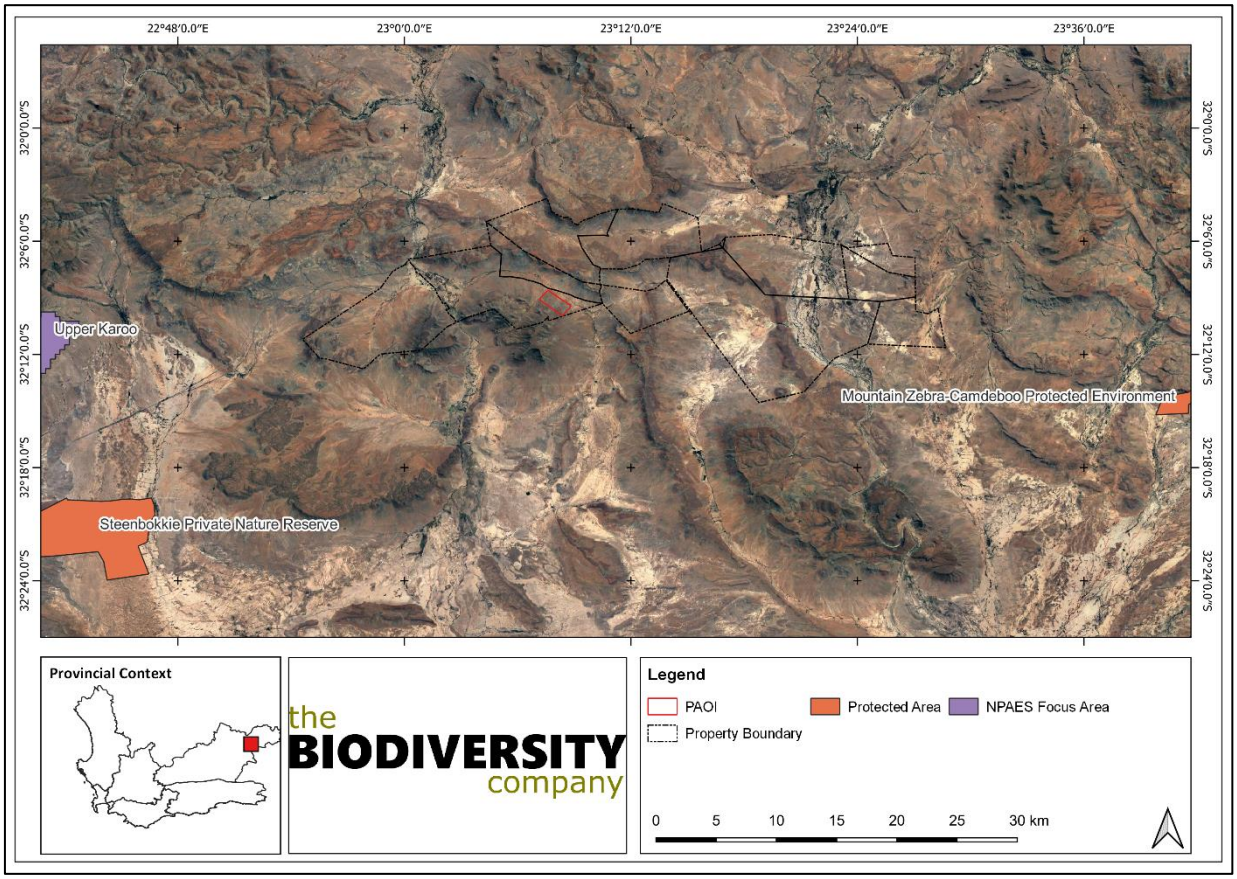


Figure 3-3 Map illustrating the location of protected areas proximal to the proposed Montana 2 Solar Energy Facility PAOI

3.1.1.4 Western Cape Biodiversity Spatial Plan

Figure 3-4 illustrates that the proposed development overlaps with an Ecological Support Area 1. ESA1 features are important in supporting the functioning of Protected Areas or Critical Biodiversity Areas and are often vital for ecosystem services. These ESAs must be maintained in a functional, near-natural state. Some habitat loss is acceptable, provided underlying biodiversity objectives/ecological functioning are not compromised (CapeNature, 2017). The ESA is characterised as such due to Watercourse protection and overlaps the drainage lines within the PAOI. The ESA also forms a corridor for fauna movement within the landscape and supports proximal CBAs. Any development within the ESA will impede the movement of fauna and propagules within the landscape.

The PAOI overlaps only marginally with a CBA1 feature (Figure 3-4). CBAs are critically required in order to meet biodiversity pattern and process thresholds. CBAs are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. Degraded areas should be rehabilitated to natural or near-natural condition. Only low-impact, biodiversity-sensitive land uses are appropriate (CapeNature, 2017).

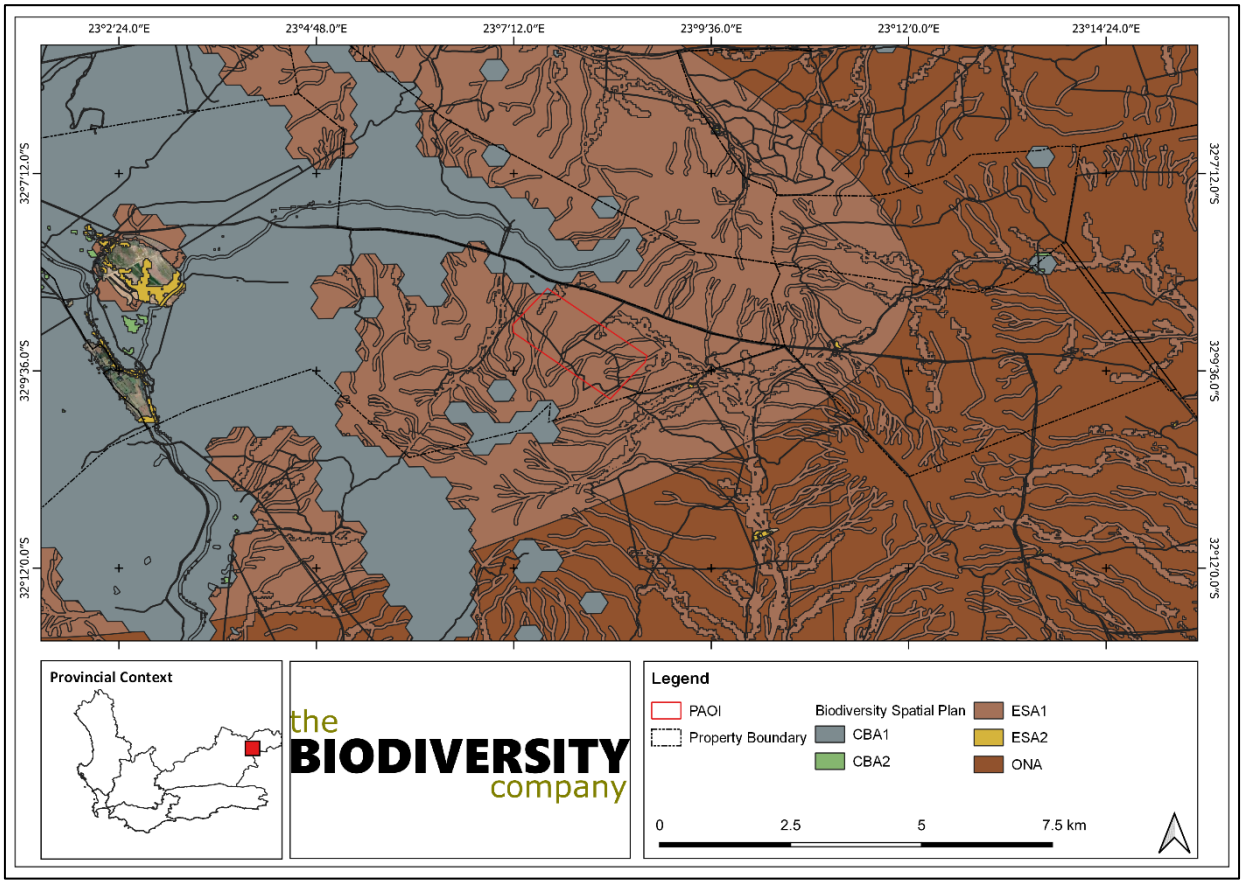


Figure 3-4 ***Map illustrating the proposed Montana 2 Solar Energy Facility PAOI overlaid onto the Western Cape Biodiversity Spatial Plan***

3.1.1.5 Hydrological Context

The PAOI is located within the Sout River Catchment, specifically quaternary catchments L11E and L11G (Figure 3-5). The drainage lines traversing the PAOI are characterised as ephemeral and drain into unnamed tributaries of the Sout River mainstem when there is sufficient precipitation to cause surface flow.

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the National Biodiversity Assessment (NBA) 2018. Ecosystem threat status (ETS) of ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT. Critically Endangered, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). These ephemeral drainage lines were not assessed as part of the SAIIAE, however, the unnamed tributary that they drain into within quaternary catchment L11E is categorised as EN and the associated reach of the Sout River is classified as LT (Figure 3-5). The unnamed tributary within quaternary catchment L11G into which the drainage lines connect is classified as LT (Figure 3-5).

The National Freshwater Ecosystem Priority Areas (NFEPAs) (Driver *et al*, 2011) spatial data has been incorporated in the above mentioned SAIIAE spatial data set. They are included here as the database is intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al,* 2011). The NFEPA spatial layer indicates that the unnamed tributary is regarded as a Freshwater Ecosystem Priority Area. Therefore,

negative alterations to the aquatic systems draining the PAOI are likely to have downstream impacts, thereby negatively impacting the functioning of the FEPA system.

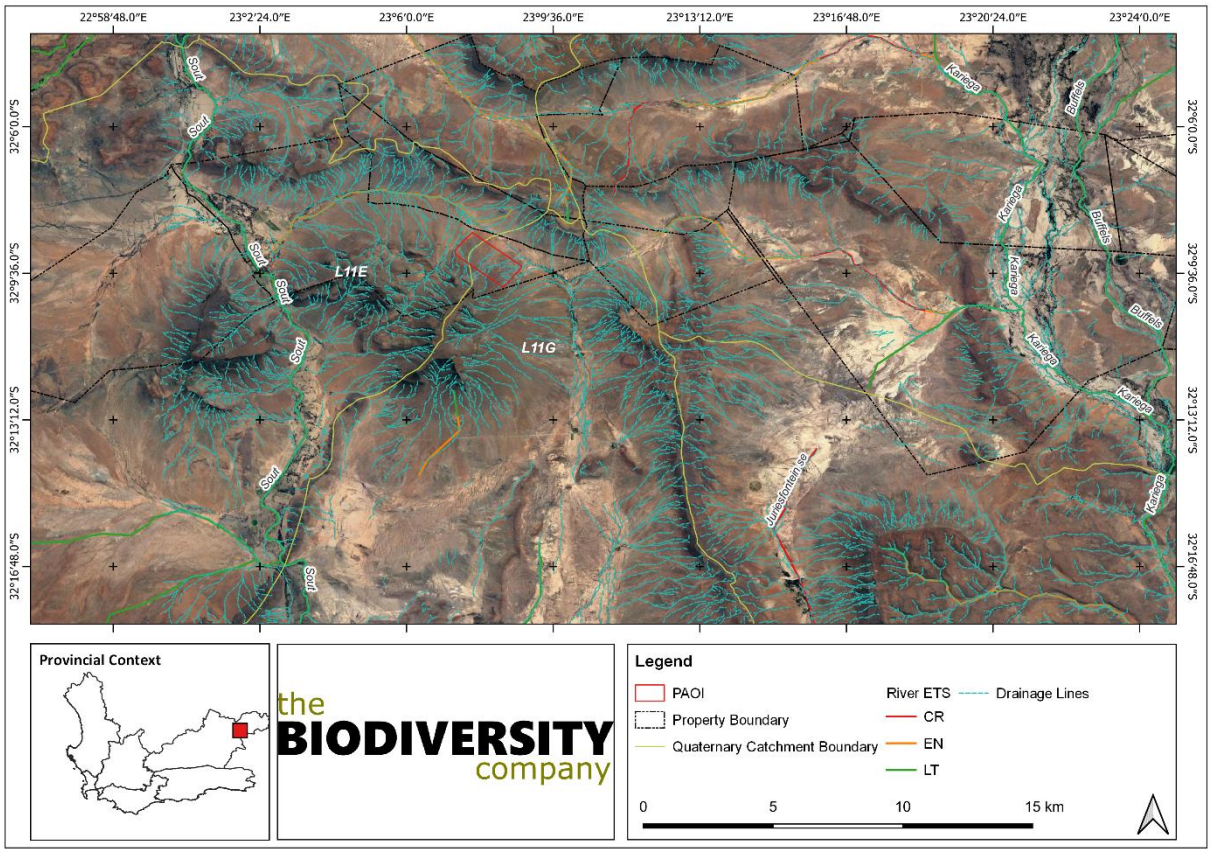


Figure 3-5 Map illustrating the hydrological context of the proposed Montana 2 Solar Energy Facility PAOI

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 project area is located within the Nama Karoo Biome, which is a large, landlocked region on the central plateau of the western half of South Africa and extends into south-eastern Namibia. This is an arid biome with majority of the river systems being non-perennial. Apart from the Orange River and the few permanent streams in the southwest that originate in higher-rainfall neighbouring areas, the limited number of perennial streams that originate in the Nama-Karoo are restricted to the more mesic east. The low precipitation is unreliable (coefficient of variation of annual rainfall up to 40%) and droughts are unpredictable and prolonged. The unpredictable rainfall impedes the dominance of leaf succulents and is too dry in summer for dominance by perennial grasses alone, and the soils are generally too shallow, and the rainfall is too low for trees. Unlike other biomes of southern Africa, local endemism is very low and consequently, the Nama-Karoo Biome does not contain any centre of endemism. Despite relatively low floristic diversity, the Nama-Karoo vegetation has a high diversity of plant life forms. These include co-occurring ephemerals, annuals, geophytes, C3 and C4 grasses, succulents, deciduous and evergreen chamaephytes and trees. This is probably a consequence of an ecotonal and climatically unstable nature of the region

On a fine-scale vegetation type, the PAOI overlaps with two vegetation types, predominantly the Gamka Karoo vegetation type and marginally the Upper Karoo Hardeveld vegetation type (Figure 3-6).

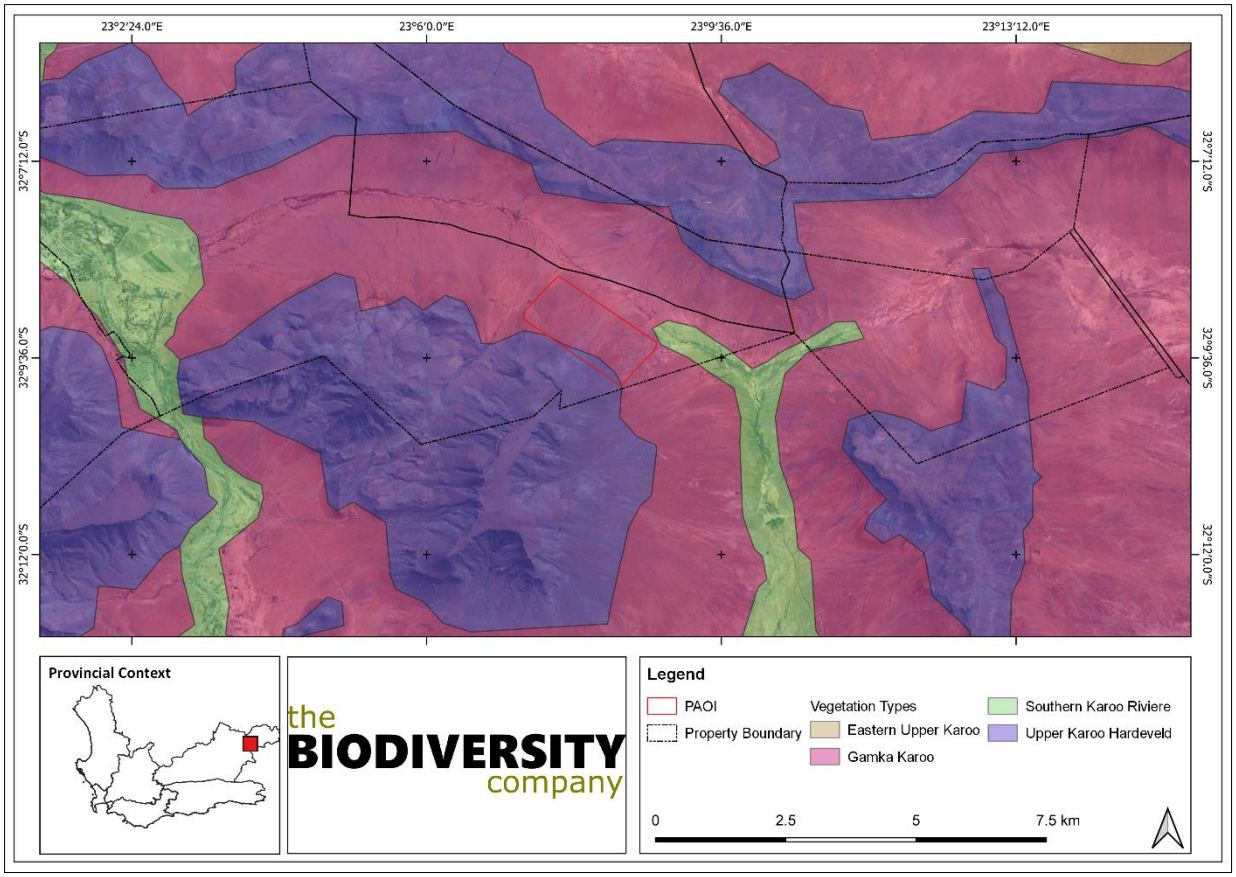


Figure 3-6 Map illustrating the vegetation types within the proposed Montana 2 Solar Energy Facility PAOI

The Gamka Karoo vegetation type is described as follows:

I. Topography – Extremely irregular to slightly undulating plains dominated by dwarf spiny shrubs.

II. Geology & Soils – Mudstones and sandstones of the Beaufort Group (Adelaide Subgroup) with some Ecca (Fort Brown Formation) shales supporting very shallow and stony soils of the Glenrosa and/or Mispah forms.

III. Important Taxa - Tall Shrubs: *Lycium cinereum, L. oxycarpum, Rhigozum obovatum, Vachellia karroo, Cadaba aphylla, Lycium schizocalyx, Searsia burchellii, Sisyndite spartea*. Low Shrubs: *Chrysocoma ciliata, Eriocephalus ericoides subsp. ericoides , E. spinescens , Felicia muricata , Galenia fruticosa , Limeum aethiopicum, Pentzia incana, Pteronia adenocarpa, Rosenia humilis, Aptosimum indivisum, Asparagus burchellii, Blepharis mitrata, Eriocephalus microphyllus var. pubescens, Felicia filifolia subsp. filifolia, F. muricata subsp. cinerascens, Galenia secunda, Garuleum bipinnatum, G. latifolium, Gomphocarpus filiformis, Helichrysum lucilioides, Hermannia desertorum, H. grandiflora, H. spinosa, Melolobium candicans, Microloma armatum, Monechma spartioides, Pentzia pinnatisecta, Plinthus karooicus, Polygala seminuda, Pteronia glauca, P. sordida, P. viscosa, Selago geniculata, Sericocoma avolans, Zygophyllum microcarpum, Z. microphyllum*. Succulent Shrubs: *Ruschia intricata, Aridaria noctiflora*

subsp. straminea, Crassula muscosa, Drosanthemum lique, Galenia sarcophylla, Kleinia longiflora, Ruschia spinosa, Salsola tuberculata, Sarcocaulon patersonii, Trichodiadema barbatum, Tripteris sinuata var. linearis. Semi-parasitic Shrub: *Thesium lineatum*. Herbs: *Gazania lichtensteinii, Chamaesyce inaequilatera, Dicoma capensis, Galenia glandulifera, Lepidium africanum subsp. africanum, L. desertorum, Lessertia pauciflora var. pauciflora, Leysera tenella, Osteospermum microphyllum, Sesamum capense, Tetragonia microptera, Tribulus terrestris, Ursinia nana*. Geophytic Herbs: *Drimia intricata, Moraea polystachya.* Graminoids: *Aristida congesta, A. diffusa, Fingerhuthia africana, Stipagrostis ciliata, S. obtusa, Aristida adscensionis, Cenchrus ciliaris, Digitaria argyrograpta, Enneapogon desvauxii, Enneapogon scaber, Eragrostis homomalla, E. lehmanniana, E. obtusa, Tragus berteronianus, T. koelerioides*.

IV. Biogeographically Important Taxa – Succulent Shrubs: *Hereroa latipetala, H. odorata, Pleiospilos compactus, Rhinephyllum luteum, Stapelia engleriana*. Geophytic Herb: *Tritonia tugwelliae*. Low Shrub: *Felicia lasiocarpa*. Succulent Herbs: *Piaranthus comptus, Tridentea parvipuncta subsp. parvipuncta*. Graminoid: *Oropetium capense*.

V. Endemic Taxa – Succulent Shrubs: *Chasmatophyllum stanleyi, Hereroa incurva, Hoodia dregei, Ruschia beaufortensis*. Low Shrubs: *Jamesbrittenia tenuifolia*. Herb: *Manulea karrooica*. Succulent Herb: *Piaranthus comptus*.

VI. Conservation – About 2% statutorily conserved in the Karoo National Park and some in private reserves, such as Steenbokkie Private Nature Reserve (near Beaufort West). The alien *Salsola kali* is a serious infestation problem in certain areas. Erosion varies from low to high depending on location.

The Upper Karoo Hardeveld is described as follows:

I. Topography – Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones.

II. Geology & Soils – Primitive, skeletal soils in rocky areas developing over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and sub-summit positions of mesas and butts with dolerite boulder slopes.

III. Important Taxa - Tall Shrubs: *Lycium cinereum, Rhigozum obovatum, Cadaba aphylla, Diospyros austro-africana, Ehretia rigida subsp. rigida, Lycium oxycarpum, Melianthus comosus, Searsia burchellii.* Low Shrubs: *Chrysocoma ciliata , Eriocephalus ericoides subsp. ericoides , Euryops lateriflorus, Felicia muricata , Limeum aethiopicum , Pteronia glauca , Amphiglossa triflora, Aptosimum elongatum, A. spinescens, Asparagus mucronatus, A. retrofractus, A. striatus, A. suaveolens, Eriocephalus spinescens, Euryops annae, E. candollei, E. empetrifolium, E. nodosus, Felicia filifolia subsp. filifolia, Garuleum latifolium, Helichrysum lucilioides, H. zeyheri, Hermannia filifolia var. filifolia, H. multiflora, H. pulchella, H. vestita, Indigofera sessilifolia, Jamesbrittenia atropurpurea, Lessertia frutescens, Melolobium candicans, M. microphyllum, Microloma armatum, Monechma incanum, Nenax microphylla, Pegolettia retrofracta, Pelargonium abrotanifolium, P. ramosissimum, Pentzia globosa, P. spinescens, Plinthus karooicus, Polygala seminuda, Pteronia adenocarpa, P. sordida, Rosenia humilis, Selago albida, Solanum capense, Sutera halimifolia, Tetragonia arbuscula, Wahlenbergia tenella*. Succulent Shrubs: *Aloe broomii, Drosanthemum lique, Faucaria bosscheana, Kleinia*

longiflora, Pachypodium succulentum, Trichodiadema barbatum, Zygophyllum flexuosum. Semi-parasitic Shrub: *Thesium lineatum*. Herbs: *Troglophyton capillaceum subsp. capillaceum, Dianthus caespitosus subsp. caespitosus, Gazania krebsiana, Lepidium africanum subsp. africanum, Leysera tenella, Pelargonium minimum, Sutera pinnatifida, Tribulus terrestris*. Geophytic Herbs: *Albuca setosa, Androcymbium albomarginatum, Asplenium cordatum, Boophone disticha, Cheilanthes bergiana, Drimia intricata, Oxalis depressa*. Graminoids: *Aristida adscensionis, A. congesta, A. diffusa, Cenchrus ciliaris, Enneapogon desvauxii, Eragrostis lehmanniana, E. obtusa, Sporobolus fimbriatus, Stipagrostis obtusa, Cynodon incompletus, Digitaria eriantha, Ehrharta calycina, Enneapogon scaber, E. scoparius, Eragrostis curvula, E. nindensis, E. procumbens, Fingerhuthia africana, Heteropogon contortus, Merxmuellera disticha, Stipagrostis ciliata, Themeda triandra, Tragus berteronianus, T. koelerioides*.

IV. Endemic Taxa – Succulent Shrubs: *Aloe chlorantha, Crassula barbata subsp. broomii, Delosperma robustum, Sceletium expansum, Stomatium suaveolens*. Low Shrubs: *Cineraria polycephala, Euryops petraeus, Lotononis azureoides, Selago magnakarooica*. Tall Shrub: *Anisodontea malvastroides*. Herbs: *Cineraria arctotidea, Vellereophyton niveum*. Succulent Herbs: *Adromischus fallax, A. humilis*. Geophytic Herbs: *Gethyllis longistyla, Lachenalia auriolae*, *Ornithogalum paucifolium subsp. karooparkens*e.

V. Conservation – Only about 3% statutorily conserved in Karoo National Park and Karoo Nature Reserve. Small percentage also protected in private reserves such as Rupert Game Farm. Erosion is moderate and high.

3.1.2.2 Expected Flora Species of Conservation Concern

Based on the POSA database and the Environmental Screening Tool five threatened floral species are expected to occur within the POAI and surrounding landscape (Table 3-2).

Table 3-2 Threatened flora species that are expected to occur within the Montana 2 Solar Energy Facility PAOI. VU = Vulnerable

Family	Species Name	Conservation Status	Endemism	Habitat	Likelihood of Occurrence
Aizoaceae	*Hereroa concava*	VU	Endemic	Plants occur sheltered among shrubs on flats and plateaus with shale outcrops.	Low
Aizoaceae	*Peersia frithii*	VU	Endemic	Slopes or flats of finely weathered Ecca shales.	Low
Apocynaceae	*Tridentea virescens*	Rare		Stony ground, or hard loam in floodplains.	Low
Bruniaceae	*Audouinia esterhuyseniae*	VU	Endemic	Shale soil on south-facing slopes below sandstone cliffs. A rare montane resprouter known from only two locations.	Low
Malvaceae	*Anisodontea malvastroides*	Rare	Endemic	It occurs in arid grassland on summit plateaus and escarpments. Locally abundant on cliffs or summit plateaus.	Low

3.1.3 Fauna Assessment

This section provides the list of threatened species expected to occur within the project area. N.B. the likelihood of occurrence that is provided refers to the development footprints and not the surrounding landscape.

3.1.3.1 Expected Amphibian Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the FrogMAP database, six amphibian species are expected to occur within the area with none of these expected species regarded as threatened (Appendix C).

3.1.3.2 Expected Reptile Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 27 reptile species are expected to occur within the PAOI and surrounding landscape with one of these species regarded as threatened (Appendix D).

Table 3-3 Reptile species of conservation concern that are expected to occur within the Montana 2 Solar Energy Facility PAOI. NT= Near Threatened

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Testudinae	*Chersobius boulengeri*	Karoo Dwarf Tortoise	EN	EN	Low
Testudinae	*Psammobates tentorius tentorius*	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. The species typically occupies dolerite ridges and rocky outcrops of the southern Succulent and Nama Karoo biomes at altitudes between 800 and 1 500 m above sea level (Hofmeyr *et al*, 2018a). 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. *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 (Tent Tortoise) is restricted to South Africa and Namibia and of the three subspecies, *P. tentorius* occurs furthest to the south. The subspecies occurs in regions with winter, summer and all-year rainfall, and dwarf shrubland with succulents, annuals, grasses and geophytes. Although the species is widespread, population density is generally low throughout its range, and populations appear to be declining slowly (Hofmeyr *et al*, 2018b). There is no estimate on the total global population. Threats include road mortality, veld fires, electrocution by livestock/game fences, and overgrazing from domestic livestock. 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 and MammalMAP database lists eight non-volant mammal species of conservation concern that could be expected to occur within the PAOI (Table 3-4). This list excludes larger mammal species that are generally restricted to protected areas.

Table 3-4 ***Mammal species of conservation concern that are expected to occur within the Montana 2 Solar Energy Facility PAOI. CR = Critically Endangered, LC = Least Concern, NT= Near Threatened and VU = Vulnerable***

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	Low
Felidae	*Leptailurus serval serval*	Southern Serval	NT	LC	Low
Felidae	*Panthera pardus*	Leopard	VU	VU	Low
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC	Low
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	NT	NT	Low
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	CR	CR	Low
Muridae	*Parotomys littledalei*	Littledale's Whistling Rat	NT	LC	High
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT	Low

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. Although the species has been assigned a ‘low’ likelihood of occurrence for the development footprints, there are records within the broader landscape, as well as suitable habitat in the surrounding areas.

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.

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. This species is protected by provincial legislation.

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).

Parotomys littledalei (Littledale's Whistling Rat) is restricted to the arid areas of southern Africa, that is western South Africa and Namibia and has a patchy distribution, linked to the distribution of deep sandy soils. This diurnal species occurs in shrubland and is dependent on ground cover, avoiding open habitats (Schradin *et al*, 2016). It is not known if the species can persist in disturbed or modified habitats, but it does occur in rangelands. The species is dependent on plant leaves and succulents as food and cannot switch to seeds or other resources. Burrows are constructed below bushes and linked together through surface pathways that also link to foraging areas and contain several nest chambers. It is relatively common in suitable habitat but undergoes population irruptions in response to environmental conditions. Prolonged droughts

therefore will have a substantial negative affect on population numbers as it will reduce foraging availability. The primary threats are loss of habitat from climate change and overgrazing by livestock (Schradin *et al*, 2016).

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. The total population size has been estimated between 5 000-8 000 individuals with a continuing decline in mature individuals (Wiesel, 2015). Outside protected areas, the Brown Hyaena may come into conflict with humans, and they are often shot, poisoned, trapped, and hunted with dogs in predator eradication or control programmes, or inadvertently killed in non-selective control programs (Wiesel, 2015). The species is regarded as a threat to livestock in some areas, despite the finding that they very seldom prey on livestock. Their body parts are also used in traditional medicine.

3.2 Field Assessment

The following sections provides the results from the field survey for the proposed development that was undertaken November 2021.

3.2.1 Flora Assessment

3.2.1.1 Indigenous Flora

The vegetation recorded within the PAOI was congruent with the Gamka Karoo vegetation type. Several species of flora protected under provincial legislation were recorded within the project area during the survey period[1]. The list of these protected species is provided in Table 3-5. It is important to note that during the field survey these species were not geotagged due to time constraints. Additional succulent species that although not protected, but that should be relocated due to their scarcity within the landscape include *Euphorbia ferox* and *E. decepta.*

Table 3-5 Protected flora recorded within the Montana 2PAOI and surrounding landscape during the survey period

Family	Scientific Name	Photograph
Aizoaceae	*Drosanthemum hispidum*	

[1] Note that not all were necessarily recorded within the PAOI footprint but also within the adjacent landscape. However, there is a high likelihood that these species occur within the footprint.

Family	Scientific Name	Photograph
Aizoaceae	*Psilocaulon coriarium*	
Aizoaceae	*Ruschia intricata*	
Aizoaceae	*Ruschia spinosa*	
Aizoaceae	*Trichodiadema* sp.	

Family	Scientific Name	Photograph
Amaryllidaceae	*Ammocharis coranica*	
Apocynaceae	*Pachypodium succulentum*	
Asparagaceae	*Albuca* sp.	
Euphorbiaceae	*Euphorbia ferox*	

Family	Scientific Name	Photograph
Euphorbiaceae	*Euphorbia decepta*	
Hyacinthaceae	*Dipcadi* sp.	

Notably, there are likely more protected flora species within the PAOI, but these were not recorded as the ideal survey period would have been during March as indicated by the Species Environmental Assessment Guideline (SANBI, 2020) (Figure 3-7). This would have ensured that flora species are correctly identified, and a true representative sample of the species community structure is obtained. Therefore, it is imperative that a Search and Rescue effort be undertaken for protected plant species, and these species be relocated to proximal areas that will not be developed. A permit from the relevant authority, Cape Nature, must be obtained in order to achieve this. It is further recommended that not only protected species be relocated, but also succulent species of other taxonomic groups where it is feasible.

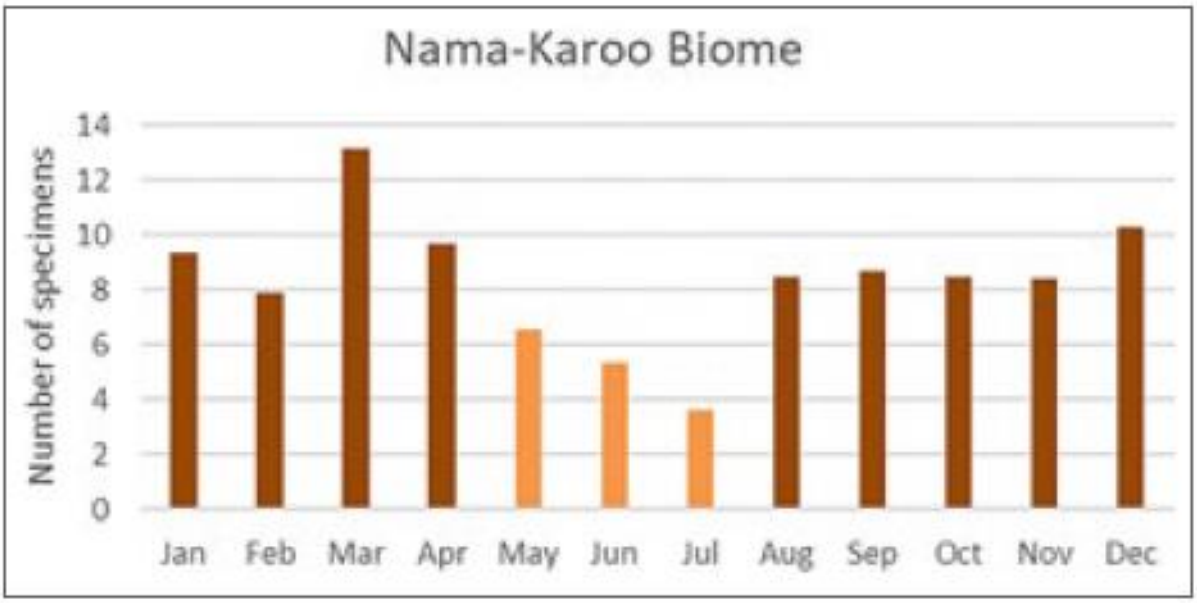


Figure 3-7 Plant collection month summary of the Nama Karoo Biome to indicate optimal survey periods. Source: SANBI (2020)

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 IAP 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.

- 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.

Notably, no IAP species were recorded within the PAOI. However, invasive species tend to encroach into disturbed areas and should be considered a possible risk.

3.2.2 Fauna Assessment

3.2.2.1 Amphibians

No amphibian species were recorded within the PAOI during the survey period due to the lack of a night survey, albeit it is unlikely to support a diverse assemblage amphibian species due to the lack of suitable habitat diversity. It is postulated that when surface water is present, opportunistic species such *Vandijkophrynus gariepensis gariepensis* (Karoo Toad) and *Poyntonophrynus vertebralis* (Southern Pygmy Toad) will be active.

3.2.2.2 Reptiles

Five (5) species of reptile were recorded within the assessment area during the survey period, accounting for approximately 18% of the expected species (Table 3-6, Figure 3-8). None of the species recorded are regarded as SCC, albeit a portion are protected under provincial legislation. The lack of species diversity recorded within the PAOI is due to the secretive behaviour of many reptile species and therefore, extensive survey periods are required to obtain an accurate representative sample. However, considering the homogenous structure of the PAOI in terms of habitat diversity, it is unlikely to support a highly diverse species assemblage.

Table 3-6 Summary of reptile species recorded within the proposed Montana 2 Solar Energy Facility PAOI during the survey period. LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Protection Status
			Regional	Global	
Lacertidae	*Pedioplanis lineoocellata pulchella*	Spotted Sand Lizard	LC	LC	Schedule 2
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	LC	LC	Schedule 2
Scincidae	*Trachylepis variegata*	Variegated Skink	LC	LC	Schedule 2
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	LC	LC	Schedule 2
Varanidae	*Varanus albigularis albigularis*	White-throated Monitor	LC	LC	

Notably, *Stigmochelys pardalis* (Leopard Tortoise), is regarded as a keystone species within the Nama Karoo biome. The species possesses a relatively large home range between 40.53 and 258.52 ha and therefore, are vital seed dispersers. Moreover, *S. pardalis* was ubiquitous within the landscape and numerous males were seen combatting for females, thereby denoting that the area supports an important breeding ground for the species.

Figure 3-8 ***Photograph illustrating individuals of the reptile species recorded within the proposed Montana 2 Solar Energy Facility PAOI during the survey period. A) Pedioplanis lineoocellata pulchella (Spotted Sand Lizard), B) Trachylepis variegata (Variegated Skink) and C) Stigmochelys pardalis (Leopard Tortoise)***

3.2.2.3 Mammals

Eleven (11) mammal species were recorded during the survey based on either direct observation, capture of specimens by passive sampling techniques or the presence of visual tracks and signs (Table 3-7, Figure 3-9). This accounts for approximately 19% of the expected species. None of the species recorded are regarded as SCC, either on a regional or global scale. Although none of the species are regarded as threatened, many are considered important in maintaining biodiversity and ecosystem functioning. Species such as *Orycteropus afer* (Aardvark) and *Geosciurus inauris* (South African Ground Squirrel) are regarded as ecosystem engineers and the burrows they create are also utilised as shelter by an array of faunal species, which is pertinent in the thermally variable and arid environment of the PAOI and surrounding landscape. In addition, the foraging behaviour of the former species plays a role in vegetation dynamics. *Orycteropus afer* feed on the Formicidae species, *Messor capensis*, which is a major seed predator within the Karoo bioregion. During foraging by *O.afer*, the nests are damaged but usually not destroyed, and the seed stores are frequently distributed with the mound soils over a larger area. The seeds are usually buried within the mound soil and germinate during favourable conditions. A portion of the seeds may also be ingested by *O. afer* while feeding on the ants and these are distributed with the faeces. Consequently, the species inadvertently also plays a role in seed dispersal and germination.

While it is acknowledged that *O. afer* is regarded as keystone species within the landscape, *G. inauris* could also be regarded as such, as herbivorous mammal burrows are usually associated with higher levels of soil nutrients and greater degree of water infiltration and can result in elevated foliar nutrient concentrations and greater plant biomass surrounding their burrows (Davidson *et al*, 2012). Therefore, the areas around the burrows are utilised by many species and can result in a highly diverse arthropod community, which consequently drives a higher diversity in higher trophic levels. The PAOI and surrounding landscape also supports an 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 3-7 Summary of mammal species recorded within the proposed Montana 2 Solar Energy Facility PAOI during the survey period. LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Protection Status
			Regional	Global	
Bathyergidae	*Cryptomys hottentotus*	Common Molerat	LC	LC	
Bovidae	*Antidorcas marsupialis*	Springbok	LC	LC	Schedule 2
Bovidae	*Raphicerus campestris campestris*	Southern Steenbok	LC	LC	Schedule 2
Canidae	*Vulpes chama*	Cape Fox	LC	LC	
Herpestidae	*Cynictis penicillata penicillata*	Southern Yellow Mongoose	LC	LC	
Hyaenidae	*Proteles cristata cristata*	Southern Aardwolf	LC	LC	Schedule 2
Hystricidae	*Hystrix africaeaustralis africaeaustralis*	Southern Porcupine	LC	LC	
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC	
Mustelidae	*Ictonyx striatus shortridgei*	Cape Striped Polecat	LC	LC	
Orycteropodidae	*Orycteropus afer*	Aardvark	LC	LC	Schedule 2
Sciuridae	*Geosciurus inauris*	South African Ground Squirrel	LC	LC	

Figure 3-9 ***Photographs illustrating a portion of the mammal species recorded within the proposed Montana 2 Solar Energy Facility PAOI during the survey period. A) Antidorcas marsupialis (Springbok), B) Lepus saxatilis (Scrub Hare), C) Vulpes chama (Cape Fox), D) Hystrix africaeaustralis africaeaustralis (Southern Porcupine), E) Ictonyx striatus striatus (Southern Striped Polecat) and F) Cryptomys hottentotus (Common Molerat)***

3.2.3 Hydrology

As aforementioned, the PAOI is drained by minor ephemeral drainage lines that drain into a FEPA system The channel physiognomy of these drainage systems was distinct from the terrestrial component and were identified by a bedrock substrate and the presence of *Vachellia karoo* (Figure 3-10).

A 50 m buffer was applied to these drainage systems (Macfarlane *et al*, 2009) as they are regarded as Ecological Support Areas and during surface flow would be important in the distribution of propagules and also form a corridor for movement of fauna.

The following Zones of Regulation (ZoR) are applicable to the drainage lines identified within the PAOI:

- A 32 m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) should be assigned to the drainage lines; and
- A 100 m ZoR in accordance with the National Water Act, 1998 (Act No. 36 of 1998) should be assigned to the drainage lines.

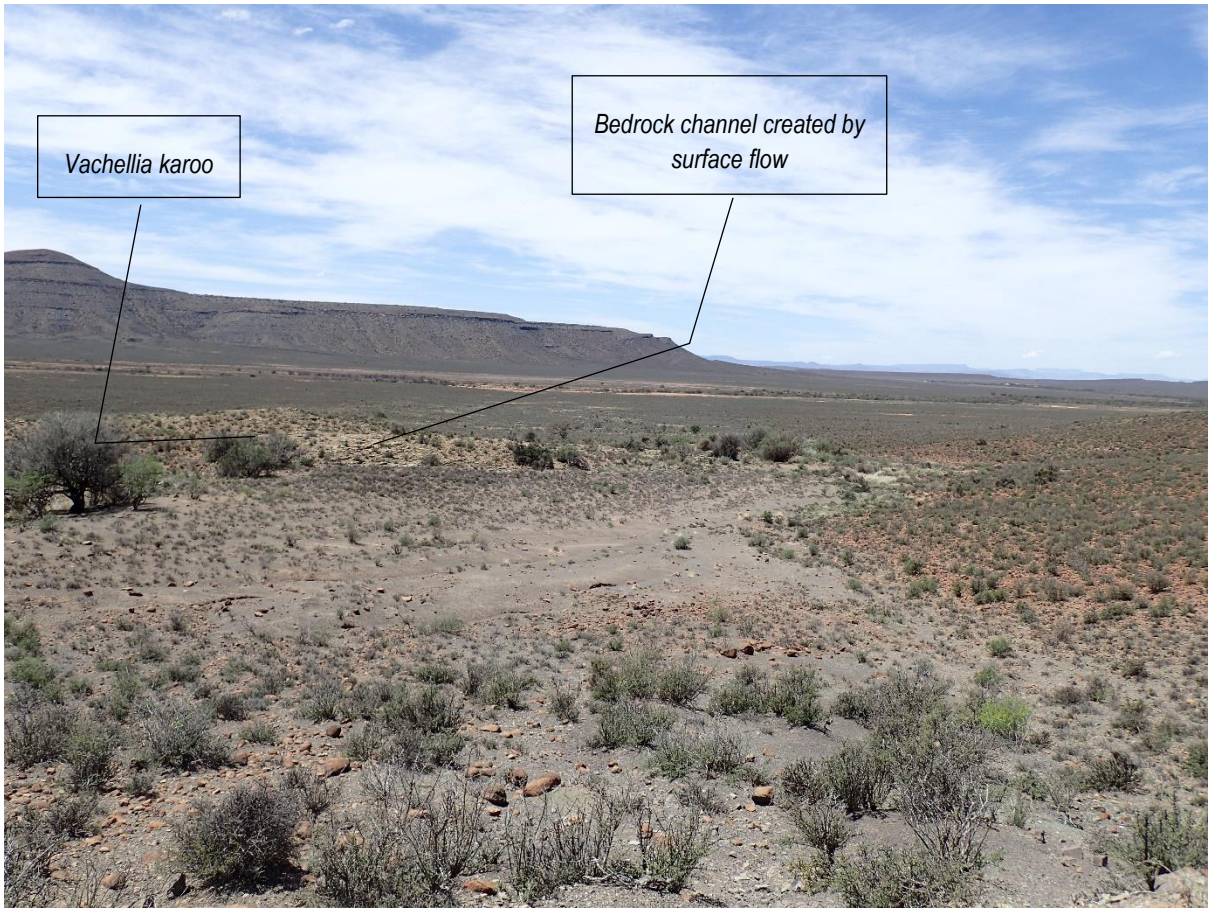


Figure 3-10 Photograph illustrating an example of a drainage line within the proposed Montana 2 Solar Energy Facility PAOI

3.2.3.1 Risk Assessment

Due to the presence of watercourses (non-perennial) within the 100 m regulatory area, a risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998, (Act 36 of 1998).

This assessment has been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS). This notice was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 509 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM). This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

The findings of the risk assessment are presented in Table 3-8 and Table 3-9. The risks associated with the proposed development area range from low to moderate, with moderate risks associated with the drainage lines in proximity to the development area. The construction of infrastructure within the drainage areas (and buffers) is considered to pose a moderate risk without mitigation, however, should recommended buffers be adhered to, the risks are considered low. During the operational phase, the increase in hardened surfaces due to solar panels and roads is considered a moderate risk due to the potential of erosion and sedimentation of downstream reaches. A comprehensive and site-specific stormwater management plan is critical to negate these potential impacts during higher rainfall periods.

Table 3-8 Impacts assessed for the proposed development area

Aspect	Activity	Impacts to Watercourses
Construction		
Habitat integrity & Sediment balance	Clearing associated with construction of roads and laydown yards	Increased runoff and sediment input into the water courses
		Smothering and subsequent loss of instream habitat due to sediment inputs
		Flow path modification
		Input of toxicants
Flow dynamics	Construction of stormwater management infrastructure around PV Area	Alteration to flow patterns and velocities
		Erosion of exposed surfaces
Water quality	Contamination due to improper storage of chemicals, construction materials, fuel and machinery leaks	Physical changes (e.g. turbidity)
		Chemical changes (e.g. pH, salinity toxicants and heavy metals)
Rehabilitation	Final landscaping and post-construction rehabilitation	Indiscriminate dumping of rubble and construction material
		Improper re-establishment of flow paths
		Increased sedimentation
		Increased erosion from exposed surfaces
Operation		

Aspect	Activity	Impacts to Watercourses
Flow dynamics & Stormwater management	Increased hard surfaces due to solar panels and roads and stormwater infrastructure	Flow alteration/concentrations during heavy precipitation events
		Flow concentration leading to increased erosion and scouring downstream systems
		Increased runoff and flow velocities entering the watercourse
	Reduced vegetation on ground due to loss of light penetration	Increased flow concentration
		Increased erosion and scouring of bed and banks, especially in discharge areas
		Increased sedimentation and turbidity
Anthropogenic disturbance	Increased traffic and human disturbance	Watercourse and water quality impairment
		Increased exposed and hardened surfaces
	Establishment of alien plants on disturbed areas	Degradation of watercourse flora and fauna through the spread of alien and invasive species
Water quality	Contamination, dumping of solid wastes and input associated with surface runoff from roads	Increased litter and refuse within the channel
		Input of toxicants
		Nutrient loading
Compiled by	**Andrew Husted Pr Sci Nat 400213/11**	

Table 3-9 DWS Risk Impact Matrix for the proposed project

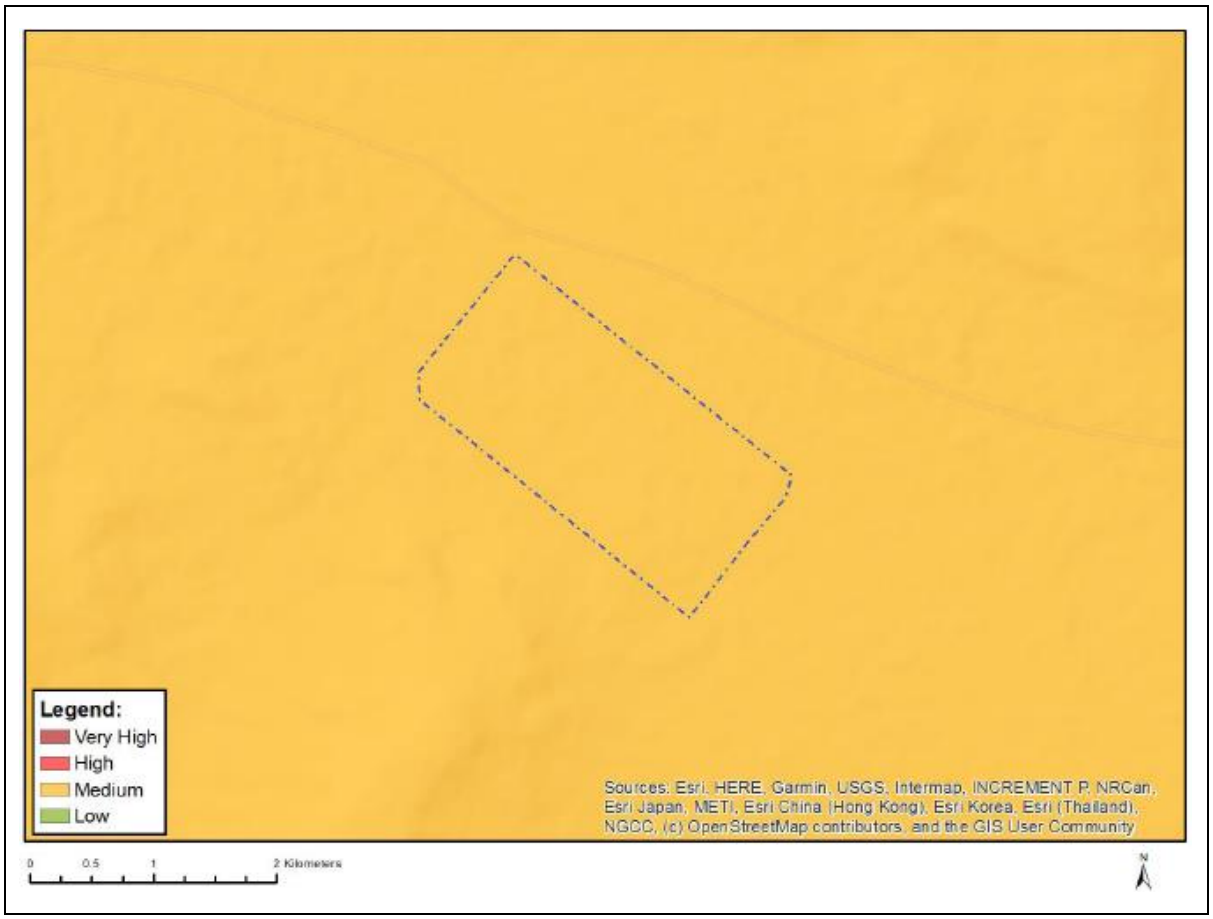
Activity	Mitigation	Flow Regime	Physico & Chemical	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
Construction Phase																	
Clearing associated with construction of roads and laydown yards	Without	2	2	3	2	2.3	2	2	6.3	2	4	1	2	**9**	**56.3**	Moderate	• Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. • Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Educate staff and relevant contractors on the location and importance of the identified water resources through toolbox talks and by including them in site inductions as well as the overall master plan. • All activities (including driving) must remain at least 50 m outside of the edge of drainage lines that will be conserved. • Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • Landscape and re-vegetate all denuded areas as soon as possible.
	With	1	1	2	1	1.3	2	2	5.3	2	2	1	2	**7**	**36.8**	Low	
Final landscaping and post-construction rehabilitation	Without	**1**	**1**	**2**	**1**	1.3	**1**	**2**	4.3	2	3	1	2	**8**	**34.0**	Low	
	With	**1**	**1**	**1**	**1**	1.0	**1**	**2**	4.0	1	2	1	2	**6**	**24.0**	Low	
Stormwater Management Infrastructure	Without	3	2	3	2	2.5	3	2	7.5	2	3	1	3	**9**	**67.5**	Moderate	• Limit construction activities to winter (as much as possible) when rain is least likely to wash concrete and sand into the systems. This limitation must be prioritised for activities near drainage lines. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • Do not situate any of the construction material laydown areas within buffer areas. • No machinery should be allowed to park in any water resources or buffer areas, cleaning of vehicles in these systems is also prohibited. • Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.
	With	1	1	2	1	1.3	3	2	6.3	2	2	1	2	**7**	**43.8**	Low	
Erosion and sedimentation control measures	Without	3	2	3	2	2.5	2	3	7.5	2	2	1	3	**8**	**60.0**	Moderate	
	With	1	1	2	1	1.3	2	2	5.3	1	1		2	**4**	**21.0**	Low	
Pollution Control	Without	1	1	2	1	1.3	1	2	4.3	1	1	1	3	**6**	**25.5**	Low	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately stockpile topsoil cleared from the development area. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel
	With	1	1	1	1	1.0	1	2	4.0	1	1	1	2	**5**	**20.0**	Low	
Staff ablutions	Without	1	3	1	2	1.8	2	2	5.8	1	2	1	3	**7**	**40.3**	Low	

Activity	Mitigation	Flow Regime	Physico & Chemical	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
	With	1	1	1	1	1.0	2	2	5.0	1	2	1	2	**6**	**30.0**	Low	etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the drainage lines. • Do not store any construction materials or equipment within any of the identified drainage lines or their buffers. • Mixing of concrete must under no circumstances take place within any wetland. • Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. • All aspects and activities to adhere to the 50 m buffer width. • No servicing of vehicles, machinery or equipment that may cause spillages within the development area. All servicing to be undertaken in a designated workshop or bay. • All vehicles, machinery or equipment to be inspected and monitored for leaks where applicable. No leaking vehicles, machinery or equipment may be permitted for operation within the development area.
Operation of machinery & equipment	Without	1	2	3	2	2.0	2	3	7.0	2	2	1	2	**7**	**49.0**	Low	
	With	1	1	2	1	1.3	2	2	5.3	1	1	1	2	**5**	**26.3**	Low	
	Without	1	2	3	2	2.0	2	2	6.0	2	2	1	2	**7**	**42.0**	Low	
Temporary infrastructure	With	1	1	1	1	1.0	2	2	5.0	1	2		2	**5**	**25.0**	Low	
Operation Phase																	
Increased hard surfaces due to solar panels and roads and stormwater infrastructure	Without	3	2	3	2	2.5	3	4	9.5	2	3	1	3	2	**85.5**	Moderate	• Design and Implement an effective stormwater management plan. • Promote water infiltration into the ground beneath the solar panels. • Release only clean water into the environment. • Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). • Re-vegetate denuded areas as soon as possible. • Regularly clear drains. • Minimise the extent of concreted / paved / gravel areas. • A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible then gravel is preferable over concrete or paving. • Avoid excessively compacting the ground beneath the solar panels.
	With	2	1	2	1		2	4	6.0	2	2	1	2	**7**	**42.0**	Low	
Increased traffic and human disturbance (maintenance)	Without	1	2	3	2	2.0	3	4	9.0	2	1	1	1	**5**	**45.0**	Low	• Where possible minimise the use surfactants to clean solar panels and herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used do so well prior to any significant predicted rainfall events.
	With	1	1	2	1		2	4	6.0	1	1	1	1	**4**	**24.0**	Low	
Alien invasive plants	Without	2	1	3	2	2.0	2	4	8.0	1	1	1	1	**4**	**32.0**	Low	

Activity	Mitigation	Flow Regime	Physico & Chemical	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
	With	1	1	2	1	1.3	2	4	7.3	1	1	1	1	**4**	**29.0**	Low	• Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.
Decommissioning Phase																	
Decommissioning of the solar facility.	Without	1	1	3	1	1.5	2	2	5.5	2	4	1	2	**9**	**49.5**	Low	• Develop and implement a rehabilitation and closure plan. • Appropriately rehabilitate the development area by ripping, landscaping and re-vegetating with locally indigenous species.
	With	1	1	2	1	1.3	2	2	5.3	2	2	1	2	**7**	**36.8**	Low	

4 Site Ecological Importance (SEI)

The National Web based Environmental Screening Tool provides the environmental sensitivity of the PAOI at a desktop level. The Plant Species Theme Sensitivity as indicated in the screening report was derived to be 'Medium' (Figure 4-1) and the Animal Species Theme Sensitivity was derived to be 'High' (Figure 4-1). The screening tool report can be downloaded at https://screening.environment.gov.za/screeningtool/#/pages/welcome.



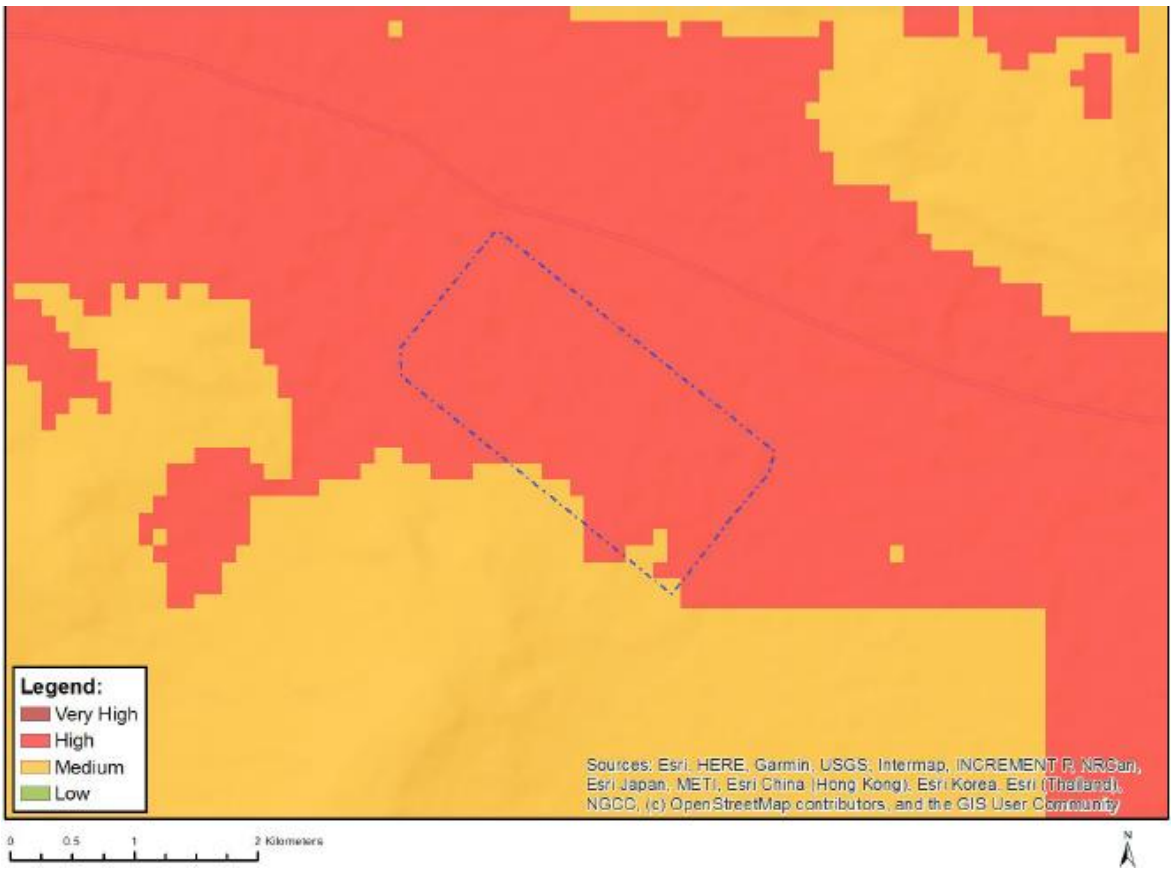


Figure 4-1 Plant Species Theme Sensitivity (top) and Animal Species Theme Sensitivity (bottom) for the proposed Montana 2 Solar Energy Facility PAOI

Based on the criteria provided in section 2.4 of this report, all habitats within the PAOI were assigned a sensitivity category, i.e., a SEI category. The PAOI was categorised as possessing a 'High Sensitivity' (Table 4-1). This indicates that the findings of this assessment are congruent with the Screening Tool with respect to the Animal Species Theme sensitivity. The SEI of the PAOI is illustrated in Figure 4-2 and photographs illustrating the habitat structure of the PAOI is provided in Figure 4-3. The guidelines for interpreting the SEI category within the context of the proposed development is provided in Table 4-2.

Table 4-1 Summary of the proposed Montana 2 Solar Energy Facility PAOI Site Ecological Importance

Area (ha)	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
297.168	Medium Confirmed or highly likely occurrence of populations of NT species	High Very large (> 100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	Medium	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.	High

Table 4-2 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
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.

During meandering the PAOI, the species richness of the Formicidae was recorded. Formicidae are reliable indicators of habitat condition because each species or group differ in their tolerance to anthropogenic drivers (Andersen et al, 2002; Gollan et al, 2011). 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. It is also important to consider that Formicidae are regarded as keystone taxa within the Nama Karoo Biome. A standardized method was not utilised as that was beyond the scope of this assessment, but species were recorded while meandering through the PAOI. Due to the arid environment of the project area, a diverse assemblage is not expected under natural conditions. However, the community was not dominated by a single species or generalist species, with arid specialists comprising the community. The species assemblage included *Ocymyrmex barbiger*, which is an active predator of other arthropods, thereby controlling species abundances, including potential pest species. Furthermore, the species was observed to be scavenging on carcasses, alluding to a role in nutrient recycling.

The species *Messor capensis* influences soil characteristics and plant growth via its tunnelling activity. The major physical change to the soils is the drier mound than inter-mound spaces, as although they permit greater water infiltration, they dry out faster due to less compaction and higher organic content. The chemical properties between mounds and inter-mound spaces also differ significantly, with mounds containing approximately 50% more phosphorous, potassium and nitrogen. This spatial discrepancy in soil physico-chemical properties therefore influences vegetation heterogeneity. Mounds are also not static, with new mounds being developed around replacement entrances after disturbance by rainfall or feeding *O. afer*, thereby affecting wide areas. As aforementioned, the foraging activity of *O. afer* inadvertently distributes the nest seed stores with mound soil and considering that the mound soil possesses elevated nutrient content, it is likely to provide an improved germination material.

An additional important ecosystem process and service observed within the PAOI was pollination, specifically by Bombyliidae (Diptera) and Lycaenidae (Lepidoptera). Information on the influence of habitat fragmentation on the pollinator community within the Nama Karoo Biome is lacking. However, it is known that fragmentation of other shrub- or graminoid-dominated vegetation communities leads to a loss in pollinator diversity and behaviour (Donaldson *et al*, 2002; Rusterholz & Baur, 2010; Zschokke *et al*, 2000). This leads to negative alterations in the reproductive success in terms of fruit set of particular plant species, thereby causing a negative shift in the flora species composition and diversity. Therefore, it is postulated that if the proposed development drives habitat fragmentation, it will lead to a negative shift in the diversity of the pollinator community. However, if natural vegetation is maintained under the solar panels and the riparian buffers maintained, the effect of habitat fragmentation will be impeded and the risk to the wellbeing of pollinators is lowered.


Bombyliidae


Chrysoritis chrysantas (Lycaenidae)

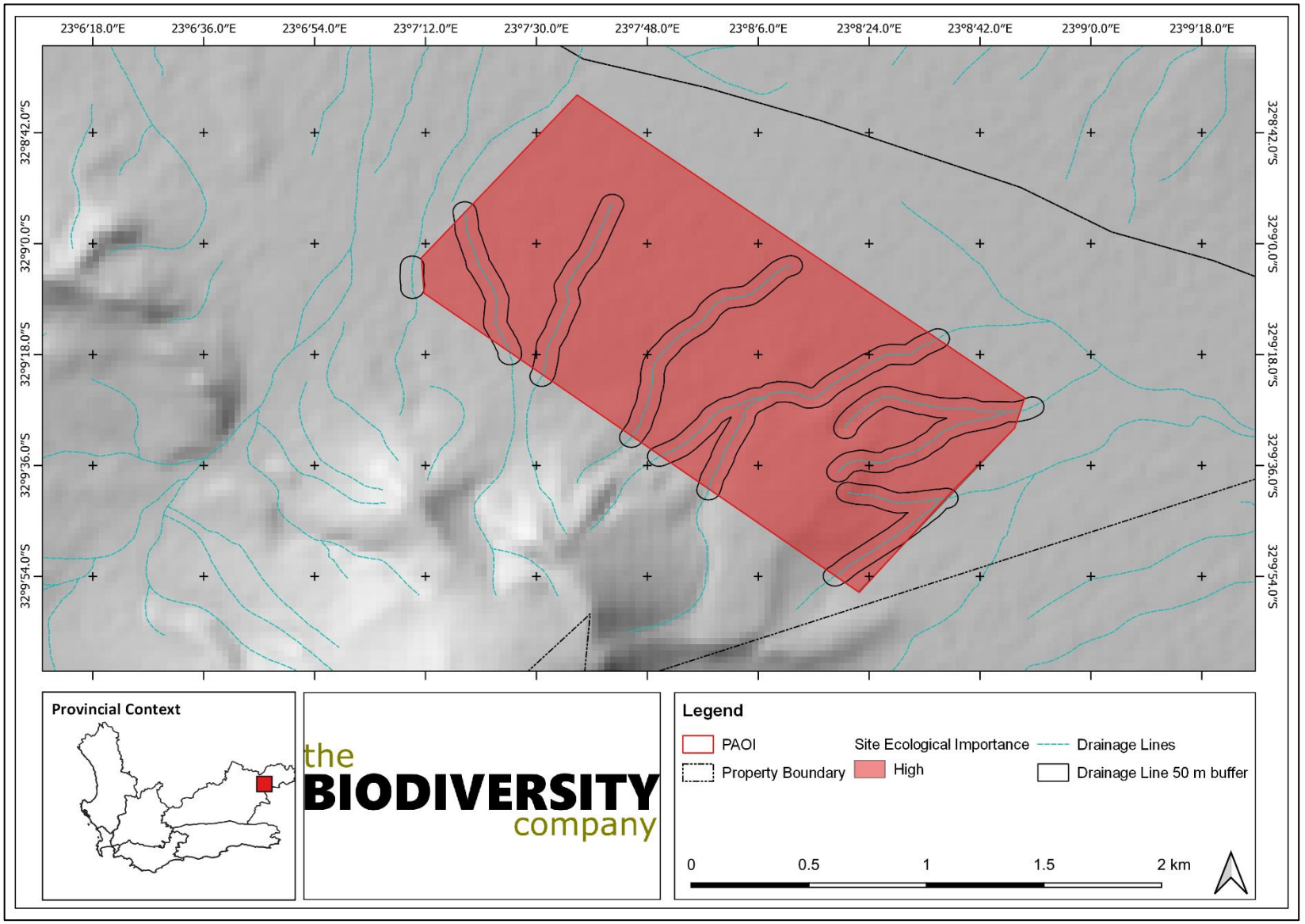


Figure 4-2 Map illustrating the Site Ecological Importance of the proposed Montana 2 Solar Energy Facility PAOI

Figure 4-3 Photograph illustrating an overview of the habitat structure present within the proposed Montana 2 Solar Energy Facility PAO

5 Impact Assessment

Anthropogenic activities drive habitat destruction causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

This section provides the impact assessment of the proposed development, which is the Montana 2 SEF with a maximum installed capacity of 160 MW and will have a generating capacity of 140 MW.

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 broader surrounding landscape. Note that these impacts were not necessarily within the PAOI but within the surrounding but still nevertheless influence species occupancy. These include:

- Livestock grazing land-use;
- Exacerbated erosion;
- Persecution and trapping;
- Roads and associated vehicle traffic and road kills; and
- Jackal-proof fences.

Figure 5-1 ***Photographs illustrating impacts to biodiversity within the surrounding area of the proposed Montana 2 Solar Energy Facility PAOI. A) Roads and overhead powerlines, B-C) Carnivore persecution and trapping and E) Carnivore-proof fencing***

5.2 Alternatives Considered

No alternatives were considered for the proposed development.

5.3 Irreplaceable Loss

The current proposed layout of the development may result in the irreplaceable loss of Ecological Support Areas.

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.

The biotic components influencing vegetation heterogeneity and wellbeing have been described in sections 3.2.2.3 and 4 of this report. The proposed development will lead to a loss in habitat for these biotic components and therefore, cause a negative shift in the wellbeing of the vegetation within the development footprint. However, the proposed development in isolation is unlikely to affect the dynamics of the surrounding vegetation, only if it is not fragmented or forms a barrier for species movement.

Within southern Africa, a proportion of biomes, and the associated vegetation types, are dependent on the dynamics of fire to maintain ecosystem functioning and wellbeing. In contrast, fire in the western arid region of the Nama Karoo is extremely rare. Occasional fires may occur after successive years of good rainfall in combination with light grazing, resulting in an increased fuel load. Fire is potentially more common in the east along the southwestern edge of the Grassland Biome including the interface with this biome on the eastern mountains. However, fires within the regional context of the project should be avoided as post-fire recovery is extremely slow. Therefore, any accidental fires are likely to cause long-term negative impacts to the functioning of surrounding ecosystems.

The potential impacts during the life of operation of the proposed development are presented in Table 5-1.

Table 5-1 Potential impacts to biodiversity associated with the proposed Montana 2 Solar Energy Facility

Main Impact	Project activities that can cause loss of habitat	Secondary impacts anticipated
Habitat Destruction	Physical removal of vegetation and surface grading for construction of the Solar Park.	• Displacement/loss of flora & fauna (including SCC) • Increased potential for soil erosion • Habitat fragmentation • Increased potential for establishment of alien & 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	• 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
	Vehicles potentially spreading seed	
	Unsanitary conditions surrounding infrastructure promoting the establishment of pest rodents	
Main Impact	**Project activities that can cause the direct mortality of fauna**	**Secondary impacts anticipated**
	Roadkill due to vehicle collision	• Loss of ecosystem services
	Intentional killing of fauna for food (hunting and persecution)	
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	• Loss of ecosystem services • Reduced plant seed dispersal • Reduced gene flow
	Removal of vegetation	
Main Impact	**Project activities that can cause emigration of fauna**	**Secondary impacts anticipated**
Emigration of fauna	Operation of machinery (Large earth moving machinery, generators)	• Loss of ecosystem services
	Reflection of solar panel arrays	
	Heavy vehicle use	
	Outside lighting	

5.5 Assessment of Impact Significance

The assessment of impact significance was undertaken in consideration of the following:

- Extent of impact;
- Duration of impact;
- Magnitude of impact;
- Probability of impact; and
- Reversibility.

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Closure/Rehabilitation Phase.

5.5.1 Construction Phase

Impact Nature: Loss of habitat within development footprint		
There will be a loss of natural vegetation and habitat due to construction of the solar energy facility. This impact was considered for both the construction and operational phases.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	High	Medium
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	
Mitigation:		
• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun et al, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas. • Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents.   • Vegetation clearing to commence only after the necessary permits have been obtained. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities. • Riparian buffer zones must be avoided and not used as laydown and/or storage areas.		
Residual Impacts:		
The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.		

Impact Nature: Degradation and loss of surrounding natural habitat		
Degradation and loss of surrounding natural vegetation arising from construction activities if these are allowed to penetrate into the surrounding area.		
	Without mitigation	**With mitigation**

Impact Nature: Degradation and loss of surrounding natural habitat		
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Very short term (1)
Magnitude	Moderate (6)	None (0)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc. • All construction activity and roads to be within the clearly defined and demarcated areas. • Temporary laydown areas should be clearly demarcated and rehabilitated subsequent to end of use. • Appropriate dust control measures to be implemented. If feasible, it is recommended that a wind fence be constructed to prevent excessive dust pollution. • Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act. • All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.		
Residual Impacts:		
It is unlikely that residual impacts are expected if the appropriate mitigation measures are implemented. However, there may still be minimal degradation due to dust precipitation.		

Impact Nature: Direct mortality of fauna		
Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	
Mitigation:		
• All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate. • Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist. • All construction vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.		

Impact Nature: Direct mortality of fauna
• All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner. • Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.
Residual Impacts:
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Impact Nature: Emigration of fauna due to noise pollution		
Construction activity will likely lead to the emigration of fauna due to noise pollution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium	Medium
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but only to a limited extent. The mitigation of noise pollution during construction is difficult to mitigate against	
Mitigation:		
• Considering that many of the mammal fauna recorded within the project area are nocturnal, no construction activity is to occur at night.		
Residual Impacts:		
It is probable that some individuals of susceptible species will emigrate due to the noise generated from the construction activity. However, this is not likely to impact the viability of the local population of any fauna species.		

5.5.2 Operational Phase

Impact Nature: Loss of habitat within development footprint		
There will be a loss of natural vegetation and habitat due to construction of the solar energy facility. This impact was considered for both the construction and operational phases.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	High	Medium
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	
Mitigation:		

Impact Nature: Loss of habitat within development footprint
• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity (Bennun et al, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas. • Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents.   • Vegetation clearing to commence only after the necessary permits have been obtained. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities. • No development is to occur within the riparian buffer zones.
Residual Impacts:
The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.

Impact Nature: Encroachment of Invasive Alien Plants into disturbed areas		
Invasive Alien Plants (IAPs) tend to encroach into disturbed areas and can outcompete/displace indigenous vegetation.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	High	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• An IAP Management Plan must be written for the development. • Regular monitoring for IAP encroachment during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project. • All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.		
Residual Impacts:		
Based on the lack of IAPs within the development area and the implementation of an IAP Management Plan there are unlikely to be residual impacts		

Impact Nature: Soil erosion and continued habitat degradation		
Disturbance created during the construction phase will leave the development area vulnerable to erosion		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	High	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• A Rehabilitation Plan must be written for the development area and ensured that it be adhered to. • Access roads should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • All erosion observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and re-vegetation of any remaining denuded areas with local indigenous perennial shrubs and succulents from the area.		
Residual Impacts:		
There is still the potential for erosion but would have a low impact.		

Impact Nature: Impacts to fauna movement patterns due to reflection effects		
The reflection caused by solar panels may affect the movement patterns of fauna within the landscape		
	Without Mitigation	**With Mitigation**
Extent	High (4)	High (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	MIinor (2)
Probability	Probable (3)	Probable (3)
Significance	Medium	Low
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun *et al*, 2021). The reflection caused by the panels attracts numerous insects as the panels are perceived as water bodies. This will negatively impact surrounding ecosystems due to the loss of biota and will result in an influx of fauna attempting to feed on the insects.		
Residual Impacts	There is still the potential for reflection impacts but would have a low impact.	

Impact Nature: Disturbance or persecution of fauna		
The operation and maintenance of the Solar Energy Facility may lead to disturbance or persecution of fauna in the vicinity of the development.		
	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Very short term (1)
Magnitude	High (8)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium**	**Low**
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• All staff are to be educated on the importance of local fauna and must be made aware that no poaching or persecution is allowed. • Any fauna threatened by the maintenance and operational activities should be removed to a safe location by an appropriate individual. • All vehicles accessing the site should adhere to a max 40 km/h max to avoid collisions. Appropriate signs must be erected. • If any excavations are to be dug these must not be left open for more than a few hours without ramps for trapped fauna to leave and must be filled at night.		
Residual Impacts:		
Disturbance from maintenance activities will occur albeit at a low and infrequent level.		

5.5.3 Decommissioning/Rehabilitation Phase

Impact Nature: Direct mortality of fauna		
Decommissioning activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions and persecution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Mlinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	
Mitigation:		
• All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate. • Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist.		

Impact Nature: Direct mortality of fauna
• All construction vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected. • All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner. • Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.
Residual Impacts:
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Impact Nature: Continued habitat degradation		
Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years.		
	Without Mitigation	**With Mitigation**
Extent	Moderate (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Medium	Low
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
• Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase. • Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.		
Residual Impacts:		
No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

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 is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system.

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,

other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

Presently, the surrounding immediate and broader landscape consists of natural vegetation used for supporting livestock and to a lesser extent game. The Phase 1 and Phase 2 REDZs spatial files and the South African Renewable Energy EIA Application Database (DFFEb, 2021) was overlaid onto the Gamka Karoo remnants layer. The remnants layer was released as part of the NBA (Skowno *et al*, 2019) and provides the present spatial extent of vegetation. The South African Renewable Energy EIA Application 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. Considering the limited extent of approved and in process developments within the Gamka Karoo (Figure 5-2), the expected cumulative impact is expected to be of a 'Medium' significance.

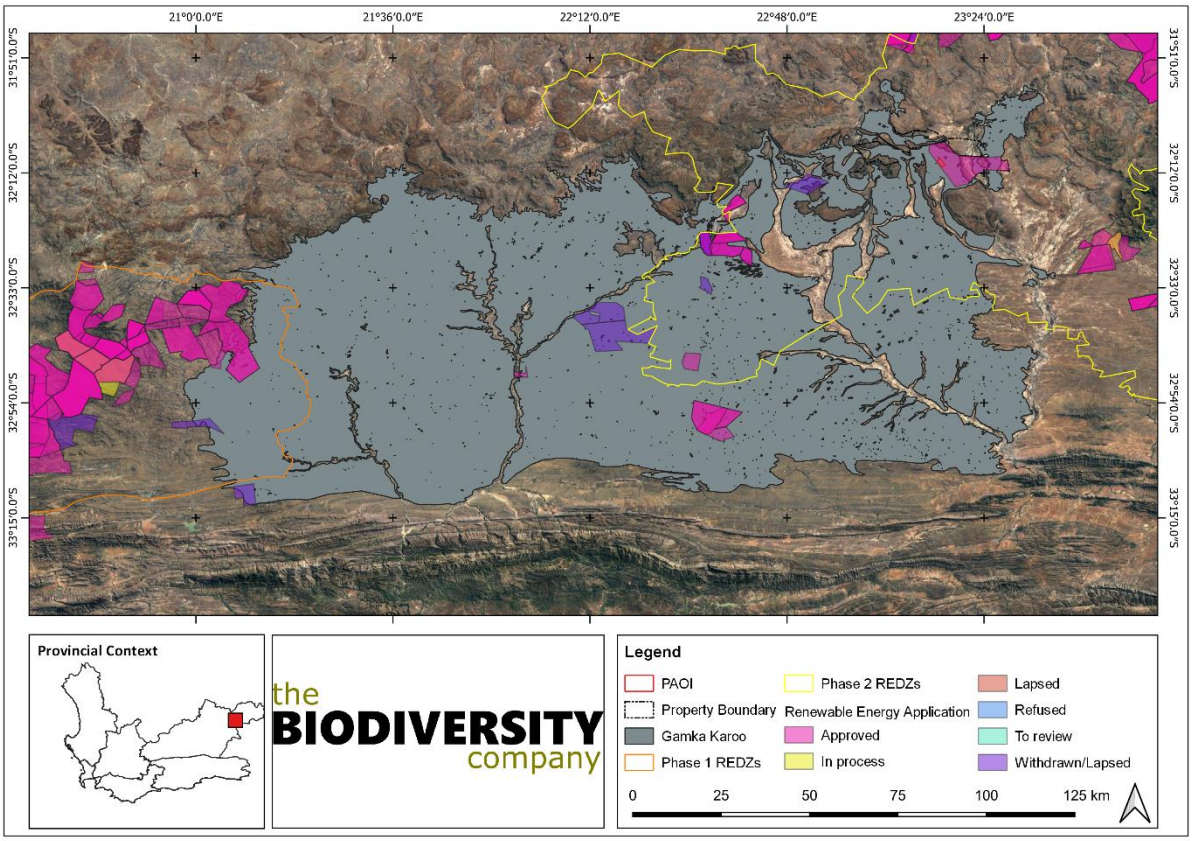


Figure 5-2 Map illustrating additional renewable energy developments within the Gamka Karoo vegetation type

Impact Nature: Cumulative habitat loss within the region		
The development of the proposed Montana 2 Solar Energy Facility will contribute to cumulative habitat loss within the Gamka Karoo, Other Natural Areas and Ecological Support Areas		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Very low (1)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)

Impact Nature: Cumulative habitat loss within the region		
The development of the proposed Montana 2 Solar Energy Facility will contribute to cumulative habitat loss within the Gamka Karoo, Other Natural Areas and Ecological Support Areas		
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium	Medium
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	Yes, in certain cases
Can impacts be mitigated	Yes, to some degree. However, should the entirety of the REDZ areas be developed, the cumulative impacts on the receiving environment will be regarded as 'High'.	
Mitigation: Ensure that a rehabilitation plan and IAP management plan be compiled for each development and are effectively implemented. Set-aside areas (Avoidance areas) should be established in order to conserve natural habitats where possible.		

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 5-2 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 5-2 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.	Appropriate/Adequate fire management plan needs to be implemented.

5.8 Biodiversity Impact Management Actions

The purpose of the Biodiversity Impact Management Actions to inform on the mitigations required to lower the risk of the impacts associated with the proposed activity, provide measures for improving the conservation value of the property and to be able to be inserted into the Environmental Management Programme (EMPr). The mitigation actions required to reduce the significance of the impacts associated with the development are provided in Table 5-3.

Table 5-3 The Biodiversity Impact Management Actions for the proposed Montana 2 Solar Energy Facility

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.	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
Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	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.	Decommissioning /Rehabilitation	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 complied 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.	Life of operation	Environmental Officer Contractor	Fire Management	During Phase
Management Outcome: Fauna				

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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	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	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	Project Manager Environmental Officer	Light pollution and period of light.	Ongoing
Wildlife friendly fences must be incorporated into the design. A tunnel underpass of a height of 500 mm will be acceptable for small mammals. Pre-fabricated concrete elements are appropriate for rectangular tunnels. Metal pipes must be avoided. This will also ensure fences are not damaged by burrowing activity.	Operational	Project Manager Environmental Officer Design Engineer	Fauna movement	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. If feasible, it is recommended that a wind fence be constructed to prevent excessive dust pollution, especially due the sandy nature of the soil.	Life of operation	Project Manager Environmental Officer	Dust pollution levels	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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	Compliance to the training.	Ongoing
Management Outcome: Erosion				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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
A row of indigenous trees can be planted along the boundary to act as wind break to impede 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.	Rehabilitation	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 Montana 2 Solar Energy Facility to the ecosystems affected by its development 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 an Ecological Support Area, with marginal overlap with a Critical Biodiversity Area, as per the Western Cape Biodiversity Spatial Plan;
- The Combined Animal Species Theme Sensitivity was rated as 'High' according the Environmental Screening Tool;
- The Ecosystem Protection Level for the vegetation type associated with the development footprint is regarded as Poorly Protected; and
- The ephemeral drainage lines traversing the PAOI drain into a Freshwater Ecosystem Priority Area to the NFEPA database.

Based on the fauna components recorded within the PAOI and proximal landscape, the area provides important ecosystem services, particularly with regards to the maintenance of dynamic soil properties, nutrient cycling and pollination. The SEI of the PAOI was determined to 'High' based on the high likelihood of occurrence for NT species, the extent of the area considered and its connectivity to natural areas within the landscape, and the low resilience of the vegetation type.

6.2 Impact Statement

The main expected impacts of the proposed Montana 2 SEF will be the loss of habitat and emigration of fauna. Based on the outcomes of the SEI determination, the project possesses a 'High' SEI. This denotes that avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted. Moreover, the avoidance and minimisation mitigation measures are the most important with respect to the mitigation hierarchy (Figure 6-1).

In order to evaluate the extent of 'avoidance' achieved for the project, the following is noteworthy:

- The footprint areas for the four proposed solar facilities amounts to 1 144.645 ha; and
- The total extent of the entire property area comprising 49 337.900 ha, thus approximately 2% of the property area will be developed.

The project area has been designated as a REDZ (Renewable Energy Development Zone) and taking into consideration the extent of 'avoidance' achieved for the project, it is the opinion of the specialist that the authorisation of the proposed project may be favourably considered.

It is recommended that should any future developments be proposed for the remaining extent of any 'Very High' or 'High' SEI areas within the associated properties, that offset strategies be required for these authorisations.

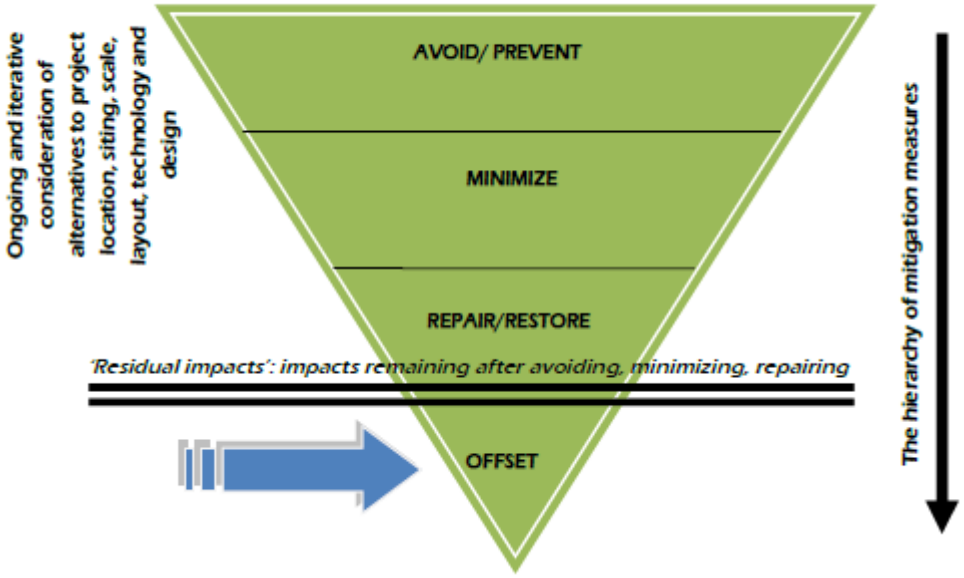


Figure 6-1 Schematic diagram illustrating the mitigation hierarchy indicating where residual impacts are considered. Source: (DFFE, 2021c)

The proposed solar facility is expected to pose a low residual risk to the delineated drainage lines, with key mitigation being the avoidance and adherence to the recommended buffer widths. Due to the low residual risk, a General Authorisation is required for the required water use authorisation.

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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.	5, 11	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these.	23, 36-38, 46-49, 54	
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site	23, 36-38, 46-49, 54	
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna.	21-22	
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.	22-23	
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.	18-20, 23-25	
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.	21-22	
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.	21-22	
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.	20-21	

2.3.7.4	Priority areas for protected area expansion, including- (a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.	-	Does not overlap NPAES areas
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	22-23	
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.	93	
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.	5, 11	
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.	11-14	
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.	5	
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	50	
3.1.7	Additional environmental impacts expected from the proposed development.	55-64	
3.1.8	Any direct, indirect and cumulative impacts of the proposed development.	55-64	
3.1.9	The degree to which impacts and risks can be mitigated.	55-64	
3.1.10	The degree to which the impacts and risks can be reversed.	55-64	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	55-64	
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	64-68	
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;	69-70	
3.1.15	any conditions to which this statement is subjected	69-70	

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

Scientific Name	Conservation Status	Endemism
Adromischus filicaulis	LC	Endemic
Adromischus hemisphaericus	LC	Endemic
Agrostis lachnantha	LC	
Aizoon glinoides	LC	Endemic
Albuca exuviata	LC	Endemic
Albuca namaquensis	LC	
Albuca setosa	LC	
Albuca unifolia	LC	
Aloe broomii	LC	
Aloe claviflora	LC	
Aloe humilis	LC	Endemic
Aloinopsis rosulata	LC	Endemic
Anacampseros albidiflora	LC	Endemic
Anacampseros arachnoides	LC	Endemic
Anacampseros filamentosa		Endemic
Anchusa riparia	LC	
Anisodontea anomala	LC	Endemic
Anisodontea malvastroides	LC	Endemic
Anisodontea sp.		
Anisodontea triloba	LC	Endemic
Anthospermum dregei	LC	
Anthospermum sp.		
Anthospermum spathulatum	LC	
Antimima sp.		
Aptosimum indivisum	LC	
Aptosimum marlothii	LC	
Aptosimum procumbens	LC	
Aptosimum spinescens	LC	
Arctotis dregei	LC	Endemic
Arctotis leiocarpa	LC	
Arctotis microcephala	LC	
Arctotis subacaulis	LC	
Argyrolobium argenteum	LC	Endemic
Argyrolobium sp.		
Aristida adscensionis	LC	
Aristida congesta	LC	
Aristida diffusa	LC	
Aristida engleri	LC	
Aristida junciformis	LC	
Aristida sp.		
Aspalathus aciphylla	LC	Endemic
Aspalathus fusca	LC	Endemic
Asparagus aethiopicus	LC	
Asparagus burchellii	LC	Endemic

Scientific Name	Conservation Status	Endemism
Asparagus capensis	LC	
Asparagus exuvialis	LC	
Asparagus laricinus	LC	
Asparagus lignosus	LC	Endemic
Asparagus mucronatus	LC	Endemic
Asparagus racemosus	LC	
Asparagus retrofractus	LC	
Asparagus sp.		
Asparagus striatus	LC	Endemic
Asparagus suaveolens	LC	
Asplenium adiantum-nigrum	LC	
Asplenium cordatum	LC	
Asplenium trichomanes	LC	
Astroloba congesta	LC	Endemic
Astroloba foliolosa	LC	Endemic
Athanasia microcephala	LC	Endemic
Audouinia esterhuyseniae	VU	Endemic
Barleria stimulans	LC	Endemic
Berkheya carlinifolia		
Berkheya glabrata	LC	Endemic
Berula thunbergii	LC	
Blepharis capensis	LC	Endemic
Blepharis mitrata	LC	
Brachystelma circinatum	LC	
Buddleja glomerata	LC	Endemic
Buddleja salviifolia	LC	
Bulbine abyssinica	LC	
Bulbine frutescens	LC	
Bulbine lagopus	LC	
Bulbine narcissifolia	LC	
Bulbine sp.		
Bulbine triebneri	LC	
Bulbostylis humilis	LC	
Cadaba aphylla	LC	
Capeochloa arundinacea	LC	
Caputia tomentosa	LC	Endemic
Carissa bispinosa	LC	
Cenchrus ciliaris	LC	
Cerastium capense	LC	
Ceropegia stapeliiformis	LC	Endemic
Chaenostoma halimifolium	LC	
Chaenostoma macrosiphon	LC	Endemic
Chaenostoma pauciflorum	LC	Endemic
Chaenostoma rotundifolium	LC	Endemic
Chaenostoma sp.		

Scientific Name	Conservation Status	Endemism
Chascanum pumilum	LC	
Chasmatophyllum musculinum	LC	
Cheilanthes eckloniana	LC	
Cheilanthes hirta		
Cheilanthes induta	LC	Endemic
Chironia palustris	LC	
Chloris virgata	LC	
Chrysocoma ciliata	LC	
Chrysocoma sp.		
Cineraria aspera	LC	
Clematis brachiata	LC	
Clutia sp.		
Clutia thunbergii	LC	
Colchicum melanthioides		
Colchicum striatum	LC	
Convolvulus sagittatus	LC	
Conyza scabrida		
Cotula microglossa	LC	Endemic
Cotyledon cuneata	LC	Endemic
Cotyledon orbiculata	LC	
Cotyledon papillaris	LC	
Cotyledon sp.		
Crassula barbata	LC	Endemic
Crassula capitella	LC	
Crassula corallina	LC	
Crassula expansa	LC	
Crassula montana	LC	Endemic
Crassula pubescens	LC	Endemic
Crassula rupestris	LC	Endemic
Crassula socialis	LC	Endemic
Crassula tomentosa	LC	
Cromidon decumbens	LC	Endemic
Cucumis africanus	LC	
Cucumis zeyheri	LC	
Curio articulatus	LC	Endemic
Curio radicans	LC	
Cussonia paniculata	LC	Endemic
Cymbopogon dieterlenii	LC	
Cymbopogon prolixus	LC	
Cynodon dactylon	LC	
Cynodon incompletus	LC	Endemic
Cyperus longus	NE	
Cyperus marginatus	LC	
Cyperus textilis	LC	Endemic
Cyperus usitatus	LC	

Scientific Name	Conservation Status	Endemism
Delosperma sp.		
Dianthus micropetalus	LC	
Dianthus thunbergii	NE	Endemic
Diascia alonsooides	LC	Endemic
Diascia capsularis	LC	
Dicerothamnus rhinocerotis		Endemic
Dichilus gracilis	LC	
Dicoma picta	LC	Endemic
Digitaria argyrograpta	LC	
Digitaria eriantha	LC	
Dimorphotheca cuneata	LC	
Dimorphotheca sp.		
Diospyros austroafricana	LC	Endemic
Diospyros lycioides	LC	
Dipcadi viride	LC	
Drimia intricata	LC	
Drimia sp.		
Drosanthemum hispidum	LC	
Drosanthemum karrooense	LC	Endemic
Drosanthemum lique	LC	Endemic
Drosanthemum sp.		
Drosanthemum vespertinum	LC	Endemic
Duvalia maculata	LC	
Dysphania schraderiana		
Ehretia rigida	LC	Endemic
Ehrharta calycina	LC	
Ehrharta erecta	LC	
Empodium flexile	LC	Endemic
Empodium gloriosum	LC	Endemic
Enneapogon cenchroides	LC	
Enneapogon desvauxii	LC	
Enneapogon scaber	LC	
Enneapogon scoparius	LC	
Eragrostis bergiana	LC	
Eragrostis bicolor	LC	
Eragrostis chloromelas	LC	
Eragrostis cilianensis	LC	
Eragrostis curvula	LC	
Eragrostis homomalla	LC	
Eragrostis lehmanniana	LC	
Eragrostis obtusa	LC	
Eragrostis procumbens	LC	
Eragrostis truncata	LC	
Eriocephalus africanus	LC	Endemic
Eriocephalus ericoides	LC	

Scientific Name	Conservation Status	Endemism
Eriocephalus eximius	LC	
Eriocephalus microcephalus	LC	Endemic
Eriocephalus spinescens	LC	Endemic
Eriocephalus tenuifolius	LC	
Eulophia hians	LC	
Eumorphia corymbosa	LC	Endemic
Euphorbia braunsii	LC	
Euphorbia clavarioides	LC	
Euphorbia decepta	LC	Endemic
Euphorbia hypogaea	LC	Endemic
Euphorbia inaequilatera	LC	
Euphorbia mauritanica	LC	
Euphorbia patula		Endemic
Euphorbia pentagona	LC	Endemic
Euphorbia rhombifolia	LC	
Euphorbia spartaria	LC	
Euphorbia stellispina	LC	Endemic
Euphorbia stolonifera	LC	Endemic
Euryops anthemoides	LC	Endemic
Euryops cuneatus	LC	Endemic
Euryops empetrifolius	LC	
Euryops imbricatus	LC	Endemic
Euryops lateriflorus	LC	
Euryops oligoglossus	LC	
Euryops subcarnosus	LC	
Faurea recondita	LC	Endemic
Felicia fascicularis	LC	
Felicia filifolia	LC	
Felicia hirsuta	LC	
Felicia hyssopifolia	LC	
Felicia muricata	LC	
Felicia namaquana	LC	
Felicia ovata	LC	Endemic
Felicia sp.		
Festuca scabra	LC	
Fingerhuthia africana	LC	
Fingerhuthia sesleriiformis	LC	
Forsskaolea candida	LC	
Frankenia pulverulenta	LC	
Fuirena coerulescens	LC	
Galenia africana	LC	
Galenia glandulifera	LC	Endemic
Galenia papulosa	LC	
Galenia procumbens	LC	Endemic
Galenia sarcophylla	LC	

Scientific Name	Conservation Status	Endemism
Galium capense	LC	
Galium tomentosum	LC	
Garuleum bipinnatum	LC	Endemic
Gasteria disticha		
Gasteria sp.		
Gazania heterochaeta	LC	
Gazania krebsiana		
Gazania lichtensteinii	LC	
Gazania sp.		
Geigeria filifolia	LC	
Geigeria ornativa	LC	
Geranium dregei	LC	Endemic
Geranium harveyi	LC	Endemic
Gerbera piloselloides	LC	
Gethyllis longistyla	LC	Endemic
Gisekia pharnaceoides		
Gladiolus permeabilis	LC	Endemic
Gnaphalium capense	LC	Endemic
Gnidia meyeri	LC	Endemic
Gomphocarpus filiformis	LC	
Gomphocarpus fruticosus	LC	
Gomphocarpus tomentosus	LC	
Gorteria alienata		Endemic
Grewia robusta	LC	Endemic
Guthriea capensis	LC	
Haemanthus humilis	LC	Endemic
Haworthia marumiana	NE	Endemic
Haworthia semiviva	LC	Endemic
Haworthiopsis fasciata		Endemic
Haworthiopsis nigra		Endemic
Haworthiopsis tessellata		
Hebenstretia parviflora	LC	
Hebenstretia robusta	LC	Endemic
Hebenstretia sp.		
Helichrysum asperum	LC	Endemic
Helichrysum caespititium	LC	
Helichrysum dregeanum	LC	
Helichrysum hamulosum	LC	Endemic
Helichrysum lineare	LC	
Helichrysum lucilioides	LC	
Helichrysum pumilio	LC	Endemic
Helichrysum rugulosum	LC	
Helichrysum scitulum	LC	Endemic
Helichrysum sp.		
Helichrysum trilineatum	LC	

Scientific Name	Conservation Status	Endemism
Helichrysum zeyheri	LC	
Heliophila carnosa	LC	
Heliophila crithmifolia	LC	
Heliophila minima	LC	
Heliophila sp.		
Hermannia althaeifolia	LC	Endemic
Hermannia burkei	LC	
Hermannia cernua	LC	
Hermannia coccocarpa	LC	
Hermannia comosa	LC	
Hermannia cuneifolia	LC	
Hermannia desertorum	LC	
Hermannia filifolia	NE	Endemic
Hermannia grandiflora	LC	
Hermannia pulchella	LC	
Hermannia sp.		
Hermannia spinosa	LC	
Hermannia stricta	LC	
Hermannia vestita	LC	
Hertia ciliata	LC	
Heteromorpha arborescens	LC	Endemic
Heteropogon contortus	LC	
Hibiscus pusillus	LC	
Holothrix villosa	LC	Endemic
Huernia barbata	LC	
Huernia thuretii	LC	
Hyparrhenia hirta	LC	
Indigofera alternans		
Indigofera heterophylla	LC	Endemic
Indigofera meyeriana	LC	Endemic
Indigofera sessilifolia	LC	
Indigofera sp.		
Isolepis angelica	LC	
Isolepis cernua	LC	
Isolepis setacea	LC	
Ixia marginifolia	LC	Endemic
Jamesbrittenia atropurpurea	LC	
Jamesbrittenia filicaulis	LC	
Jamesbrittenia sp.		
Jamesbrittenia tysonii	LC	Endemic
Juncus acutus	LC	
Juncus exsertus	LC	
Juncus inflexus	LC	
Juncus scabriusculus	LC	Endemic
Justicia incana		

Scientific Name	Conservation Status	Endemism
Justicia spartioides		
Kewa salsoloides	LC	
Kiggelaria africana	LC	
Lachenalia aurioliae	LC	Endemic
Lacomucinaea lineata		
Lactuca inermis	LC	
Lantana rugosa	LC	
Lasiosiphon deserticola	LC	Endemic
Lasiosiphon polycephalus	LC	
Lasiosiphon sp.		
Leonotis ocymifolia	LC	
Leptochloa fusca	LC	
Lessertia annularis	LC	
Lessertia frutescens	LC	
Lessertia inflata	LC	Endemic
Lessertia pauciflora		
Lessertia sp.		
Leysera gnaphalodes	LC	
Leysera tenella	LC	
Limeum aethiopicum	NE	Endemic
Limosella grandiflora	LC	
Limosella vesiculosa	LC	
Lithospermum scabrum	LC	Endemic
Lobelia dregeana	LC	
Lobelia thermalis	LC	
Lobostemon stachydeus	LC	
Lotononis azureoides	LC	Endemic
Lotononis caerulescens	LC	Endemic
Lotononis fruticoides	LC	Endemic
Lycium cinereum	LC	
Lycium hirsutum	LC	
Lycium horridum	LC	
Lycium pumilum	LC	
Lycium schizocalyx	LC	
Malephora thunbergii	LC	Endemic
Marsilea burchellii	LC	
Massonia echinata	LC	Endemic
Melianthus comosus	LC	
Melica decumbens	LC	
Melica racemosa	LC	
Melinis repens	LC	
Melolobium candicans	LC	
Melolobium canescens	LC	
Melolobium microphyllum	LC	
Melolobium sp.		

Scientific Name	Conservation Status	Endemism
Mentha longifolia	LC	
Mesembryanthemum articulatum		
Mesembryanthemum coriarium		
Mesembryanthemum crystallinum	LC	
Mesembryanthemum emarcidum		Endemic
Mesembryanthemum excavatum	LC	Endemic
Mesembryanthemum geniculiflorum		
Mesembryanthemum grossum		Endemic
Mesembryanthemum guerichianum	LC	
Mesembryanthemum inachabense	LC	
Mesembryanthemum noctiflorum		
Mesembryanthemum stenandrum	LC	Endemic
Mesembryanthemum tetragonum		
Mestoklema arboriforme	LC	Endemic
Mestoklema tuberosum	LC	Endemic
Microloma armatum	LC	
Monsonia salmoniflora	LC	
Moquiniella rubra	LC	
Moraea ciliata	LC	Endemic
Moraea cookii	LC	
Moraea crispa	LC	
Moraea polystachya	LC	
Moraea speciosa	LC	Endemic
Moraea unguiculata	LC	Endemic
Muraltia macrocarpa	LC	
Nemesia cynanchifolia	LC	
Nemesia fruticans	LC	
Nemesia linearis	LC	
Nemesia sp.		
Nenax microphylla	LC	
Nesaea anagalloides	LC	
Notobubon laevigatum	LC	
Oedera glandulosa		Endemic
Oedera humilis		
Oedera oppositifolia		Endemic
Oedera spinescens		Endemic
Ophioglossum polyphyllum	LC	
Ornithogalum flexuosum	LC	
Ornithogalum hispidum	LC	
Ornithoglossum vulgare	LC	
Oropetium capense	LC	
Osteospermum calendulaceum	LC	Endemic
Osteospermum muricatum	LC	
Osteospermum scariosum	NE	Endemic
Osteospermum sinuatum	LC	

Scientific Name	Conservation Status	Endemism
Othonna eriocarpa	LC	Endemic
Othonna furcata	LC	
Othonna pavonia	LC	Endemic
Othonna sp.		
Oxalis pes-caprae	LC	
Oxalis psilopoda	LC	Endemic
Panicum maximum	LC	
Passerina corymbosa	LC	Endemic
Pegolettia retrofracta	LC	
Pelargonium abrotanifolium	LC	Endemic
Pelargonium aridum	LC	
Pelargonium glutinosum	LC	Endemic
Pelargonium griseum	LC	Endemic
Pelargonium grossularioides	LC	Endemic
Pelargonium laxum		Endemic
Pelargonium malacoides		
Pelargonium multicaule	LC	
Pelargonium ramosissimum	LC	Endemic
Pelargonium ribifolium	LC	Endemic
Pelargonium senecioides	LC	Endemic
Pelargonium sessiliflorum		Endemic
Pelargonium sidoides	LC	
Pelargonium tetragonum	LC	Endemic
Pelargonium tragacanthoides	LC	
Peliostomum leucorrhizum	LC	
Pellaea calomelanos	LC	
Pennisetum sphacelatum	LC	
Pentameris airoides	LC	
Pentzia calcarea	LC	
Pentzia incana	LC	
Pentzia lanata	LC	
Pentzia quinquefida	LC	Endemic
Phragmites australis	LC	
Phylica purpurea		
Phymaspermum parvifolium	LC	Endemic
Piaranthus comptus	LC	Endemic
Piaranthus geminatus	LC	Endemic
Pleiospilos compactus	LC	Endemic
Plinthus karooicus	LC	
Polygala ephedroides	LC	
Polygala leptophylla	LC	
Polygala sp.		
Polypogon sp.		
Pseudognaphalium undulatum	LC	
Pseudoschoenus inanis	LC	

Scientific Name	Conservation Status	Endemism
Pteronia adenocarpa	LC	Endemic
Pteronia bolusii	LC	Endemic
Pteronia hutchinsoniana	LC	Endemic
Pteronia membranacea	LC	Endemic
Pteronia staehelinoides	LC	Endemic
Radyera urens	LC	
Ranunculus multifidus	LC	
Ranunculus trichophyllus	LC	
Relhania sp.		
Rhamnus prinoides	LC	
Rhigozum obovatum	LC	
Rhigozum trichotomum	LC	
Rhynchosia capensis	LC	Endemic
Roepera incrustata		
Roepera lichtensteiniana		
Romulea atrandra	LC	Endemic
Romulea macowanii	LC	
Rubus ludwigii	LC	
Ruschia intricata	LC	Endemic
Ruschia sp.		
Ruschia spinosa	LC	
Salsola aphylla	LC	
Salsola atrata	LC	Endemic
Salsola dealata	LC	Endemic
Salsola minutifolia	LC	Endemic
Salsola rabieana	LC	
Salsola seminuda	LC	
Salsola tuberculata	LC	
Salvia disermas	LC	
Salvia stenophylla		
Scabiosa columbaria	LC	
Schismus barbatus	LC	
Schlechteranthus spinescens		Endemic
Schoenoxiphium sp.		
Scleranthus sp.		
Searsia burchellii	LC	
Searsia lancea	LC	
Searsia pallens	LC	
Searsia pyroides	LC	
Searsia undulata	LC	
Sebaea sp.		
Selago albida	LC	
Selago centralis	LC	
Selago geniculata	LC	Endemic
Selago magnakarooica	LC	Endemic

Scientific Name	Conservation Status	Endemism
Selago saxatilis	LC	
Selago sp.		
Senecio achilleifolius	LC	
Senecio angustifolius	LC	
Senecio asperulus	LC	
Senecio burchellii	LC	Endemic
Senecio cordifolius	LC	Endemic
Senecio cotyledonis	LC	
Senecio hastatus	LC	
Senecio inaequidens	LC	
Senecio niveus	LC	
Senecio pinnulatus	LC	Endemic
Sericocoma avolans	LC	
Setaria sphacelata	LC	
Setaria verticillata	LC	
Silene burchellii		
Silene undulata		
Solanum capense	LC	
Solanum retroflexum	LC	
Solanum tomentosum		
Sonchus dregeanus	LC	
Sporobolus fimbriatus	LC	
Sporobolus ioclados	LC	
Sporobolus tenellus	LC	
Stachys cuneata	LC	Endemic
Stachys dregeana	LC	
Stachys linearis	LC	
Stachys rugosa	LC	
Stapelia grandiflora	LC	
Stipagrostis anomala	LC	
Stipagrostis ciliata	LC	
Stipagrostis namaquensis	LC	
Stipagrostis obtusa	LC	
Stipagrostis uniplumis	LC	
Stomatium sp.		
Syringodea concolor	LC	Endemic
Talinum caffrum	LC	
Tamarix usneoides	LC	
Tarchonanthus minor	LC	
Tenaxia disticha		
Tetraena chrysopteron		
Tetraena microcarpa		
Tetragonia arbuscula	LC	
Tetragonia spicata	LC	
Teucrium africanum	LC	Endemic

Scientific Name	Conservation Status	Endemism
Teucrium trifidum	LC	
Themeda triandra	LC	
Thesium hystrix	LC	
Thesium sonderianum	DD	Endemic
Trachyandra acocksii	LC	Endemic
Trachyandra jacquiniana	LC	Endemic
Tragus berteronianus	LC	
Tragus koelerioides	LC	
Tragus racemosus	LC	
Trianthema parvifolia	LC	
Tribolium purpureum	LC	
Tribulus terrestris	LC	
Trichodesma africanum	LC	
Trichodiadema barbatum	LC	Endemic
Trichodiadema intonsum	LC	Endemic
Trichodiadema setuliferum	LC	Endemic
Trichodiadema sp.		
Tridentea jucunda	LC	
Trisetopsis hirtula		
Tritonia laxifolia	LC	
Troglophyton capillaceum	LC	
Tylecodon reticulatus	LC	
Tylecodon wallichii	LC	Endemic
Typha capensis	LC	
Urochloa panicoides	LC	
Ursinia nana	LC	
Urtica lobulata	LC	
Vachellia karroo	LC	
Veltheimia capensis	LC	Endemic
Veronica anagallis-aquatica	LC	
Viscum continuum	LC	Endemic
Viscum rotundifolium	LC	
Wahlenbergia cernua	LC	Endemic
Wahlenbergia nodosa	LC	Endemic
Wahlenbergia sp.		
Wahlenbergia tenella	LC	Endemic
Wahlenbergia undulata	LC	
Xysmalobium gomphocarpoides	LC	Endemic
Zaluzianskya venusta	LC	Endemic

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

Family	Scientific Name	Common Name	Conservation Status
Bufonidae	*Poyntonophrynus vertebralis*	Southern Pygmy Toad	LC
Bufonidae	*Vandijkophrynus gariepensis gariepensis*	Karoo Toad (subsp. gariepensis)	LC
Pipidae	*Xenopus laevis*	Common Platanna	LC
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	LC
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	LC
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	LC

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

Family	Scientific Name	Common Name	Conservation Status
Agamidae	*Agama aculeata aculeata*	Common Ground Agama	LC
Agamidae	*Agama atra*	Southern Rock Agama	LC
Chamaeleonidae	*Bradypodion ventrale*	Eastern Cape Dwarf Chameleon	LC
Cordylidae	*Cordylus cordylus*	Cape Girdled Lizard	LC
Cordylidae	*Cordylus minor*	Western Dwarf Girdled Lizard	LC
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	LC
Cordylidae	*Pseudocordylus microlepidotus namaquensis*	Nuweveldberg Crag Lizard	LC
Elapidae	*Naja nivea*	Cape Cobra	LC
Gekkonidae	*Afroedura karroica*	Karoo Flat Gecko	LC
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	LC
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	LC
Gekkonidae	*Pachydactylus maculatus*	Spotted Gecko	LC
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	LC
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common Sand Lizard	LC
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	LC
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	LC
Lamprophiidae	*Pseudaspis cana*	Mole Snake	LC
Scincidae	*Acontias meleagris*	Cape Legless Skink	LC
Scincidae	*Trachylepis homalocephala*	Red-sided Skink	LC
Scincidae	*Trachylepis sulcata sulcata*	Western Rock Skink	LC
Scincidae	*Trachylepis variegata*	Variegated Skink	LC
Testudinidae	*Homopus femoralis*	Greater Padloper	LC
Testudinidae	*Psammobates tentorius tentorius*	Karoo Tent Tortoise	NT
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	LC
Varanidae	*Varanus albigularis albigularis*	Rock Monitor	LC
Viperidae	*Bitis arietans arietans*	Puff Adder	LC

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

Family	Scientific Name	Conservation Status
Bathyergidae	*Cryptomys hottentotus*	LC
Bovidae	*Raphicerus campestris*	LC
Bovidae	*Sylvicapra grimmia*	LC
Bovidae	*Pelea capreolus*	LC
Bovidae	*Alcelaphus buselaphus*	LC
Bovidae	*Antidorcas marsupialis*	LC
Bovidae	*Tragelaphus oryx*	LC
Bovidae	*Tragelaphus strepsiceros*	LC
Canidae	*Canis mesomelas*	LC
Canidae	*Vulpes chama*	LC
Canidae	*Otocyon megalotis*	LC
Cercopithecidae	*Papio ursinus*	LC
Chrysochloridae	*Chlorotalpa sclateri*	LC
Felidae	*Felis nigripes*	VU
Felidae	*Leptailurus serval*	LC
Felidae	*Panthera pardus*	VU
Felidae	*Caracal caracal*	LC
Felidae	*Felis silvestris*	LC
Gliridae	*Graphiurus ocularis*	LC
Herpestidae	*Cynictis penicillata*	LC
Herpestidae	*Herpestes pulverulentus*	LC
Herpestidae	*Suricata suricatta*	LC
Hyaenidae	*Parahyaena brunnea*	NT
Hyaenidae	*Proteles cristata*	LC
Hystricidae	*Hystrix africaeaustralis*	LC
Leporidae	*Lepus capensis*	LC
Leporidae	*Lepus saxatilis*	LC
Leporidae	*Pronolagus saundersiae*	LC
Macroscelididae	*Macroscelides proboscideus*	LC
Macroscelididae	*Elephantulus rupestris*	LC
Macroscelididae	*Elephantulus edwardii*	LC
Muridae	*Aethomys granti*	LC
Muridae	*Aethomys namaquensis*	LC
Muridae	*Desmodillus auricularis*	LC
Muridae	*Gerbillurus paeba*	LC
Muridae	*Otomys unisulcatus*	LC
Muridae	*Parotomys brantsii*	LC
Muridae	*Parotomys littledalei*	LC
Muridae	*Mus musculus*	LC
Muridae	*Mastomys coucha*	LC
Muridae	*Rhabdomys pumilio*	LC
Mustelidae	*Aonyx capensis*	NT
Mustelidae	*Ictonyx striatus*	LC
Mustelidae	*Mellivora capensis*	LC

Mustelidae	*Poecilogale albinucha*	LC
Nesomyidae	*Malacothrix typica*	LC
Orycteropodidae	*Orycteropus afer*	LC
Procaviidae	*Procavia capensis*	LC
Pteropodidae	*Rousettus aegyptiacus*	LC
Sciuridae	*Xerus inauris*	LC
Soricidae	*Suncus varilla*	LC
Soricidae	*Crocidura cyanea*	LC
Viverridae	*Genetta genetta*	LC

8.6 Appendix G – 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

May 2022