TERRESTRIAL BIODIVERSITY ASSESSMENT FOR THE PROPOSED KAMBREEK PROSPECTING APPLICATION

Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape Province, South Africa

24/05/2024

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**TERRESTRIAL BIODIVERSITY ASSESSMENT FOR THE PROPOSED KAMBREEK PROSPECTING APPLICATION**	
Specialist Theme	Terrestrial Biodiversity	
Project Reference	Kambreek Prospecting Application	
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Environmental Assessment Practitioner		
Fieldwork & Report Writer	Leigh-Ann de Wet (SACNASP 400233/12)	
Reviewer	Sarah Newman (SACNASP 158474)	
Reviewer	Andrew Husted (SACNASP 400213/11)	
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.	

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a Terrestrial Biodiversity Assessment for the proposed prosecting rights for African Exploration Mining and Finance Corporation SOC Ltd for Portions 1, 2, and 3 of Kambreek 38 (Excluding Koenabib 43, Pella 40 Portion 1), and Klein Pella 40. The project is situated within the administrative district of Namaqualand, in the Khâi-Ma Local Municipality in the greater Namakwa District Municipality in the Northern Cape Province. The regional context of the Project Area can be seen in Figure 1-1. The Project Area of Influence (PAOI) encompasses the geographical extent of the potential impacts of the proposed development on the receiving environment. Essentially, the PAOI is defined according to the important ecosystem processes and functions that may be plausibly affected by the proposed development and its associated activities. The PAOI was considered to be the proposed footprint of the solar PV infrastructure for the site. The proposed Project Area of Influence can be seen illustrated in Figure 1-2.

The National Web based Environmental Screening Tool has characterised the Terrestrial Theme Sensitivity of the Project Area as “Very High”. Accordingly, 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) and GN 1150 (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).

The purpose of the specialist studies is to provide relevant input into the impact assessment process and to provide a report for the proposed activities associated with the development. 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.

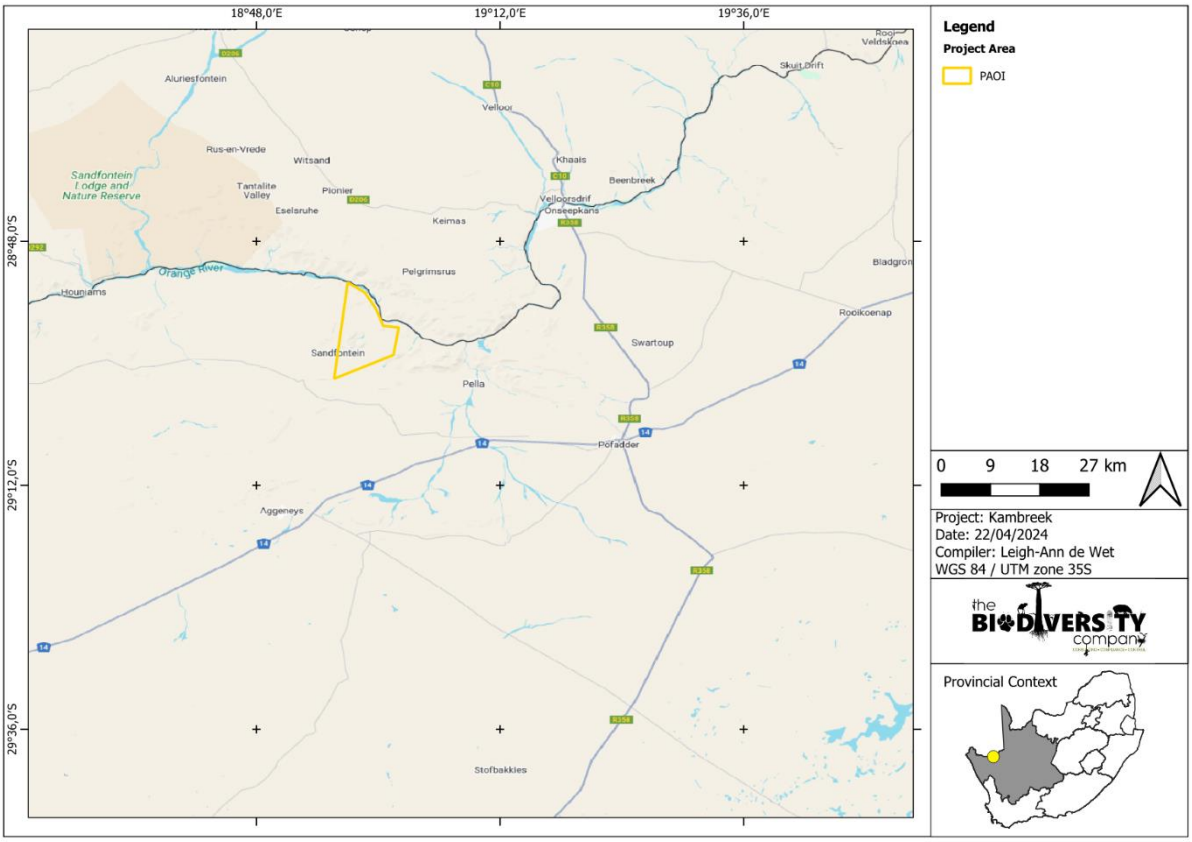


Figure 1-1 Map illustrating the regional context of the Project Area

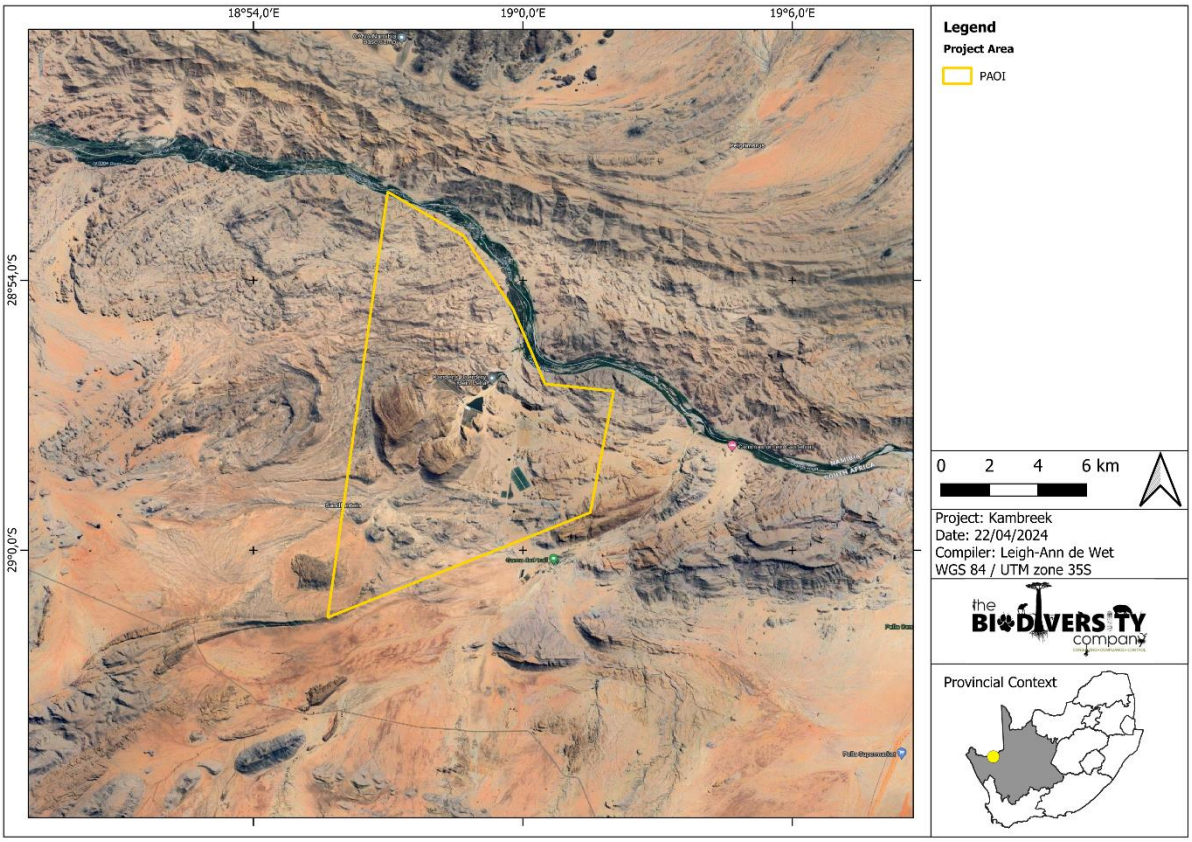


Figure 1-2 Map illustrating the Project Area.

1.2 Project Description

African Exploration Mining and Finance Corporation SOC Ltd is applying for prospecting rights in terms of Section 16 of the Mineral and Petroleum Resources Development Act, 2002 as amended by Section 12 of Act 49 of 2008 and Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as amended for Portions 1, 2, and 3 of Kambreek 38 (Excluding Koenabib 43, Pella 40 Portion 1), and Klein Pella 40. The project is situated within the administrative district of Namaqualand.

African Exploration Mining and Finance Corporation SOC Ltd will be prospecting for Copper Ore, Iron Ore, Lead, Lithium Ore, Rare Earths and Zinc Ore. Water abstraction will be from the Orange River.

The prospecting activities will be done by drilling prospecting boreholes using circulation drilling which the most cost-effective method for the testing and assessing the deposit with Percussion techniques being offered as an alternative should circumstances so require. Initially 10 such boreholes are proposed to recover core samples in support of laboratory analysis. Laboratory will proceed concurrently with drilling.

All drilling shall be undertaken to a maximum depth of 500 meters.

- There won't be any excavation, and pitting.

- No extensive trenching will be done, only for the water reticulation and sump during drilling (no more than 1m X 1m area per drilling site) comprising and area of less than 10 square meters per site with a total of less than 0.1 ha disturbed at any given time. Prior to moving to the next drill block these sites will have to be fully rehabilitated as per the mitigation measures set out in this document as well as in consultation with the landowner / landowners.

- Drill sites will be accessed utilizing existing roads to minimize environmental disruption and ensure efficient transport logistics. Prior to the commencement of any invasive activities, all sites will undergo thorough assessments conducted by qualified specialists. These evaluations will ensure compliance with environmental regulations, identify any potential ecological impacts, and establish necessary mitigation measures.

1.3 Scope of Work

The aim of the biodiversity assessment was to provide information to guide the risk of the proposed activity to the current state of the associated ecosystems within the development area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the Project Area and surrounding landscape;

- Desktop assessment to compile an expected species list and identify possible Species of Conservation Concern (SCC) that occur within the Project Area and surrounding landscape;

- Field survey to record flora and fauna species, especially Species of Conservation Concern (SCC);

- Determination of the Site Ecological Importance (SEI), also commonly referred to as sensitivity;

- A biodiversity impact assessment; and
- The prescription of mitigation measures for identified risks, including assigning buffer areas, where necessary.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client/developer is accurate;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area (Project Area of Influence [PAOI]) was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- This assessment does not consider temporal trends and considers only autumn (April) in which graminoid species could not be identified;
- The site visit was conducted in the dry season (autumn), therefore, the probability of detection of certain faunal species will be lowered as certain species or groups of fauna are inherently secretive and require extensive sampling periods. Spring and summer season flowering flora (particularly geophytes and certain succulents, which require an inflorescence for identification) may have been missed. It is considered necessary that a second site visit be undertaken in spring (October) in order to augment the existing data;
- Much of the site was inaccessible due to the mountainous terrain, and as such, a representative sample was taken;
- This report should be considered in conjunction with the corresponding freshwater and wetland assessments (Afzelia, 2024);
- Whilst every effort was made to cover as much of the Project Area as possible, it is possible that some plant and animal species that are present within the Project Area were not recorded during the field investigations. However, it is the opinion of the specialist that an accurate representative sample of the ecological components considered within this assessment was collected; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 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

Region	Legislation / Guideline	Comment
National	NEMA	Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017), Appendix 6 requirements
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection
	Assessment Protocol (March 2020)	The minimum criteria for reporting.
	Assessment Protocol (October 2020)	Protocol for the specialist assessment and minimum report content requirements.
	NEMWA;	The regulation of waste management to protect the environment.
	NWA	The regulation of water uses.
	GN 1003 of GG 43726 of 18 Sept 2020	The regulation and management of alien invasive species.
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
Provincial	Northern Cape Critical Biodiversity Areas (NCDENC, 2016)	To provide for the management and conservation of the Province's biophysical environment and protected areas. To inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management.

2 Fieldwork

2.1 Biodiversity Field Assessment

One (1) dry season field survey was undertaken for the project on the 8th to the 11th of April 2024 to confirm the presence of SCC, as well as any sensitive habitat features (Table 2-1). Effort was made to cover all the different habitat types within the limits of time and access (Figure 2-1). During the survey, notes were made regarding current impacts, recording of dominant vegetation species and any sensitive or important features (e.g., drainage lines, rock outcrops, termite mounds etc.).

Table 2-1 Summary of surveys undertaken for the biodiversity assessment

Survey Number	Season	Date/s	Comments
1	Dry (Autumn)	8 April – 11 April 2024	Survey to determine the presence of flora and fauna of the site, as well as likelihood of occurrence within the PAOI. Vegetation and habitat units were also identified. This included the identification of faunal habitats and any fauna present.

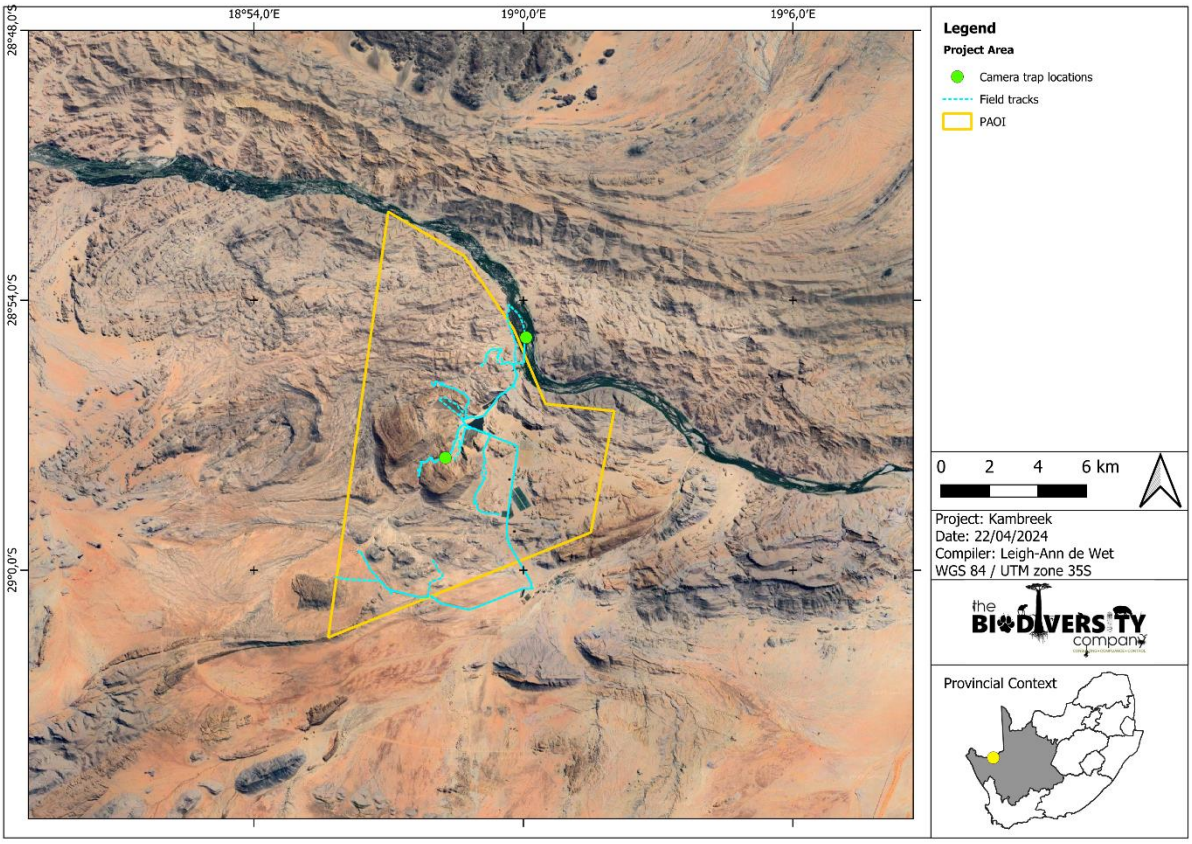


Figure 2-1 Map illustrating the field tracks of the field survey

3 Results & Discussion

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

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

Desktop Information Considered	Relevance	Reasoning	Section
Ecosystem Threat Status (RLE 2021)	Relevant	Overlaps with a 'Least Concern' ecosystem	3.1.1.1
Ecosystem Protection Level	Relevant	Overlaps with a 'Not Protected' and 'Poorly Protected' Ecosystem	3.1.1.2
Provincial Conservation Plan	Relevant	Overlaps with a Critical Biodiversity Area 1, a Critical Biodiversity Area 2 and an Ecological Support Area	3.1.1.3
SAPAD & SACAD	Relevant	The Project Area is within 10 km of the Gamsberg Nature Reserve and forms part of the expansion plans for the Augrabies Naitonal Park as well as being currently managed as a conservation area.	3.1.1.4
National Protected Areas Expansion Strategy	Relevant	The PAOI overlaps with a NPAES Priority Focus Area.	3.1.1.5
Important Bird & Biodiversity Areas (IBA)	Irrelevant	Project Area is located over 10 km from the Haramoep and Black Mountain Mine IBA.	3.1.1.6
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Relevant	500 m Regulated Area overlaps with a LC river and a CR wetland.	3.1.1.7
National Freshwater Priority Area	Relevant	500 m Regulated Area overlaps with a FEPA river and a FEPA wetland.	3.1.1.8
Strategic Water Source Area	Irrelevant	The PAOI is not located near any SWSA	-

3.1.1.1 Red List of Ecosystems

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) 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 Red List of Ecosystems dataset (Skowno & Monyeki, 2021) the proposed development overlaps with a LC ecosystem (Figure 3-1).

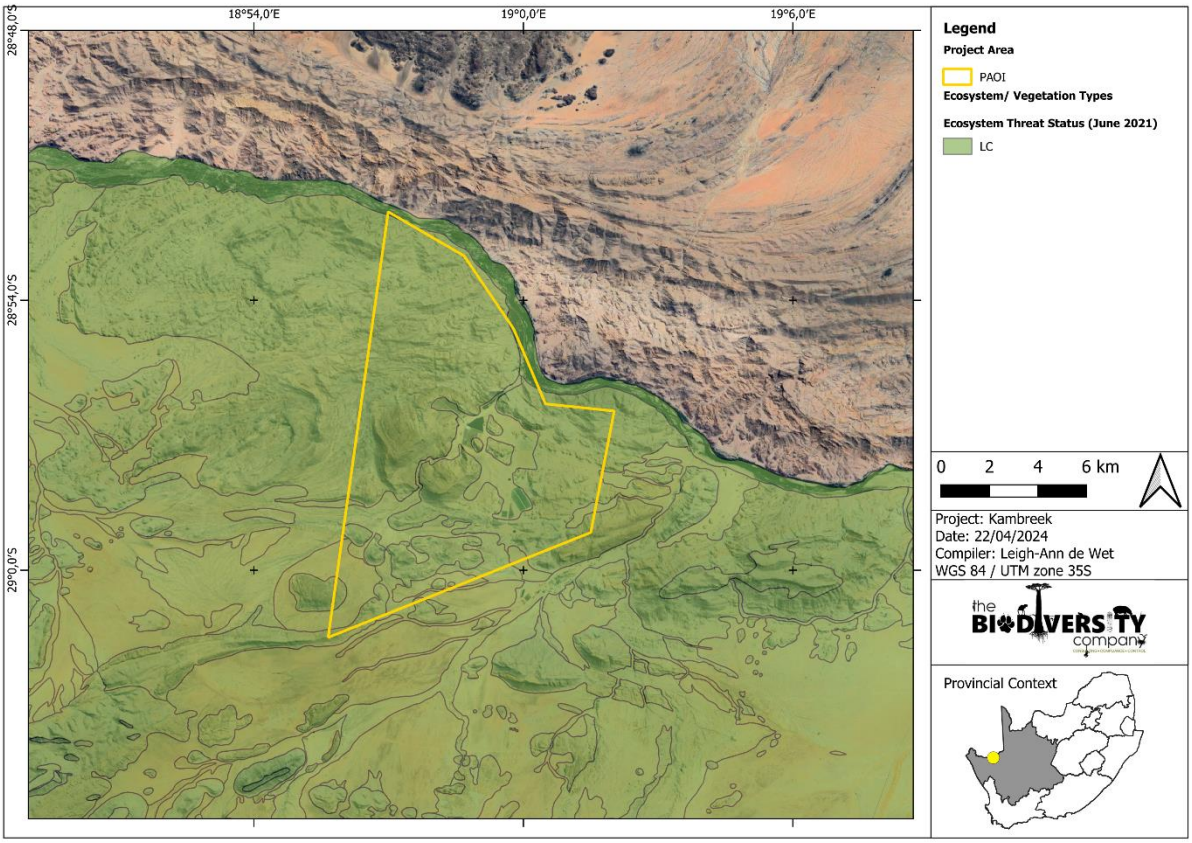


Figure 3-1 Map illustrating the ecosystem threat status associated with the Project Area

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, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with a NP and PP ecosystem (Figure 3-2).

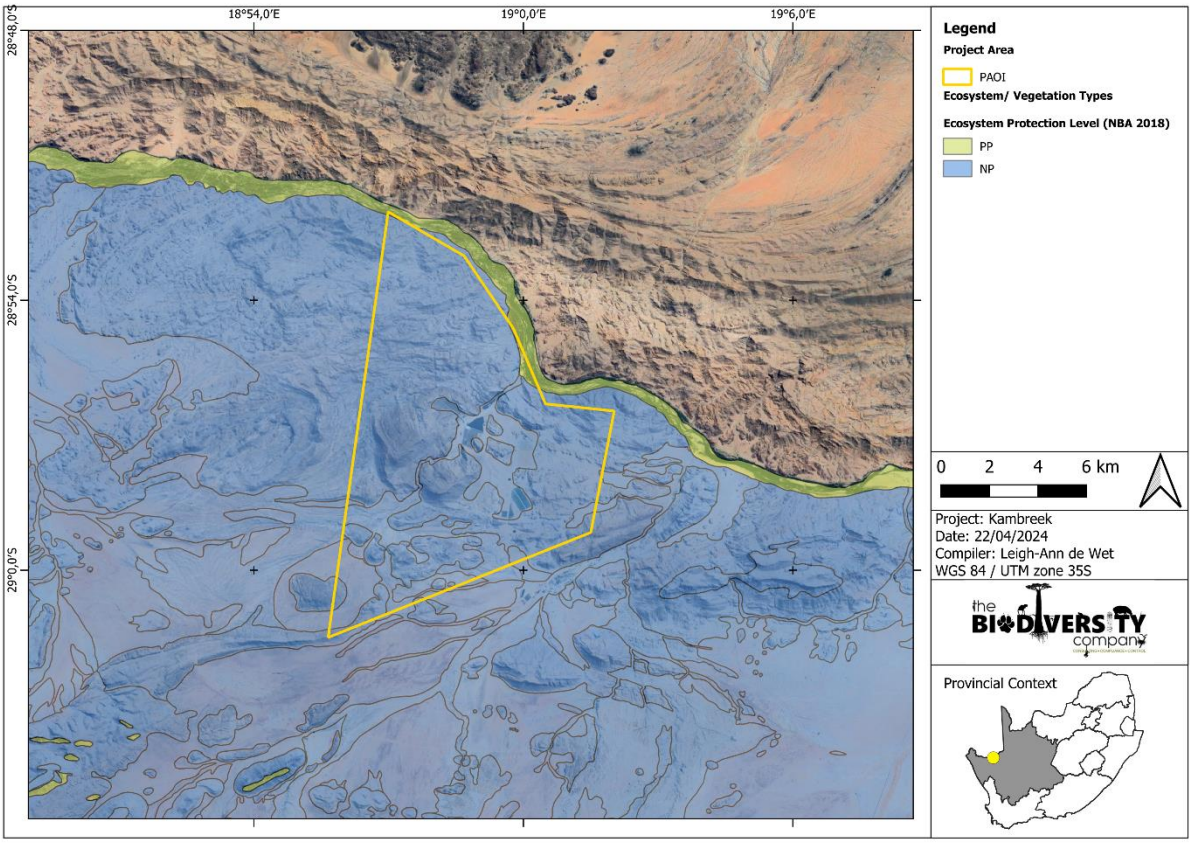


Figure 3-2 Map illustrating the ecosystem protection level associated with the Project Area

3.1.1.3 Provincial Conservation Plan

The Northern Cape Department of Environment and Nature Conservation has developed the Northern Cape CBA Map which identifies biodiversity priority areas for the province, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

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 collate. The Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province. The PAOI overlaps with a Critical Biodiversity Area 1, a Critical Biodiversity Area 2 and an Ecological Support Area (Figure 3-3).

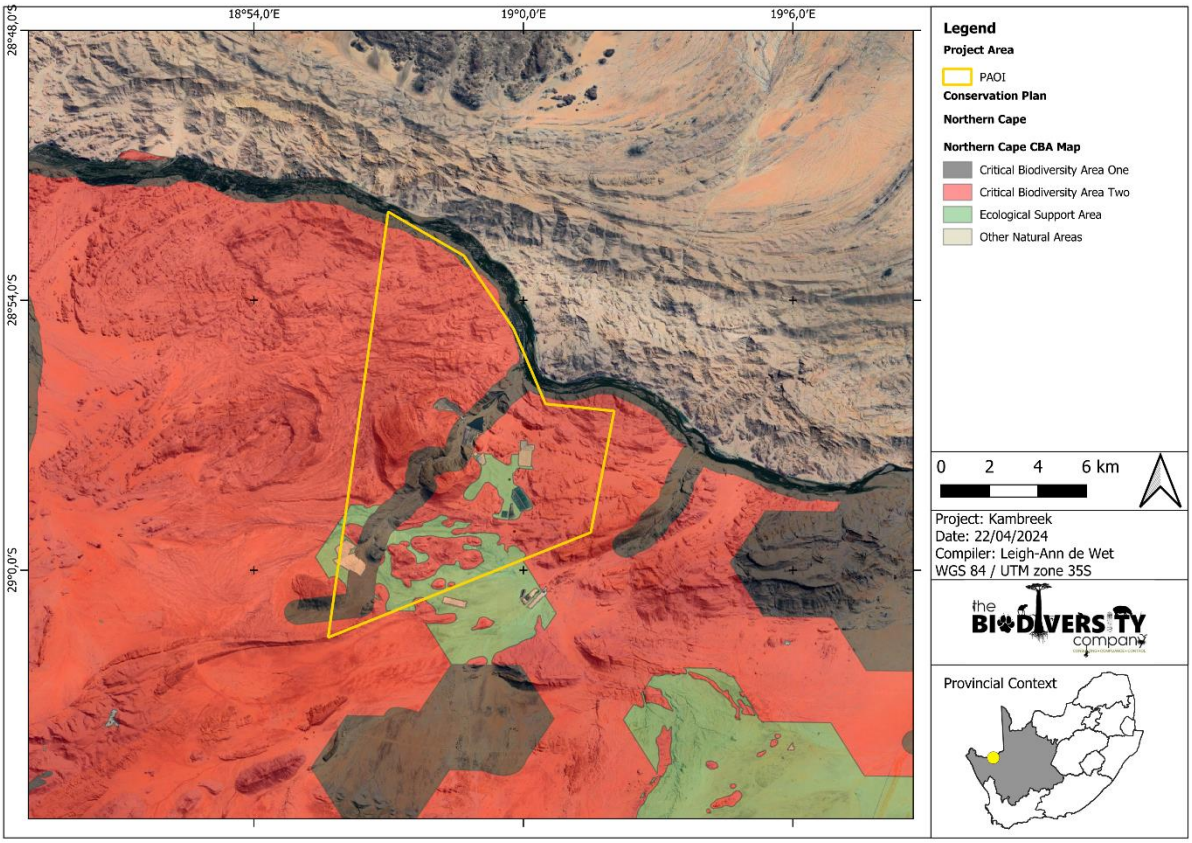


Figure 3-3 Map illustrating the Project Area in relation to the Northern Cape CBA Map

3.1.1.4 Protected Areas

The latest SAPAD and SACAD database indicates that the PAOI is located within 10 km north east of the Gamsberg Nature Reserve (Figure 3-4). It should also be noted that the site is planned as part of the Augrabies National Park expansion for the future and is currently managed as a conservation area (Bed-jon Dreyer, pers comm).

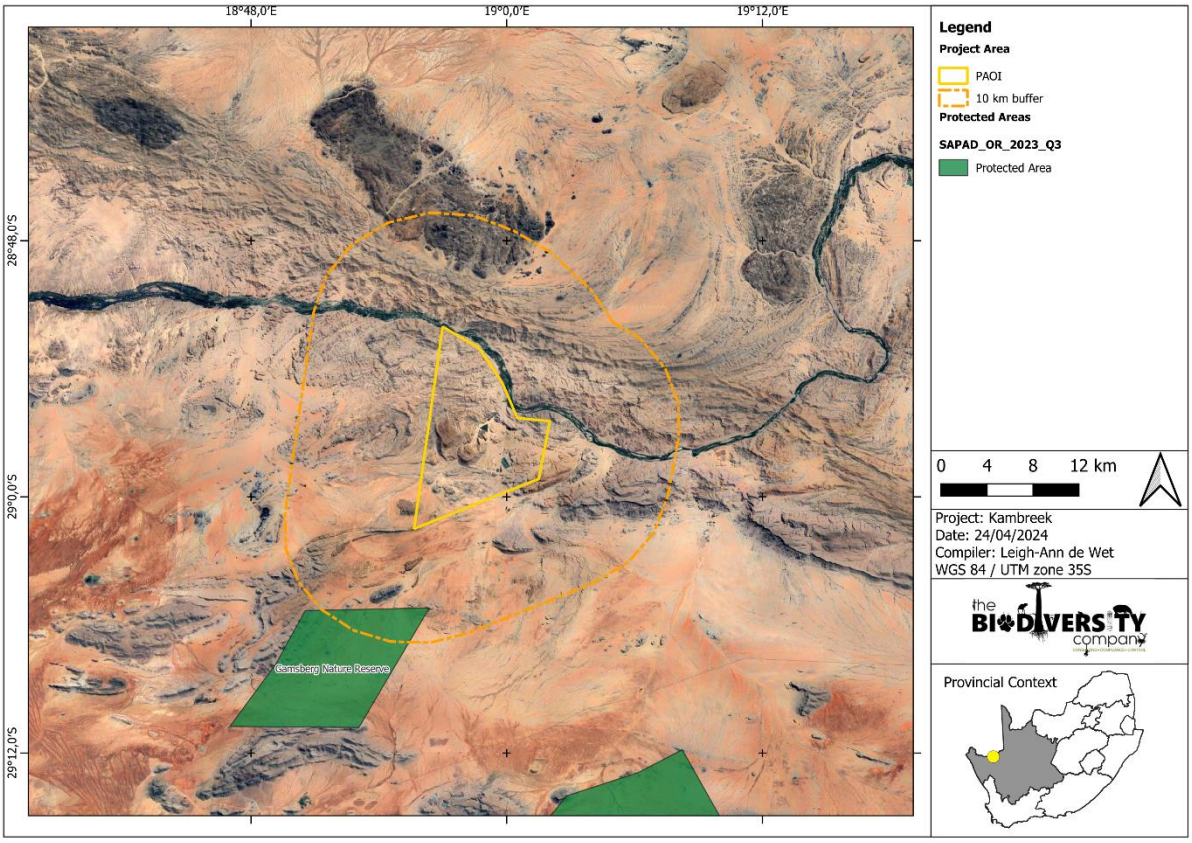


Figure 3-4 Map illustrating the Project Area in relation to Protected Areas.

3.1.1.5 National Protected Areas Expansion Strategy

According to the latest National Protetced Areas Expansion Strategy (NPAES) datset, the PAOI is located within a Priority Focus Area and is iunlcuded in expansion plans for the Augrabies National Park (Figure 3-5).

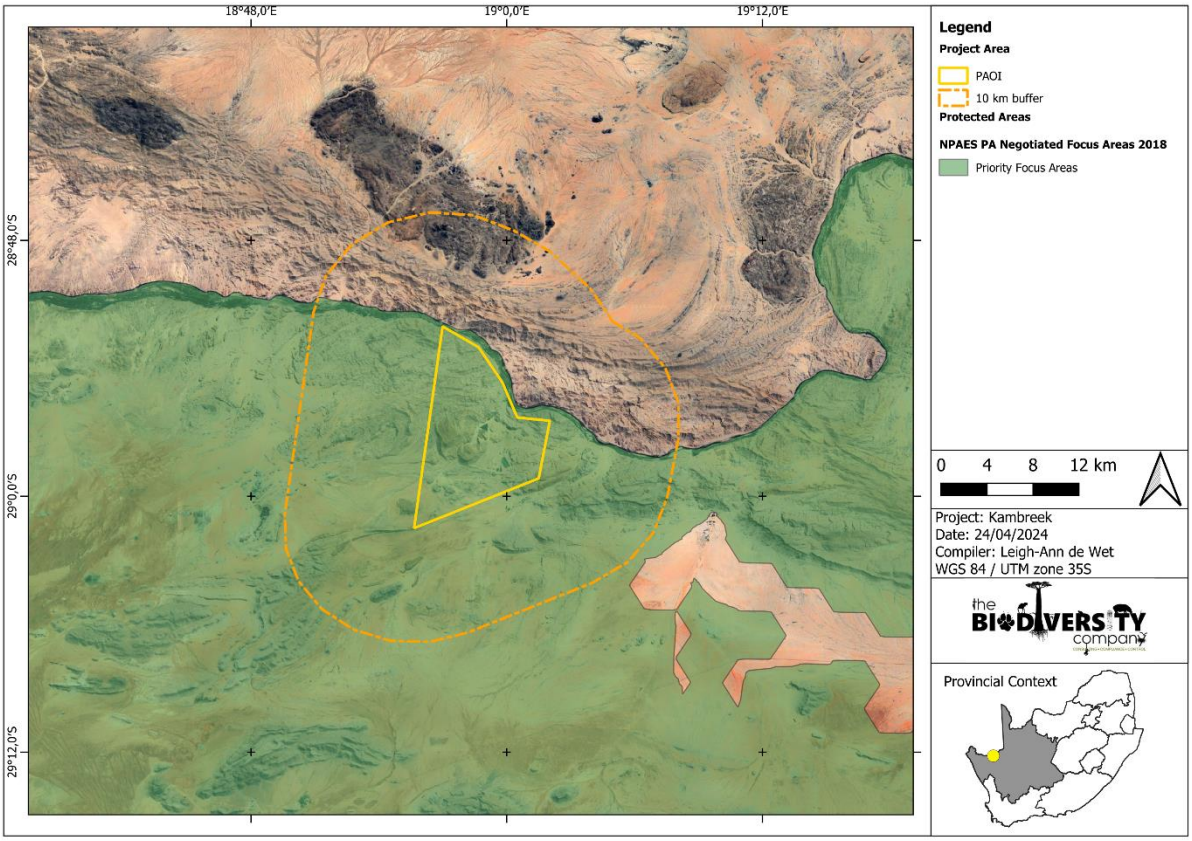


Figure 3-5 Map illustrating the Project Area in relation to the National Protected Areas Expansion Strategy Focus Areas.

3.1.1.6 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

Figure 3-6 indicates that the PAOI lies over 10 km from the Haramoep and Black Mountain Mine IBA.

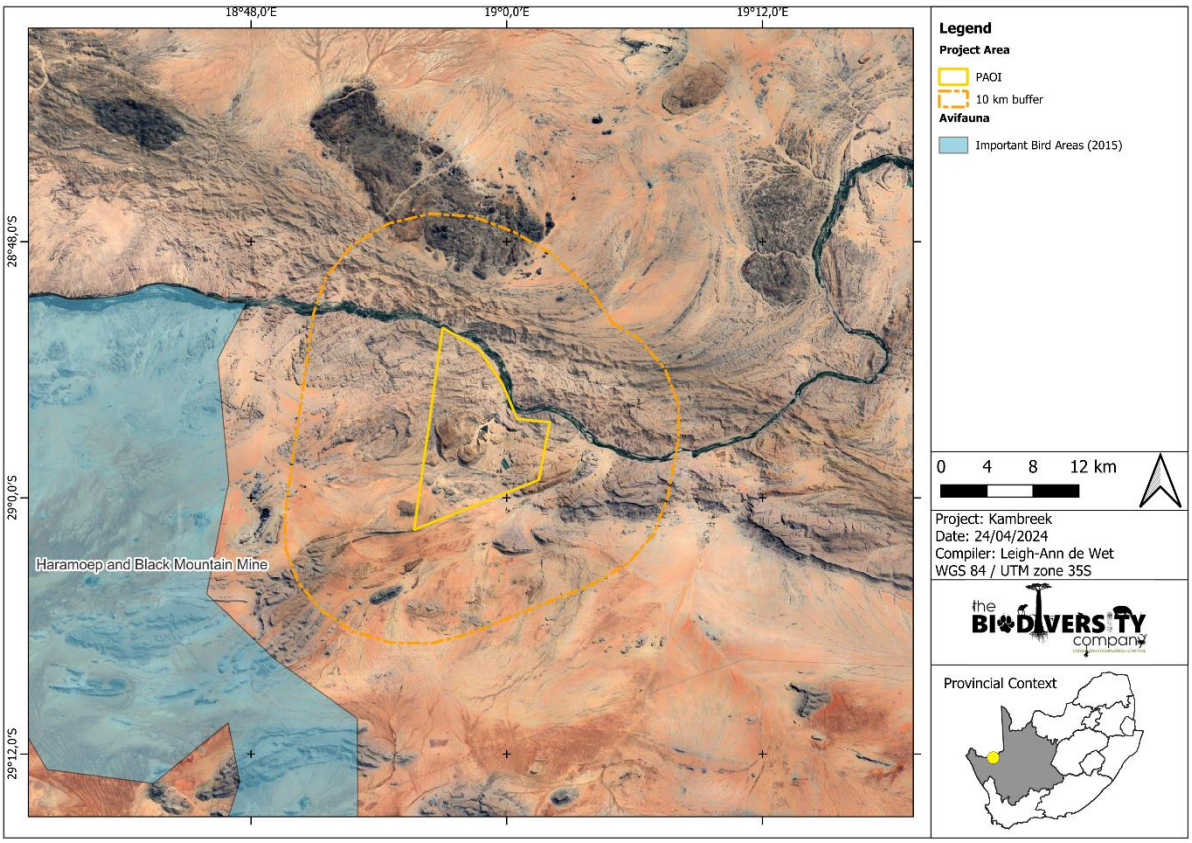


Figure 3-6 Map illustrating the Project Area in relation to Important Bird and Biodiversity Areas

3.1.1.7 South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA in 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 PAOI and its 500 m Regulated Area overlap with LC rivers and a CR wetland (Figure 3-7).

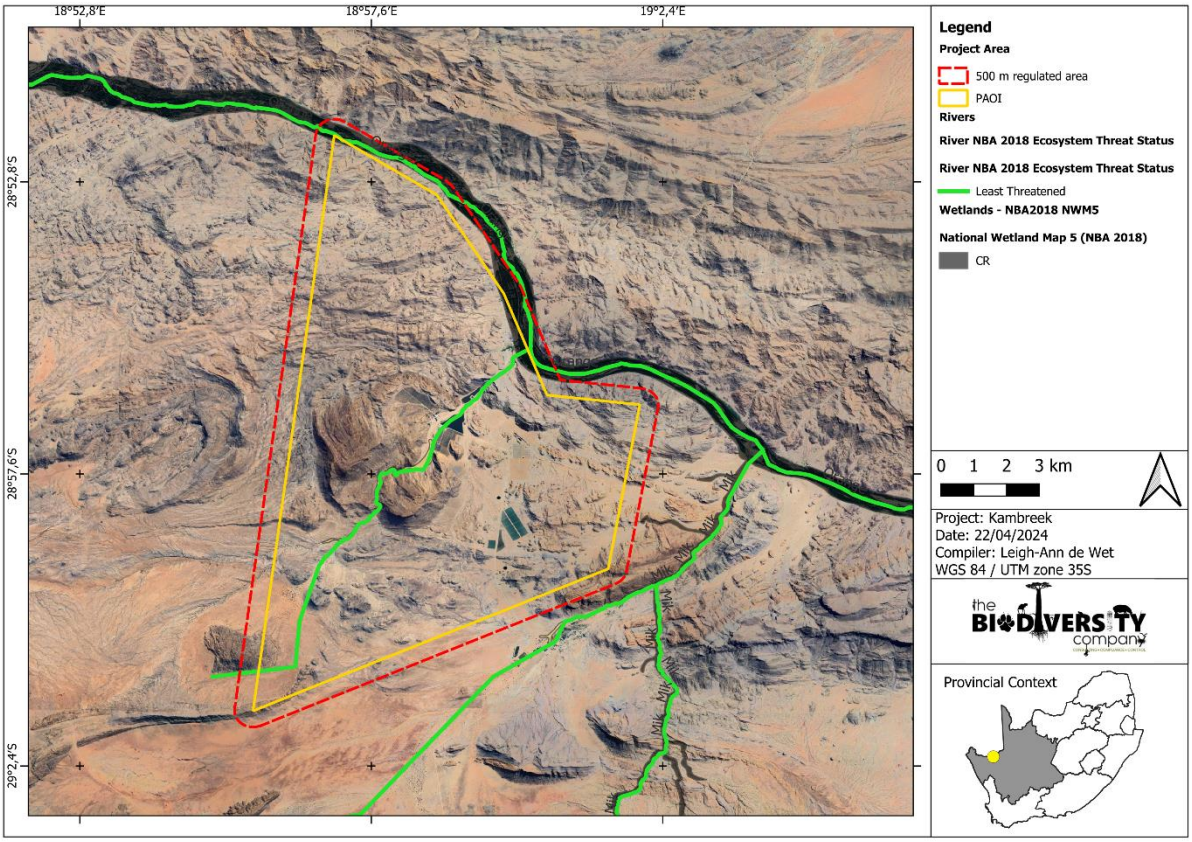


Figure 3-7 Map illustrating the Project Area in relation to the South African Inventory of Inland Aquatic Ecosystems dataset

3.1.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al*., 2011). The PAOI and its 500 m Regulated Area overlap with a FEPA river and a FEPA wetland (Figure 3-8).

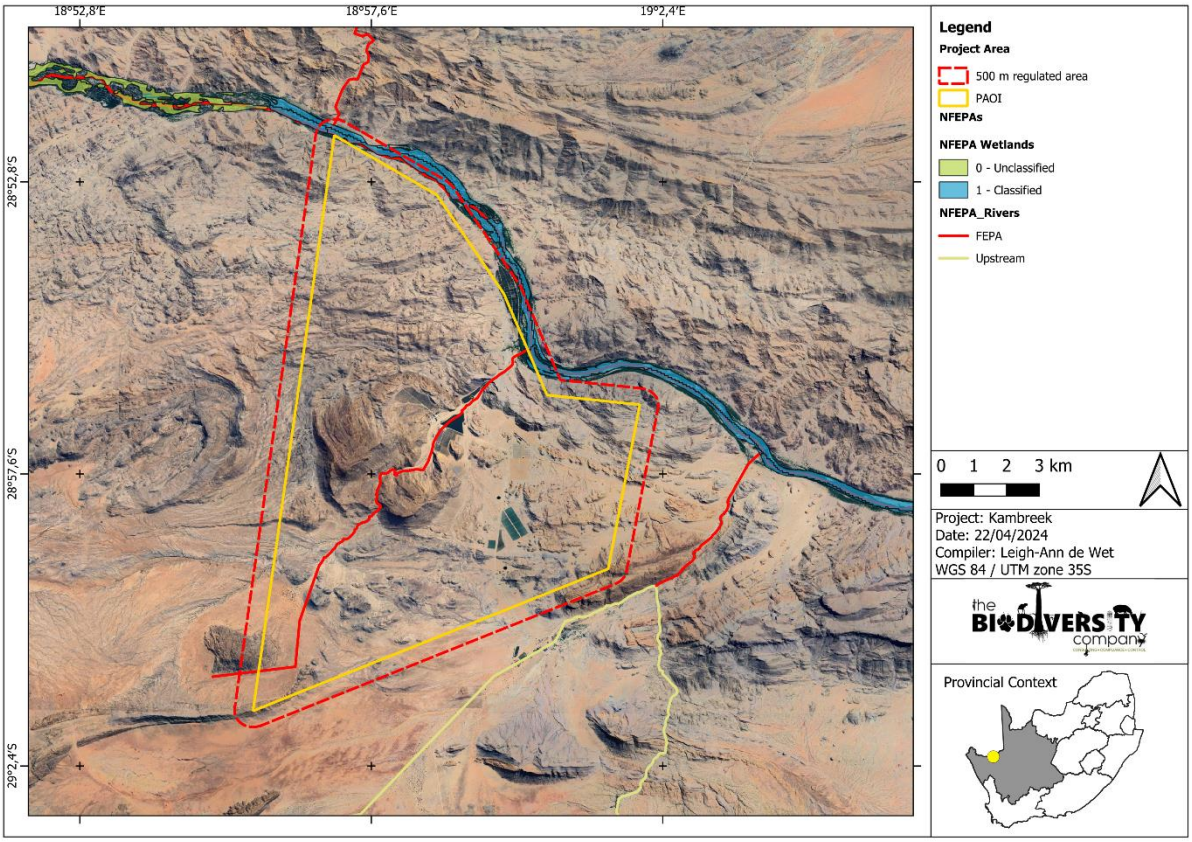


Figure 3-8 Map illustrating the Project Area in relation to the National Freshwater Ecosystem Priority Area dataset

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 PAOI falls within the Nama Karroo Biome as well as the Desert Biome and also includes a small portion of Azonal vegetation..

The Nama Karoo biome is found in the central plateau of the western half of South Africa. The geology underlying the biome is varied, as the distribution of this biome is determined primarily by rainfall. The rain falls in summer, and varies between 100 and 520 mm per year. This also determines the predominant soil type - over 80% of the area is covered by a lime-rich, weakly developed soil over rock. Although less than 5% of rain reaches the rivers, the high erodibility of soils poses a major problem where overgrazing occurs (SANBI, 2019).

The dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils. Grazing rapidly increases the relative abundance of shrubs. Most of the grasses are of the C4 type and, like the shrubs, are deciduous in response to rainfall events (SANBI, 2019).

The Desert Biome presents incredibly harsh environmental conditions, surpassing even those of the Succulent Karoo and Nama-Karoo Biomes (SANBI 2019). Its climate is marked by summer rainfall but experiences high levels of aridity during the summer months. Annual rainfall varies widely, ranging from around 10 mm in the west to 70 or 80 mm towards the desert's inland boundaries, with significant year-to-year variability. Most of southern Africa's true desert lies in Namibia, though a small portion extends into South Africa, notably in the Springbokvlakte area of the Richtersveld within the lower Orange River valley (SANBI, 2019).

Vegetation in the Desert Biome is characterized by the prevalence of annual plants, particularly annual grasses (SANBI 2019). Following seasons of sporadic abundant rains, the desert plains can be blanketed by a profusion of short-lived annual grasses. In typical years, however, the plains may appear barren, with annual plants enduring in the form of seeds. Perennial plants are usually found in specialized habitats linked to localized water concentrations, such as broad drainage lines or washes. Examples include the well-known shrub Welwitschia mirabilis in the Namib Desert and the perennial grass *Stipagrostis sabulicola*, which sporadically grows on large dunes with significant water reserves. Along the Namibian coast, coastal fog influences the distribution of certain species commonly associated with the desert (SANBI 2019).

Azonal vegetation is formed in and around flowing and stagnant freshwater bodies. Habitats with high levels of salt concentration form a highly stressed environment for most plants and often markedly affect the composition of plant communities. Invariably, both waterlogged and salt-laden habitats appear as ‘special’, deviating strongly from the typical surrounding zonal vegetation. They are considered to be of azonal character.

The Project Area is situated in the Bushmanland Arid Grassland (NKb 3), Eastern Gariep Plains Desert (Dg 9), Eastern Gariep Rocky Desert (Dg 10) and Lower Gariep Alluvial Vegetation (Aza 3) vegetation types according to SANBI (2018) (Figure 3-9). Descriptions of the vegetation types are taken directly from Mucina & Rutherford (2006).

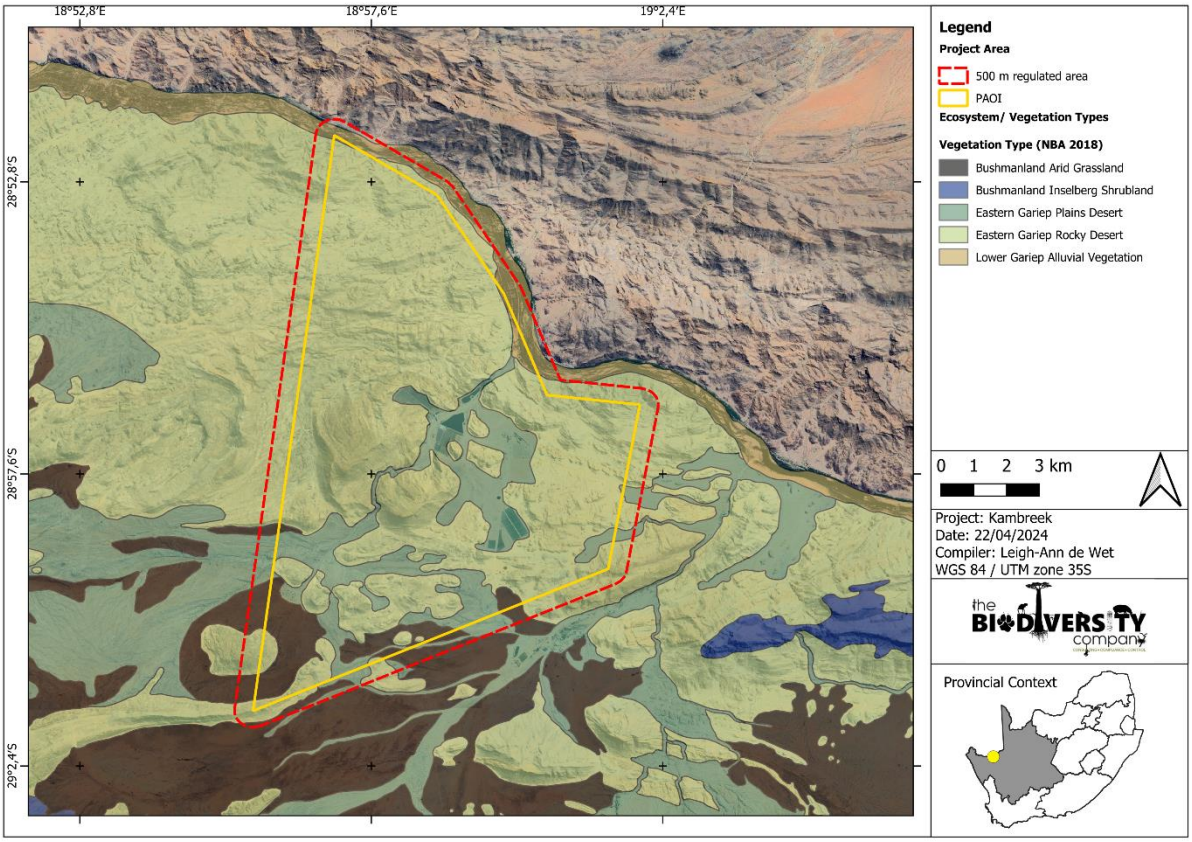


Figure 3-9 Map illustrating the vegetation types associated with the Project Area

3.1.2.1.1 Bushmanland Arid Grassland (Nkb 3)

Bushmanland Arid Grassland occurs in the Northern Cape Province from around Aggeneys in the west to Prieska in the east (Mucina & Rutherford 2006). It occurs on extentsive to irregular plains on a slightly sloping plateau sparsly vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semidesert 'steppe'. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displayes of annual herbs can be expected (Mucina & Rutherford 2016).

Geology and soils (Mucina & Rutherford 2006)**:** A third of the area is covered by recent (Quaternary) alluvium and calcrete. Superficial deposits of the Kalahari Group are also present in the east. The extensive Palaeozoic diamictites of the Dwyka Group also outcrop in the area as do gneisses and metasediments of Mokolian age. The soils of most of the area are red-yellow apedal soils, freely drained, with a high base status and <300 mm deep, with about one fifth of the area deeper than 300 mm, typical of Ag and Ae land types.

Climate (Mucina & Rutherford 2006)**:** Rainfall largely in late summer/early autumn (major peak) and very variable from year to year. Mean Annual Precipitation (MAP) ranges from about 70 mm in the west to 200 mm in the east. Mean maximum and minimum monthly temperatures for Kenhardt are 40.6°C and – 3.7°C for January and July respectively. Corresponding values for Pofadder are 38.3°C and – 0.6°C. Frost incidence ranges from around 10 frost days per year in the northwest to about 35 days in the east. Whirl winds (dust devils) are common on hot summer days.

Important Taxa (Mucina & Rutherford 2006). ([W]Western and [E]Eastern regions of the unit only) (d) = dominant

Graminoids: *Aristida adscensionis (d), A. congesta (d), Enneapogon desvauxii (d), Eragrostis nindensis (d), Schmidtia kalahariensis (d), Stipagrostis ciliata (d), S. obtusa (d), Cenchrus ciliaris, Enneapogon scaber, Eragrostis annulata[E], E. porosa[E], E. procumbens, Panicum lanipes[E], Setaria*

verticillata[E], *Sporobolus nervosus, Stipagrostis brevifolia*[W], *S. uniplumis, Tragus berteronianus, T. racemosus*[E].

Small Trees: *Senegalia mellifera subsp. detinens*[E], *Boscia foetida subsp. foetida.*

Tall Shrubs: *Lycium cinereum (d), Rhigozum trichotomum (d), Cadaba aphylla, Parkinsonia africana.*

Low Shrubs: *Aptosimum spinescens (d), Hermannia spinosa (d), Pentzia spinescens (d), Aizoon asbestinum*[E], *A. schellenbergii*[E], *Aptosimum elongatum, A. lineare*[E], *A. marlothii*[E], *Barleria rigida, Berkheya annectens, Blepharis mitrata, Eriocephalus ambiguus, E. spinescens, Limeum aethiopicum, Lophiocarpus polystachyus, Monechma incanum, M. spartioides, Pentzia pinnatisecta, Phaeoptilum spinosum*[E], *Polygala seminuda, Pteronia leucoclada, P. mucronata, P. sordida, Rosenia humilis, Senecio niveus, Sericocoma avolans, Solanum capense, Talinum arnotii*[E], *Tetragonia arbuscula, Zygophyllum microphyllum.*

Succulent Shrubs: *Kleinia longiflora, Lycium bosciifolium, Salsola tuberculata, S. glabrescens.*

Herbs: *Acanthopsis hoffmannseggiana, Aizoon canariense, Amaranthus praetermissus, Barleria lichtensteiniana*[E], *Chamaesyce inaequilatera, Dicoma capensis, Indigastrum argyraeum, Lotononis platycarpa, Sesamum capense, Tribulus pterophorus, T. terrestris, Vahlia capensis.*

Succulent Herbs: *Gisekia pharnacioides*[E], *Psilocaulon coriarium, Trianthema parvifolia.*

Geophytic Herb: *Moraea venenata.*

Biogeographically Important Taxon (Bushmanland endemic) Succulent Herb: *Tridentea dwequensis.*

Endemic Taxa Succulent Shrubs: *Dinteranthus pole-evansii, Larryleachia dinteri, L. marlothii, Ruschia kenhardtensis.*

Herbs*: Lotononis oligocephala, Nemesia maxii.*

Conservation (Mucina & Rutherford 2006): This vegetatin Type is Listed as Least Concern (RLE 2021). The conservation target is 21%. Only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%).

3.1.2.1.2 Eastern Gariep Plains Desert (Dg 9)

Eastern Gariep Plains Desert occurs on often sloping plains, sharply contrasting with the surrounding rocky hills and mountains (Mucina & Rutherford 2006). Typical wash vegetation in the breaks between the mountains to the Orange River. Grassland dominated by 'white grasses', some spinescent (*Stipagrostis* species), on much of the flats with additional shrubs and herbs in the drainage lines or on more gravelly or loamy soil next to the mountain (Mucina & Rutherford 2006).

Geology & Soils (Mucina & Rutherford 2016): Quaternary sheet-wash alluvial deposits, sands, deep in places; in south, red-yellow apedal, freely drained soils with a high base status. Land types Ag and Ae.

Climate (Mucina & Rutherford 2006).: MAP about 45 – 80 mm, with rainfall peak in late summer and early autumn, becoming more pronounced eastwards. Summer maximum temperatures are often higher than 40°C, and occasionally reaching 50°C at low altitudes. Frost very rare. Mean monthly maxima and minima for Goodhouse are 44.9°C and 1.9°C for January and July, respectively.

Important Taxa (Mucina & Rutherford 2006): (d) = dominant

Small Tree: *Parkinsonia africana.*

Stem- & Leaf-succulent Shrubs: *Brownanthus pseudoschlichtianus*, *Psilocaulon subnodosum.*

Stem-succulent Shrub: *Euphorbia gregaria.*

Leaf-succulent Shrub: *Zygophyllum microcarpum.*

Other Shrubs: *Sisyndite spartea* (d), *Calicorema capitata*, *Gaillonia crocyllis*, *Hermbstaedtia glauca*, *Monechma spartioides*, *Petalidium setosum.*

Graminoids: *Stipagrostis brevifolia* (d), *S. ciliata* (d), *Schmidtia kalahariensis*, *Stipagrostis obtusa.*

Perennial Herbs: *Codon royenii*, *Rogeria longiflora.*

Succulent Herb: *Mesembryanthemum guerichianum.*

Conservation(Mucina & Rutherford 2006). Considered Least Concern (RLE 2021) with a conservation target of 34%. None conserved in statutory conservation areas. Few intact examples of this vegetation remain. Heavy grazing and arid climate combined with the ease of accessibility of the vegetation to stock mean that pastoral activities in the past have significantly altered the structure and composition of vegetation of this unit. In some areas *Prosopis* shows potential to become a serious problem, especially around natural springs or aquifers. Some very restricted areas are cultivated, mainly with date palms and grape vines.

3.1.2.1.3 Eastern Gariep Rocky Desert (Dg 10)

Eastern Gariep Rocky Desert occurs on hills and mountains (up to 650 m of relative altitude from their base), mostly with bare rock outcrops and covered with very sparse shrubby vegetation in crevices (Mucina & Rutheroford 2006). Separated by broad sheet-wash plains (Dg 9 Eastern Gariep Plains Desert). Habitats are mainly controlled by topography, aspect, local climate and lithology. On the Groot Pellaberg, for example, there is a sparse shrubland on the southern foothills (with, for example, *Aloe dichotoma*, *Rhigozum trichotomum* and *Petalidium setosum*) and a higher cover of plants in the southern ravines and rocky drainage lines (e.g. *Abutilon pycnodon, Asparagus suaveolens, Ficus cordata, Searsia populifolia* and *S. viminalis*). On the higher southern slopes *Justicia orchioides* is often dominant, with localised grassland directly below steep cliffs (*Enneapogon scaber, Triraphis ramosissima* and *Danthoniopsis ramosa*). The south-facing quartzite cliffs and steep slopes support chasmophytes (cremnophytes) such as *Ficus ilicina, Aloe dabenorisana* and *Bowiea gariepensis*. On the summits and higher northern slopes there is a much higher preponderance of succulent plants including *Euphorbia avasmontana, Aloe dichotoma, A. microstigma* subsp. *microstigma, Pelargonium aridum* and *Kleinia longiflora*. Succulent plants are also important on the northern foothills and also include *Aloe dichotoma, Euphorbia avasmontana, Sarcostemma viminale* and the diminutive *Lapidaria margarethae* (Mucina & Rutheroford 2006)..

Geology & Soils (Mucina & Rutheroford 2006): In the east mainly leucocratic biotite gneiss and quartz-feldspar gneiss of the Stalhoek Complex and lesser amounts of leucocratic biotite gneiss occur, with intercalations of calc-silicate rocks, mafic gneiss, and a quartzite-schist association of the Hom Subgroup, Bushmanland Group. In the west the area consists of granodiorite, adamellite, leucogranite, tonalite and diorite of the Vioolsdrif Suite and intermediate and acid volcanics of the Haib Subgroup of the Orange River Group (all of the above of Mokolian age). Very rocky substrate, with little or no soils. Land type Ic.

Climate (Mucina & Rutheroford 2006): MAP about 45 – 80 mm with rainfall peak in late summer and early autumn, becoming more pronounced eastwards. Summer maximum temperatures often more than 40°C, occasionally reaching 50°C at low altitudes. Frost is very rare, but occurs at high altitudes.

Important Taxa ([W]Mainly western part, [E]Mainly eastern part) (Mucina & Rutheroford 2006). (d) = Dominant.

Succulent Tree: *Aloe dichotoma* (d).

Small Trees: *Senegalia mellifera*, *Boscia albitrunca*, *B. foetida*, *Ehretia rigida*, *Euclea pseudebenus*, *Maerua gilgii*, *Pappea capensis*.

Stem-& Leaf-succulent Shrubs: *Brownanthus pseudoschlichtianus*, *Ceraria fruticulosa*, *Psilocaulon subnodosum*, *Ruschia barnardii.*

Stem-succulent Shrubs: *Ceraria namaquensis*, *Commiphora capensis*[W], *C. cervifolia*[W], *C. gracilifrondosa*[E], *C. namaensis*, *Euphorbia avasmontana*, *E. friedrichiae*, *E. gariepina*, *E. gregaria*, *E. guerichiana*, *E. virosa.*

Leaf-succulent Shrubs: *Aloe dabenorisana*, *A. gariepensis*, *Mesembryanthemum inachabense, Prenia tetragona*, *Trianthema parvifolia*, *Tylecodon rubrovenosus*, *Zygophyllum decumbens*, *Z. microcarpum*, *Z. rigidum.*

Other Shrubs: *Adenolobus gariepensis*, *Antherothamnus pearsonii*, *Aptosimum tragacanthoides*, *Barleria lancifolia*[E], *B. rigida*, *Cadaba aphylla*, *Calicorema capitata*, *Diospyros acocksii*, *Dyerophytum africanum*, *Eriocephalus scariosus*, *Hermannia stricta*, *Justicia orchioides*, *Monechma mollissimum*, *Petalidium setosum*, *Rhigozum obovatum*, *Rhus populifolia*, *Sisyndite spartea.*

Graminoids: *Enneapogon scaber*, *Schmidtia kalahariensis*, *Stipagrostis anomala*, *S. ciliata, S. obtusa*.

Perennial Herbs: *Abutilon pycnodon*, *Chascanum garipense*, *Codon royenii*, *Rogeria longiflora*, *Tribulus cristatus.*

Geophytic Herb: *Bowiea gariepensis*.

Succulent Herb: *Mesembryanthemum guerichianum.*

Annual Herbs: *Cleome angustifolia* subsp. *diandra*, *C. foliosa* var. *lutea.*

Endemic Taxa (Mucina & Rutheroford 2016).:

Small Tree: *Ozoroa namaquensis.*

Leaf-succulent Dwarf Shrub: *Tylecodon sulphureus.*

Conservation (Mucina & Rutheroford 2006)**:** Listed as Least Threatened (RLE 2021) with a conservation target of 34%. None conserved in South Africa in statutory conservation areas. This unit also occurs north of the Orange River in Namibia where it is potentially conserved through the ownership of the Farm Tsams by the Namibian Ministry of Environment and Tourism.

3.1.2.1.4 Lower Gariep Alluvial Vegetation (AZa 3)

Lower Gariep Alluvial Vegetation occurs in the Northern Cape Province as broad alluvium of the Oranger (Gariep) River between Groblershoop and the mouth into the Atlantic Ocean at Oranjemund (Namibia) (Mucina & Rutherford 2006). It occurs in fat alluvial terrraces and riverine islands supporting a complex of riparian thickets (dominated by *Ziziphus mucronata, Euclea pseudebenus* and *Tamaris useoides*), reed beds with *Phragmites australis* as well as flooded grasslands and herbalnds populating sand banks and terraces within and along the river (Mucina & Rutherford 2006).

Geology, Soil & Hydrology (Mucina & Rutherford 2006): Recent alluvial deposits of the Orange River supporting soil forms such as Dundee and Oakleaf. The river cuts through a great variety of Precambrian metamorphic rocks. Ia land type. Subject to floods, especially in summer, caused by high precipitation on the highveld.

Climate (Mucina & Rutherford 2006): Region with very arid (desert) to subarid (semidesert) climate and erratic, unimodal (winter-rainfall) regime in the extreme west (near the Orange River mouth) to bimodal, equinoctial with major peak in March and less pronounced peak in November in the extreme east (near Upington). MAP 40–150 mm and MAT between 15.4°C (Alexander Bay) and 20.5°C (Upington). See also climate diagram for AZa 3 Lower Gariep Alluvial Vegetation (Figure 13.2).

Important Taxa (Mucina & Rutherford 2006):

Riparian thickets:

Small Trees: *Vachellia karroo* (d), *Euclea pseudebenus* (d), *Salix mucronata* subsp. *mucronata* (d), *Schotia afra* var. *angustifolia* (d), *Ziziphus mucronata* (d), *Vachellia erioloba*, *Combretum erythrophyllum*, *Ficus cordata*, *Maerua gilgii*, *Prosopis glandulosa* var. *glandulosa*, *Searsia lancea*.

Tall Shrubs: *Gymnosporia linearis* (d), *Tamarix usneoides* (d), *Ehretia rigida*, *Euclea undulata*, *Sisyndite spartea*.

Low Shrub: *Asparagus laricinus*.

Woody Climber: *Asparagus retrofractus*.

Succulent Shrub: *Lycium bosciifolium*.

Herb: *Chenopodium olukondae*.

Reed beds:

Megagraminoid: *Phragmites australis* (d).

Flooded grasslands & herblands

Low Shrubs: *Tetragonia schenckii* (d), *Litogyne gariepina*.

Graminoids: *Cynodon dactylon* (d), *Setaria verticillata* (d), *Cenchrus ciliaris*, *Cyperus laevigatus*, *Eragrostis echinochloidea*, *Leucophrys mesocoma*, *Polypogon monspeliensis*, *Stipagrostis namaquensis*.

Herbs: *Amaranthus praetermissus*, *Coronopus integrifolius*, *Frankenia pulverulenta*, *Gnaphalium confine, Pseudognaphalium luteo-album*.

Conservation (Mucina & Rutherford 2006): It is listed as Least Concern (RLE 2021) with a conservatyion target of 31%. About 6% statutorily conserved in the Richtersveld and Augrabies Falls National Parks. Some 50% transformed for agricultural purposes (vegetables and grapes) or alluvial diamond mining. *Prosopis* species, *Nicotiana glauca* and *Argemone ochroleuca* can invade the alluvia in places.

3.1.2.2 Expected Flora Species

The iNaturalist (https://www.inaturalist.org/) database indicates that 205 species of plants are expected to occur within the PAOI (The full list of expected species can be found in Appendix E).Six (6) SCC are expected in the project area as identified by the Screening Tool (with seven (7) additional SCC previously recorded in the general area as per iNat) with a total of thirteen (13) expected flora SCC. Each of their likelihood of occurrence can be seen in Table 6-2.

Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. Such species have had their names obscured and are listed as sensitive plant unique number / sensitive animal unique number. As per the best practise guideline that accompanies the protocol and screening tool, the **name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain**. It should be referred to as *sensitive plant* or *sensitive animal* and its threat status may be included, e.g. *critically endangered sensitive plant* or *endangered sensitive animal*.

Table 6-2 List of flora Species of Conservation Concern that may occur in the Project Area. DD = Data Deficient, EN = Endangered, CR = Critically Endangered, VU = Vulnerable.

Scientific name	Screening Tool Designation	Redlist	Habitat	Likelihood of Occurrence
Acanthopsis hoffmannseggiana		DD	It occurs in the Nama Karoo and Succulent Karoo in sandy plains, stony hillsides and ridges, usually associated with weathered quartzite and granite, but also occurs on mudstone and limestone, usually at an elevation between 650 and 1000 m	Recorded
Adromischus diabolicus		DD	It occurs in the desert and Nama Karoo on quartzite inselbergs on south-facing aspects of steep, inaccessible cliff faces.	Medium
Anacampseros quinaria alstonii		EN	It occurs in the Nama Karoo and Succulent Karoo on rock outcrops	Medium
Hoodia gordonii		DD	It occurs in a variety of vegetation types in a wide variety of arid habitats and may occur on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds.	HIgh
Nemesia fleckii		DD	It occurs in Eastern Gariep Plains Desert in reddish-brown sand with quartz pebbles.	Medium
Oxalis extensa		DD	It occurs in Nama Karoo with specific habitat details unknown.	Low
Pachypodium namaquanum		CR	It occurs in a wide variety of vegetation types on rocky and arid slopes.	Medium
Sensitive Species 1070	Medium	Rare		High
Sensitive Species 122	Medium	Rare		Medium
Sensitive Species 144	Medium	VU		Recorded
Sensitive Species 622	Medium	Rare		High
Sensitive Species 772	Medium	Rare		High
Sensitive Species 901	Medium	EN		High

*All information in the table was accessed from http://redlist.sanbi.org/

3.1.3 Fauna Assessment

No herpetofauna or mammals are identified by the Screening Tool as important for the site, two avifauna SCC were identified as High sensitivity for the site.

Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. Such species have had their names obscured and are listed as sensitive plant unique number / sensitive animal unique number. As per the best practise guideline that accompanies the protocol and screening tool, the **name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain**. It should be referred to as *sensitive plant* or *sensitive animal* and its threat status may be included, e.g. *critically endangered sensitive plant* or *endangered sensitive animal*.

3.1.3.1 Mammals

The MammalMap database provided by the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023a) lists 24 mammal species that could be expected to occur within the PAOI. Species generally restricted to protected areas such as game reserves were not expected to occur in PAOI and were removed from the list (Appendix E).

One (1) mammal species is listed by the MammalMap database as being of conservation concern for the PAOI (Table 3-3). No mammal species were listed by the screening tool.

Table 3-3 List of mammal Species of Conservation Concern that may occur in the Project Area. VU = Vulnerable

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Panthera pardus	Leopard	VU	VU	Recorded

3.1.3.2 Herpetofauna

Based on the ReptileMap database provided by the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023b) thirty-five (35) reptile species have the potential to occur in the Project Area (Appendix E). One of the expected species is an SCC (Table 3-4). No reptile SCC were listed by the screening tool.

Based on the AmphibianMap database provided by the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023c) Six (6) amphibian species have the potential to occur in the Project Area (Appendix E). None of the expected species is an SCC. No amphibian SCC were listed by the screening tool.

Table 3-4 List of herpatofauna Species of Conservation Concern that may occur in the Project Area. VU = Vulnerabe, NT = Near Threatened

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
		Reptile		
Psammophis leightoni	Cape Sand Snake	VU	LC	Moderate

3.2 Fieldwork Findings

3.2.1 Flora Assessment

This section is divided into four sections:

- Flora in general;
- Species of Conservation Concern (SCC);
- Protected Species; and
- Invasive Alien Plants (IAPs).

3.2.1.1 Flora in general

Numerous (101, Appendix E) indigenous flora species were recorded for the Project Area (a record of all recorded species for the project area and surrounds can be found here: https://www.inaturalist.org/projects/klein-pella . In addition, there is an iNaturalist project for the farm Klein Pella which is added to regularly and includes observations from a variety of observers which can be found here: https://www.inaturalist.org/projects/karsten-klein-pella-farm these observations have been used in this report where they have research grade identifications), characteristic of the vegetation types for the site. These lists are dynamic and will change when observations are identified by iNaturalist users. Some of these species can be seen presented in Figure 3-10.

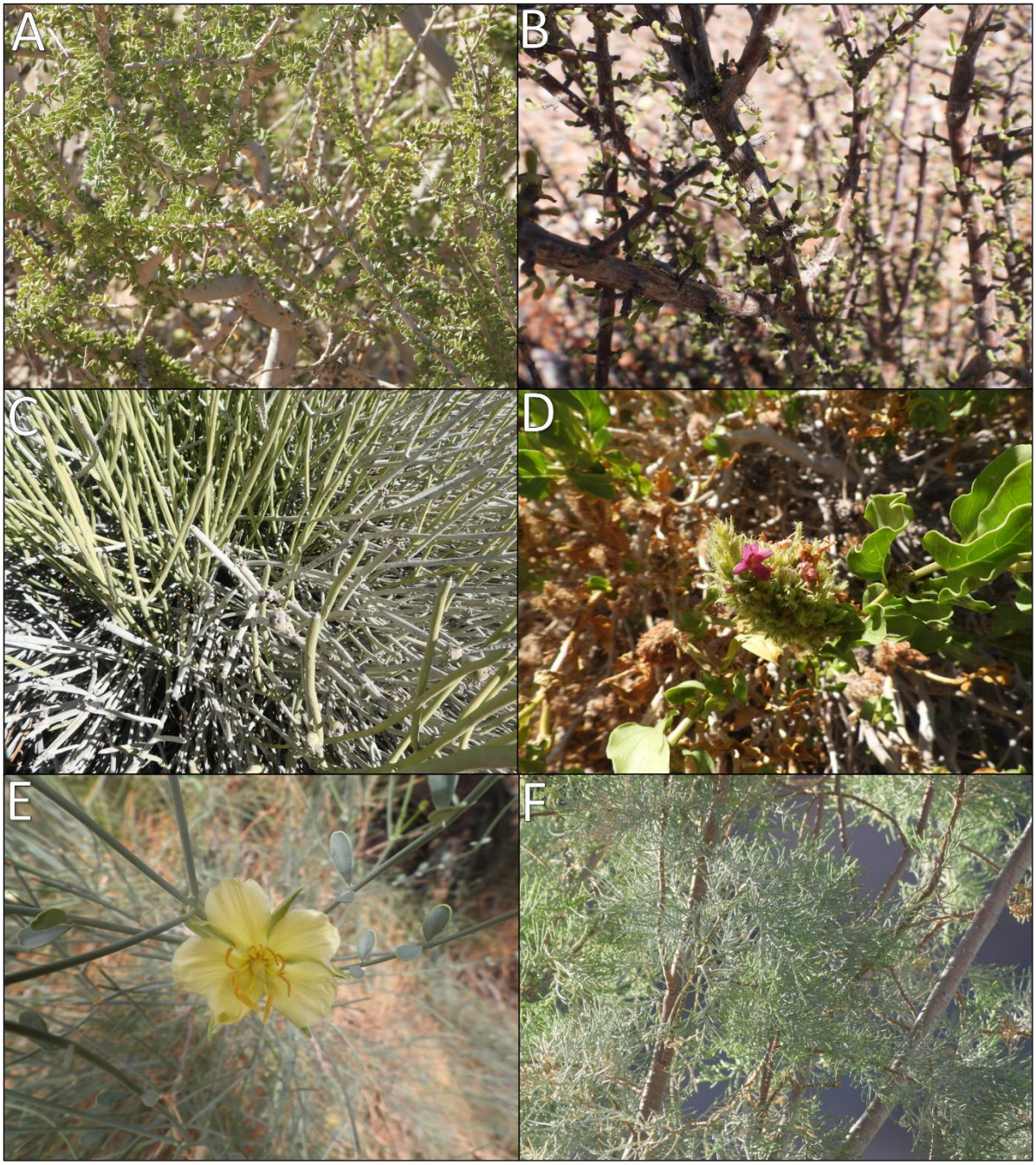


Figure 3-10 ***Photos illustrating indigenous flora species recorded for the Project Area; A) Boscia foetida, B) Portulacaria namaquensis, C) Euphorbia gregaria, D) Petalidium setosum, E) Sisyndite spartea and F) Tamarix usneoides***

3.2.1.2 Species of Conservation Concern

Two Species of Conservation Concern (SCC) were recorded from the project area, with several others expected to occur there. Recorded were Sensitive Species 144 (VU) and *Acantospsis hoffmanseggiana* (Gariep Spikeviolet) (DD), which can be seen in Figure 3-11.

Figure 3-11 Acanthopsis hoffmanseggiana (Karoo Spikeviolet). Picture from https://www.inaturalist.org/observations/106541916 (c) botaneek

3.2.1.3 Protected Species

It is important to note that all indigenous flora is protected in the Northern Cape under Schedule 2: protected species. Sixteen (16) species that are specifically listed under Schedule 2 of the Provincial Conservation Ordinance were recorded from the site, and three (3) tree species listed under the National List of Protected Trees governed by the National Forests Act (Table 3-5 and Figure 3-12),. Permits will be required from the Northern Cape to damage, cut or destroy these species.

A walkdown of the site in flowering season is recommended in order to record these plants and provide the information required for permits for their removal or cutting, if and where required.

Table 3-5 List of Protected Species recorded from the PAOI including both provincially protected species as well as trees listed on the National List of Protected Trees

Family	Scientific name	Common name	Red List	Provincial	Protected Trees
Aizoaceae	*Mesembryanthemum subnodosum*	Gariep Asbush	LC	Sch2	
Aizoaceae	*Schwantesia ruedebuschii*		LC	Sch2	
Aizoaceae	*Sesuvium sesuvioides*	Oukraal Seapurslane	LC	Sch2	
Apocynaceae	*Microloma incanum*	Grey Minimouth	LC	Sch2	
Apocynaceae	*Pergularia daemia garipensis*		LC	Sch2	
Capparaceae	*Boscia albitrunca*	Shepherds tree	LC	Sch2	Protected
Capparaceae	*Boscia foetida*	Stink Shepherdstree	LC	Sch2	
Capparaceae	*Boscia foetida foetida*	Foetid Bush	LC	Sch2	
Ebenaceae	*Euclea pseudebenus*	Black Guarri	LC		Protected
Euphorbiaceae	*Euphorbia avasmontana*	Slender Candelabra Naboom	LC	Sch2	

Family	Scientific name	Common name	Red List	Provincial	Protected Trees
Euphorbiaceae	*Euphorbia glanduligera*	Namib Milkweed	LC	Sch2	
Euphorbiaceae	*Euphorbia gregaria*	Karas Milkbush	LC	Sch2	
Euphorbiaceae	*Euphorbia guerichiana*	Paperbark Woody-euphorbia	LC	Sch2	
Euphorbiaceae	*Euphorbia mauritanica*	Yellow Milkbush	LC	Sch2	
Euphorbiaceae	*Euphorbia virosa*	Namib Candelabra Naboom	LC	Sch2	
Fabaceae	*Vachellia erioloba*	Camel Thorn	LC		Protected
Scrophulariaceae	*Jamesbrittenia maxii*	Painted Jaybee	LC	Sch2	
Scrophulariaceae	*Jamesbrittenia ramosissima*	Desert Jaybee	LC	Sch2	

Figure 3-12 ***Photos illustrating a portion of the protected flora species recorded for the Project Area; A) Boscia albitrunca, B) Vachellia erioloba, C) Euclea pseudebenus and D) Euphorbia mauritanica***

3.2.1.4 Alien Invasive Plants

Alien Invasive Plants (AIPs) 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 first list of Alien Invasive Species was published in terms of the NEMBA. This list has subsequently been repealed and replaced by the Alien and Invasive Species Regulations was published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of alien

invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), 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 National Environmental Management: Biodiversity Act (Act 10 of 2004) (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.

Five (5) alien invasive species and weeds were recorded from the PAOI and surrounds (and therefore likely to invade as a result of disturbance). Three (3) NEMBA category 1b AIP species were recorded from the Project Area (Table 3-6 and Figure 3-13).

Table 3-6 Table presenting the Alien Invasive Species and weeds recorded for the Project Area

Family	Scientific name	Common name	NEM:BA
Casuarinaceae	*Casuarina cunninghamiana*	Beefwood	**2**
Fabaceae	*Neltumia glandulosa (Prosopis glandulosa)*	Honey Mesquite	3

Solanaceae	*Datura ferox*	Large thorn apple	1b
Solanaceae	*Datura innoxia*	Downy thorn apple	1b
Solanaceae	*Nicotiana glauca*	Tree tobacco	1b

Considering that the Project Area includes desert habitats which likely support a variety of sensitive indigenous species, it is recommended that any AIP species that may colonise the area in the future be controlled by implementing an AIP Management Programme in compliance of section 75 of the Act as stated above. This is also pertinent to the development as invasive species are linked to enhanced fire effects and risk (Aslan & Dickson, 2020). The AIP Management Programme must implement the following monitoring framework must be implemented to ensure that AIPs are continually monitored, and progress pertaining to their control is recorded (Table 3-7). The monitoring of the project area throughout the process is crucial in order to prevent AIPs growing and spreading out of control, thereby threatening the wellbeing of indigenous flora and fauna. It is also important to note that while herbicide application has been recommended for control, herbicides should not be applied adjacent to the aquatic ecosystems within the site area and herbicide application should not be used during windy days to prevent drift.

Table 3-7 Proposed monitoring framework for the control of alien invasive plants within the Project Area

Metric	Frequency	Method	Response
How effective are the control methods?	4-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after photographs are effective for this. Observe for non-target effects of herbicide application.	If the survey reveals that the control methods are effective, e.g., low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (If the results show that the control methods are not effective, adapt by e.g., cutting lower above ground or changing herbicides or timing of herbicide application.
Do the infestation levels decrease?	Annually	Survey the cleared areas and record species, densities and size. Before and after pictures are very effective.	If the infestation levels are not decreasing, reconsider clearing intervals and look at clearing methods. If infestation levels are decreasing, then continue current control method.
Quantity of herbicides used	During every operation	Keep track of cost and ensure no wastage. Record herbicide usage	Track usage over time, it will reveal a certain trend in quantities for different infestation levels. Less herbicides should be used when the infestation levels are lower. Record herbicide cost.
Does the indigenous vegetation recover in the cleared areas?	Annually	Survey the cleared areas and look out for indigenous species variety and presence. Before and after pictures are effective.	If there is recovery of indigenous vegetation, then continue current control method. If there is no recovery, consider rehabilitation with local indigenous species.
How many jobs were created?	After every operation	Timesheets	Job creation figures are useful when asking for landowner assistance from WFW or to

			demonstrate contributions to jobs and socio-economic conditions
How many person days (PD) were spent per operations?	After every operation	Timesheets	Keep track of cost and assist with planning and budgeting. Determine cost per person per day (PD)

Figure 3-13 ***Photograph illustrating a portion of the alien invasive species recorded from the project area. A: Nicotiana glauca, B) Neltumia glandulosa, C) Datura ferox and D) Datura innoxia.***

3.2.2 Fauna Assessment

3.2.2.1 Mammals

A total of fifteen (15) mammal species were recorded across the project area during the survey period and observed on the farm (Table 3-8 and Figure 3-14). It is considered highly likely that additional small mammal species would be recorded from the project area with extensive sampling.

Table 3-8 Mammal species recorded within the general PAOI and surrounds.

Family	Scientific name	Common name	Red List (Child et al 2016)
Bovidae	*Oreotragus oreotragus oreotragus*	Cape Klipspringer	LC
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu*	LC
Canidae	*Canis mesomelas*	Black-backed Jackal*	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox*	LC
Canidae	*Vulpes chama*	Cape Fox*	LC
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	LC
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC
Felidae	*Panthera pardus*	Leopard*	VU
Herpestidae	*Herpestes sanguineus*	Common Slender Mongoose	LC
Hyaenidae	*Proteles cristata*	Aardwolf*	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus capensis*	Cape Hare	LC
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	LC
Procaviidae	*Procavia capensis capensis*	Cape Rock Hyrax*	LC
Sciuridae	*Xerus inauris*	South African Ground Squirrel	LC

- *recorded by Ehlers Gagiano, pers comm

Figure 3-14 ***Photograph illustrating a portion of the mammals recorded within the PAOI and surrounding area during the survey period. A: Hystrix africaeaustralis (Cape porcupine), B: Oreotragus oreotragus oreotragus (Cape Klipspringer), C: Xerus inauris (South African Ground Squirrel), D: Chlorocebus pygerythrus (Vervet monkey), E: Papio ursinus (Chacma Baboon) and F: Herpestes sanguineus (Common Slender Mongoose).***

3.2.2.2 Reptiles

Sixteen (16) reptile species, representing three families were recorded within the project area during the survey periods as well as within the farm boundaries during iNaturalist observations (Table 3-9 and Figure 3-15). The lack of species richness was likely due to the combination of the inherent secretive nature of reptile species, and limited time available for fieldwork (a true representative sample requires an extensive sampling period over several surveys). The presence of suitable habitat suggests that the

project area supports a diverse reptile community but as per the screening tool, no SCC are likely to occur within the project area.

Table 3-9 Reptile species recorded within the general PAOI and surrounds.

Family	Scientific Name	Common Name	Red List (Bates *et al* 2014)
Gekkonidae	Pachydactylus latirostris	Quartz Gecko	LC
Gekkonidae	Ptenopus garrulus maculatus	Spotted Barking Gecko	LC
Scincidae	Trachylepis variegata	Variegated Skink	LC
Scincidae	Acontias lineatus	Striped Legless Skink	LC
Scincidae	Trachylepis sulcata	Western Rock Skink	LC
Viperidae	Bitis xeropaga	Desert Mountain Adder	LC
Agamidae	Agama anchietae	Western Rock Agama	LC
Agamidae	Agama atra	Southern Rock Agama	LC
Scincidae	Trachylepis occidentalis	Western three-striped skink	LC
Viperidae	Bitis caudalis	Horned Adder	LC
Prosymnidae	Prosymna frontalis	South-western African Shovel-snout	LC
Gekkonidae	Chondrodactylus angulifer	Namib Giant Ground Gecko	LC
Gekkonidae	Pachydactylus montanus	Montane Thick-toed Gecko	LC
Lamprophiidae	Boaedon mentalis	Bug-Eyed House Snake	NE
Lacertidae	Pedioplanis inornata	Plain Sand Lizard	LC
Gekkonidae	Chondrodactylus laevigatus	Fischer's Thick-toed Gecko	NE

Figure 3-15 Photograph illustrating a portion of the reptiles recorded from the PAOI and surrounds. A: Pedioplanis inornate (Plain Sand Lizard), B: Trachylepis sulcata (Western Rock Skink) C: Agama anchietae (Western Rock Agama), D: Agama atra (Southern Rock Agama).

3.2.2.3 Amphibians

One amphibian species were recorded during the survey period (Table 3-10, Figure 3-16). The lack of species richness was attributed to the dry nature of the project area with most water bodies and perennial drainage lines being dry at the time of the site visit. The species expected to occur within the project area are provided in Appendix D.

Table 3-10 Amphibian species recorded within the general PAOI and surrounds.

Family	Scientific Name	Common Name	Red List (Minter et al 2004)
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC

Figure 3-16 Photograph illustrating the amphibian recorded for the PAOI: Amietia delalandii (Delalande's River Frog).

3.2.2.4 Avifauna

Forty-one (41) avifauna species have been recorded from the PAOI as well as the Kelin Pella farm boundary during this study as well as taking into account other observations (Table 3-11 and Figure 3-17). One of the avifauna species is an SCC: *Aquila verreauxii* (Verreaux's Eagle), which has been recorded breeding in the PAOI (Ehlers Gagiano, pers. Comm.). The species expected to occur within the project area are provided in Appendix D.

Table 3-11 Avifauna species recorded within the general PAOI and surrounds.

Family	Scientific name	Common name	Red List regional (Bird Life SA 2019)	Red List Global (Birdlife SA 2019)
Accipitridae	*Aquila verreauxii*	African Black Eagle	NE	VU
Accipitridae	*Buteo rufofuscus*	Jackal Buzzard		
Accipitridae	*Hieraaetus pennatus*	Booted Eagle		
Accipitridae	*Icthyophaga vocifer*	African Fish-Eagle		
Alaudidae	*Certhilauda subcoronata*	Karoo Long-billed Lark		
Alcedinidae	*Megaceryle maxima*	Giant Kingfisher		
Anatidae	*Plectropterus gambensis*	Spur-winged Goose		
Charadriidae	*Charadrius tricollaris tricollaris*	African Three-banded Plover		
Charadriidae	*Vanellus armatus*	Blacksmith Lapwing		
Cisticolidae	*Euryptila subcinnamomea*	Cinnamon-breasted Warbler		
Columbidae	*Oena capensis capensis*	Namaqua Dove		

Family	Scientific name	Common name	Red List regional (Bird Life SA 2019)	Red List Global (Birdlife SA 2019)
Emberizidae	*Emberiza capensis*	Cape Bunting		
Emberizidae	*Emberiza impetuani*	Lark-like Bunting		
Estrildidae	*Estrilda astrild astrild*	Cape Common Waxbill		
Fringillidae	*Crithagra albogularis albogularis*	White-throated Canary		
Hirundinidae	*Ptyonoprogne fuligula*	Rock Martin		
Laniidae	*Lanius collaris*	Southern Fiscal		
Laniidae	*Lanius collaris collaris*	Common Fiscal Shrike		
Lybiidae	*Tricholaema leucomelas centralis*	Common Pied Barbet		
Malaconotidae	*Telophorus zeylonus*	Bokmakierie		
Meropidae	*Merops hirundineus*	Swallow-tailed Bee-eater		
Motacillidae	*Motacilla capensis capensis*	Common Cape Wagtail		
Muscicapidae	*Cercotrichas coryphoeus*	Karoo Scrub-Robin		
Muscicapidae	*Cossypha caffra*	Cape Robin-Chat		
Muscicapidae	*Emarginata sinuata*	Sickle-winged Chat		
Muscicapidae	*Monticola brevipes*	Short-toed Rock-Thrush		
Muscicapidae	*Myrmecocichla monticola*	Mountain Wheatear		
Muscicapidae	*Myrmecocichla monticola monticola*	Southern Mountain Chat		
Muscicapidae	*Oenanthe familiaris*	Familiar Chat		
Muscicapidae	*Oenanthe familiaris galtoni*	Kalahari Familiar Chat		
Numididae	*Numida meleagris*	Helmeted Guineafowl		
Passeridae	*Passer domesticus*	House Sparrow		
Passeridae	*Passer melanurus*	Cape Sparrow		
Passeridae	*Passer melanurus damarensis*	Arid Cape Sparrow		
Ploceidae	*Philetairus socius*	Sociable Weaver		
Ploceidae	*Ploceus velatus*	Southern Masked Weaver		
Pteroclidae	*Pterocles bicinctus*	Double-banded Sandgrouse		
Pycnonotidae	*Pycnonotus nigricans nigricans*	Red-eye Bulbul		
Sturnidae	*Onychognathus nabouroup*	Pale-winged Starling		
Turdidae	*Turdus smithi*	Karoo Thrush		
Zosteropidae	*Zosterops pallidus*	Orange River White-eye		

Figure 3-17 ***Photograph illustrating a portion of the avifauna recorded from the PAOI and surrounds. A: Motacilla capensis ssp. capensis (Common Cape Wagtail), B: Onychognathus nabouroup (Pale-winged Starling) C: Zosterops pallidus (Orange River White-Eye), D: Estrilda astrild spp. astrild (Cape Common Waxbill), E: Myrmecocichla monticola ssp. monticola (Southern Mountain Chat), and F: Crithagra albogularis ssp. albogularis (White-throated Canary).***

3.3 Habitat Assessment

Three (3) main habitat type were identified across the Project Area and include:

- Alluvial Vegetation;
- Plains Desert; and
- Rocky Desert.

Also identifed are modified areas that comprise agriculture or buidlings, or have been under agriculture in the past but are no longer reopresentative of the indigenous vegetation of the region. These areas have been mapped as well.

The habitat units for the Project Area can be seen in Figure 3-18, Figure 3-19 and Figure 3-20 and delineated in Figure 3-21 and descriptions of the habitat units can be found in Table 3-12.

Table 3-12 Table providing descriptions of the habitat types delineated for the Project Area

Habitat	Description and condition	Ecosystem Processes and Services
Alluvial Vegetation	Alluvial Vegetation is restricted to the area in and around the Orange River to the north-east of the site. This alluvial vegetation approximates that of the Lower Gariep Alluvial Vegetation as expected for the region from the Mucina and Rutherford vegetation map. Large areas are invaded by *Neltumia glandulosa* which often forms a monoculture. *Vachellia xanthophloea* occurs adjacent to the river in some areas. In areas with indigenous vegetation, the reed Phragmites australis occurs as does *Ziziphus mucronata* and *Seasrsia* species. These areas provide habitat for many water birds. Very little indigenous vegetation occurs within this unit within the PAOI with much of the wetland area given over to cultivation.	Provides refuge, grazing and foraging resources for indigenous fauna as well as habitat for a variety of wetland avifauna species. Provides water resource for fauna in a water-scarce desert environment. Important corridor for fauna and flora dispersion within the landscape. The areas may be used as a movement corridor. Habitat is used by faunal species and is important for several life stages and may support several faunal SCC.
Plains Desert	Plains desert approximates the Eastern Gariep Plains Desert as expected for the region. These areas are dominated by sandy to gravelly soils which develop on plains as well as in drainage flats in amongst the mountains that lie adjacent to the Orange River. Flora here grows on sands or on rocky outcrops adjacent to these sands. Occurring in these plans is the protected trees *Euclea pseudebenus* and *Vachellia erioloba*. Also occurring in these flats are large stands of *Euphorbia gergaria* as well as the species *Petalidium setosum, Sisyndite spartea* and *Rogeria longiflora*. Graminoids do dominate in some areas but could not be identified due to the season of the survey. It is also expected that numerous herbaceous species occur in these areas and would be visible in spring or summer after rains.	Provides refuge, grazing and foraging resources for indigenous fauna as well as providing a movement corridor between steep, rocky, mountains. Provides a drainage line for movement of water from the mountains to the Orange River as well as protecting against floods and aiding in water filtration.
Rocky Desert	Rocky desert approximates the Eastern Gariep Rocky Desert expected for the region and comprises sparse vegetation growing in small stony plains and crevices between steep and sheer rocky outcrops. Plants indicative of, and dominant within this habitat type include *Boscia albitrunca*, *Acanthopsis hoffmannseggiana, Peliostomum leucorrhizum, Blepharis mitrata, Geigera ornativa* and *Petalidium setosum*. Due to the season of the survey, several of the species were dry and not possible to identify, particularly graminoids. Succulents are	Provides niche habitats for a variety of flora (particularly succulents) and fauna (particularly reptiles and scorpions). Provides refuge, grazing and foraging resources for fauna. Aids in the filtration of water.

Habitat	Description and condition	Ecosystem Processes and Services
	expected but were not recorded during the site visit, likely due to their cryptic and dormant nature in the dry season.	
Modified	Areas under agriculture, previously under agriculture or currently made up of farm buildings and associated infrastructure.	These no longer provide a natural ecosystem which supports indigenous species, especially of flora however, areas of agriculture provide important habitat for fauna specifically avifauna as well as primates which make use of the date plantations for food and shelter. Agricultural areas aid in water filtration and flood attenuation.

Figure 3-18 Photograph illustrating the Alluvial Vegetation habitat type within the Project Area

Figure 3-19 Photograph illustrating the Plains Desert habitat type (in the foreground) within the Project Area

Figure 3-20 Photograph illustrating the Rocky Desert habitat type within the Project Area

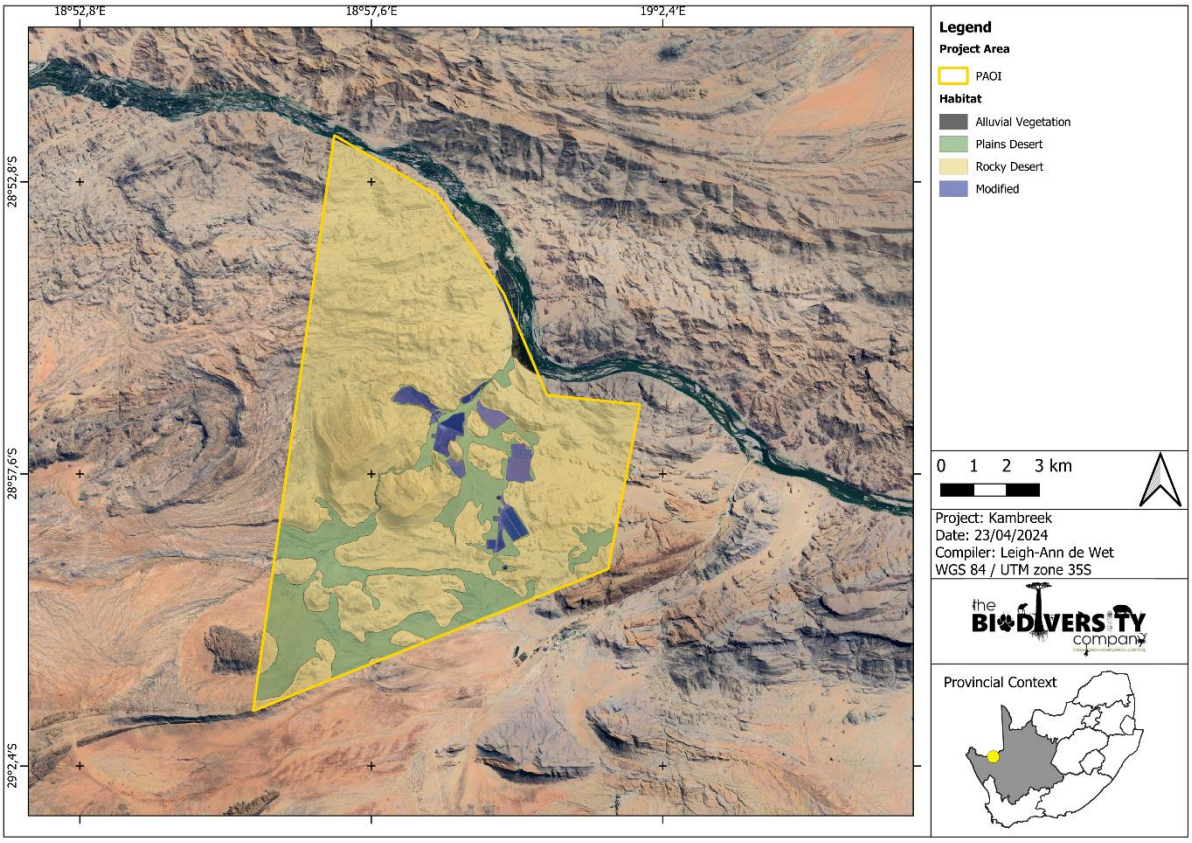


Figure 3-21 Map of the habitats delineated for the PAOI

3.4 Site Ecological Importance

Based on the criteria provided in Appendix B of this report, all habitats within the Project Area were assigned a sensitivity category, i.e., a SEI category. The Project Area was categorised as possessing habitats with areas ranging from 'Very Low' to 'Very High' SEI (Table 3-13). This indicates that the findings of this assessment are contrary to the Screening Tool with respect to the Combined Terrestrial, Plant and Animal Species Theme sensitivity. The SEI of the Project Area is illustrated in Figure 3-22.

Table 3-13 Summary of habitat types delineated within field assessment area

Habitat Type	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance Guidelines
Alluvial Vegetation	**Low**	**Very High**	**Medium**	**Low**	**High**
	< 50% of receptor contains natural habitat with limited potential to support SCC.	High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.		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	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.
Plains Desert	**Medium**	**High**	**Medium**	**Low**	**High**
	> 50% of receptor contains natural habitat with potential to support SCC.	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type		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	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.
Rocky Desert	**High**	**High**	**High**	**Very Low**	**Very High**
	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type		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	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.
Modified	**Very Low**	**Very Low**	**Very Low**	**Very High**	**Very Low**

Habitat Type	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance Guidelines
	No natural habitat remaining.	Several major current negative ecological impacts.		Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

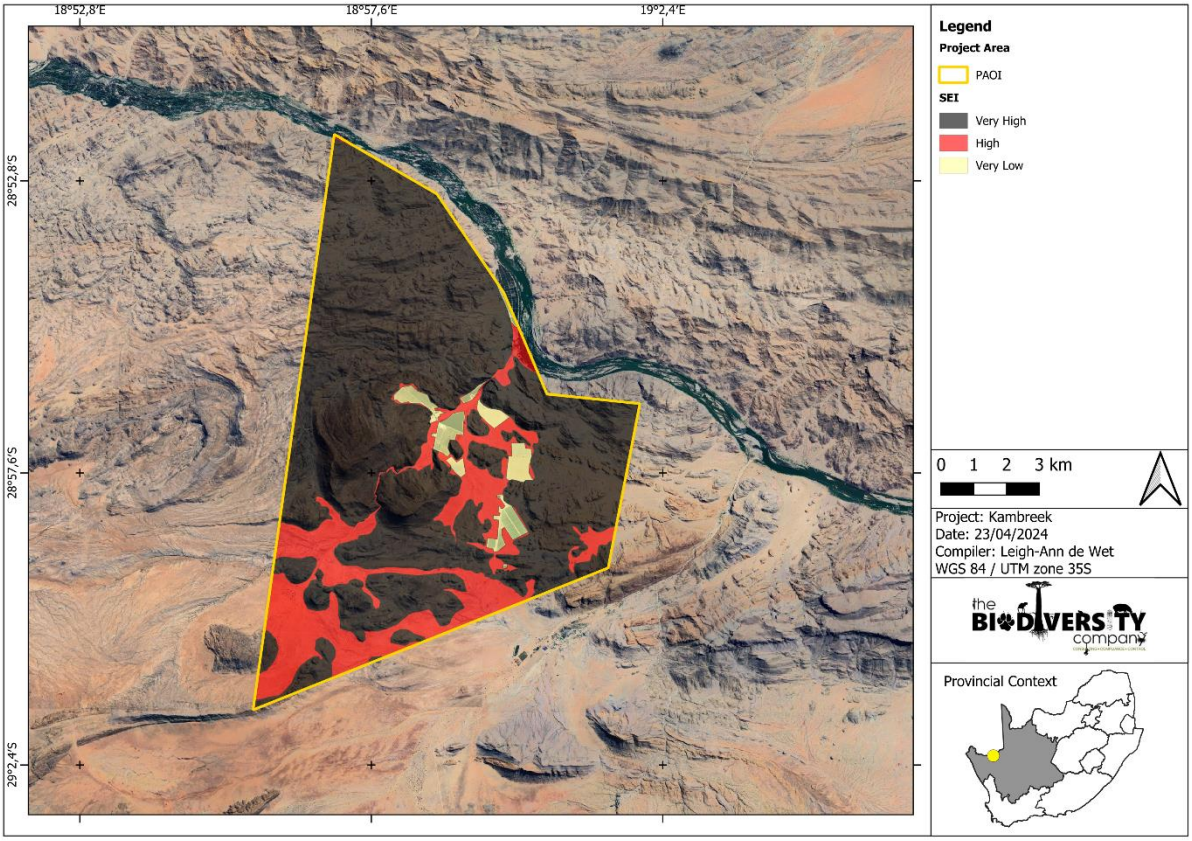


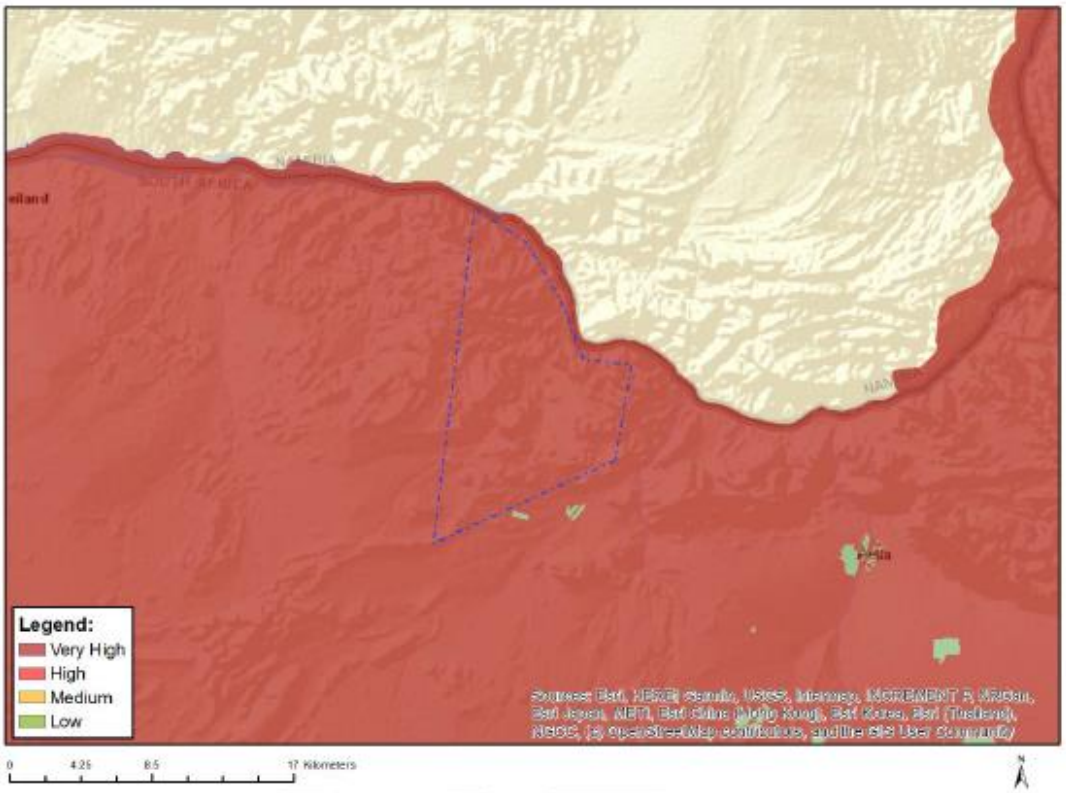
Figure 3-22 Site Ecological Importance of the Project Area.

3.4.1 Desktop Ecological Sensitivity

The following is deduced from the National Web-based Environmental Screening Tool Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Terrestrial Biodiversity Theme sensitivity is 'Very High' for the proposed development area, due to it overlapping with a CBA1, CBA2, ESA, FEPA Subcatchment and a NPAES Focus Area (Figure 3-23);
- Plant Species Theme sensitivity is 'Medium' due the presence of several medium sensitivity species (Figure 3-24); and
- Animal Species Theme sensitivity is 'High' due to the presence of two (2) high sensitivity avifauna species: *Aquila verreauxii* and *Falco biarmicus* (Figure 3-25).

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



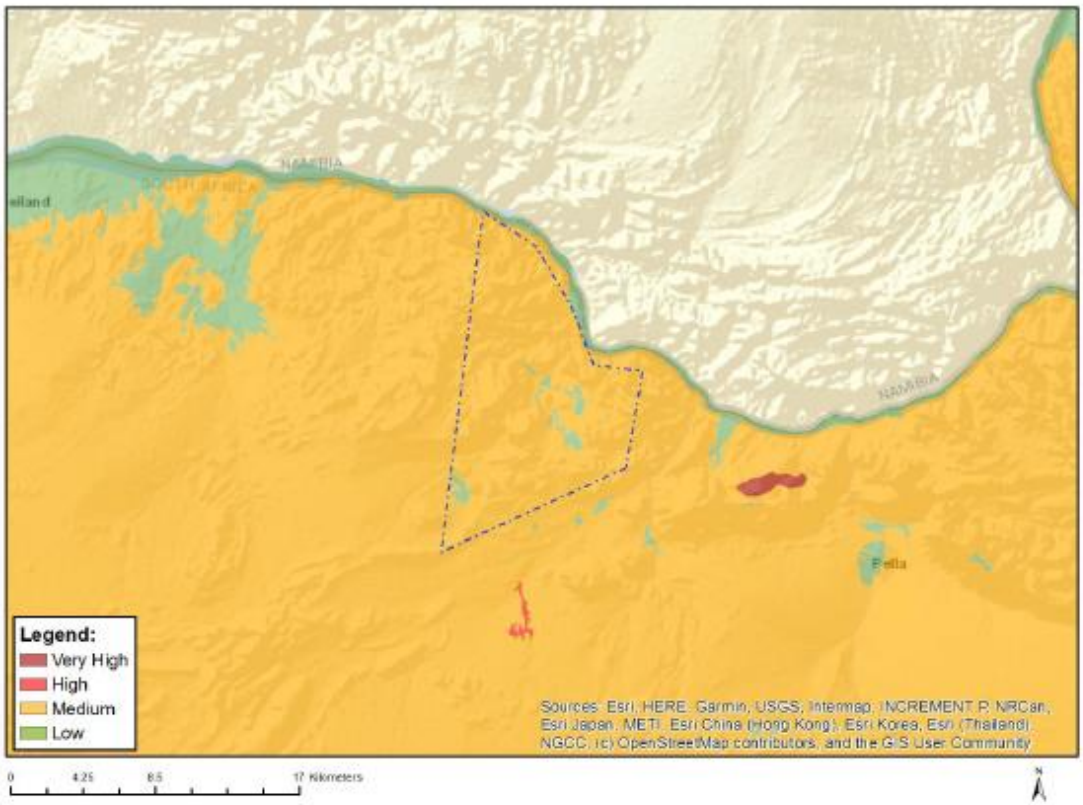
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	CBA 2
Very High	ESA
Very High	FEPA Subcatchment
Very High	National Protected Area Expansion Strategy (NPAES)

Figure 3-23 Terrestrial Biodiversity Theme sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

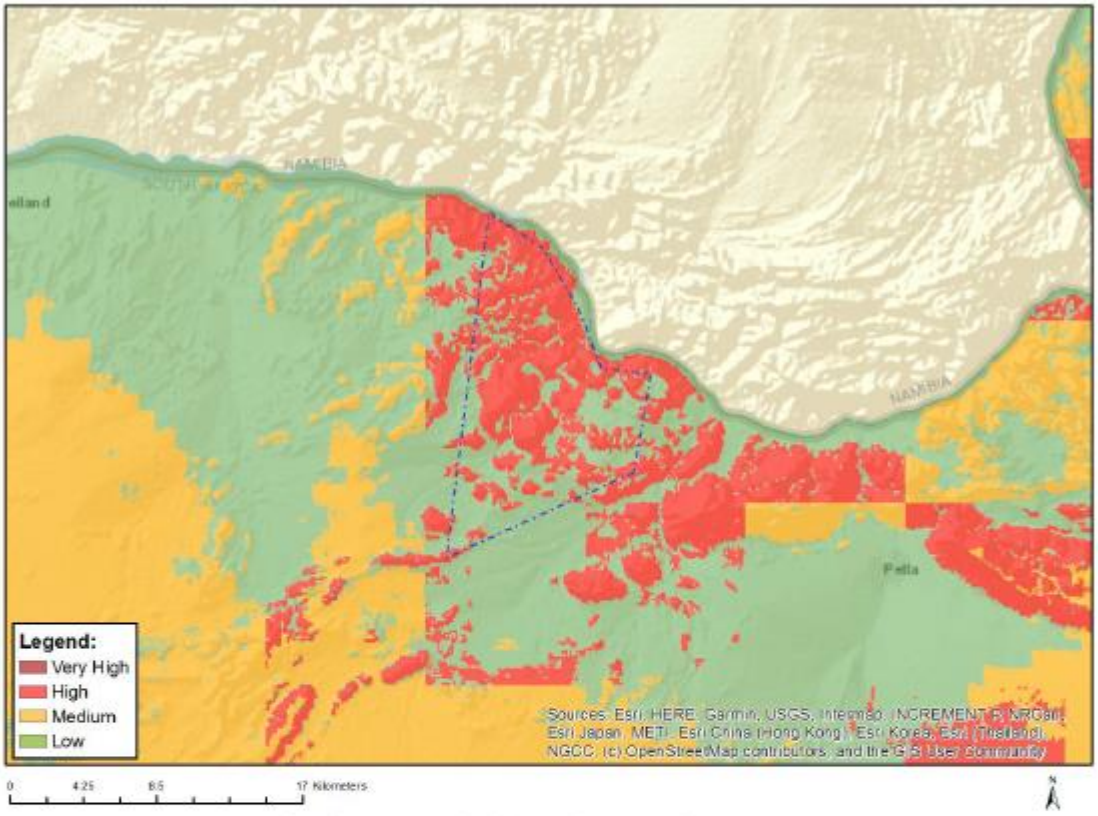
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1070
Medium	Sensitive species 901
Medium	Sensitive species 622
Medium	Sensitive species 772
Medium	Crotalaria pearsonii
Medium	Sensitive species 122
Medium	Sensitive species 144

Figure 3-24 Relative Plant Species Theme Sensitivity

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Aquila verreauxii
High	Aves-Falco biarmicus
Low	Subject to confirmation

Figure 3-25 Relative Animal Species Theme Sensitivity

3.4.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 3-14 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the SEI process followed in the previous section, and consideration is given to any observed or likely presence of SCC or protected species.

Table 3-14 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Theme	Screening Tool	Habitat	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Animal Theme	**High**	**-**	**High**	Validated – Habitat is intact and capable of supporting SCC and has a high number of reptile and mammal species.
Plant Theme	**Medium**	**-**	**Medium**	Validated – Habitat is largely intact with a high likelihood of supporting various SCC.
Terrestrial Theme	**Very High**	**Alluvial Vegetation**	**High**	Disputed – Habitat is largely modified but retains functionality within a desert landscape.
		Plains Desert	**High**	Disputed – Habitat is disturbed but much of the remaining habitat is intact supporting a variety of flora species as well as playing an important role in water distribution and flow.
		Rocky Desert	**Very High**	Validated – Habitat remains intact with a high diversity of flora and fauna species as well as a high likelihood of supporting various flora SCC and restricted-range species.
		Modified	**Very Low**	Disputed – Habitat is entirely transformed.

4 Impact Risk Assessment

4.1 Biodiversity Risk 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.

Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the Project Area. The relevant impacts associated with the proposed construction and operation of the development were then subjected to a prescribed impact assessment method. Impacts were assessed in terms of the construction and operational phases. The operational phase refers to that phase of the project where the construction has been completed. The project activities are set to be long lasting, and a closure phase was not assessed for that reason. It should be noted that the impacts described are not exhaustive, and more impacts may be identified at a later stage. Mitigation measures were only applied to impacts deemed relevant based on the impact analysis.

Impacts were assessed for the following activities:

- Construction Phase; and
- Operational Phase.

4.2 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the Project Area (Figure 4-1). These include:

- Agriculture; and
- Linear infrastructure in the form of fences and roads.

Figure 4-1 Photographs illustrating current negative impacts associated with the Project Area: A and B: Agriculture and C and D: roads.

4.3 Alternatives Considered

No alternatives were considered.

4.4 Irreplaceable Loss

Any development of the Project Area will result in the irreplaceable loss of:

- CBA 1 and CBA 2 areas;
- Loss of an ESA area;
- Drainage lines;
- Potential fauna and flora SCC;
- Protected species; and
- Indigenous vegetation.

4.5 Identification of Additional Potential Impacts

The following potential activities and potential impacts are expected. A summary of the potential impacts during the construction and operational phases of the proposed activity are presented in Figure 4-1.

Table 4-1 Summary of potential impacts to biodiversity associated with the proposed activity

Main Impact	Project Activities	Secondary Impacts Anticipated
Loss of indigenous habitat	• Direct loss as a result of construction and operation of the proposed development. • Secondary impacts associated with noise, dust and influx of AIPs into these areas. • Prevention of fires or incorrect fire regimes. • Improper solid waste disposal • Dust precipitation.	• Habitat fragmentation. • Loss of ecosystem services. • Emigration of fauna species, potentially including SCC. • Increased potential for soil erosion. • Habitat fragmentation. • Increased potential for establishment of alien invasive vegetation.
Encroachment of AIP species in disturbed areas.	• Vegetation removal. • Soil disturbance. • Vehicles potentially spreading seed. • Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents.	• Habitat loss for native flora & fauna (including potential SCC). • Alteration of fauna assemblages due to habitat modification. • Reduced forage quality of grazing habitat. • Spreading of potentially dangerous diseases.
Direct mortality of fauna species.	• Clearing of vegetation. • Roadkill due to vehicle collision. • Preparation of soil with heavy machinery • Soil excavations and soil transportation. • Intentional killing of fauna for food (hunting) or persecution (especially with regard to herpetofauna). • Pollution of water resources due to spilling of hazardous chemicals from heavy machinery during construction.	• Loss of ecosystem services. • Explosion of rodent populations and associated disease risk.
Emigration of fauna	• Disturbance from construction activities. • Loss of habitat and degradation of surrounding habitats.	• Reduced population of protected species, and potentially SCC • Loss of ecosystem services.
Reduced dispersal/migration of fauna	• Removal of vegetation	• Loss of ecosystem services • Reduced plant seed dispersal.
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, light and dust	• Operation of machinery (generators, crushers, vehicles). • Vehicles operating at night. • Large, intense fluorescent and mercury vapor lighting.	• Loss of ecosystem services.
Loss of SCCs and/or protected species	• All unregulated/unsupervised activities outdoors. • Poaching and trapping • Staff and others interacting directly with fauna (potentially dangerous), or flora.	• Loss of SCC. • Harm to people (dangerous fauna).

4.6 Quantitative Impact Assessment

The standard impact assessment methodology may be used in the capture of generic anticipated impacts and potential mitigation measures for Basic Assessment Reports and Environmental Impact Assessment (EIA) Reports. The methodology described herein complies with the requirements of the

EIA Regulations (2014), promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The impacts assessed here as assessed based on the loss of the full area of the site as well as all habitats present.

The purpose of the impact assessment is to:

- Assess impacts of proposed activities on biodiversity of the proposed development area;
- Assess whether proposed activities are likely to have significant impacts on biodiversity and specifically species of conservation concern; and
- Identify practical, implementable mitigation measures to reduce the significance of proposed activities on biodiversity.

It is important to note that the ratings applied within the risk assessment model, considered impacts to open space or natural habitats within the development area and not for areas already transformed.

4.6.1 Construction Phase

The following potential main impacts on the biodiversity (based on the framework above) were considered for the construction phase of the proposed development (Table 4-2). 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:

- Degradation, destruction and fragmentation of portions of sensitive habitats, including loss of protected species;
- Displacement of faunal community due to habitat loss and disturbance (noise, dust and vibration) and/or direct mortalities;
- Spread of alien invasive species and reduction of habitat integrity; and
- Soil erosion (especially due to clearing of vegetation), if no erosion control measures are implemented.

Table 4-2 Impacts to biodiversity associated with the proposed construction phase

Impact	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
			Prior to mitigation			
Degradation, destruction and fragmentation of portions of sensitive habitats, including loss of protected species	5	3	4	5	5	**High**
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Definite	
			Post mitigation			
	4	2	3	5	5	**Moderately High**
	Permanent	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology critically sensitive /important	Definite	
Displacement of faunal community due to habitat loss and disturbance (noise, dust and vibration) and/or direct mortalities			**Prior to mitigation**			
	5	3	4	5	5	**High**
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Definite	
			Post mitigation			
	4	2	3	5	3	**Moderate**
	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology critically sensitive /important	Likely	
Spread of alien invasive species and reduction of habitat integrity			**Prior to mitigation**			
	5	4	4	5	4	**High**
	Permanent	Regional within 5 km of the site boundary / < 2000ha	Great / harmful/ ecosystem structure and	Ecology critically sensitive /important	Highly likely	

		impacted / Linear features affected < 3000m	function largely altered			
	Post mitigation					
	3	2	2	5	2	**Low**
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted	Small / ecosystem structure and function largely unchanged	Ecology critically sensitive /important	Possible	
Soil erosion (especially due the clearing of vegetation), if no erosion control measures are implemented	**Prior to mitigation**					
	5	3	4	5	4	**High**
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Highly likely	
	Post mitigation					
	3	2	2	5	2	**Low**
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted	Small / ecosystem structure and function largely unchanged	Ecology critically sensitive /important	Possible	

4.6.2 Operational Phase

It is anticipated that daily activities associated with the operation phase will lead to further spread the AIP, as well as the deterioration of the habitats due to the increase of foot traffic, dust and edge effect impacts (Table 4-3). Dust reduces the ability of plants to photosynthesise and thus leads to degradation/retrogression of the veld. Moving maintenance vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions. Operation will continue to have an effect on erosion of the site with continued disturbance of natural water flow regimes, resulting in a further loss of habitats.

The following potential impacts were considered:

- Continued fragmentation and degradation of ecosystems;
- Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, noise, light and polluatnts);
- Spread of alien and/or invasive species and reduction of habitat integrity; and
- Erosion and resultant loss of vegetation communities.

Table 4-3 Impacts to biodiversity associated with the proposed operational phase

Impact	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
			Prior to mitigation			
Continued fragmentation and degradation of ecosystems	5	3	4	5	5	**High**
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Definite	
			Post mitigation			
	4	2	3	5	3	**Moderate**
	Life of operation or less than 20 years: Long Term	Developme nt specific/ within the site boundary / < 100 ha impacted	Significant / ecosystem structure and function moderately altered	Ecology critically sensitive /important	Likely	
			Prior to mitigation			
Ongoing displacement and direct mortalities of faunal community due to disturbances (road collisions, noise, light and pollutants)	4	3	4	5	4	**Moderately High**
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Highly likely	

		affected < 1000m				
				Post mitigation		
	3	2	2	5	2	**Low**
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology critically sensitive /important	Possible	
				Prior to mitigation		
Spread of alien invasive species and reduction of habitat integrity	5	4	4	5	4	**High**
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Highly likely	
				Post mitigation		
	3	2	2	5	2	**Low**
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted	Small / ecosystem structure and function largely unchanged	Ecology critically sensitive /important	Possible	
				Prior to mitigation		
Erosion and resultant loss of vegetation communities	5	3	4	5	5	**High**
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology critically sensitive /important	Definite	
				Post mitigation		
	3	2	2	5	2	**Low**
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted	Small / ecosystem structure and function largely unchanged	Ecology critically sensitive /important	Possible	

4.6.3 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline (Table 4-4). 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 pre-existing in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on local fauna and flora specifically.

Cumulative impacts are assessed within the context of the extent of the proposed Project Area, other similar developments and activities in the area (existing and in-process), and general habitat loss and transformation resulting from any other activities in the area. Localised cumulative impacts include those from operations that are close enough (within 30 km) to potentially cause additive effects on the local environment or any sensitive receptors (relevant operations include nearby large road networks, renewable energy facilities, other mines, and power infrastructure). Relevant impacts include the overall reduction of foraging and habitat where reproduction takes place, dust deposition, noise and vibration, disruption of functional corridors of habitat important for movement and migration, disruption of waterways, groundwater drawdown, increase risk of collisions; and groundwater and surface water quality depletion.

Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves

Table 4-4 Cumulative impact assessment for the project

Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Project in isolation					
5	3	4	4	5	**Moderately High**
Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	
Project and Surrounding projects					
4	4	4	4	4	**High**
Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly Likely	

4.6.4 Unplanned Events

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

Table 4-5 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 4-5 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be always 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 the surrounding natural vegetation.	An appropriate/adequate fire management plan needs to be implemented.

4.7 Proposed Impact Management Plan

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr), which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines. Table 4-6 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators relative to the terrestrial flora study.

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities, the CBA 1, CBA 2, ESA, and NPAES Focus Areas within and in the vicinity of the PAOI;
- Reduce soil erosion;
- Reduce the negative fragmentation effects of the development; and
- Prevent the direct and indirect loss and disturbance of flora species and communities (including any potentially protected or Species of Conservation Concern).

It is required that any AIP species that may colonise the proposed development in the future be controlled by implementing an AIP Management Programme in compliance of section 75 of the Act National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA).

Table 4-6 Summary of management objectives pertaining to impacts to biodiversity and ecosystems associated with the proposed development

Management Outcome: Vegetation and Habitats				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All CBA areas must be avoided, if this is not possible, offsets must be discussed with the provincial authorities and implemented.	Life of operation	Project Manager	Offsets	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	Natural Areas	Ongoing
All activities must make use of existing roads and tracks as far as practically and feasibly possible. No new roads are to be constructed under any circumstance. Parking of vehicles may only occur in already modified areas.	Life of operation	Project Manager	Roads and paths used	Ongoing

A protected tree and a protected plant survey must be conducted by a suitably qualified ecologist and an estimate made of the number of protected trees which were lost during vegetation clearing. The replacement of the trees must be discussed with the department.	Operation	Project Manager, Environmental Officer	Relocation/destruction of protected plant species	Ongoing
A habitat rehabilitation plan must be compiled and implemented for all developed areas. .	Life of operation	Project Manager	Site footprint rehabilitation	Ongoing
Areas that have been disturbed but will not undergo development must be revegetated with indigenous vegetation.	Life of operation	Project Manager	Rehabilitated areas	Ongoing
A fire management plan needs to be compiled and implemented to restrict the impact fire would have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
All construction waste must be removed from site.	Construction phase	Environmental Officer & Contractor	Construction waste	During Phase
A spill management plan must be put in place to ensure that should there be any leaks, bursts or overflow of contaminants used in construction or operation that it does not run into the surrounding areas.	Life of operation	Environmental Officer & Contractor	Pipe Leaks	During Phase and Ongoing Monitoring

Management Outcome: Fauna

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 minimise all possible disturbances to nocturnal fauna.	Construction	Project Manager Contractor Foreman	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be permitted and must be made a punishable offense.	Life of operation	Project Manager Contractor	Evidence of trapping or carcasses	Ongoing
Any holes/deep excavations must be dug in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected for fauna prior to backfilling.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing

Management Outcome: Invasive Alien Plants

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
An Alien Invasive Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition.	Life of operation	Project manager, Environmental Officer & Contractor	Manage and assess presence and encroachment of alien vegetation	Twice a year

Management Outcome: Dust Pollution

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all areas of construction. This includes wetting of exposed soft soil surfaces.	Life of operation	Project Manager Contractor	Dustfall	As per the air quality report and the dust monitoring program.

Management Outcome: Waste management

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and a Solid Waste Management Plan must be developed and implemented. All waste must be collected and stored effectively. All	Life of operation	Project Manager Contractor	Waste Removal	Weekly

solid waste collected shall be disposed of at a licensed disposal facility				
Where a registered disposal facility is not available close to the PAOI, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Project Manager Health and Safety Officer Contractor	Collection/handling of the waste.	Ongoing
Refuse bins must be emptied and secured against primates. Temporary storage of domestic waste must be in covered waste skips. Maximum domestic waste storage period will be 10 days. Recycling is encouraged.	Life of operation	Project Manager Health and Safety Officer Contractor	Management of bins and collection of waste	Ongoing
Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site.	Construction Phase	Environmental Officer & Contractor	Cement mixing and spills	Every occurrence

Management Outcome: Environmental Awareness Training

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the PAOI to inform contractors and site staff of the presence of species, their identification, conservation status and importance, biology, habitat requirements and management requirements within the Environmental Authorisation and the EMPr.	Life of operation	Project Manager Health and Safety Officer Contractor Environmental Officer	Compliance to the training.	As needed

Management Outcome: Erosion

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
A habitat rehabilitation and revegetation plan must be developed and implemented to reduce the occurrence of bare soil areas and the associated damage to nearby rivers because of excessive erosion.	Operational Phase and Closure	Project manager, Environmental Officer, Contractor	Rehabilitation	During Phase
Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds where relevant.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Only existing access routes and walking paths may be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
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.	Life of operation	Project manager, Enviornmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

5 Conclusion

The completion of a comprehensive desktop study, in conjunction with the results from the field survey, suggest there is a medium-high confidence in the information provided. The survey ensured that there was suitable ground-truth coverage of the open-spaces and natural habitats, and ecosystems were assessed to obtain a general species (fauna and flora) overview and the major current impacts were observed. Additional valuable data on fauna and flora must be gathered in an appropriate seasonal survey (ideally spring: September or October).

The majority of the Project Area is made up of natural habitats which remain intact and in good condition, with the only notable impact being some isolated 4x4 trails. The majority of the site (except for agricultural areas) is currently managed for conservation. CBA and ESA areas are considered to be intact with little to no current impacts. Flora and fauna SCC were confirmed for the Project Area during the assessment, and additional records are expected due to suitable habitat present on site.

The Project Area was identified with the screening tool as possessing a 'Very High' sensitivity within a Terrestrial Biodiversity context, with the Project Area made up of CBA 1, CBA 2, ESA and NPAES Focus Areas. This is largely supported: the outcome of the SEI assessment suggests that the Rocky Desert features should be assigned a 'Very High' sensitivity. The following aspects support this classification:

- Intact portions of natural habitat that function as CBA 1 and CBA 2 as per the Northern Cape Biodiversity Areas spatial dataset;
- Low resilience of the habitat;
- Connectivity to natural areas within the landscape; and
- Protected flora species present, and fauna and flora SCC occurring with additional species expected.

The ecological integrity, importance and functioning of these areas play a crucial role and an important habitat for various fauna and flora. The preservation of these systems is the most important aspect to consider for the proposed project, even more so due to the sensitivity of the areas. These habitats need to be protected and improved due to the role of this crucial and limited habitat. It is of vital importance that a search a rescue along with permit applications be done prior to the commencement of the development for any red listed and provincially protected species. Moreover, areas of 'Very High' and 'High' SEI should be avoided wherever possible and these drilling locations relocated (Figure 5-1). If not possible, it should be noted that any development within CBA areas require an offset as per the National Offset Guidelines.

Development within confirmed; 'Very High' and 'High' sensitivity areas is not considered favourably by the regulating authorities, and implementation of the mitigation hierarchy must be demonstrated.

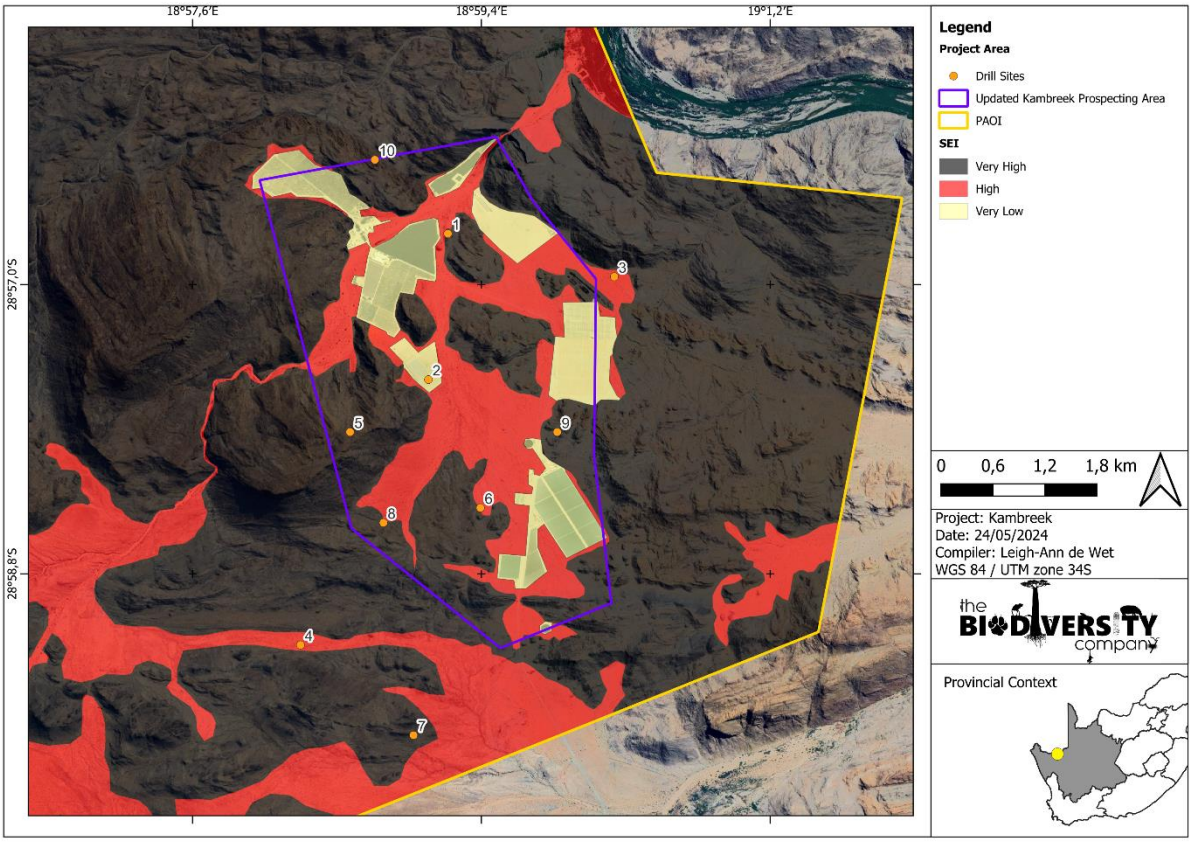


Figure 5-1 Map illustrating the SEI along with the 10 proposed drilling locations.

5.1 Impact Statement

An impact statement is required as per the NEMA regulations with regard to the proposed development. The main expected impacts of the proposed infrastructure will include the following:

- Habitat loss and fragmentation;
- Loss of CBA 1, CBA 2, ESA and NPAES Focus Area;
- Loss of protected flora and flora and fauna SCC;
- Degradation of surrounding habitat;
- Disturbance and displacement caused during the construction and operational phases; and
- Direct mortality during the construction phase.

5.2 Specialist Opinion

Considering the location of the proposed development in a CBA area as well as the area currently being managed for conservation as well as being part of the planned expansion for the Augrabies National Park, the proposed development is considered possible only if all mitigation measures provided in this and other specialist reports are implemented, as well as the following:

- CBA 1 areas must be avoided;

- CBA 2 areas must be avoided where possible;
- An offset must be developed for the proposed development;
- A final layout including all roads, site camps and associated infrastructure of the proposed development must be supplied and the impacts associated with that layout must be properly assessed;
- A site visit must be undertaken in spring (September/ October) to properly assess floral species composition and SCC;
- A rehabilitation plan must be compiled and implemented for all areas affected by construction and project activities that will not be cultivated; and
- An AIP management plan must be compiled and implemented throughout the PAOI.

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7 Appendix Items

7.1 Appendix A: Methods

7.1.1 Desktop Dataset Assessment

7.1.1.1 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:
    - Red List of Ecosystems (RLE) 2021 – The list was first published in 2011 and has since been substantially revised by authors Dr Andrew Skowno and Mrs Maphale Monyeki (SANBI, 2022). This list is based on assessments that followed the International Union for Conservation of Nature (IUCN) Red List of Ecosystems Framework (version 1.1) and covers all 456 terrestrial ecosystem types described in South Africa by Mucina and Rutherford (2006). A total of 120 of the 456 terrestrial ecosystem types assessed are categorised as threatened and together make up approximately 10% of the remaining natural habitat in the country. Of these 120 ecosystem types, 55 are Critically Endangered (CR), 51 Endangered (EN) and 14 are Vulnerable (VU). The remainder are categorised as Least Concern (LC) (SANBI, 2022; Skowno & Monyeki, 2021).
    - 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) and South Africa Conservation Areas Database (SACAD) (DFFE, 2023a) – The South African Protected Areas Database (SAPAD) and South Africa Conservation Areas Database (SACAD) 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. The database 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, 2022b) – 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.

- Conservation/Biodiversity Sector Plans:

  - The Northern Cape Department of Environment and Nature Conservation has developed the Northern Cape CBA Map which identifies biodiversity priority areas for the province, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

  - 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.

- Important Bird and Biodiversity Areas (BirdLife South Africa, 2015) – Important Bird and Biodiversity Areas (IBAs) constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and

- Freshwater Ecology:

  - Strategic Water Source Areas (SWSAs) (Le Maitre *et al,* 2018) – 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.

- 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.

7.1.2 Desktop Flora Assessment

The desktop flora assessment encompassed an assessment of all the vegetation units and habitat types within the Project Area, as well as the identification of expected plant species and any locally occurring flora SCC.

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 iNaturalist (iNat) database was accessed to compile a list of expected flora species within the proposed development area and surrounding landscape (Figure 7-1). 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.

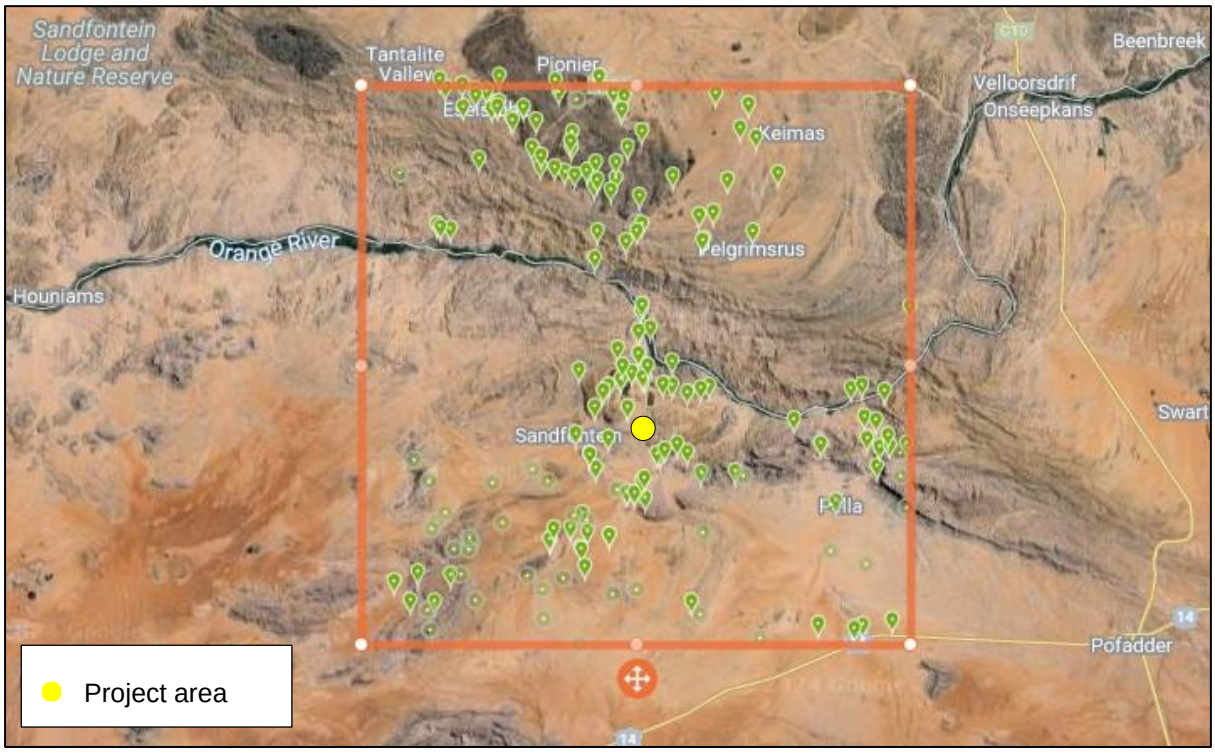

Figure 7-1 Map illustrating extent of area used to obtain the expected flora species list from the iNaturalist (iNat) database. The yellow dot indicates the approximate location of the Project Area.

The latest information regarding provincially, and nationally protected flora was obtained from the following published legislative sources:

- Provincially Protected Plant Species (Schedules 1 and 2 of the Northern Cape Nature Conservation Act No. 9 of 2009);

- Nationally Protected plant species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA No. 10 of 2004); and

- List of Nationally Protected Tree Species (DEFF, 2022).

7.1.3 Desktop Fauna Assessment

The non-volant faunal desktop assessment comprised of the following:

- Compiling an expected mammal list generated from the MammalMap database of the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023c, http://vmus.adu.org.za/) using the 2818DD, 2819CC and 2918BB degree squares.

- Compiling an expected amphibian list generated from the FrogMap database of the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023a, http://vmus.adu.org.za/) using the 2818DD, 2819CC and 2918BB degree squares.;

- Compiling an expected reptile list generated from the ReptileMap database of the Animal Demography Unit (Fitzpatrick Institute of African Ornithology, 2023b, http://vmus.adu.org.za/) using the 2818DD, 2819CC and 2918BB degree squares.; and

- Compiling an expected avifauna list generated from the SABAP2 database (https://sabap2.birdmap.africa/coverage/project/sabap2) for pentads 2850_1855, 2850_1900, 2855_1855, 2855_1900, 2900_1850, 2900_1855 and 2900_1900.

- South Africa's official site for Species Information and National Red Lists (SANBI, 2022) was used to provide the most current national Red-List status of fauna. The latest information regarding provincially, and nationally protected fauna was obtained from the following published legislative lists:

- Provincially Protected Wildlife Species (Schedules 1 and 2 of the Northern Cape Nature Conservation Act No. 9 of 2009); and

- Nationally Protected Wildlife species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA No. 10 of 2004).

7.1.4 Vegetation & Flora Survey

The fieldwork and sample sites were placed within targeted areas (i.e., target sites) 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 was, therefore, to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps (confirmed during the field survey). The floristic diversity and search for protected plants and flora SCC were conducted through timed meanders within representative habitat units delineated during the desktop assessment. Emphasis was placed on sensitive habitats, especially those overlapping with the Project Area.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting protected plants and flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling observed flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was 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 were made regarding current impacts (e.g., roads, erosion etc.), and this included the subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, rock outcrops etc.). In addition, opportunistic observations were made while navigating through the area.

Species were identified in field wherever possible. If they could not be identified in the field, field guides and texts were used. Relevant field guides and texts consulted for identification purposes included, but was not limited, to the following:

- Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al.*, 2015);
- Karoo: South African Wild Flower Guide 6. (Shearing 2008);
- Problem Plants and Alien Weeds of South Africa (Bromilow, 2018);
- Field Guide to Succulents in Southern Africa (Smith *et al.*, 2017);
- Field Guide to Wildflowers of South Africa (Manning, 2009); and
- iNaturalist. Available at https://www.inaturalist.org/home

7.1.4.1 Fauna Survey

The faunal field survey utilised a variety of sampling techniques, including but not limited to:

- Visual and auditory searches: This involves strategic meandering and the use of binoculars and specialist camera equipment to view species from a distance without them being disturbed;
- Active hand-searches: Used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.); and
- The identification of tracks and signs, and listening to species calls.

Relevant field guides and texts consulted for identification purposes included the following:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);

- 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
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

7.2 Appendix B: Terrestrial Site Ecological Importance

The different habitat types within the PAOI were delineated and identified based on observations made during the field survey, and information from available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of SCC 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 in the Project Area) and Receptor Resilience (RR) (its resilience to impacts).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor. The criteria for the CI and FI ratings are provided in Table 7-1 and Table 7-2 respectively.

Table 7-1 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 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 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 7-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts, with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts, with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. 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 7-3.

Table 7-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance		Conservation Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Functional Integrity	**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 7-4.

Table 7-4 Summary of Receptor 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.

After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 7-5.

Table 7-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Receptor Resilience	**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 7-6.

Table 7-6 Guideline for interpreting Site Ecological Importance in the context of proposed 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.

7.3 Appendix C: Definitions

7.3.1 Species of Conservation Concern

In accordance with the National Red List of South African Plants website, managed and maintained by the South African National Biodiversity Institute (SANBI), a Species of Conservation Concern (SCC) is a species that has a high conservation importance in terms of preserving South Africa's rich biodiversity. This classification covers a range of red list categories as illustrated in Figure 7-2 below.

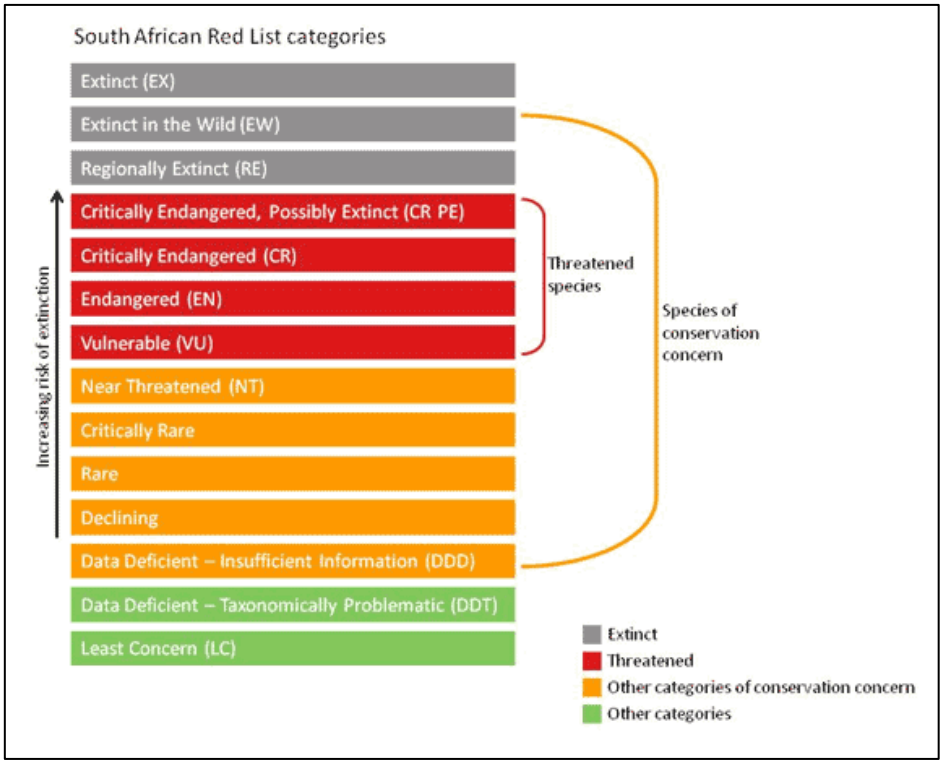

Figure 7-2 Threatened species and Species of Conservation Concern (SANBI, 2016)

South Africa uses the internationally endorsed International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN, 2012). This scientific system is designed to measure species' risk of extinction and its purpose is to highlight those species that are in need of critical conservation action. As this system has been adopted from the IUCN, the definition of an SCC as described and categorised above is extended to all red list classifications relevant to fauna as well as the IUCN categories, for the purposes of this report.

7.3.2 Protected Species

Protected species include both flora and fauna species that are protected according to some form of relevant legislation, be it provincial, national, or international. Provincial legislation may include that published in the form of a provincial ordinance, bill, or act, and national legislation includes that which is published in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or the National Forests Act (Act No. 84 of 1998). Relevant international legislation includes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2021).

7.3.3 Project Area of Influence

The Project Area of Influence (PAOI) encompasses the geographical extent of the potential impacts of the proposed development on the receiving environment. Essentially, the PAOI is defined according to the important ecosystem processes and functions that may be plausibly affected by the proposed

development and its associated activities. The PAOI was considered to be the proposed footprint of the solar PV infrastructure for the site (Figure 7-3).

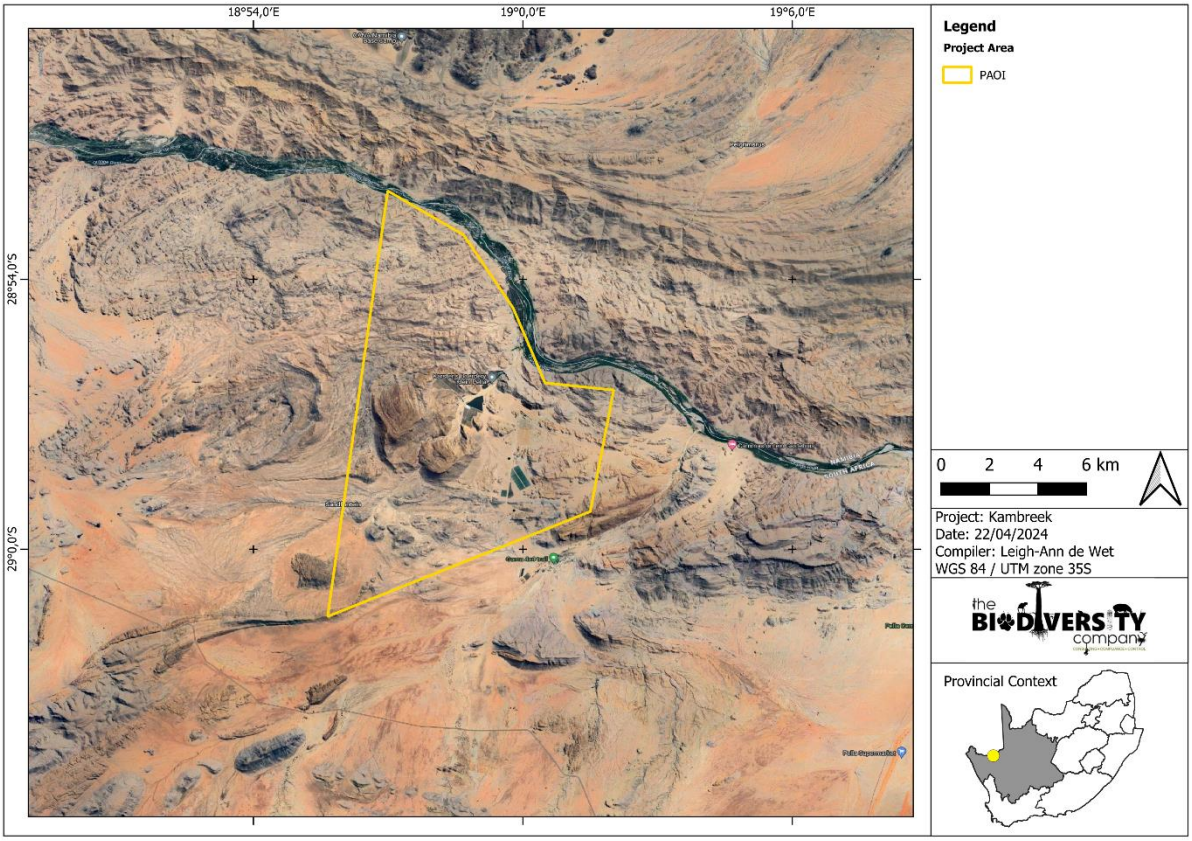

Figure 7-3 Project Area of Influence (PAOI).

7.5 Appendix D: Expected Species Lists

7.5.1 Expected Flora Species

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Acanthaceae	*Acanthopsis hoffmannseggiana*	Gariep Spikeviolet	Indigenous	DD			
Acanthaceae	*Barleria lancifolia lancifolia*	Butterfly Bushviolet	Indigenous	NE			
Acanthaceae	*Barleria rigida*	Scorpion Bushviolet	Indigenous	LC			
Acanthaceae	*Blepharis furcata*	Fork Lashes	Indigenous	LC			
Acanthaceae	*Blepharis mitrata*	Stack Lashes	Indigenous	LC			
Acanthaceae	*Justicia dregei*	Skaapbossie	Indigenous	LC			
Acanthaceae	*Justicia guerkeana*		Indigenous	LC			
Acanthaceae	*Petalidium setosum*		Indigenous	LC			
Acanthaceae	*Pogonospermum patulum*		Indigenous	NE			
Aizoaceae	*Ebracteola fulleri*		Indigenous	LC	Sch2		
Aizoaceae	*Lapidaria margaretae*		Indigenous	LC	Sch2		
Aizoaceae	*Lithops bromfieldii*		Indigenous	LC	Sch2		
Aizoaceae	*Mesembryanthemum hypertrophicum*	Yellowfinger Icefig	Indigenous	LC	Sch2		
Aizoaceae	*Mesembryanthemum lignescens*		Indigenous	LC	Sch2		
Aizoaceae	*Mesembryanthemum subnodosum*	Gariep Asbush	Indigenous	LC	Sch2		
Aizoaceae	*Ruschia centrocapsula*		Indigenous	LC	Sch2		
Aizoaceae	*Ruschia muricata*		Indigenous; Endemic	LC	Sch2		
Aizoaceae	*Schwantesia ruedebuschii*		Indigenous	LC	Sch2		
Aizoaceae	*Sesuvium sesuvioides*	Oukraal Seapurslane	Indigenous	LC	Sch2		
Amaranthaceae	*Atriplex vestita*	Cape Saltbush	Indigenous	LC			
Amaranthaceae	*Calicorema capitata*		Indigenous; Endemic	LC			
Amaranthaceae	*Hermbstaedtia glauca*	Buckwood	Indigenous	LC			
Anacampserotaceae	*Anacampseros albissima*		Indigenous	LC			
Anacampserotaceae	*Anacampseros papyracea namaensis*	Nama Gansmis	Indigenous	LC			
Anacampserotaceae	*Anacampseros quinaria alstonii*		Indigenous	EN			
Anacampserotaceae	*Anacampseros recurvata*		Indigenous; endemic	LC			
Anacardiaceae	*Ozoroa dispar*	Namaqua Resin Tree	Indigenous; Endemic	LC	Sch1		
Anacardiaceae	*Searsia burchellii*	Karoo Kunirhus	Indigenous	LC			
Anacardiaceae	*Searsia populifolia*	Gariep Currantrhus	Indigenous	LC			
Apiaceae	*Deverra aphylla*	Broom Guezah	Indigenous	LC	Sch2		
Apocynaceae	*Carissa haematocarpa*	Karoo Num-num	Indigenous	LC	Sch2		
Apocynaceae	*Cryptolepis decidua*		Indigenous	LC	Sch2		
Apocynaceae	*Hoodia gordonii*	Wild Ghaap	Indigenous	DD	Sch1	X	
Apocynaceae	*Microloma incanum*	Grey Minimouth	Indigenous	LC	Sch2		

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Apocynaceae	*Pachypodium namaquanum*	Halfmens	Indigenous	CR	Sch1		
Apocynaceae	*Pergularia daemia garipensis*		Indigenous	LC	Sch2		
Aristolochiaceae	*Hydnora africana*	Milkbush Jackalskos	Indigenous	LC			
Asphodelaceae	*Aloe gariepensis*	Gariep aloe	Indigenous	LC	Sch2		
Asphodelaceae	*Aloidendron dichotomum*	Quiver Tree	Indigenous	VU	Sch1		
Asteraceae	*Arctotis leiocarpa*	Karoo African Daisy	Indigenous; Near-endemic	LC			
Asteraceae	*Berkheya chamaepeuce*	Tree Thistlethorn	Indigenous	LC			
Asteraceae	*Berkheya spinosissima spinosissima*	Common Horrid African Thistle	Indigenous	LC			
Asteraceae	*Cineraria platycarpa*	Purple Cineraria	Indifenous; Endemic	LC			
Asteraceae	*Dicoma capensis*	Common Karmedik	Indigenous; Endemic	LC			
Asteraceae	*Didelta carnosa carnosa*	Green Dune Saladbush	Indigenous	LC			
Asteraceae	*Dimorphotheca pinnata*	Jackal Daisy	Indigenous	LC			
Asteraceae	*Eriocephalus ambiguus*		Indigenous	LC			
Asteraceae	*Eriocephalus scariosus*	Nama Kapok	Indigenous	LC			
Asteraceae	*Euryops subcarnosus vulgaris*	Common Sweet True-Eye	Indigenous	LC			
Asteraceae	*Gazania lichtensteinii*	Yellow Gazania	Indigenous	LC			
Asteraceae	*Geigeria pectidea*	River Vomitdaisy	Indigenous	LC			
Asteraceae	*Geigeria vigintisquamea*	Nama Vomitdaisy	Indigenous	LC			
Asteraceae	*Gorteria warmbadica*	Flatcapsule Beetledaisy	Indigenous	NE			
Asteraceae	*Helichrysum gariepinum*		Indigenous	LC			
Asteraceae	*Kleinia longiflora*	paintbrush flower	Indigenous	LC			
Asteraceae	*Litogyne gariepina*	Dwarf Sage	Indigenous	LC			
Asteraceae	*Namibithamnus obionifolius*		Indigenous	LC			
Asteraceae	*Osteospermum microcarpum*	Miniseed Boneseed	Indigenous	LC			
Asteraceae	*Othonna cyclophylla*		Indigenous	LC			
Asteraceae	*Othonna lasiocarpa*		Indigenous	LC			
Asteraceae	*Pegolettia oxyodonta*	Nama Draaibos	Indigenous	LC			
Asteraceae	*Pegolettia retrofracta*	Common Draaibos	Indigenous	LC			
Asteraceae	*Pentatrichia petrosa*		Indigenous	LC			
Asteraceae	*Pteronia ciliata*		Indigenous	LC			
Asteraceae	*Pteronia leucoclada*		Indigenous	LC			
Asteraceae	*Pteronia lucilioides*		Indigenous	LC			
Asteraceae	*Senecio sisymbriifolius*		Indigenous	LC			
Bignoniaceae	*Rhigozum trichotomum*	Trithorn	Indigenous	LC			
Boraginaceae	*Codon royenii*	White Nectarcup	Indigenous	LC			
Boraginaceae	*Heliotropium ciliatum*	Lash String-of-Stars	Indigenous	LC			
Boraginaceae	*Trichodesma africanum*	African Barbbell	Indigenous	LC			

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Boraginaceae	*Wellstedia dinteri dinteri*		Indigenous	LC			
Brassicaceae	*Heliophila deserticola deserticola*		Indigenous	LC			
Brassicaceae	*Heliophila trifurca*	Cow Sunspurge	Indigenous	LC			
Burseraceae	*Commiphora gracilifrondosa*	Karee Corkwood	Indigenous	LC			
Cactaceae	*Cylindropuntia fulgida mamillata*	Boxing Glove Cactus	Indigenous	NE			
Capparaceae	*Boscia albitrunca*	Shepherds tree	Indigenous	LC	Sch2		X
Capparaceae	*Boscia foetida*	Stink Shepherdstree	Indigenous	LC	Sch2		
Capparaceae	*Boscia foetida foetida*	Foetid Bush	Indigenous	LC	Sch2		
Casuarinaceae	*Casuarina cunninghamiana*	Beefwood	Not indigenous; Naturalised; Invasive	NE			
Celastraceae	*Gymnosporia linearis lanceolata*	Gariep Narrow-Leaved	Not indigenous; Naturalised; Invasive	LC	Sch2		
Cleomaceae	*Cleome angustifolia diandra*	Yellow Mouse Whiskers	Indigenous	LC			
Cleomaceae	*Cleome foliosa lutea*	Yellow Leafy Spindlepod	Indigenous	LC			
Cleomaceae	*Cleome kalachariensis*		Indigenous	LC			
Cleomaceae	*Cleome oxyphylla oxyphylla*		Indigenous	LC			
Colchicaceae	*Ornithoglossum undulatum*	Karoo slangkop	Indigenous	LC			
Colchicaceae	*Ornithoglossum vulgare*	Common Slangkop	Indigenous	LC			
Crassulaceae	*Adromischus diabolicus*		Indigenous	DD			
Crassulaceae	*Cotyledon orbiculata*	varkoor	Indigenous; Endemic	LC			
Crassulaceae	*Crassula deltoidea*	Silver-beads	Indigenous; Endemic	LC			
Crassulaceae	*Crassula exilis sedifolia*		Indigenous	LC			
Crassulaceae	*Crassula muscosa muscosa*	Common Bootlaces	Indigenous	NE			
Crassulaceae	*Crassula namaquensis*		Indigenous; Endemic	LC			
Crassulaceae	*Crassula sericea*		Indigenous	LC			
Crassulaceae	*Tylecodon paniculatus*	Buttertree	Indigenous	LC			
Crassulaceae	*Tylecodon rubrovenosus*		Indigenous	LC			
Cucurbitaceae	*Coccinia rehmannii*	Cucumber Bushpumpkin	Indigenous	LC			
Cucurbitaceae	*Corallocarpus welwitschii*		Indigenous	NE			
Cucurbitaceae	*Cucumis rigidus*	Hard Cucumber	Indigenous	LC			
Cucurbitaceae	*Cucumis sagittatus*	Goat Cucumber	Indigenous	LC			
Cyperaceae	*Cyperus marginatus*	Matting Sedge	Indigenous	LC			
Didiereaceae	*Portulacaria fruticulosa*	Dwarf Porkbush	Indigenous	LC			
Didiereaceae	*Portulacaria namaquensis*	Namaqua Porkbush	Indigenous	LC			
Ebenaceae	*Euclea pseudebenus*	Black Guarri	Indigenous	LC			X
Ebenaceae	*Euclea undulata*	Common Guarri	Indigenous	LC			

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Euphorbiaceae	*Euphorbia avasmontana*	Slender Candelabra Naboom	Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia gariepina gariepina*		Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia glanduligera*	Namib Milkweed	Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia gregaria*	Karas Milkbush	Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia guerichiana*	Paperbark Woody-euphorbia	Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia mauritanica*	Yellow Milkbush	Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia spinea*		Indigenous	LC	Sch2		
Euphorbiaceae	*Euphorbia virosa*	Namib Candelabra Naboom	Indigenous	LC	Sch2		
Fabaceae	*Adenolobus garipensis*	Blue Butterflyleaf	Indigenous	LC			
Fabaceae	*Calobota sericea*	Silver-pea	Indigenous	LC			
Fabaceae	*Cullen tomentosum*	Blue-Eyes	Indigenous; Endemic	LC			
Fabaceae	*Indigastrum argyroides*		Indigenous	LC			
Fabaceae	*Indigofera heterotricha*	Glandhair Indigo	Indigenous	LC			
Fabaceae	*Indigofera pungens*	Spiky Indigo	Indigenous	LC			
Fabaceae	*Parkinsonia africana*	Greenhair Tree	Indigenous	LC			
Fabaceae	*Rhynchosia totta*	Carpet Snoutbean	Indigenous	LC			
Fabaceae	*Schotia afra angustifolia*	Small-leaf Karoo Boerbean	Indigenous	LC			
Fabaceae	*Senegalia erubescens*	Blue Thorn	Indigenous	LC			
Fabaceae	*Senegalia mellifera detinens*	Black Thorn	Indigenous	LC			
Fabaceae	*Tephrosia dregeana dregeana*	Namaqua Hoarypea	Indigenous	LC			
Fabaceae	*Vachellia erioloba*	Camel Thorn	Indigenous	LC			X
Fabaceae	*Vachellia xanthophloea*	fever tree	Indigenous	LC			
Geraniaceae	*Monsonia parvifolia*		Indigenous	LC			
Geraniaceae	*Pelargonium spinosum*	Gifdoring	Indigenous	LC	Sch1		
Geraniaceae	*Pelargonium xerophyton*		Indigenous	LC			
Gisekiaceae	*Gisekia africana africana*	Ostrich Herb	Indigenous	LC			
Gisekiaceae	*Gisekia pharnaceoides*		Indigenous	LC			
Iridaceae	*Gladiolus saccatus*	Pouch Pypie	Indigenous	LC	Sch2		
Kewaceae	*Kewa salsoloides*	Sour Saltsorrel	Present	LC			
Lamiaceae	*Acrotome pallescens*	Napped Horsefright	Indigenous	LC			
Lamiaceae	*Salvia garipensis*	Gariep Sage	Indigenous	LC			
Limeaceae	*Limeum aethiopicum lanceolatum*	Aarbossie	Indigenous	LC			
Limeaceae	*Limeum dinteri*	Palestem Lizardfoot	Indigenous	LC			
Limeaceae	*Limeum myosotis*	Eyebright Lizardfoot	Indigenous	LC			
Loasaceae	*Kissenia capensis*	Sandpaper bush	Indigenous	LC			
Loranthaceae	*Tapinanthus oleifolius*	Namnambush	Indigenous	LC			
Malvaceae	*Abutilon pycnodon*	Bellflower	Indigenous	LC			

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Malvaceae	*Hermannia minutiflora*		Indigenous	LC			
Malvaceae	*Hermannia spinosa*	Spiny Dollsrose	Indigenous	LC			
Malvaceae	*Hermannia stricta*	desert rose	Indigenous	LC			
Malvaceae	*Hibiscus elliottiae*		Indigenous	LC			
Malvaceae	*Hibiscus engleri*	Wild Hibiscus	Indigenous	LC			
Meliaceae	*Nymania capensis*	Karoo Lanterns	Indigenous	LC			
Menispermaceae	*Antizoma miersiana*		Indigenous	LC			
Molluginaceae	*Hypertelis cerviana*	threadstem carpetweed	Indigenous	NE			
Molluginaceae	*Hypertelis spergulacea*	Cluster Saltsorrel	Indigenous	LC			
Montiniaceae	*Montinia caryophyllacea*	Pepperbush	Indigenous	LC			
Moraceae	*Ficus cordata*	Namaqua Fig	Indigenous	LC			
Neuradaceae	*Grielum humifusum*	Paper Snotblom	Indigenous	LC			
Nyctaginaceae	*Phaeoptilum spinosum*	brittle thorn	Indigenous	LC			
Oxalidaceae	*Oxalis extensa*		Indigenous	DD	Sch2		
Oxalidaceae	*Oxalis foveolata*		Indigenous	LC	Sch2		
Papaveraceae	*Argemone ochroleuca*	Mexican Poppy	Indigenous; Endemic	NE			
Pedaliaceae	*Rogeria longiflora*	White Djirrie	Not indigenous; Naturalised; Invasive	LC			
Pedaliaceae	*Sesamum capense*	Blackeye Sesame	Indigenous	LC			
Phyllanthaceae	*Phyllanthus parvulus garipensis*		Indigenous	LC			
Plumbaginaceae	*Dyerophytum africanum*		Indigenous	LC			
Poaceae	*Eragrostis nindensis*	Wether Love Grass	Indigenous	LC			
Poaceae	*Oropetium capense*	Dwarf Grass	Indigenous	LC			
Poaceae	*Phragmites australis*	common reed	Indigenous	LC			
Poaceae	*Phragmites australis australis*	common reed	Indigenous	LC			
Poaceae	*Schmidtia kalahariensis*	Kalahari Sour Grass	Indigenous	LC			
Poaceae	*Stipagrostis namaquensis*	River Bushman Grass	Indigenous	LC			
Polygalaceae	*Polygala seminuda*		Indigenous	LC			
Pteridaceae	*Anogramma leptophylla*	Jersey fern	Indigenous	LC			
Pteridaceae	*Cheilanthes deltoidea*		Indigenous	LC			
Rhamnaceae	*Ziziphus mucronata*	buffalo-thorn	Indigenous; Endemic	LC			
Rubiaceae	*Plocama crocyllis*		Indigenous	LC			
Salicaceae	*Salix mucronata mucronata*	Safsaf Cape Willow	Indigenous	LC			
Santalaceae	*Lacomucinaea lineata*	White Storm	Indigenous	LC			
Santalaceae	*Viscum rotundifolium*	Redberry Mistletoe	Indigenous	LC			
Sapindaceae	*Pappea capensis*	Jacket plum	Indigenous	LC			
Scrophulariaceae	*Antherothamnus pearsonii*	False-Honeythorn	Indigenous	LC			

Family	Scientific name	Common name	Ecology	Redlist	Provincially protected	TOPs	Protected Trees
Scrophulariaceae	*Anticharis juncea*		Indigenous	NE			
Scrophulariaceae	*Anticharis scoparia*		Indigenous	LC			
Scrophulariaceae	*Aptosimum lineare*	Bushveld Carpet Flower	Indigenous	LC			
Scrophulariaceae	*Aptosimum spinescens*	Thorn Karooviolet	Indigenous	LC			
Scrophulariaceae	*Diascia engleri*		Indigenous	LC	Sch2		
Scrophulariaceae	*Gomphostigma virgatum*	Common Otterbush	Indigenous	LC			
Scrophulariaceae	*Jamesbrittenia aridicola*		Indigenous	LC	Sch2		
Scrophulariaceae	*Jamesbrittenia maxii*	Painted Jaybee	Indigenous	LC	Sch2		
Scrophulariaceae	*Jamesbrittenia megadenia*		Indigenous	LC	Sch2		
Scrophulariaceae	*Jamesbrittenia ramosissima*	Desert Jaybee	Indigenous	LC	Sch2		
Scrophulariaceae	*Lyperia tristis*	Sad Tearbush	Indigenous	LC			
Scrophulariaceae	*Nemesia fleckii*		Indigenous	DD	Sch2		
Scrophulariaceae	*Peliostomum viscosum*		Indigenous	LC			
Solanaceae	*Lycium bosciifolium*	Bushmanland Honeythorn	Indigenous	LC			
Solanaceae	*Nicotiana glauca*	tree tobacco	Indigenous	NE			
Solanaceae	*Solanum burchellii*	Lemoenbossie	Not indigenous; Naturalised; Invasive	LC			
Solanaceae	*Solanum capense*	Horrid Snake-apple	Indigenous	LC			
Tamaricaceae	*Tamarix usneoides*	Wild Tamarisk	Indigenous	LC			
Urticaceae	*Forsskaolea candida*	Namib Nettle	Indigenous	LC			
Verbenaceae	*Chascanum garipense*	White Chascanum	Indigenous	LC			
Zygophyllaceae	*Augea capensis*	Willybush	Indigenous	LC			
Zygophyllaceae	*Sisyndite spartea*	Desert Broom	Indigenous	LC			
Zygophyllaceae	*Tetraena decumbens*		Indigenous	LC			
Zygophyllaceae	*Tetraena rigida*		Indigenous	LC			
Zygophyllaceae	*Tetraena simplex*	simple-leaved bean caper	Indigenous	LC			
Zygophyllaceae	*Tetraena stapffii*	Dollar bush	Indigenous	NE			
Zygophyllaceae	*Tribulus cristatus*	Flanged Devilthorn	Indigenous	LC			

7.5.2 Expected Mammal Species

Family	Scientific name	Common name	Red List (Child et al 2016)
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	LC
Bovidae	*Oreotragus oreotragus*	Klipspringer	LC
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	LC
Canidae	*Canis mesomelas*	Black-backed Jackal	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox	LC
Canidae	*Vulpes chama*	Cape Fox	LC
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	LC
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC
Felidae	*Panthera pardus*	Leopard	VU
Hyaenidae	*Proteles cristata*	Aardwolf	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus capensis*	Cape Hare	LC
Macroscelididae	*Elephantulus rupestris*	Western Rock Elephant Shrew	LC
Macroscelididae	*Macroscelides proboscideus*	Short-eared Elephant Shrew	LC
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	LC
Muridae	*Desmodillus auricularis*	Cape Short-tailed Gerbil	LC
Muridae	*Gerbilliscus paeba*	Paeba Hairy-footed Gerbil	LC
Muridae	*Parotomys brantsii*	Brants's Whistling Rat	LC
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	LC
Nesomyidae	*Petromyscus collinus*	Pygmy Rock Mouse	LC
Petromuridae	*Petromus typicus*	Dassie Rat	LC
Procaviidae	*Procavia capensis capensis*	Cape Rock Hyrax	LC
Rhinolophidae	*Rhinolophus capensis*	Cape Horseshoe Bat	LC
Sciuridae	*Xerus inauris*	South African Ground Squirrel	LC

7.5.3 Expected Reptile Species

Family	Scientific name	Common name	Red List (Bates at al 2014)
Agamidae	*Agama aculeata aculeata*	Common Ground Agama	LC
Agamidae	*Agama atra*	Southern Rock Agama	LC
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	LC
Colubridae	*Dipsina multimaculata*	Dwarf Beaked Snake	LC
Colubridae	*Telescopus semiannulatus polystictus*	Western Tiger Snake	LC
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	LC
Cordylidae	*Platysaurus broadleyi*	Augrabies Flat Lizard	LC
Elapidae	*Aspidelaps lubricus lubricus*	Coral Shield Cobra	LC
Elapidae	*Naja nivea*	Cape Cobra	LC
Gekkonidae	*Chondrodactylus angulifer*	Giant Ground Gecko	LC
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	LC
Gekkonidae	*Chondrodactylus laevigatus*	Fischer's Thick-toed Gecko	NE
Gekkonidae	*Lygodactylus bradfieldi*	Bradfield's Dwarf Gecko	LC
Gekkonidae	*Pachydactylus atorquatus*	Augrabies Gecko	LC
Gekkonidae	*Pachydactylus haackei*	Haacke's Gecko	LC
Gekkonidae	*Pachydactylus latirostris*	Quartz Gecko	LC
Gekkonidae	*Pachydactylus montanus*	Namaqua Mountain Gecko	LC
Gekkonidae	*Pachydactylus punctatus*	Speckled Gecko	LC
Gekkonidae	*Ptenopus garrulus maculatus*	Spotted Barking Gecko	LC
Gerrhosauridae	*Cordylosaurus subtessellatus*	Dwarf Plated Lizard	LC
Lacertidae	*Meroles knoxii*	Knox's Desert Lizard	LC
Lacertidae	*Meroles suborbitalis*	Spotted Desert Lizard	LC
Lacertidae	*Pedioplanis inornata*	Plain Sand Lizard	LC
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common Sand Lizard	LC
Lamprophiidae	*Boaedon mentalis*	Large-eyed House Snake	NE
Lamprophiidae	*Prosymna frontalis*	Southwestern Shovel-snout	LC
Lamprophiidae	*Psammophis leightoni*	Cape Sand Snake	VU
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	LC
Scincidae	*Acontias tristis*	Namaqua Dwarf Legless Skink	LC
Scincidae	*Trachylepis occidentalis*	Western Three-striped Skink	LC
Scincidae	*Trachylepis sulcata sulcata*	Western Rock Skink	LC
Scincidae	*Trachylepis variegata*	Variegated Skink	LC
Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	NE
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	LC
Viperidae	*Bitis arietans arietans*	Puff Adder	LC

7.5.4 Expected Amphibian Species

Family	Scientific name	Common name	Red List (Minter et at all 2004)
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	LC
Bufonidae	*Vandijkophrynus robinsoni*	Paradise Toad	LC
Microhylidae	*Phrynomantis annectens*	Marbled Rubber Frog	LC
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	LC
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	LC

7.6 Appendix E: Recorded Plants List

Family	Scientific name	Common name	Ecology	Red List	Provincial	Protected Trees
Acanthaceae	*Acanthopsis hoffmannseggiana*	Gariep Spikeviolet	Indigenous	DD		
Acanthaceae	*Barleria lancifolia*	Butterfly Bushviolet	Indigenous	LC		
Acanthaceae	*Barleria rigida*	Scorpion Bushviolet	Indigenous	LC		
Acanthaceae	*Blepharis furcata*	Fork Lashes	Indigenous	LC		
Acanthaceae	*Blepharis mitrata*	Stack Lashes	Indigenous	LC		
Acanthaceae	*Justicia guerkeana*		Indigenous	LC		
Acanthaceae	*Petalidium setosum*		Indigenous	LC		
Acanthaceae	*Pogonospermum patulum*		Indigenous	NE		
Aizoaceae	*Mesembryanthemum subnodosum*	Gariep Asbush	Indigenous	LC	Sch2	
Aizoaceae	*Schwantesia ruedebuschii*		Indigenous	LC	Sch2	
Aizoaceae	*Sesuvium sesuvioides*	Oukraal Seapurslane	Indigenous	LC	Sch2	
Amaranthaceae	*Atriplex vestita*	Cape Saltbush	Indigenous	LC		
Anacampserotaceae	*Anacampseros recurvata*		Indigenous; endemic	LC		
Anacardiaceae	*Searsia populifolia*	Gariep Currantrhus	Indigenous	LC		
Apocynaceae	*Cryptolepis decidua*		Indigenous	LC		
Apocynaceae	*Microloma incanum*	Grey Minimouth	Indigenous	LC	Sch2	
Apocynaceae	*Pergularia daemia garipensis*		Indigenous	LC	Sch2	
Aristolochiaceae	*Hydnora africana*	Milkbush Jackalskos	Indigenous	LC		
Asteraceae	*Berkheya chamaepeuce*	Tree Thistlethorn	Indigenous	LC		
Asteraceae	*Berkheya spinosissima spinosissima*	Common Horrid African Thistle	Indigenous	LC		
Asteraceae	*Didelta carnosa carnosa*	Green Dune Saladbush	Indigenous	LC		
Asteraceae	*Euryops subcarnosus vulgaris*	Common Sweet True-Eye	Indigenous	LC		
Asteraceae	*Geigeria vigintisquamea*	Nama Vomitdaisy	Indigenous	LC		
Asteraceae	*Kleinia longiflora*	paintbrush flower	Indigenous	LC		
Asteraceae	*Osteospermum microcarpum*	Miniseed Boneseed	Indigenous	LC		
Asteraceae	*Othonna cyclophylla*		Indigenous	LC		
Asteraceae	*Pegolettia oxyodonta*	Nama Draaibos	Indigenous	LC		
Asteraceae	*Pegolettia retrofracta*	Common Draaibos	Indigenous	LC		
Asteraceae	*Pentatrichia petrosa*		Indigenous	LC		
Bignoniaceae	*Rhigozum trichotomum*	Trithorn	Indigenous	LC		
Boraginaceae	*Codon royenii*	White Nectarcup	Indigenous	LC		
Boraginaceae	*Trichodesma africanum*	African Barbbell	Indigenous	LC		
Boraginaceae	*Wellstedia dinteri*		Indigenous	LC		
Boraginaceae	*Wellstedia dinteri dinteri*		Indigenous	LC		
Burseraceae	*Commiphora gracilifrondosa*	Karee Corkwood	Indigenous	LC		
Capparaceae	*Boscia albitrunca*	Shepherds tree	Indigenous	LC	Sch2	Protected

Family	Scientific name	Common name	Ecology	Red List	Provincial	Protected Trees
Capparaceae	*Boscia foetida*	Stink Shepherdstree	Indigenous	LC	Sch2	
Capparaceae	*Boscia foetida foetida*	Foetid Bush	Indigenous	LC	Sch2	
Capparaceae	*Maerua gilgii*	River Bushcherry	Indigenous	LC		
Casuarinaceae	*Casuarina cunninghamiana*	Beefwood	Not indigenous; Naturalised; Invasive	NE		
Cleomaceae	*Cleome angustifolia*	Yellow Mouse Whiskers	Indigenous	LC		
Cleomaceae	*Cleome foliosa lutea*	Yellow Leafy Spindlepod	Indigenous	LC		
Crassulaceae	*Crassula exilis sedifolia*		Indigenous	LC		
Crassulaceae	*Crassula sericea*		Indigenous	LC		
Cucurbitaceae	*Cucumis rigidus*	Hard Cucumber	Indigenous	LC		
Cyperaceae	*Cyperus marginatus*	Matting Sedge	Indigenous	LC		
Didiereaceae	*Portulacaria namaquensis*	Namaqua Porkbush	Indigenous	LC		
Ebenaceae	*Euclea pseudebenus*	Black Guarri	Indigenous	LC		Protected
Euphorbiaceae	*Euphorbia avasmontana*	Slender Candelabra Naboom	Indigenous	LC	Sch2	
Euphorbiaceae	*Euphorbia glanduligera*	Namib Milkweed	Indigenous	LC	Sch2	
Euphorbiaceae	*Euphorbia gregaria*	Karas Milkbush	Indigenous	LC	Sch2	
Euphorbiaceae	*Euphorbia guerichiana*	Paperbark Woody-euphorbia	Indigenous	LC	Sch2	
Euphorbiaceae	*Euphorbia mauritanica*	Yellow Milkbush	Indigenous	LC	Sch2	
Euphorbiaceae	*Euphorbia virosa*	Namib Candelabra Naboom	Indigenous	LC	Sch2	
Fabaceae	*Adenolobus garipensis*	Blue Butterflyleaf	Indigenous	LC		
Fabaceae	*Cullen tomentosum*	Blue-Eyes	Indigenous; Endemic	LC		
Fabaceae	*Indigofera pungens*	Spiky Indigo	Indigenous	LC		
Fabaceae	*Parkinsonia africana*	Greenhair Tree	Indigenous	LC		
Fabaceae	*Schotia afra*	Karoo Boerbean	Indigenous	LC		
Fabaceae	*Tephrosia dregeana*	Namaqua Hoarypea	Indigenous	LC		
Fabaceae	*Vachellia erioloba*	Camel Thorn	Indigenous	LC		Protected
Fabaceae	*Vachellia xanthophloea*	fever tree	Indigenous	LC		
Kewaceae	*Kewa salsoloides*	Sour Saltsorrel	Indigenous	LC		
Lamiaceae	*Salvia garipensis*	Gariep Sage	Indigenous	LC		
Limeaceae	*Limeum aethiopicum lanceolatum*		Indigenous	LC		
Loasaceae	*Kissenia capensis*	Sandpaper bush	Indigenous	LC		
Malvaceae	*Abutilon pycnodon*	Bellflower	Indigenous	LC		
Malvaceae	*Hermannia minutiflora*		Indigenous	LC		
Malvaceae	*Hibiscus elliottiae*		Indigenous	LC		
Malvaceae	*Hibiscus engleri*	Wild Hibiscus	Indigenous	LC		
Menispermaceae	*Antizoma miersiana*		Indigenous	LC		
Molluginaceae	*Hypertelis spergulacea*	Cluster Saltsorrel	Indigenous	LC		
Moraceae	*Ficus cordata*	Namaqua Fig	Indigenous	LC		

Family	Scientific name	Common name	Ecology	Red List	Provincial	Protected Trees
Nyctaginaceae	*Phaeoptilum spinosum*	brittle thorn	Indigenous	LC		
Pedaliaceae	*Rogeria longiflora*	White Djirrie	Not indigenous; Naturalised; Invasive	LC		
Pedaliaceae	*Sesamum capense*	Blackeye Sesame	Indigenous	LC		
Plumbaginaceae	*Dyerophytum africanum*		Indigenous	LC		
Poaceae	*Eragrostis nindensis*	Wether Love Grass	Indigenous	LC		
Poaceae	*Oropetium capense*	Dwarf Grass	Indigenous	LC		
Poaceae	*Phragmites australis*	common reed	Indigenous	LC		
Poaceae	*Schmidtia kalahariensis*	Kalahari Sour Grass	Indigenous	LC		
Poaceae	*Stipagrostis namaquensis*	River Bushman Grass	Indigenous	LC		
Pteridaceae	*Anogramma leptophylla*	Jersey fern	Indigenous	LC		
Rhamnaceae	*Ziziphus mucronata*	buffalo-thorn	Indigenous; Endemic	LC		
Rubiaceae	*Plocama crocyllis*		Indigenous	LC		
Santalaceae	*Lacomucinaea lineata*	White Storm	Indigenous	LC		
Sapindaceae	*Pappea capensis*	Jacket plum	Indigenous	LC		
Scrophulariaceae	*Antherothamnus pearsonii*	False-Honeythorn	Indigenous	LC		
Scrophulariaceae	*Anticharis juncea*		Indigenous	NE		
Scrophulariaceae	*Jamesbrittenia maxii*	Painted Jaybee	Indigenous	LC	Sch2	
Scrophulariaceae	*Jamesbrittenia ramosissima*	Desert Jaybee	Indigenous	LC	Sch2	
Solanaceae	*Nicotiana glauca*	tree tobacco	Indigenous	NE		
Solanaceae	*Solanum burchellii*		Not indigenous; Naturalised; Invasive	LC		
Solanaceae	*Solanum capense*	Horrid Snake-apple	Indigenous	LC		
Tamaricaceae	*Tamarix usneoides*	Wild Tamarisk	Indigenous	LC		
Urticaceae	*Forsskaolea candida*	Namib Nettle	Indigenous	LC		
Verbenaceae	*Chascanum garipense*	White Chascanum	Indigenous	LC		
Zygophyllaceae	*Augea capensis*	Willybush	Indigenous	LC		
Zygophyllaceae	*Sisyndite spartea*	Desert Broom	Indigenous	LC		
Zygophyllaceae	*Tetraena decumbens*		Indigenous	LC		
Zygophyllaceae	*Tribulus cristatus*	Flanged Devilthorn	Indigenous	LC		

7.7 Appendix F: Specialist Declaration of Independence

I, Leigh-Ann de Wet, 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.

Leigh-Ann de Wet

Terrestrial Ecologist

The Biodiversity Company

April 2024

I, Sarah Newman, 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.

Sarah Newman

Terrestrial Ecologist

The Biodiversity Company

April 2024

I, Andrew Husted, 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.

Andrew Husted

Ecologist

The Biodiversity Company

April 2024

7.8 Appendix G: Specialist CVs

Leigh-Ann de Wet

M.Sc Botany (*Pr Sci Nat*)

Cell: +27 83 352 1936
Email: leigh-ann@thebiodiversitycompany.com
Identity Number: 8209010127081
Date of birth: 1 September 1982

Profile Summary

Working experience throughout South Africa, Southern Africa West and Central Africa and also Madagascar.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international biodiversity projects.

Experience with IFC Performance Standards, Critical Habitat and High Conservation Value Assessments. Experience in numerous vegetation and habitat types throughout Africa,

Specialist expertise includes botany, forest ecology, avifauna and terrestrial fauna. Methodology development, conservation management and terrestrial monitoring.

Areas of Interest

Forest ecology and ecosystem functionality.

Ecology and plant identification.

Field methodology.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements.
- Familiar with High Conservation Value assessments as per ProForest guidelines.
- Conservation Management Plans.
- Flora assessments.
- Avifauna assessments.
- Terrestrial fauna assessments.
- Monitoring.
- Ecosystem services
- Rehabilitation Plans.
- Alien Invasive Plant Management Plans.
- Permitting.

Country Experience

Mozambique,

Malawi,

Zambia,

Madagascar,

Liberia,

Guinea'

Democratic Republic of the Congo,

South Africa

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

Zulu - Basic

Qualifications

- MSc (Rhodes University) – Botany.
- BSc Honours (Rhodes University) – Botany
- BSc Natural Science (Botany and Entomology)
- Pr Sci Nat (400233/12)
- Certificate of Competence: UFS Introduction to wetland delineation.
- Certificate of Competence: UFS Introduction to wetland law
- Certificate of competence: Africa Land Use Training Grass Identification (long and short course)
- Certificate of Competence: ASI Snake Awareness, first aid for snake bite and venomous snake handling.

CURRICULUM VITAE: Leigh-Ann de Wet

Sarah Newman

M.Sc Entomology

Cell: +27 73 391 6933
Email: sarah@thebiodiversitycompany.com
Identity Number: 9312170034086
Date of birth: 17 December 1993

Profile Summary

Work experience in South Africa, Lesotho and Costa Rica.

Extensive experience working in the Sani Pass region of southern Africa investigating the patterns and drivers of ant diversity across an elevation gradient.

Experience with sea turtle monitoring and conservation in Costa Rica.

Areas of Interest

Entomology, Zoology, Biodiversity, Conservation and Community Ecology.

Key Experience

- Terrestrial Ecological Assessments
- Rehabilitation plans and monitoring
- Field work and research
- Taxonomic classification of insects

Country Experience

South Africa

Lesotho

Costa Rica

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

Spanish – Conversational

Qualifications

- MSc Entomology (*Distinction*), University of Pretoria
- BSc (Hons) Zoology, University of Pretoria
- BSc Zoology, University of Pretoria
- Cand Sci Nat (158474)

CURRICULUM VITAE: Sarah Newman

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225
Email: andrew@thebiodiversitycompany.com
Identity Number: 7904195054081
Date of birth: 19 April 1979

Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia & Serbia.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, Freshwater Ecology, Terrestrial Ecology and also Ecosystem Services.

Areas of Interest

Sustainability and Conservation.

Instream Flow and Ecological Water Requirements.

Publication of scientific journals and articles.

Key Experience

- World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Angola, Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mauritius, Mozambique

Nigeria, Republic of Armenia,

Senegal, Serbia, Sierra Leone, South Africa

Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondi Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

CURRICULUM VITAE: Andrew Husted