Biodiversity Scoping Report for the Pixley Park Renewable Energy Project – Carolus Solar Photo-Voltaic (PV) Solar Energy Facility

De Aar, Northern Cape

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1 Introduction

The Biodiversity Company was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a biodiversity scoping level assessment for the Pixley Park Renewable Energy project. The Pixley Park Solar Cluster Project comprises of photovoltaic (PV) facilities and associated powerlines, substations and BESS facilities.

This assessment was conducted in accordance with the amendments to 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 (GN) 320 (20 March 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).

The purpose of the specialist assessment is to provide relevant input into the basic assessment process and provide a report for the proposed activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.1 Background

Carolus Solar PV1 (Pty) Ltd is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 3 of the Farm Carolus Poort No.3, located approximately 10km east of De Aar within the Emthanjeni Local Municipality in the Northern Cape Province . The facility will have a contracted capacity of up to 100 MW and will be known as Carolus Solar PV1. The project is planned as part of a cluster of renewable energy facilities known as Pixley Park, which includes three (3) additional 100 MW Solar PV Facilities (Wagt Solar PV1, Rietfontein PV1, and Fontein Solar PV1), and grid connection infrastructure connecting the facilities to the existing Hydra Substation. The projects will all connect to the new Vetlaagte Main Transmission Substation (MTS) via the Wag ‘n Bietjie MTS.

Infrastructure associated with the Carolus Solar PV1 Facility will include the following:

- Solar PV array comprising bifacial PV modules and mounting structures, using single axis tracking technology;
- Inverters and transformers;
- Cabling between the panels;
- Battery Energy Storage System (BESS);
- Laydown areas, construction camps, site offices;
- 12m wide Access Road and entrance gate to the project site and switching station;
- 6m wide internal distribution roads;

- Operations and Maintenance Building, Site Offices, Ablutions with conservancy tanks, Storage Warehouse, workshop, Guard House;
- Onsite 132kV IPP Substation, including the HV Step-up transformer, and MV Interconnection building;
- 132kV Overhead Power Line (OHPL) – 30 m height from the switching station to the Main Transmission Substation (MTS) located on farms Vetlaagte and Wagt, which is to be handed back to Eskom (a separate EA is being applied for in this regard);
- Extension of the 132kV Busbar at the MTS;
- 132kV Feeder Bay at the MTS;
- Extension of the 400kV Busbar at the MTS; and
- Installation of a new 400/132 kV Transformer and bay at the MTS.

A development footprint of approximately 285 ha has been identified within the broader project site (approximately 8 200 ha in extent), by the developer for the development of the Carolus Solar PV1 Facility, which is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes.

It is the developer's intention to bid the proposed project under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with Carolus Solar PV1 Facility set to inject up to 100MW into the national grid

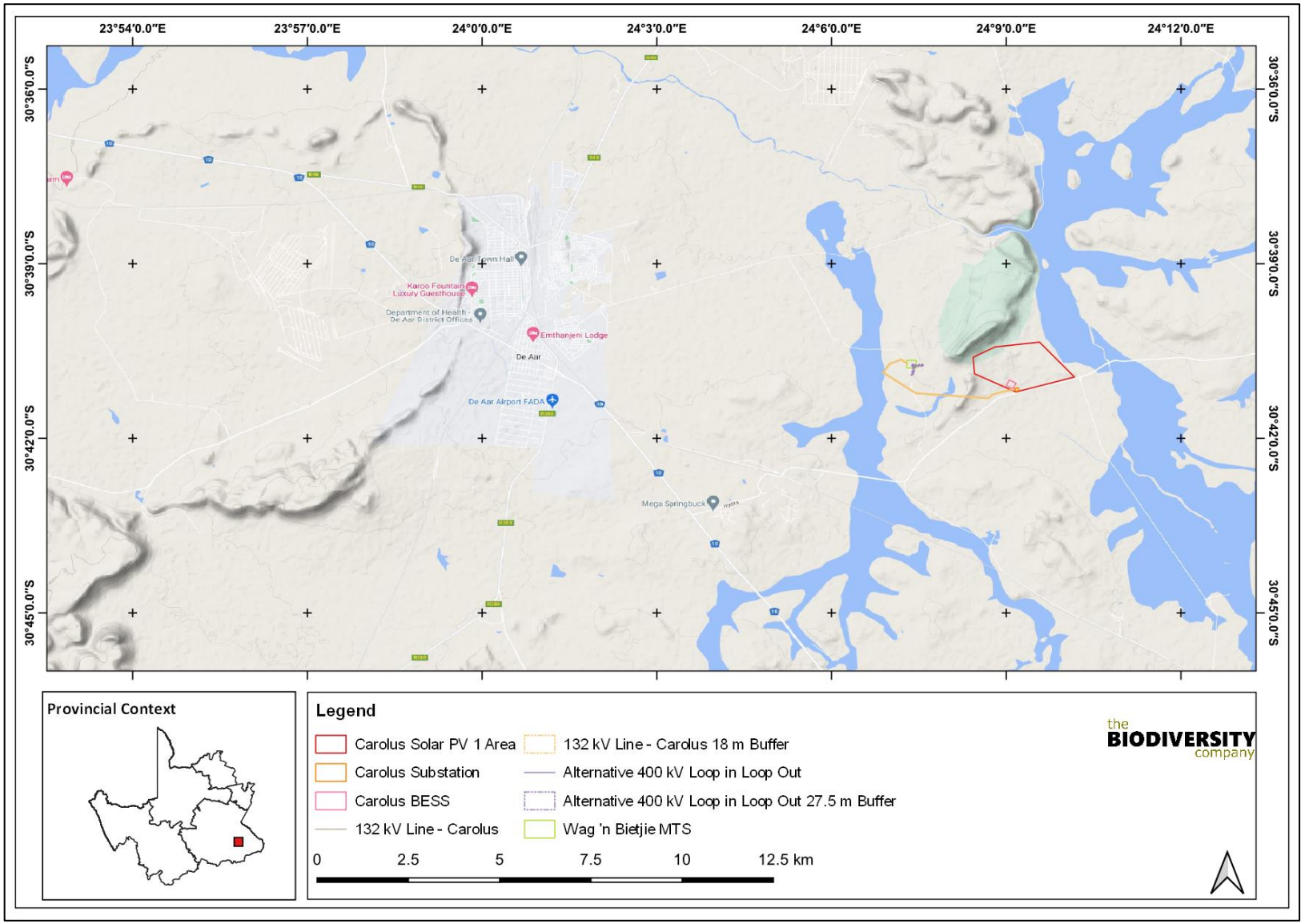

Figure 1-1 Map illustrating the location of the proposed Carolus Solar PV1 Facility

1.2 Scope of Work

The aim of the screening survey was to provide information to guide future proposed biodiversity impact surveys of the proposed projects. This will allow a more accurate risk assessment of the proposed facilities to current ecosystems and their associated biodiversity (fauna and flora) within the project area as well as highlighting no-go areas and areas of concern. This was achieved through the following:

- Desktop assessment to identify ecologically important landscape features within the project area;
- Desktop assessment to identify the reference vegetation types within the landscape; and
- Desktop assessment to identify possible Species of Conservation Concern that occur within the proposed project area.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- This being a scoping assessment, only desktop information was considered; and
- The fauna component of this assessment only considered herpetofauna (amphibians and reptiles) and mammals.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 2-1 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 2-1 A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape Province

Region	Legislation / Guideline
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 1996)
	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), Threatened or Protected Species Regulations
	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, GNR 320 of Government Gazette 43310 (March 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, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)

Region	Legislation / Guideline
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Northern Cape Nature Conservation Act No. 9 of 2009

3 Desktop Assessment

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

3.1 Ecologically Important Landscape Features

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

- National Biodiversity Assessment 2018 (Skowno et al, 2019) (NBA) - The purpose of the 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. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:
    - South Africa Conservation Areas Database (SACAD) and South Africa Protected Areas Database (SAPAD) (DFFE, 2021) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
    - National Protected Areas Expansion Strategy (NPAES) (SANBI, 2021) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection.

These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.

- Northern Cape Critical Biodiversity Areas (CBAs) (SANBI, 2016) - The identification of Critical Biodiversity Areas for the Northern Cape was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated. Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes. CBA categories are based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:
    - Critical Biodiversity Area (CBA) – An area that must be maintained in a good ecological condition (natural or near-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types as well as for species and ecological processes that depend on natural or near-natural habitat, that have not already been met in the protected area network (SANBI, 2016).
    - Ecological Support Area (ESA) – An area that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or no necessary to meet them in natural or near-natural areas (SANBI, 2016).
    - Other Natural Area (ONA) – An area in good or fair ecological condition (natural, near-natural or semi-natural) that is not required to meet biodiversity targets for ecosystem types, species or ecological processes (SANBI, 2016).
- Hydrological Setting:
    - South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.
    - Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2021) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water SWSAs areas is vital for

national security because a lack of water security will compromise national security and human wellbeing.

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

3.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) and SANBI (2019) was used 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 project area (Figure 3-1). 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.

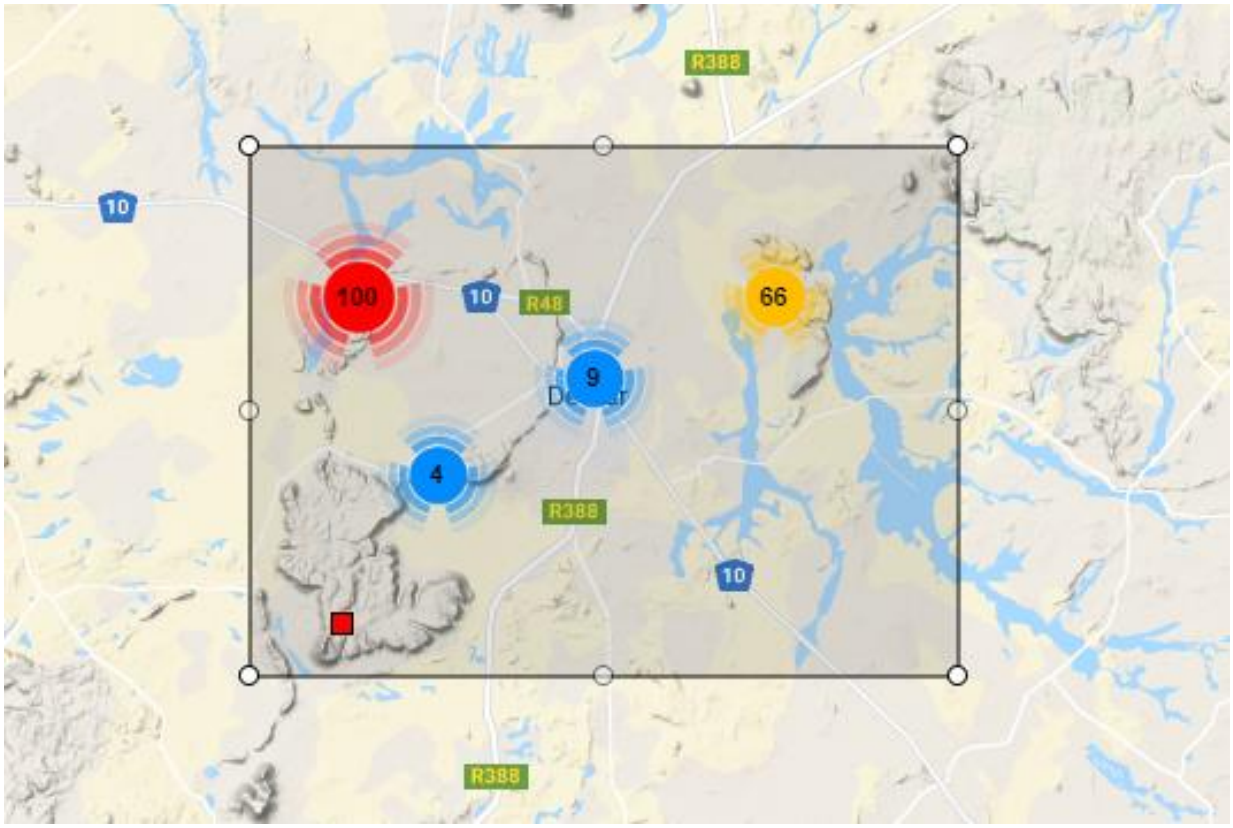

Figure 3-1 Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database

3.3 Desktop Fauna Assessment

The faunal desktop assessment comprised of the following:

- Compiling an expected Amphibian list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2022a), using the 3024CA quarter degree square;

- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2022b), using the 3024CA quarter degree square; and
- Mammal list from the IUCN spatial dataset (2017).

4 Results & Discussion

4.1 Desktop Assessment

4.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features are summarised in Table 4-1.

Table 4-1 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	4.1.1.1
Ecosystem Protection Level	Relevant – Overlaps with Not Protected and Poorly Protected ecosystems	4.1.1.2
Protected Areas	Irrelevant – Located approximately 11.8 km east from the De Aar Nature Reserve	4.1.1.3
National Protected Areas Expansion Strategy (NPAES)	Irrelevant – Does not overlap a NPAES focus area	4.1.1.3
Northern Cape Critical Biodiversity Areas	Relevant – Overlaps Ecological Support Areas	4.1.1.4
Hydrological Context	Relevant – Drainage lines draining into an Endangered reach of the Brak River	4.1.1.5

4.1.1.1 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 proposed project overlaps with LC ecosystems (Figure 4-1).

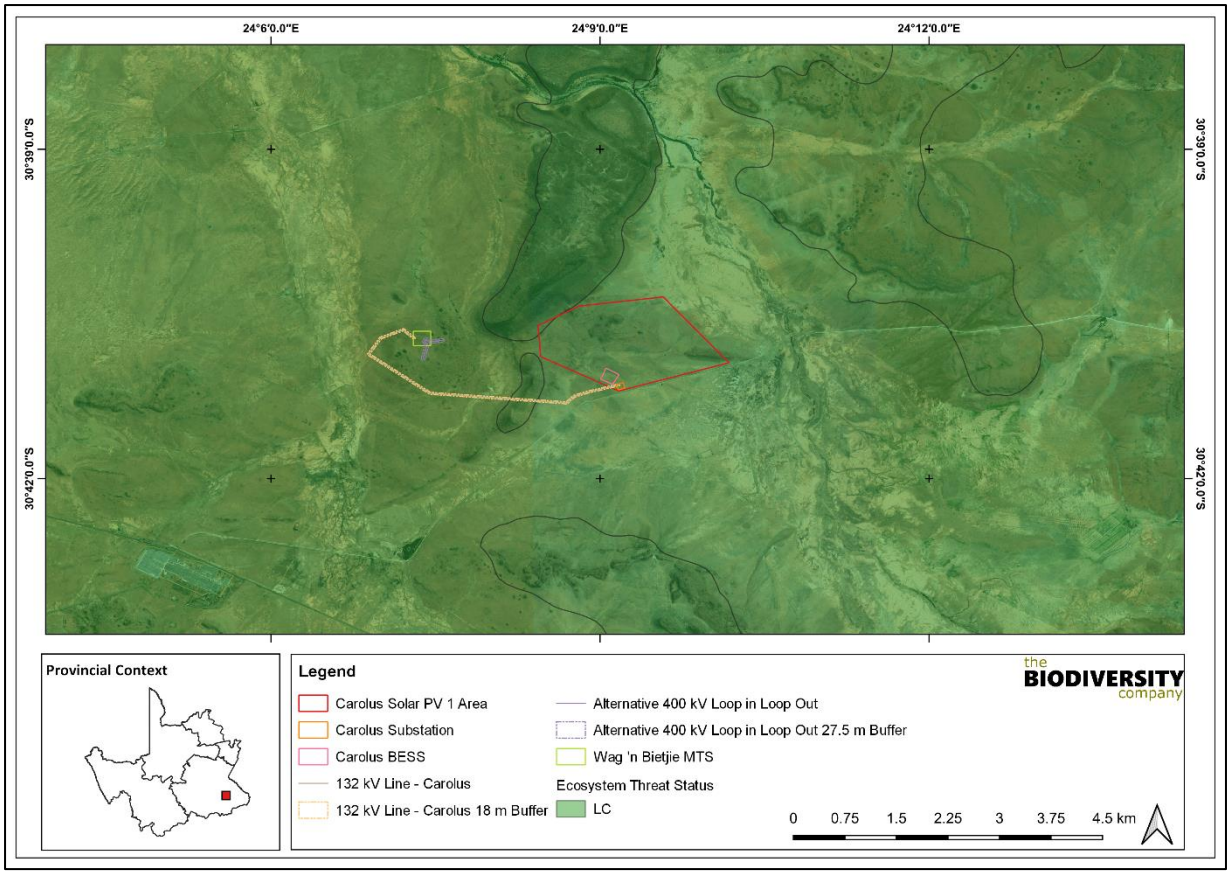

Figure 4-1 Map illustrating the ecosystem threat status associated with the proposed Carolus Solar PV1 Facility

4.1.1.2 Ecosystem Protection Level

This is an 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 lls. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps with NP and PP ecosystems (Figure 4-2).

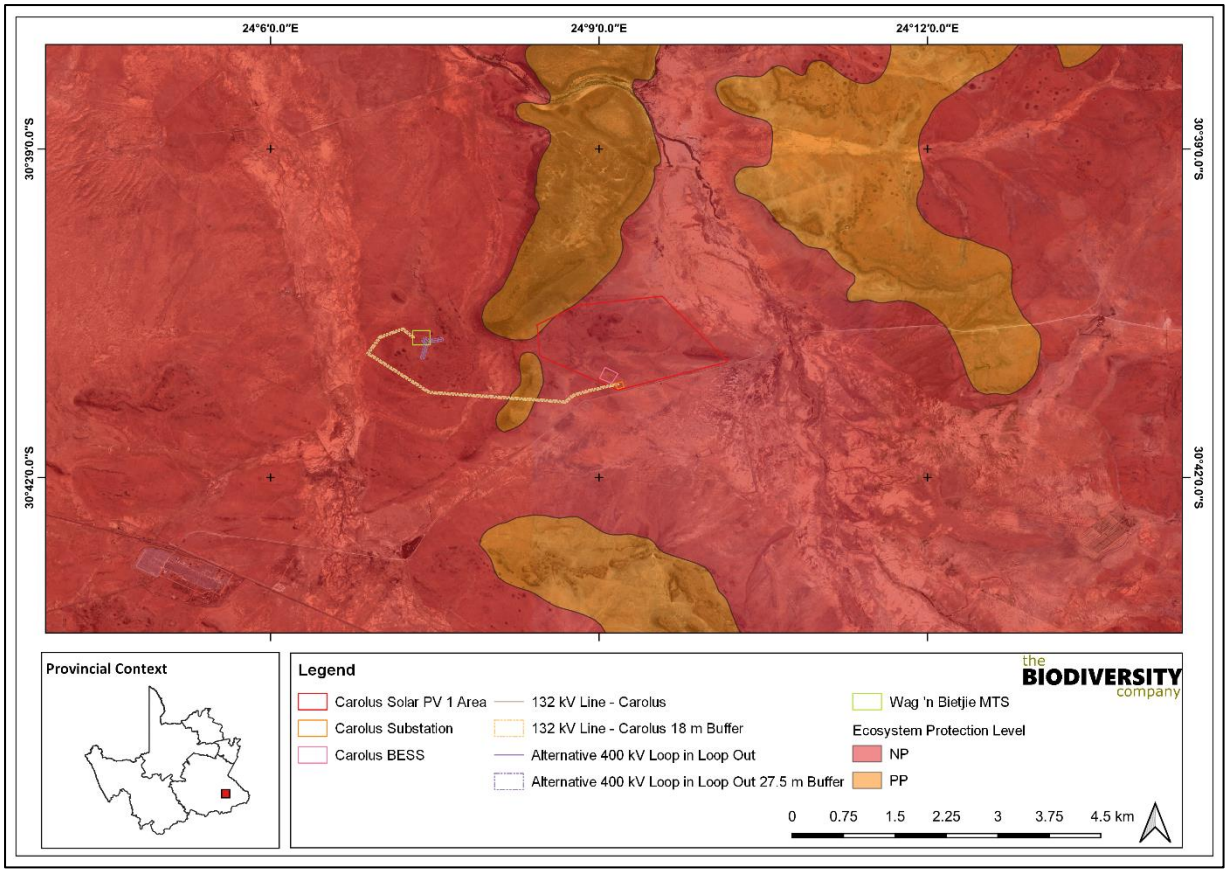

Figure 4-2 Map illustrating the ecosystem protection level associated with the proposed Carolus Solar PV1 Facility

4.1.1.3 Protected Areas

The proposed Carolus Solar PV1 Facility is not located within a protected area, nor does it overlap with any NPAES Focus Areas (Figure 4-3). The De Aar Nature Reserve is located approximately 11.8 km to the west, thereby located outside the 5 km buffer zone. The Senqu Caledon NPAES Focus Area is located approximately 10 km to the north-east.

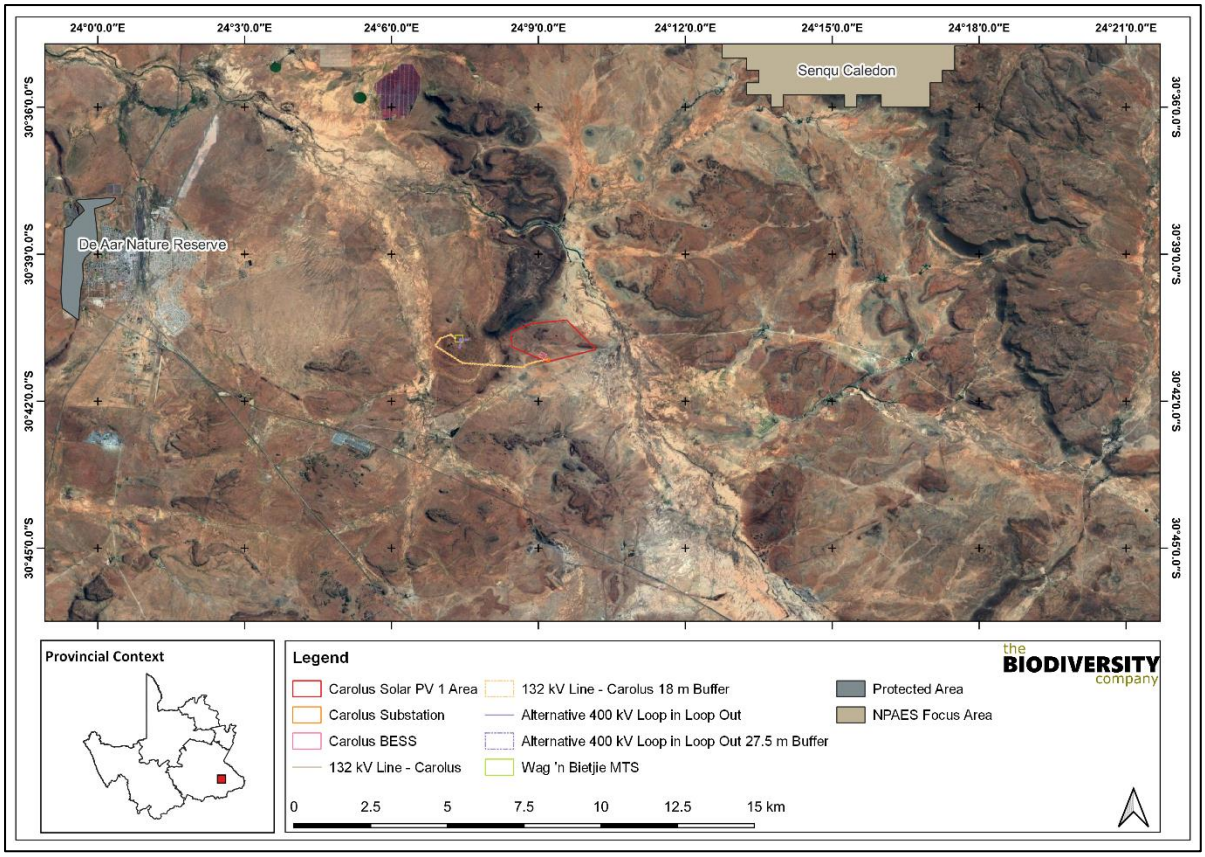

Figure 4-3 Map illustrating the proposed Carolus Solar PV1 Facility in relation to the Protected Areas and National Protected Area Expansion Strategy Focus Areas

4.1.1.4 Northern Cape Critical Biodiversity Areas

Figure 4-4 illustrates that the proposed development overlaps with an Ecological Support Area. The nature of the development, i.e., a solar cluster and associated infrastructure, will lead to destruction of the ESA and consequently, the footprint area will be no longer congruent with an ESA. The adjacent landscape to the east is classified as a CBA1 and CBA2.

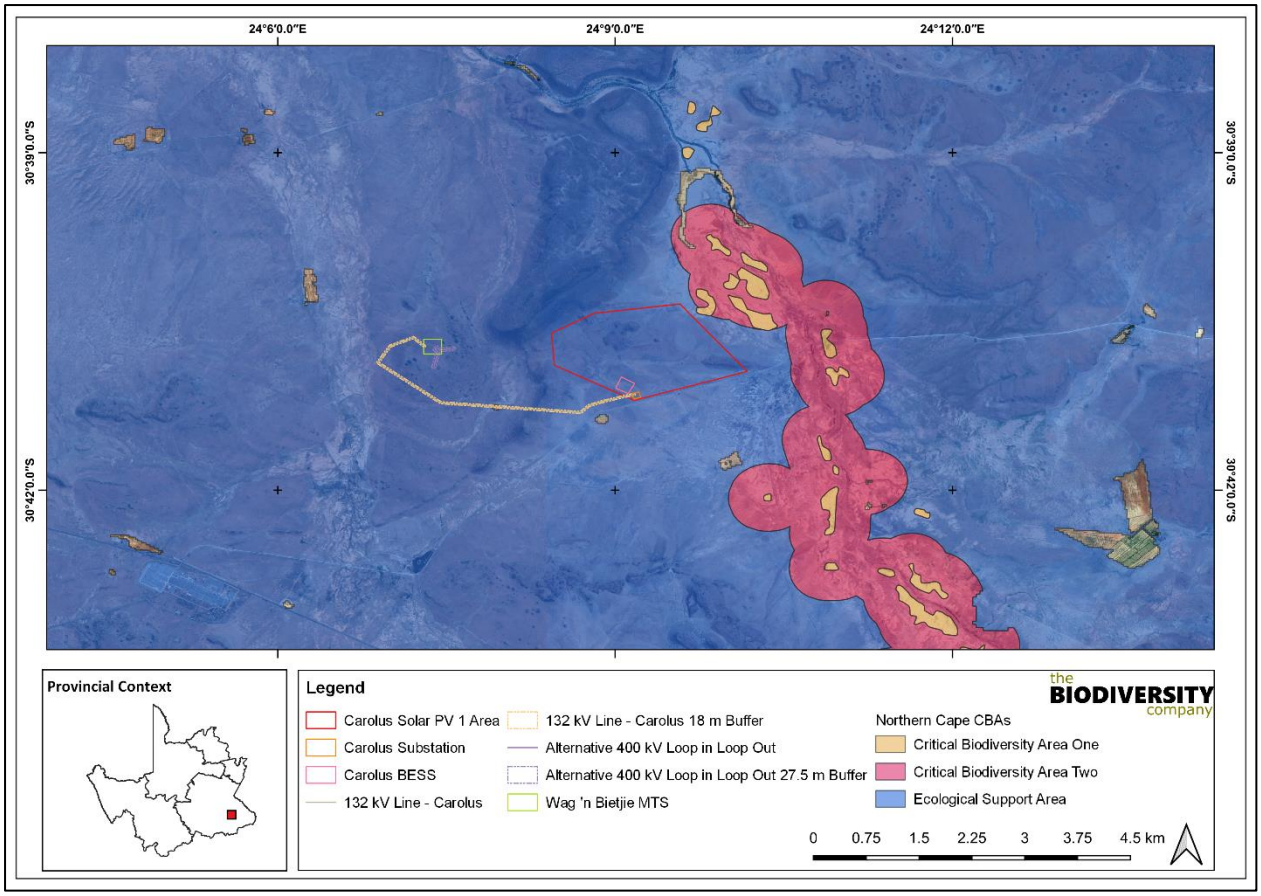

Figure 4-4 ***Map illustrating the proposed Carolus Solar PV1 Facility in relation to the Northern Cape Critical Biodiversity Areas***

4.1.1.5 Hydrological Context

The proposed Carolus Solar PV1 Facility is located within the Brak River Catchment (Secondary Catchment D6).

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are 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, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area does not overlap with any wetland or river systems that were assessed as part of the SAIIAE (Figure 4-5). However, there are minor drainage lines traversing the project that drain into the Brak River. The Brak River is located in close proximity to the project area, and the associated reach classified as EN. Wetlands within the surrounding landscape are classified as CR.

The NFEPA database indicates that the wetlands within the surrounding landscape are not important for maintaining threatened biodiversity or support large numbers of waterbirds.

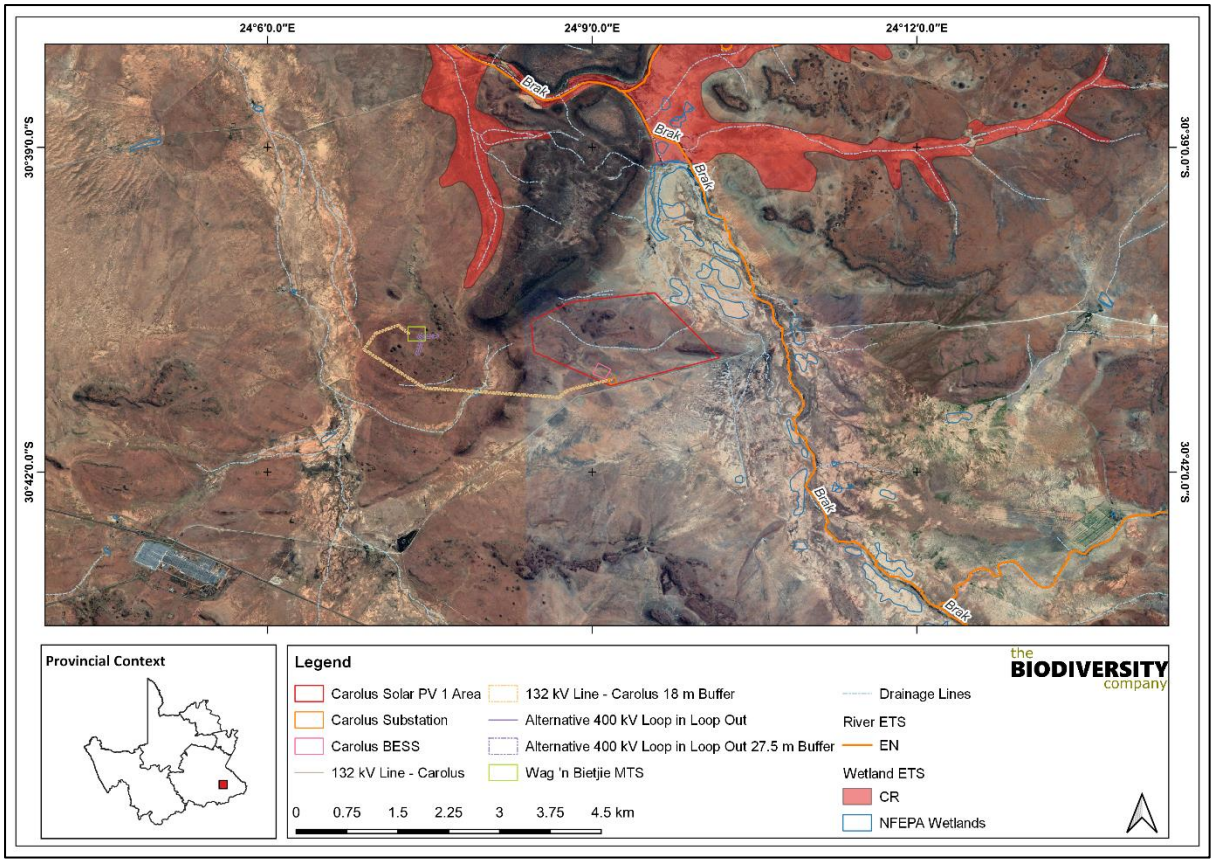

Figure 4-5 Map illustrating the hydrological context of the proposed Carolus Solar PV1 Facility

4.1.2 Flora Assessment

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

4.1.2.1 Vegetation Type

The proposed Carolus Solar PV1 Facility is situated within two biomes, the Grassland and Nama Karoo biomes.

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.

The Grassland biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- Seasonal precipitation; and
- The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

On a fine-scale vegetation type, the project area overlaps with Besemkaree Koppies Shrubland and Northern Upper Karoo (Figure 4-6).

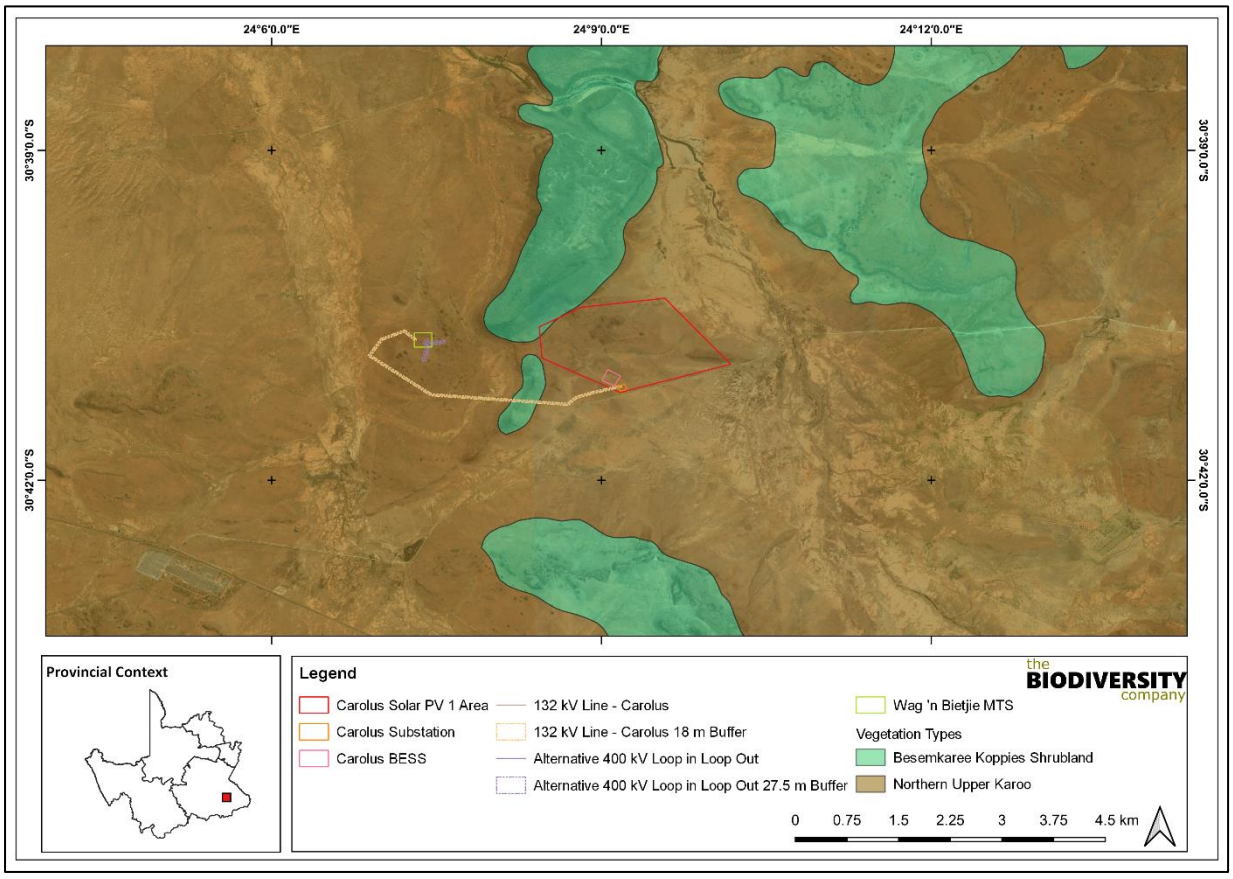

Figure 4-6 Map illustrating the vegetation types associated with the proposed Carolus Solar PV1 Facility

The Northern Upper Karoo is described as follows:

- Topography and Structure - Flat to gently sloping dominated by dwarf shrubs and grasses.
- Geology and Soils - Shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites form

the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms.

- Important Taxa - Tall Shrubs: *Lycium cinereum, L. horridum, L. oxycarpum*. Low Shrubs: *Chrysocoma ciliata, Gnidia polycephala, Pentzia calcarea, P. globosa, P. incana, P. spinescens, Berkheya annectens, Eriocephalus ericoides subsp. ericoides, E. glandulosus, E. spinescens, Euryops asparagoides, Felicia muricata, Osteospermum leptolobum, O. spinescens, Selago geniculata, S. saxatilis*. Succulent Shrubs: *Hertia pallens, Salsola calluna, S. glabrescens, S. rabieana, S. tuberculata, Zygophyllum flexuosum*. Semi-parasitic Shrub: *Thesium hystrix*. Herbs: *Dicoma capensis, Gazania krebsiana, Hermannia comosa, Indigofera alternans, Lessertia pauciflora*, *Radyera urens, Sesamum capense, Sutera pinnatifida, Tribulus terrestris, Vahlia capensis.* Succulent Herb: *Psilocaulon coriarium.* Geophytic Herb: *Moraea pallida.* Graminoids: *Aristida adscensionis, A. congesta, A. diffusa, Enneapogon desvauxii, Eragrostis lehmanniana, E. obtusa, E. truncata, Sporobolus fimbriatus, Stipagrostis obtusa, Eragrostis bicolor, E. porosa, Fingerhuthia africana, Heteropogon contortus, Stipagrostis ciliata, Themeda triandra, Tragus berteronianus, T. koelerioides, T. racemosus.*

- Biogeographically Important Taxa – Herb*: Convolvulus boedeckerianus.* Tall Shrub: *Gymnosporia szyszylowiczii subsp. namibiensis.*

- Endemic Taxa – Succulent Shrubs: *Lithops hookeri, Stomatium pluridens.* Low Shrubs: *Atriplex spongiosa, Galenia exigua.* Herb: *Manulea deserticola.*

- Conservation – No portion conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams. Areas of human settlements are increasing in the north-eastern part of this vegetation type. Prosopis glandulosa, regarded as one of the most important invasive alien plants in South Africa, is widely distributed in this vegetation type.

The Besemkaree Koppies Shrubland is described as follows:

- Topography and Structure – Slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower (closed-canopy) layer is dominated by dwarf small-leaved shrubs and, especially in high precipitation years, also by abundant grasses, while the upper (loose canopy) layer is dominated by tall shrubs.

- Geology and Soils – Dolerite koppies and sills embedded within Karoo Supergroup sediments. The dolerite dykes and sills are igneous intrusions that are the result of extensive volcanic activity, which accompanied the break-up of Gondwana in the Jurassic. In places the slopes of mesas and butts carrying this vegetation type have a mixed geology where dolerites occur together with sandstones and mudstones of the Ecca and Beaufort Groups.

- Important Taxa – Small Trees: *Cussonia paniculata, Ziziphus mucronata*. Tall Shrubs: *Diospyros austro-africana, Euclea crispa subsp. ovata, Olea europaea subsp. cuspidata, Searsia burchellii, S. ciliata, S. erosa, Buddleja saligna, Diospyros lycioides subsp. lycioides, Ehretia rigida, Grewia occidentalis, Gymnosporia polyacantha, Tarchonanthus minor.* Low Shrubs: *Asparagus suaveolens, Chrysocoma ciliata Diospyros pallens, Eriocephalus ericoides, E. spinescens, Euryops empetrifolius, Felicia filifolia subsp. filifolia, F. muricata, Helichrysum dregeanum, H. lucilioides, Hermannia multiflora, H. vestita, Lantana rugosa, Limeum aethiopicum, Lycium cinereum, Melolobium candicans, M. microphyllum.* Succulent Shrubs: *Aloe broomii, Chasmatophyllum musculinum, C. verdoorniae, Cotyledon orbiculata var. dactylopsis, Pachypodium succulentum.* Graminoids: *Aristida adscensionis, A. congesta, A. diffusa, Cenchrus ciliaris, Cymbopogon caesius, Cynodon incompletus, Digitaria eriantha, Eragrostis curvula, E. lehmanniana, Heteropogon contortus, Setaria lindenbergiana, Cymbopogon pospischilii, Enneapogon scoparius, Eragrostis chloromelas, E. obtusa, Eustachys paspaloides, Fingerhuthia africana, Hyparrhenia hirta, Sporobolus fimbriatus.* Herbs: *Convolvulus sagittatus, Dianthus caespitosus subsp. caespitosus, Gazania krebsiana subsp. krebsiana, Hibiscus pusillus, Indigofera alternans, I. rhytidocarpa, Lepidium africanum subsp. africanum, Pollichia campestris. Herbaceous Climber: Argyrolobium lanceolatum. Geophytic Herbs: Albuca setosa, Asplenium cordatum, Cheilanthes bergiana, C. eckloniana, Freesia andersoniae, Haemanthus humilis subsp. humilis, Oxalis depressa, Pellaea calomelanos. Succulent Herbs: Aloe grandidentata, Crassula nudicaulis, Duvalia caespitosa, Euphorbia pulvinata, Huernia piersii, Stapelia grandiflora, S. olivacea, Tridentea gemmiflora.*

- Endemic Taxa – Small Tree: *Cussonia sp. nov.* (P.J. du Preez 3666 BLFU). Succulent Shrubs: *Euphorbia crassipes, Neohenricia sibbettii, N. spiculata*.

- Conservation - About 5% statutorily conserved in the Rolfontein, Tussen Die Riviere, Oviston, Gariep Dam, Caledon and Kalkfontein Dam Nature Reserves. In addition, a small patch is also protected in the private Vulture Conservation Area. About 3% of the area has been lost through building of dams. Erosion varies from low to high.

4.1.2.2 Expected Flora Species of Conservation Concern

The POSA database indicates that 116 species of indigenous plants are expected to occur within the project area and surrounding landscape. Appendix A provides the list of species and their respective conservation status and endemism. None of the species expected are species of conservation concern (SCC).

4.1.3 Fauna Assessment

4.1.3.1 Expected Amphibian Species of Conservation Concern

Based on the IUCN Red List Spatial Data and AmphibianMap database, 10 amphibian species are expected to occur within the project area (Appendix B). One of the species is regarded as a SCC (Table 4-2).

Table 4-2 Amphibian Species of Conservation Concern (SCC) that are expected to occur within the proposed Carolus Solar PV1 Facility

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bullfrog	NT	LC	Low

The Giant Bull Frog (*Pyxicephalus adspersus*) is listed as LC on a global scale (IUCN SSC Amphibian Specialist Group, 2013), but NT on a regional scale (Minter *et al*, 2004). The species is widely distributed in arid sub-saharan Africa, mainly at higher elevations. Within South Africa, it occurs in the north-eastern part of the Western Cape, central and southern Eastern Cape, northern, central and eastern parts of Northern Cape, northern KwaZulu-Natal (except the low-lying parts), Free State, North West, Gauteng and Limpopo provinces, and at only a few localities in Mpumalanga Province. It typically breeds in seasonal, shallow, grassy pans in flat, open areas but also utilises non-permanent vleis and shallow water on the margins of waterholes and dams. Although they sometimes inhabit clay soils, they prefer sandy substrates. Habitat loss due to crop agriculture and urbanisation is a major threat to this species. Adults migrating to, and juveniles dispersing from, breeding sites are often killed on roads. The use of insecticides and herbicides may also have a negative impact on breeding success, but requires further investigation.

4.1.3.2 Expected Reptile Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 19 reptile species are expected to occur within the area (Appendix C). One (1) is regarded as a SCC (Table 4-3).

Table 4-3 Reptile Species of Conservation Concern (SCC) that are expected to occur within the proposed Carolus Solar PV1 Facility

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	NT	NT	High

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

4.1.3.3 Expected Mammal Species of Conservation Concern

The IUCN Red List Spatial Data lists 51 mammal species that could be expected to occur within the area (Appendix D). This list excludes large mammal species that are limited to protected areas. Three (3) of these expected species are regarded as SCC (Table 4-4).

Table 4-4 Mammal Species of Conservation Concern (SCC) that are expected to occur within the proposed Carolus Solar PV1 Facility

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	Low
Felidae	*Panthera pardus*	Leopard	VU	VU	Low
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	NT	NT	Low

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

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).

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.

5 Site Sensitivity

The Relative Plant Species Theme Sensitivity for the project area[1], as indicated in the screening report, was derived to be 'Low' (Figure 5-1).

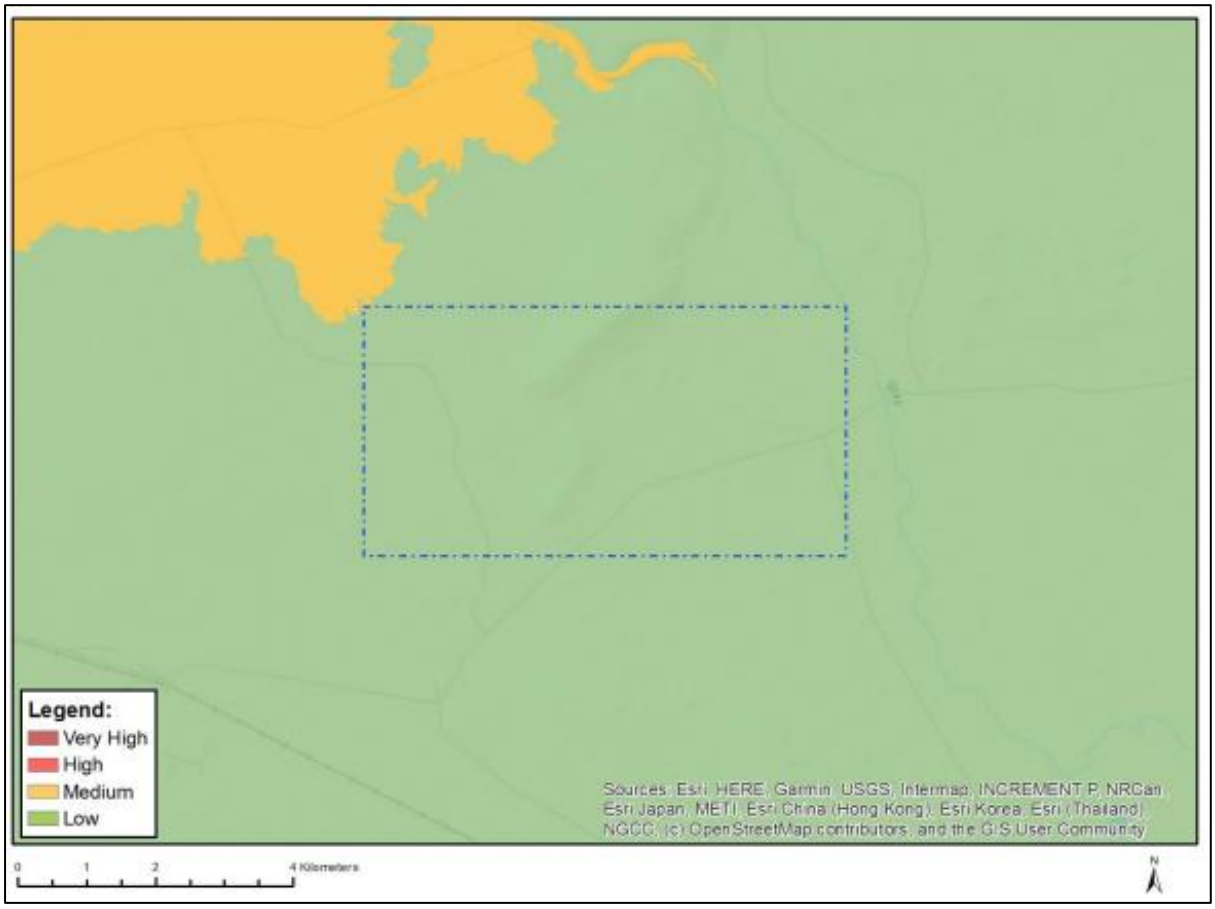

Figure 5-1 Map illustrating the Relative Plant Species Theme Sensitivity

The Relative Animal Species Theme Sensitivity for the project area, as indicated in the screening report, was derived to be 'Medium' to 'High' (Figure 5-2). The 'Medium-High' sensitivity is attributed to avifauna species that were not considered as a component of this assessment.

[1] Please note that a polygon was encompassing the project layout was used in the screening tool as it cannot be used with multiple spatial files.

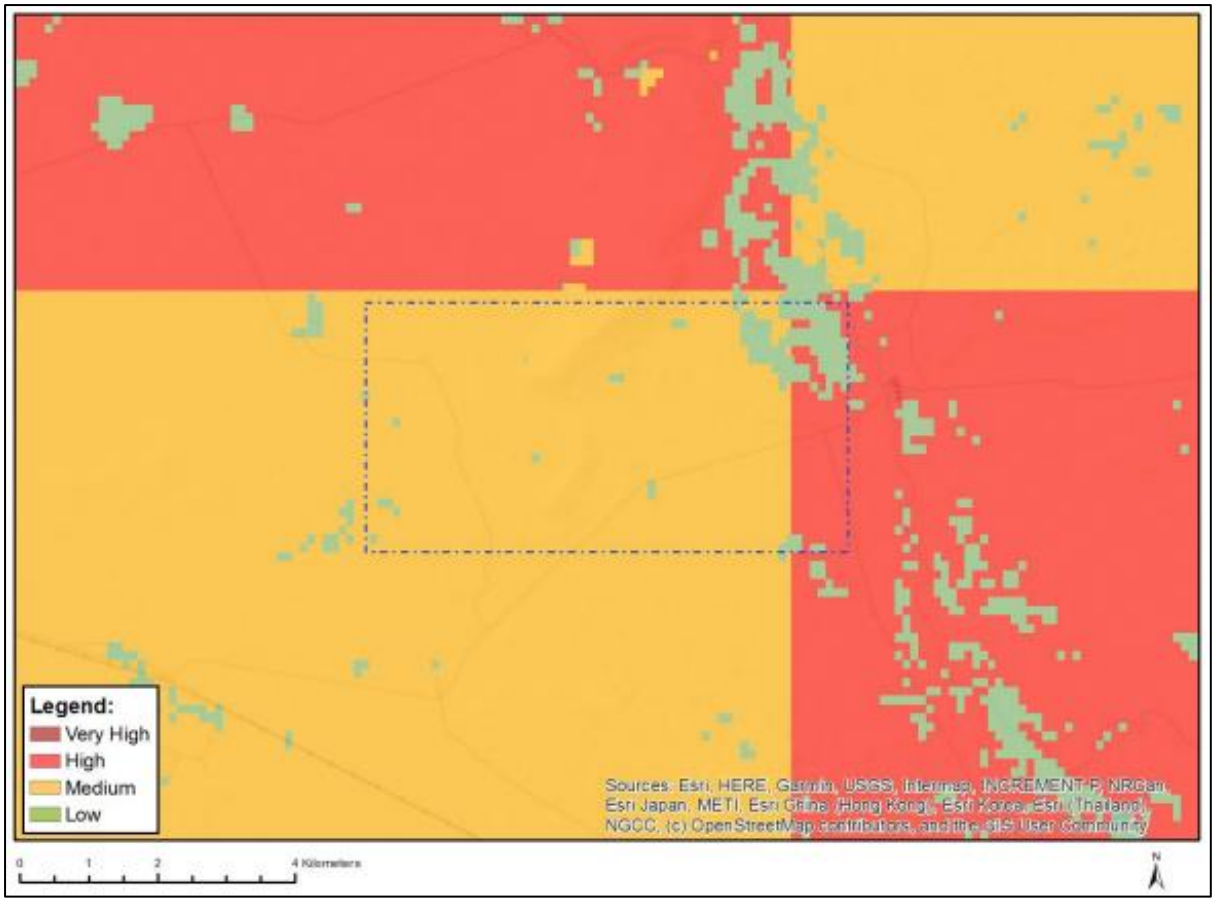

Figure 5-2 Map illustrating the Relative Animal Species Theme Sensitivity

The Relative Combined Terrestrial Biodiversity Theme Sensitivity for the project area, as indicated in the screening report, was derived to be 'Very High'. This is due to the area being classified as an ESA (Figure 5-3).

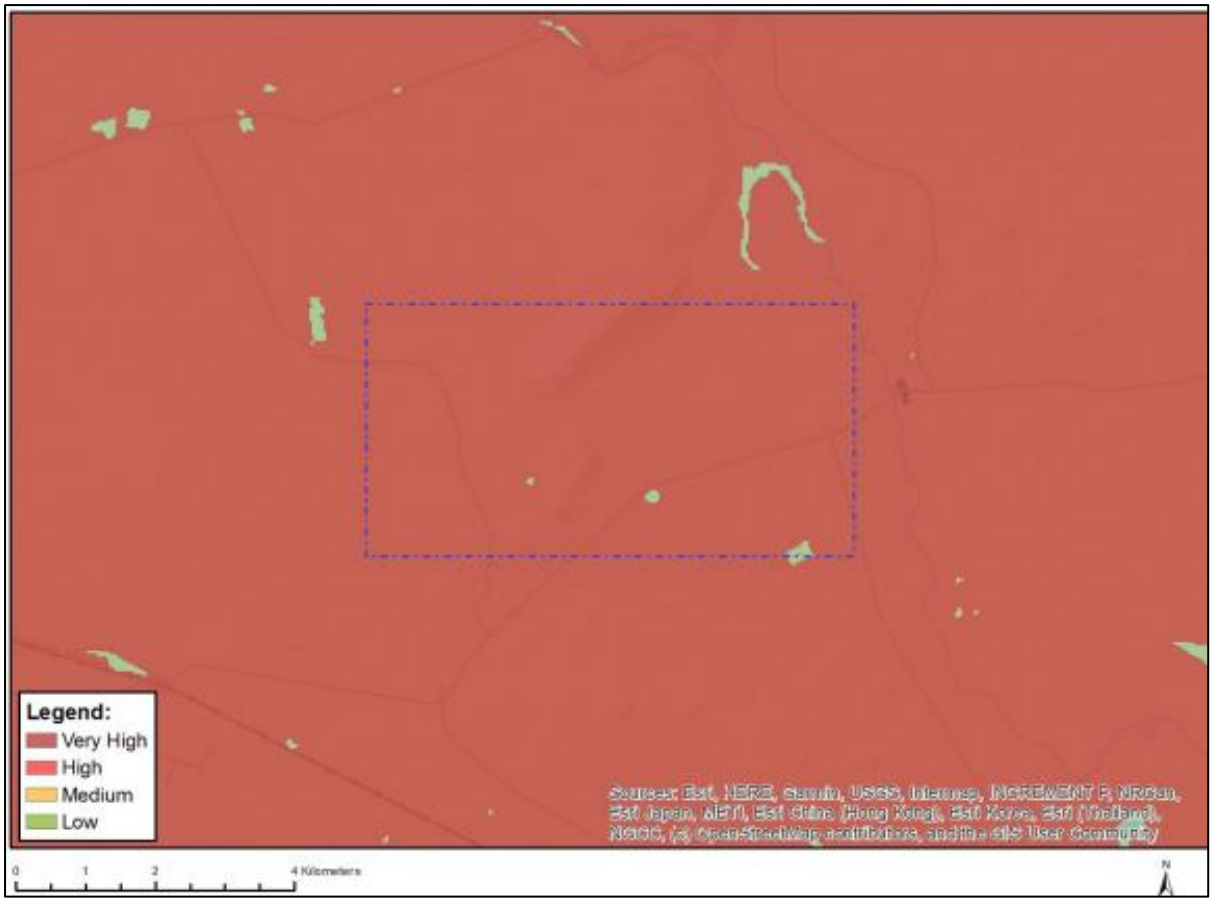

Figure 5-3 Map illustrating the Relative Combined Terrestrial Biodiversity Theme Sensitivity

6 Developable and Non-developable Areas

Figure 6-1 below illustrates the non-developable areas (areas where no infrastructure or development is to occur) and potentially developable areas (areas more suitable for development) for the proposed Carolus Solar PV1 Facility Area. The non-developable areas were delineated based on the 50 m buffer of the drainage lines which are recommended for maintaining species diversity (Macfarlane *et al*, 2009), as well as the dolerite koppies and sills. The potentially developable areas are still subject to the outcomes of the Biodiversity Impact Assessment.

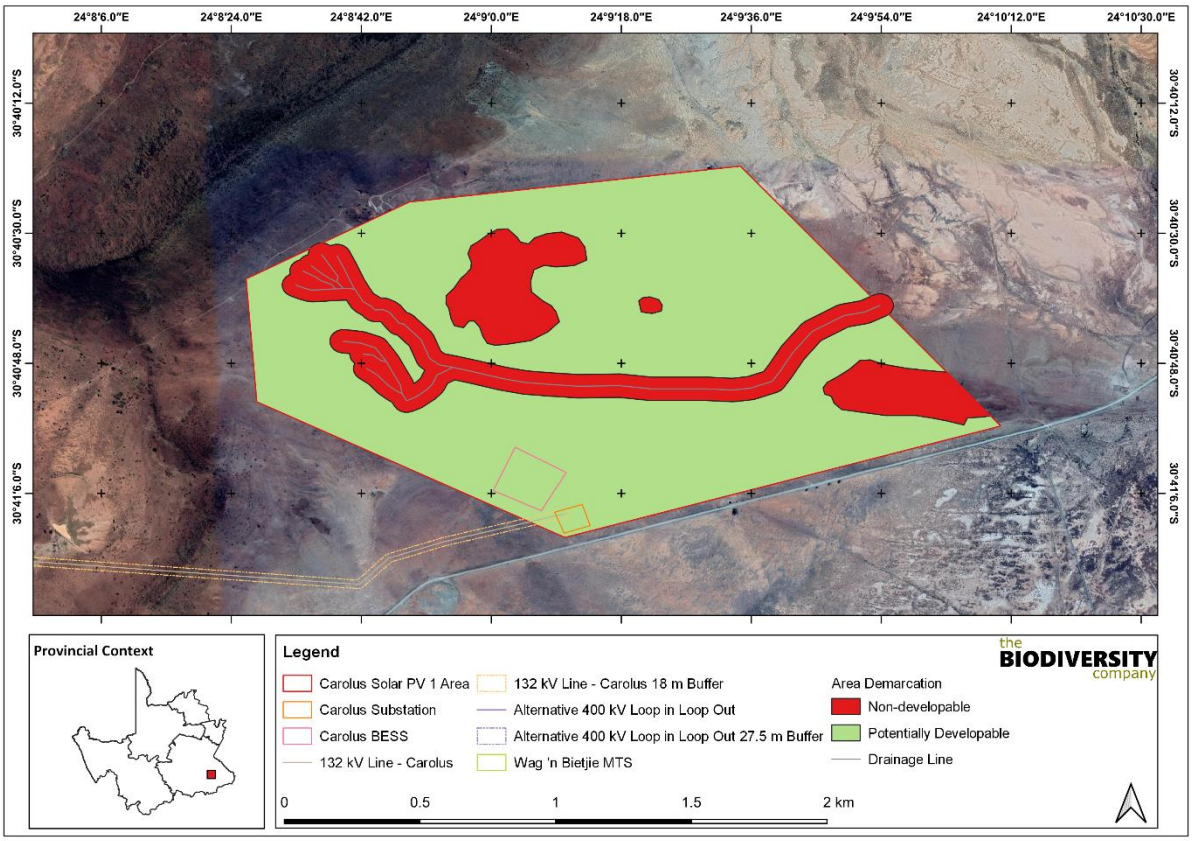

Figure 6-1 Map illustrating the developable and non-developable areas within the proposed Carolus Solar PV1 Facility Area

7 Impact Risk Assessment

The section below and associated tables serve to indicate and summarise the significance of perceived impacts on the terrestrial ecology of the project area.

7.1 Biodiversity Risk Assessment

Potential impacts were evaluated against the data captured during the desktop assessment to identify relevance to the project area. The relevant impacts associated with the proposed development were then subjected to a prescribed impact assessment methodology which were provided by Savannah Environmental and is available on request. No decommissioning phase was considered based on the nature of the development.

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.

7.1.1 Alternatives considered

No alternatives were provided for the development.

7.1.2 Loss of Irreplaceable Resources

- An ESA; and
- Potentially occurring SCC will also be lost.

7.1.3 Anticipated Impacts

The impacts anticipated for the proposed Carolus Solar PV1 Facility are considered in order to predict and quantify these impacts and assess and evaluate the magnitude on biodiversity (Table 7-1).

Table 7-1 Anticipated impacts of the proposed Carolus Solar PV1 Facility on biodiversity

Main Impact	Project activities responsible for destruction, fragmentation and degradation of habitats and ecosystems	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Development infrastructure will require vegetation clearing	Displacement/loss of flora & fauna (including possible SCC)
	Access roads and servitudes	Increased potential for soil erosion
	Soil dust precipitation	Habitat fragmentation
	Dumping of waste products	Increased potential for encroachment by invasive species
	Random events such as fire (cooking fires or cigarettes)	
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
2. Spread and/or establishment of invasive alien species	Vegetation removal	Habitat loss for indigenous flora & fauna (including SCC)
	Vehicles potentially spreading seed	Spreading of potentially dangerous diseases due to invasive and pest species

	Unsanitary conditions surrounding infrastructure promoting the establishment of invasive alien rodents	Alteration of fauna assemblages due to habitat modification
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation	Loss of ecosystem services
	Roadkill due to vehicle collision	
	Pollution of water resources due to dust effects, chemical spills, etc.	Increase in rodent populations and associated disease risk
	Intentional killing of fauna for food (hunting)	
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor	Reduced plant seed dispersal
		Loss of ecosystem services
	Compacted roads	Loss of gene flow leading to genetic bottle-necking
	Removal of vegetation	
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Hazardous chemical spills	Pollution of water resources
		Faunal mortality (acute and chronic)
	Erosion	Groundwater pollution
		Loss of ecosystem services
Main Impact	**Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.**	**Secondary impacts anticipated**
6.Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light pollution.	Operation of machinery (Large earth moving machinery, vehicles)	Disruption/alteration of ecological life cycles due to noise
	Project activities/infrastructure that can cause noise, vibration, and light pollution	Loss of ecosystem services
	Vehicles	
Main Impact	**Project activities that can cause staff to interact directly with potentially dangerous fauna**	**Secondary impacts anticipated**
8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	All unregulated/supervised activities	Loss of SCC
	Staff entering 'no-go' or unauthorised areas	Loss of ecosystem services

7.1.4 Identification of Additional Potential Impacts

The impacts provided in Table 7-2 are expected for the proposed development and will be assessed for the impact phase of the process.

Table 7-2 Scoping evaluation table summarising the impacts identified to biodiversity

Impact			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Loss of vegetation (& habitat) within development footprint	Direct impacts: » Disturbance / degradation / loss to vegetation » Destruction of protected plant species Indirect impacts:	Regional	Non-developable Areas

	» Loss of ecosystem services » Introduction of alien species, especially plants » Displacement of faunal community due to habitat loss, direct mortalities and disturbance		

Description of expected significance of impact

The following potential main impacts on the biodiversity were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed features are constructed; and is considered to have the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered:

- Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community;
- Introduction of alien species, especially plants;
- Destruction of protected plant species; and
- Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and poaching).

Gaps in knowledge & recommendations for further study

- This is completed at a desktop level only.
- Identification, delineation and characterisation of vegetation communities.
- Undertake a sensitivity assessment of systems where applicable.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas.
- Beneficial to undertake fieldwork during the wet season period.

7.1.5 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general loss and transformation resulting from other activities in the area. The expected post-mitigation risk significance is expected to be low, and the overall cumulative impact is therefore expected to be medium.

Table 7-3 Cumulative Impacts to biodiversity associated with the proposed project

Impact Nature: Cumulative habitat loss within the region		
The development of the proposed infrastructure will contribute to cumulative habitat loss within ESAs and thereby impact the ecological processes in the region.		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low	Moderate
Duration	Long term	Long term
Magnitude	Low	Moderate
Probability	Probable	Highly probable
Significance	**Medium**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	To some degree, but most of the impact results from the presence of the various facilities which cannot be well mitigated.	
Mitigation:		
• Ensure that a rehabilitation plan and IAP management plan be compiled for each development and are effectively implemented.		

8 Assessment Approach

8.1 Biodiversity Field Assessment

8.1.1 Flora Survey

The fieldwork will be 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. The focus of the fieldwork is therefore to maximise coverage and navigate to each target site in the field, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis will be placed on sensitive habitats, especially those overlapping with the proposed project area.

Homogenous vegetation units will be subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC will be conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis will be placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is highly efficient for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search will be performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes will be made regarding current impacts (e.g., livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

8.1.2 Fauna Survey

The faunal assessment within this report pertains to herpetofauna (amphibians and reptiles) and mammals. The faunal field survey will comprise of the following techniques:

- Visual and auditory searches – This typically comprises of traversing the project area and using binoculars to view species from a distance without them being disturbed or listening for species calls. Tracks, scat and other signs will also be included as part of the visual search;
- Active hand-searches – This will be used for species that shelter in or under particular micro-habitats (e.g., under rocks, exfoliating bedrock, fallen trees, leaf litter and peeling bark); and
- Passive sampling – Camera traps will be utilised to survey for secretive and nocturnal species.

8.2 Site Ecological Importance

The different habitat types within the project area will be delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types are assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

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

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 8-1 and Table 8-2, respectively.

Table 8-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km2. 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 km2. 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 Near Threatened (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 8-2 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.

Functional Integrity	Fulfilling Criteria
	Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy 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 8-3.

Table 8-3 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 8-4.

Table 8-4 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remain at a site even when a disturbance or impact is occurring, or (ii) 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 8-5.

Table 8-5 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 project is provided in Table 8-6.

Table 8-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

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

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

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10 Appendix Items

10.1 Appendix A – Flora species expected to occur in the project area

Family	Species Name	Conservation Status	Endemism
Aizoaceae	*Mesembryanthemum coriarium*	LC	
Aizoaceae	*Oscularia deltoides*	LC	Endemic
Aizoaceae	*Tetragonia fruticosa*	LC	
Amaranthaceae	*Atriplex vestita var. appendiculata*	LC	
Amaranthaceae	*Bassia salsoloides*	LC	
Amaranthaceae	*Salsola calluna*	LC	Endemic
Amaryllidaceae	*Brunsvigia radulosa*	LC	
Apocynaceae	*Microloma armatum var. armatum*	LC	
Apocynaceae	*Pachypodium succulentum*	LC	Endemic
Apocynaceae	*Stapelia grandiflora var. grandiflora*	LC	
Asparagaceae	*Asparagus striatus*	LC	Endemic
Asparagaceae	*Asparagus suaveolens*	LC	
Asphodelaceae	*Haworthiopsis tessellata*	LC	
Asphodelaceae	*Haworthiopsis tessellata var. tessellata*	LC	
Asteraceae	*Arctotis leiocarpa*	LC	
Asteraceae	*Athanasia minuta subsp. minuta*	LC	
Asteraceae	*Berkheya eriobasis*	LC	Endemic
Asteraceae	*Chrysocoma ciliata*	LC	
Asteraceae	*Dimorphotheca cuneata*	LC	
Asteraceae	*Dimorphotheca zeyheri*	LC	
Asteraceae	*Felicia burkei*	LC	
Asteraceae	*Felicia filifolia subsp. filifolia*	LC	
Asteraceae	*Felicia muricata subsp. muricata*	LC	
Asteraceae	*Gazania jurineifolia subsp. jurineifolia*	LC	Endemic
Asteraceae	*Gazania krebsiana subsp. arctotoides*	LC	
Asteraceae	*Geigeria filifolia*	LC	
Asteraceae	*Geigeria ornativa subsp. ornativa*	LC	
Asteraceae	*Helichrysum asperum var. asperum*	LC	Endemic
Asteraceae	*Helichrysum dregeanum*	LC	
Asteraceae	*Helichrysum zeyheri*	LC	
Asteraceae	*Hertia kraussii*	LC	Endemic
Asteraceae	*Hertia pallens*	LC	
Asteraceae	*Leysera tenella*	LC	
Asteraceae	*Oedera humilis*	LC	
Asteraceae	*Osteospermum leptolobum*	LC	Endemic
Asteraceae	*Osteospermum scariosum var. scariosum*	NE	
Asteraceae	*Osteospermum spinescens*	LC	
Asteraceae	*Othonna pavonia*	LC	Endemic
Asteraceae	*Pentzia calcarea*	LC	
Asteraceae	*Pentzia elegans*	LC	Endemic
Asteraceae	*Pentzia incana*	LC	
Asteraceae	*Pentzia spinescens*	LC	

Family	Species Name	Conservation Status	Endemism
Asteraceae	*Phymaspermum parvifolium*	LC	Endemic
Asteraceae	*Pteronia glauca*	LC	
Asteraceae	*Pteronia glaucescens*	LC	Endemic
Asteraceae	*Pteronia sordida*	LC	
Asteraceae	*Senecio niveus*	LC	
Boraginaceae	*Heliotropium lineare*	LC	
Brassicaceae	*Erucastrum strigosum*	LC	
Campanulaceae	*Wahlenbergia nodosa*	LC	Endemic
Caryophyllaceae	*Dianthus micropetalus*	LC	
Colchicaceae	*Colchicum asteroides*	LC	Endemic
Colchicaceae	*Ornithoglossum vulgare*	LC	
Crassulaceae	*Crassula corallina subsp. corallina*	LC	
Cucurbitaceae	*Cucumis africanus*	LC	
Cucurbitaceae	*Cucumis heptadactylus*	LC	Endemic
Cucurbitaceae	*Cucumis myriocarpus subsp. leptodermis*	LC	
Euphorbiaceae	*Euphorbia arida*	LC	Endemic
Euphorbiaceae	*Euphorbia juttae*	LC	
Fabaceae	*Calobota spinescens*	LC	
Fabaceae	*Cullen tomentosum*	LC	
Fabaceae	*Leobordea platycarpa*	LC	
Fabaceae	*Lessertia annularis*	LC	
Fabaceae	*Melolobium candicans*	LC	
Gentianaceae	*Sebaea pentandra var. pentandra*	LC	
Geraniaceae	*Monsonia salmoniflora*	LC	
Geraniaceae	*Pelargonium tragacanthoides*	LC	
Gisekiaceae	*Gisekia pharnaceoides var. pharnaceoides*	LC	
Hyacinthaceae	*Daubenya comata*	LC	Endemic
Hyacinthaceae	*Dipcadi viride*	LC	
Hyacinthaceae	*Ornithogalum nanodes*	LC	
Iridaceae	*Gladiolus permeabilis subsp. edulis*	LC	
Kewaceae	*Kewa salsoloides*	LC	
Lamiaceae	*Stachys cuneata*	LC	Endemic
Leucobryaceae	*Campylopus robillardei*	LC	
Malvaceae	*Hermannia burkei*	LC	
Malvaceae	*Hermannia cuneifolia var. cuneifolia*	LC	
Malvaceae	*Hermannia erodioides*	LC	
Malvaceae	*Hermannia pulchella*	LC	
Malvaceae	*Radyera urens*	LC	
Poaceae	*Cenchrus ciliaris*	LC	
Poaceae	*Enneapogon scaber*	LC	
Poaceae	*Eragrostis bergiana*	LC	
Poaceae	*Eragrostis bicolor*	LC	
Poaceae	*Eragrostis curvula*	LC	
Poaceae	*Eragrostis homomalla*	LC	
Poaceae	*Eragrostis procumbens*	LC	

Family	Species Name	Conservation Status	Endemism
Poaceae	*Eragrostis truncata*	LC	
Poaceae	*Oropetium capense*	LC	
Poaceae	*Panicum impeditum*	LC	
Poaceae	*Puccinellia acroxantha*	LC	
Poaceae	*Sporobolus ioclados*	LC	
Poaceae	*Stipagrostis namaquensis*	LC	
Poaceae	*Stipagrostis obtusa*	LC	
Poaceae	*Tragus berteronianus*	LC	
Poaceae	*Tragus racemosus*	LC	
Polygalaceae	*Polygala ephedroides*	LC	
Polygonaceae	*Rumex lanceolatus*	LC	
Pteridaceae	*Cheilanthes eckloniana*	LC	
Ruscaceae	*Sansevieria aethiopica*	LC	
Santalaceae	*Osyris lanceolata*	LC	
Scrophulariaceae	*Aptosimum procumbens*	LC	
Scrophulariaceae	*Aptosimum spinescens*	LC	
Scrophulariaceae	*Jamesbrittenia tysonii*	LC	Endemic
Scrophulariaceae	*Manulea fragrans*	LC	Endemic
Scrophulariaceae	*Nemesia linearis*	LC	
Scrophulariaceae	*Peliostomum leucorrhizum*	LC	
Scrophulariaceae	*Peliostomum origanoides*	LC	Endemic
Scrophulariaceae	*Selago albida*	LC	
Scrophulariaceae	*Selago paniculata*	LC	Endemic
Scrophulariaceae	*Zaluzianskya karrooica*	LC	Endemic
Solanaceae	*Lycium horridum*	LC	
Solanaceae	*Lycium pumilum*	LC	
Tecophilaeaceae	*Cyanella lutea*	LC	
Thymelaeaceae	*Lasiosiphon polycephalus*	LC	
Zygophyllaceae	*Tetraena microcarpa*	LC	

10.2 Appendix B – Amphibian species expected to occur in the project area

Family	Scientific Name	Conservation Status	
		Regional	Global
Bufonidae	*Poyntonophrynus vertebralis*	LC	LC
Bufonidae	*Sclerophrys gutturalis*	LC	LC
Bufonidae	*Vandijkophrynus gariepensis*	LC	LC
Hyperoliidae	*Kassina senegalensis*	LC	LC
Pipidae	*Xenopus laevis*	LC	LC
Pyxicephalidae	*Cacosternum boettgeri*	LC	LC
Pyxicephalidae	*Pyxicephalus adspersus*	NT	LC
Pyxicephalidae	*Strongylopus grayii*	LC	LC
Pyxicephalidae	*Tomopterna cryptotis*	LC	LC
Pyxicephalidae	*Tomopterna tandyi*	LC	LC

10.3 Appendix C – Reptile species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chondrodactylus bibronii	Bibron's Gecko	LC	Unlisted
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Duberria lutrix	Common Slug-eater	LC	LC
Elapsoidea sundevallii	Sundevall's Garter Snake	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Homopus femoralis	Greater Dwarf Tortoise	LC	LC
Homoroselaps dorsalis	Striped Harlequin Snake	NT	LC
Karusasaurus polyzonus	Southern Karusa Lizard	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Lamprophis guttatus	Spotted Rock Snake	LC	LC
Leptotyphlops scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis	Cape dwarf gecko	LC	LC
Monopeltis capensis	Cape Worm Lizard	LC	LC
Naja nivea	Cape Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Pachydactylus mariquensis	Common Banded Gecko	LC	LC
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC

Psammophis notostictus	Karoo Sand Snake	LC	Unlisted
Psammophis trinasalis	Fork-marked Sand Snake	LC	Unlisted
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus melanotus melanotus	Common Crag Lizard	LC	LC
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis punctulata	Speckled Sand Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted
Xenocalamus bicolor bicolor	Bicoloured Quill-snouted Snake	LC	Unlisted

10.4 Appendix D – Mammal species expected to occur within the project area

Family	Scientific Name	Conservation Status	
		Regional	Global
Bathyergidae	*Cryptomys hottentotus*	LC	LC
Bovidae	*Antidorcas marsupialis*	LC	LC
Bovidae	*Raphicerus campestris*	LC	LC
Bovidae	*Sylvicapra grimmia*	LC	LC
Canidae	*Canis mesomelas*	LC	LC
Canidae	*Otocyon megalotis*	LC	LC
Canidae	*Vulpes chama*	LC	LC
Cercopithecidae	*Papio ursinus*	LC	LC
Felidae	*Caracal caracal*	LC	LC
Felidae	*Felis nigripes*	VU	VU
Felidae	*Felis silvestris*	LC	LC
Felidae	*Leptailurus serval*	LC	LC
Felidae	*Panthera pardus*	VU	VU
Herpestidae	*Atilax paludinosus*	LC	LC
Herpestidae	*Cynictis penicillata*	LC	LC
Herpestidae	*Herpestes pulverulentus*	LC	LC
Herpestidae	*Suricata suricatta*	LC	LC
Hyaenidae	*Parahyaena brunnea*	NT	NT
Hyaenidae	*Proteles cristata*	LC	LC
Hystricidae	*Hystrix africaeaustralis*	LC	LC
Leporidae	*Lepus capensis*	LC	LC
Leporidae	*Lepus saxatilis*	LC	LC
Leporidae	*Pronolagus saundersiae*	LC	LC
Macroscelididae	*Elephantulus myurus*	LC	LC
Macroscelididae	*Elephantulus rupestris*	LC	LC
Macroscelididae	*Macroscelides proboscideus*	LC	LC
Molossidae	*Tadarida aegyptiaca*	LC	LC
Muridae	*Aethomys namaquensis*	LC	LC
Muridae	*Desmodillus auricularis*	LC	LC
Muridae	*Gerbilliscus brantsii*	LC	LC
Muridae	*Gerbillurus paeba*	LC	LC
Muridae	*Mastomys coucha*	LC	LC
Muridae	*Otomys unisulcatus*	LC	LC
Muridae	*Parotomys brantsii*	LC	LC
Muridae	*Parotomys littledalei*	LC	LC
Muridae	*Rhabdomys pumilio*	LC	LC
Mustelidae	*Ictonyx striatus*	LC	LC
Mustelidae	*Mellivora capensis*	LC	LC
Mustelidae	*Poecilogale albinucha*	LC	LC
Nesomyidae	*Malacothrix typica*	LC	LC
Orycteropodidae	*Orycteropus afer*	LC	LC
Pedetidae	*Pedetes capensis*	LC	LC
Procaviidae	*Procavia capensis*	LC	LC

Family	Scientific Name	Conservation Status	
		Regional	Global
Rhinolophidae	*Rhinolophus darlingi*	LC	LC
Sciuridae	*Xerus inauris*	LC	LC
Soricidae	*Suncus varilla*	LC	LC
Suidae	*Phacochoerus africanus*	LC	LC
Vespertilionidae	*Eptesicus hottentotus*	LC	LC
Vespertilionidae	*Neoromicia capensis*	LC	LC
Vespertilionidae	*Neoromicia zuluensis*	LC	LC
Viverridae	*Genetta genetta*	LC	LC