SCOPING REPORT

Vrede Solar PV Facility

De Aar, Northern Cape

June 2022

CLIENT

Prepared by:

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1 Introduction

1.1 Project Description

A consortium consisting of Akuo Energy Afrique, Africoast Investments and Golden Sunshine Trading propose to develop the Vrede Solar PV Facility and its associated electrical infrastructure on Portion 5 of the Farm Bas Berg 88 in the Renosterberg Local Municipality in the greater Pixley ka Seme District Municipality in the Northern Cape Province. The project site is located approximately 20km north of Philipstown and 30km west of Petrusville and within the Central Transmission Corridor. The Project (Vrede Solar PV Facility) is part of a cluster known as the Hydra B Renewable Energy Cluster. The Cluster entails the development of up to Twenty-one (21) solar energy facilities. Each is considered within a separate environmental application process.

A technically suitable project site of ~1102ha has been identified by Akuo Energy Afrique for the establishment of the Vrede Solar PV facility. The proposed facility will have a contracted capacity of 150MW and will include the following infrastructure:

- Solar PV array comprising PV modules and mounting structures (monofacial or bifacial and a single axis tracking system);
- Inverters and transformers;
- Cabling between the project components;
- Battery Energy Storage System (BESS) ;
- On-site facility substation and power lines between the solar PV facility and the Eskom substation (to be confirmed and assessed through a separate process);
- Site offices, Security office, operations and control, and maintenance and storage laydown areas; and
- Access roads, internal distribution roads.

1.2 Background

The Biodiversity Company was appointed to undertake a scoping assessment for the proposed PV solar development. The scoping assessment comprises of terrestrial and freshwater ecology, and also agricultural potential for the area.

The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach is in accordance with the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). The National Web based Environmental Screening Tool has characterised the terrestrial theme sensitivity of the project area as "Very High". The agricultural theme sensitivity has been characterised as "Medium". Whilst the screening tool does not pertain specifically to wetlands, the presence of wetlands does contribute to the aquatic theme sensitivity being characterised as "Very High".

This report has identified potential constraints and/or concerns which will be further assessed during the impact phase of the project.

1.3 Presentation

The Project Area of Influence (PAOI) comprises the collective extent of the farms proposed for the Hydra B Renewable Energy Cluster (Figure 1-1). The baseline information presented herein pertains to the PAOI. Table 1-1 presents the project names which comprise the cluster development, and the corresponding farm portions (Figure 1-2) and planned capacity. A summary of ecological features specific to the Vrede Solar PV Facility is provided in this report. Further to this, impacts expected for the development of renewable energy projects in the area have also been presented.

Table 1-1 The project name, farm portion and accompanying capacity for the Hydra B Renewable Energy Cluster

No	Project name	Farm Name and portion Number	Capacity
1	Tafelkop Solar PV Facility	Portion 3 of the Farm Grass Pan 40	240MW
2	Koppy Alleen Solar PV Facility	Portion 5 of the Farm Koppy Alleen 83	100MW
3	Vrede Solar PV Facility	Portion 5 of the Farm Bas Berg 88	150MW
4	Zionsheuvel Solar PV Facility	Remainder of Farm Leeuwberg 79	240MW
5	Amper Daar Solar PV Facility	Remainder of Farm Wolwe Kuil 44	100MW
6	Wag-'n-Bietjie Solar PV Facility	Portion 1 of the Farm Leeuwe Berg 45	100MW
7.1	Ruspoort 1 Solar PV Facility (**Option A)**	Portion 5 of the Farm Bokken Kraal 81 **(Option A)**	100MW
7.2	Ruspoort 1 Solar PV Facility (**Option B)**	Portion 4 on the Farm Knoffelfontein 74 Portion 1 on the Farm 78 Portion 2 on the Farm Leeuwberg 79 **(Option B)**	100MW
8	Ruspoort 2 Solar PV Facility	Portion 2 of the Farm Leeuwberg 79	100MW
9	JW Solar PV Facility	Remainder of the Farm Plaas 196	240MW
10	Pro Deo Solar PV Facility	Portion 1 of the Farm Grass Pan 40	100MW
11	Uitkyk Solar PV Facility	Remainder of the Farm Plaas 197	100MW
12	Middelplaas Solar PV Facility	Portion 4 of the Farm Grass Pan 40	100MW
13	Kareekloof Solar PV Facility	Remainder of the Farm Swart Koppies 86	100MW
14	Oosthuisfontein Solar PV Facility	Remainder of the Farm Oosthuisfontein 108	100MW
15	JAN Solar PV Facility	Portion 1 of the Farm Schaap Kraal 38, Portion 1 of the Farm Annex Donker Hoek 89; and Remainder of Farm Kuhns Post 90	240MW
16	Driefontein Solar PV Facility	Portion 1 of the Farm Driefontein 87	100MW
17	Jagpoort Solar PV Facility	Portion 2 of the Farm Driefontein 87, Portion 3 of the Farm Driefontein 87, and Portion 2 of the Farm Kareekloof 85	150MW
18	Strydam Solar PV Facility	Portion 3 of the Farm Stryd Dam 107	240MW
19	Roodekraal Solar PV Facility	Remainder of the Farm Roode Kraal 106	150MW
20	Bokkraal Solar PV Facility	Remainder of the Farm Bokken Kraal 81	100MW
21	HCA Solar PV Facility	Portion 4 of the Farm Koppy Alleen 83	100MW

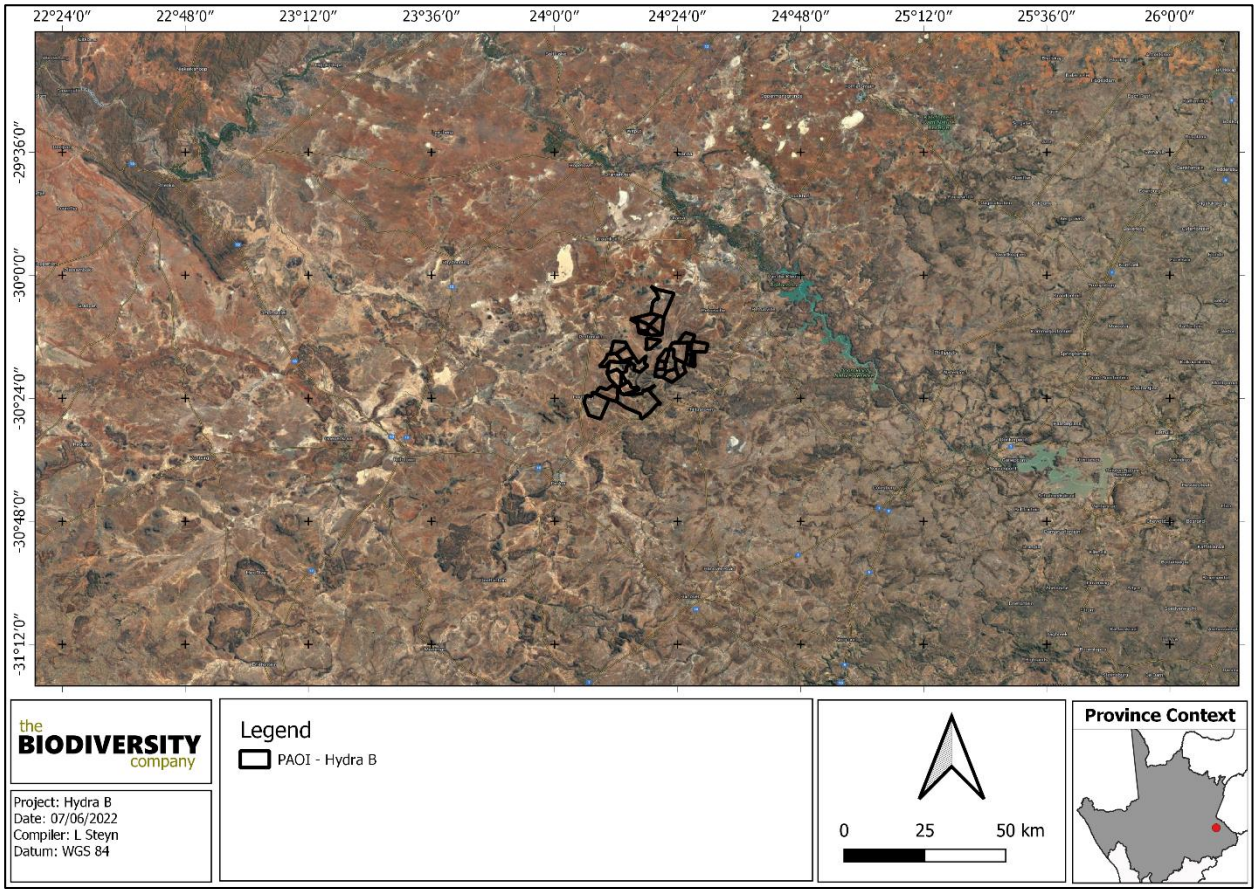


Figure 1-1 The location of the PAOI in relation to the nearby towns

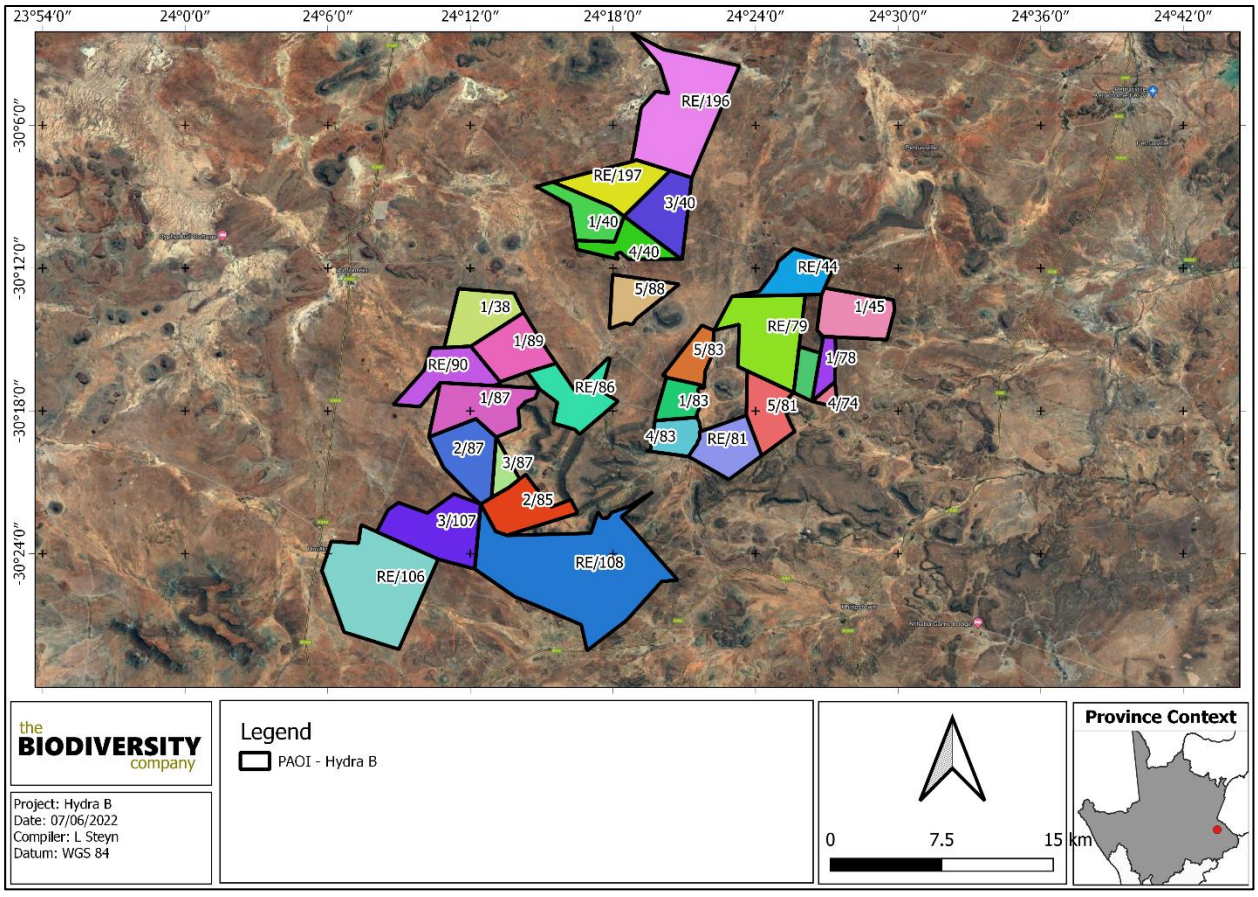


Figure 1-2 The farm portions that comprise the cluster development

1.4 Specialist Details

Report Name	**SCOPING REPORT**
Reference	**Vrede Solar PV Facility**
Submitted to	savannah environmental
Report Writer	**Lindi Steyn** 
	Dr Lindi Steyn has completed her PhD in Biodiversity and Conservation from the University of Johannesburg. Lindi is a terrestrial ecologist with a special interest in ornithology. She has completed numerous studies ranging from basic Assessments to Environmental Impact Assessments following IFC standards.
Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

2 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the ecological communities of the associated ecosystems and the agricultural potential within the project area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and identify possible threatened flora and fauna species that occur within the project area;
- A desktop description of the land type and soil characteristics for the area;
- Identify the manner that the proposed project impacts based on the screening assessment information and the desktop information, and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

3 Key Legislative Requirements

The legislation listed below in Table 3-1 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 3-1 A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	Northern Cape Nature Conservation act no. 9 of 2009
	Northern Cape Planning and Development Act no. 7 of 1998
	Northern Cape Critical Biodiversity Area 2017

4 Methods

4.1 Desktop Assessment

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

4.1.1 Ecologically Important Landscape Features

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

- National Biodiversity Assessment 2018 (Skowno *et al,* 2019) (NBA) - The purpose of the NBA is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species, and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:

- *Ecosystem Threat Status* – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.

- *Ecosystem Protection Level* – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

- Protected areas - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The SAPAD Database contains spatial data pertinent to the conservation of South African biodiversity. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
- National Protected Areas Expansion Strategy (NPAES) (SANBI, 2016) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and 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.

The Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province. These include the:

- Namakwa District Biodiversity Sector Plan;
- Cape Fine-Scale Plan (only the extent of the areas in the Northern Cape i.e. Bokkeveld and Nieuwoudtville); and
- Richtersveld Municipality Biodiversity Assessment.

- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2015) – 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;

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

- South African Land Type Data. Land type data was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006).

4.1.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) and SANBI (2019) was used to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the project area (Figure 4-1). 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.

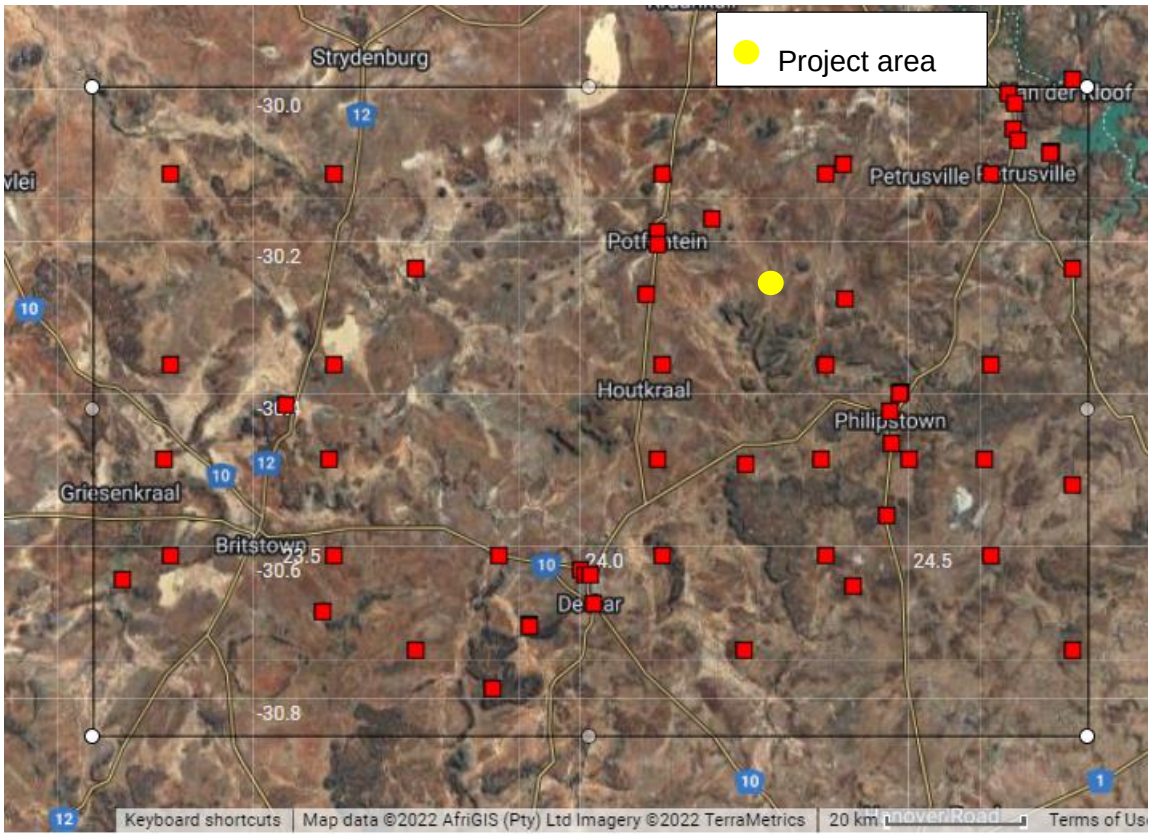


Figure 4-1 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Yellow dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data***

4.1.3 Desktop Faunal Assessment

The faunal desktop assessment comprised of the following, compiling an expected:

- Amphibian list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 3024 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 3024 quarter degree square;

- Avifauna list, generated from the SABAP2 dataset by looking at pentads 3010_2355; 3010_2400; 3010_2405; 3010_2410; 3015_2405; 3005_2410; 2950_2420; 2945_2420; 2945_2425; 3020_2400); and
- Mammal list from the IUCN spatial dataset (2017).

4.2 Terms of Methodology

4.2.1 Flora Survey

The fieldwork and sample sites to be undertaken in the EIA Phase will be 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 will included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork will therefore be to maximise coverage and navigate to each target site in the field, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis will be placed on sensitive habitats, especially those overlapping with the proposed project area.

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

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

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

4.2.2 Fauna Survey

The faunal assessment within this report pertains to herpetofauna (amphibians and reptiles), avifauna and mammals. The faunal field survey to be undertaken in the EIA Phase will be comprised of the following techniques:

- Visual and auditory searches - This typically comprises of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- 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.);
- Point counts for the avifauna; and
- Utilization of local knowledge.

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

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);

- Smithers' Mammals of Southern Africa (Apps, 2000);
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

4.2.3 Avifauna Assessment

The avifaunal field survey to be undertaken in the EIA Phase will be comprised of the following techniques:

- Visual and auditory searches - This typically comprises of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Point counts for the avifauna; and
- Utilization of local knowledge.

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

- Book of birds of South Africa, Lesotho and Swaziland (Taylor *et al.,* 2015); and
- Roberts – Birds of Southern Africa (Hockey *et al.,* 2005).

4.3 Terrestrial Site Ecological Importance

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

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

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 4-1 and

Table 4-2, respectively.

Table 4-1 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 4-2 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 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

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

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

Table 4-4 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.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

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

Interpretation of the SEI in the context of the proposed project is provided in Table 4-6.

Table 4-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

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

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

4.4 Wetland Assessment

4.4.1 Wetland Identification and Mapping

The National Wetland Classification Systems (NWCS) developed by the SANBI will be considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method also includes the assessment of structural features at the lower levels of classification (Ollis et al., 2013).

The wetland areas will be delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 4-2. The outer edges of the wetland areas will be identified by considering the following four specific indicators, the:

- Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
    - The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile due to prolonged and frequent saturation; and
- Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

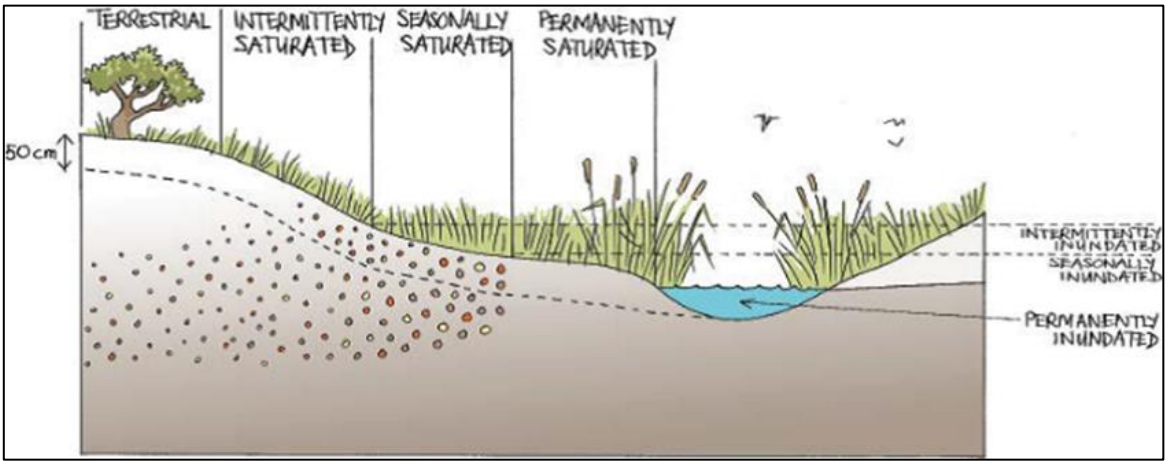


Figure 4-2 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013).

4.4.2 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands and humans. EcoServices serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands will be conducted per the guidelines as described in WET-EcoServices (Kotze et al. 2008). An assessment will be undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 4-7).

Table 4-7 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

4.4.3 Present Ecological Status

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 4-8.

Table 4-8 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

4.4.4 Importance and Sensitivity

The importance and sensitivity of water resources is determined to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category, as listed in Table 4-9 (Rountree and Kotze, 2013).

Table 4-9 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

4.4.5 Determining Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane et al., 2014) will be used to determine the appropriate buffer zone for the proposed activity.

4.5 Land Capability

Land capability and agricultural potential will be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes and these may be divided into three capability groups. Table 4-10 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use and sensitivity increases from class I to class VIII (Smith, 2006).

Table 4-10 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		MG - Moderate Grazing			MC - Moderate Cultivation					
F- Forestry		IG - Intensive Grazing			IC - Intensive Cultivation					
LG - Light Grazing		LC - Light Cultivation			VIC - Very Intensive Cultivation					

Land capability has been classified into 15 different categories by the DAFF (2017) which indicates the national land capability category and associated sensitivity related to soil resources.

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-11. The final land potential results are then described in

Table 4-12. These land potential classes are regarded as the final delineations subject to sensitivity, given the comprehensive addition of climatic conditions as those relevant to the DAFF (2017) land capabilities. The main contributors to the climatic conditions as per Smith (2006) is that of MAP, Mean Annual Potential Evaporation (MAPE), mean September temperatures, mean June temperatures and mean annual temperatures. These parameters will be derived from Mucina and Rutherford (2006) for each vegetation type located within a relevant project area. This will give the specialist the opportunity to consider micro-climate, aspect, topography etc.

Table 4-11 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	C2	C3	C4	C5	C6	C7	C8

I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-12 The Land Potential Classes

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

4.5.1 Climate Capability

According to Smith (2006), climatic capability is determined by taking into consideration various steps pertaining to the temperature, rainfall and Class A-pan of a region. The first step in this methodology is to determine the MAP to Class A-pan ratio.

Table 4-13 Climatic capability (step 1) (Smith, 2006)

Climatic Capability Class	Limitation Rating	Description	MAP: Class A pan Class
C1	None to Slight	Local climate is favourable for good yields for a wide range of adapted crops throughout the year.	0.75-1.00
C2	Slight	Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperature increase risk and decrease yields relative to C1.	0.50-0.75
C3	Slight to Moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.	0.47-0.50
C4	Moderate	Moderately restricted growing season due to the occurrence of low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.	0.44-0.47
C5	Moderate to Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss.	0.41-0.44
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss.	0.38-0.41

C7	Severe to Very Severe	Severely restricted choice of crops due to heat and moisture stress.	0.34-0.38
C8	Very Severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.	0.30-0.34

In the event that the MAP: Class A-pan ratio is calculated to fall within the C7 or C8 class, no further steps are required, and the climatic capability can therefore be determined to be C7 or C8. In cases where the above-mentioned ratio falls within C1-C6, steps 2 to 3 will be required to further refine the climatic capability.

Step 2

Mean September temperatures;

- <10℃ = C6
- 10 - 11℃ = C5
- 11 - 12℃ = C4
- 12 - 13℃ = C3
- >13℃ = C1

Step 3

Mean June temperatures;

- <9℃ = C5
- 9 - 10℃ = C4
- 10 - 11℃ = C3
- 11 - 12℃ = C2

4.5.2 Current Land Use

A generalised land-use will be derived for the larger project area considering agricultural productivity.

- Mining;
- Bare areas;
- Agriculture crops;
- Natural veld;
- Grazing lands;
- Forest;
- Plantation;
- Urban;
- Built-up;
- Waterbodies; and
- Wetlands.

4.6 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The species likelihood of occurrence is based on desktop information; and
- The impact description included is preliminary and is solely based on the screening survey and desktop information.

5 Results & Discussion

5.1 Desktop Assessment

5.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the PAOI overlaps with a LC ecosystem (Figure 5-1).

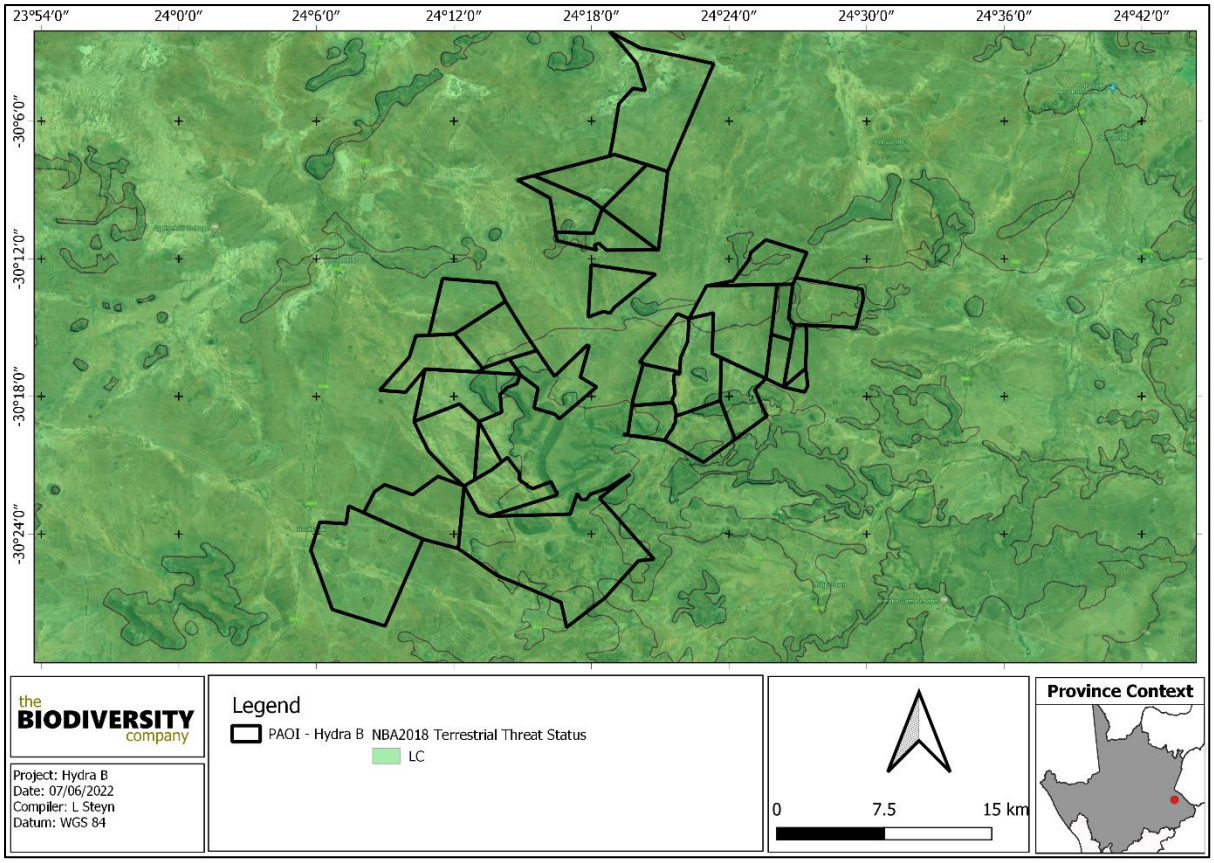


Figure 5-1 Map illustrating the ecosystem threat status associated with the PAOI

5.1.2 Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with a NP and PP ecosystems (Figure 5-2).

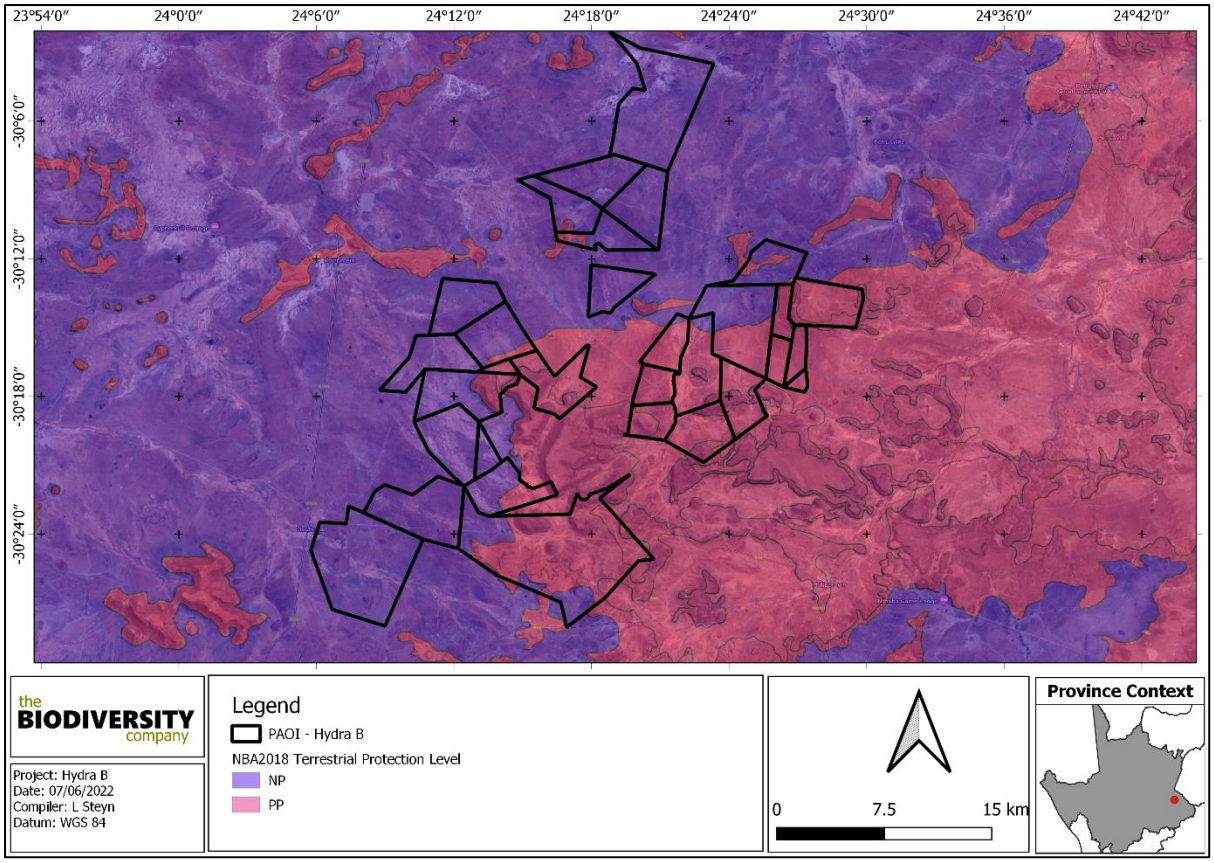


Figure 5-2 Map illustrating the ecosystem protection level associated with the PAOI

5.1.3 Critical Biodiversity Areas and Ecological Support Areas

The key output of a systematic biodiversity plan is a map of biodiversity priority areas. The CBA map delineates Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state.

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

Figure 5-3 shows the project area superimposed on the Terrestrial CBA maps. The PAOI is dominated by areas classified as ESAs, with CBAs located to the north and east of the area. Smaller (isolated) unclassified areas are scattered across the PAOI.

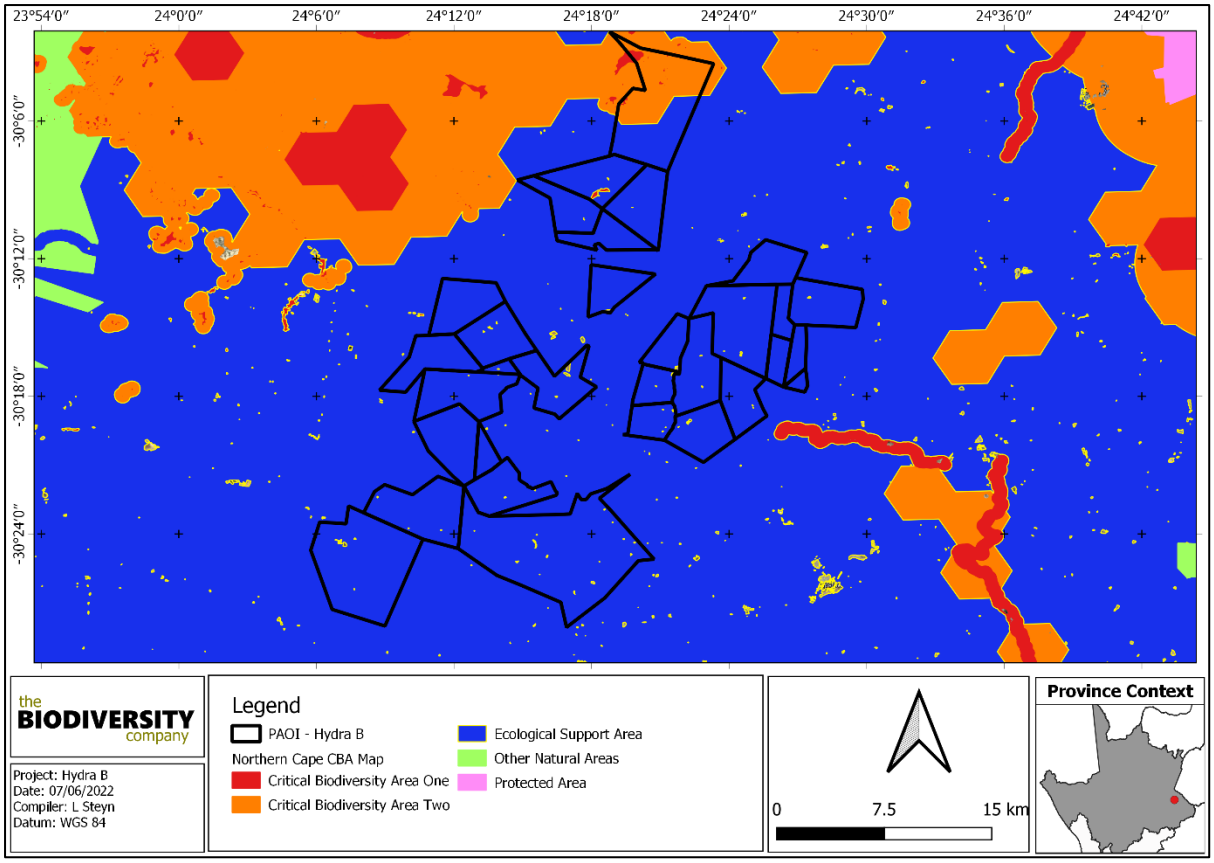


Figure 5-3 Map illustrating the locations of conservation areas in the PAOI

5.1.4 Important Bird and Biodiversity Area

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 5-6 shows that the project area is located 3.25 km northeast from the Platberg-Karoo Conservancy.

The Platberg–Karoo Conservancy IBA covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns, and consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. It is used mainly for grazing and agriculture (Birdlife South Africa, 2015).

This IBA is important because it contributes significantly to the conservation of large terrestrial birds as well as raptors. These birds include Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreaux's Eagle (*Aquila verreauxii*) and Tawny Eagle (*A. rapax*) (Birdlife South Africa, 2015).

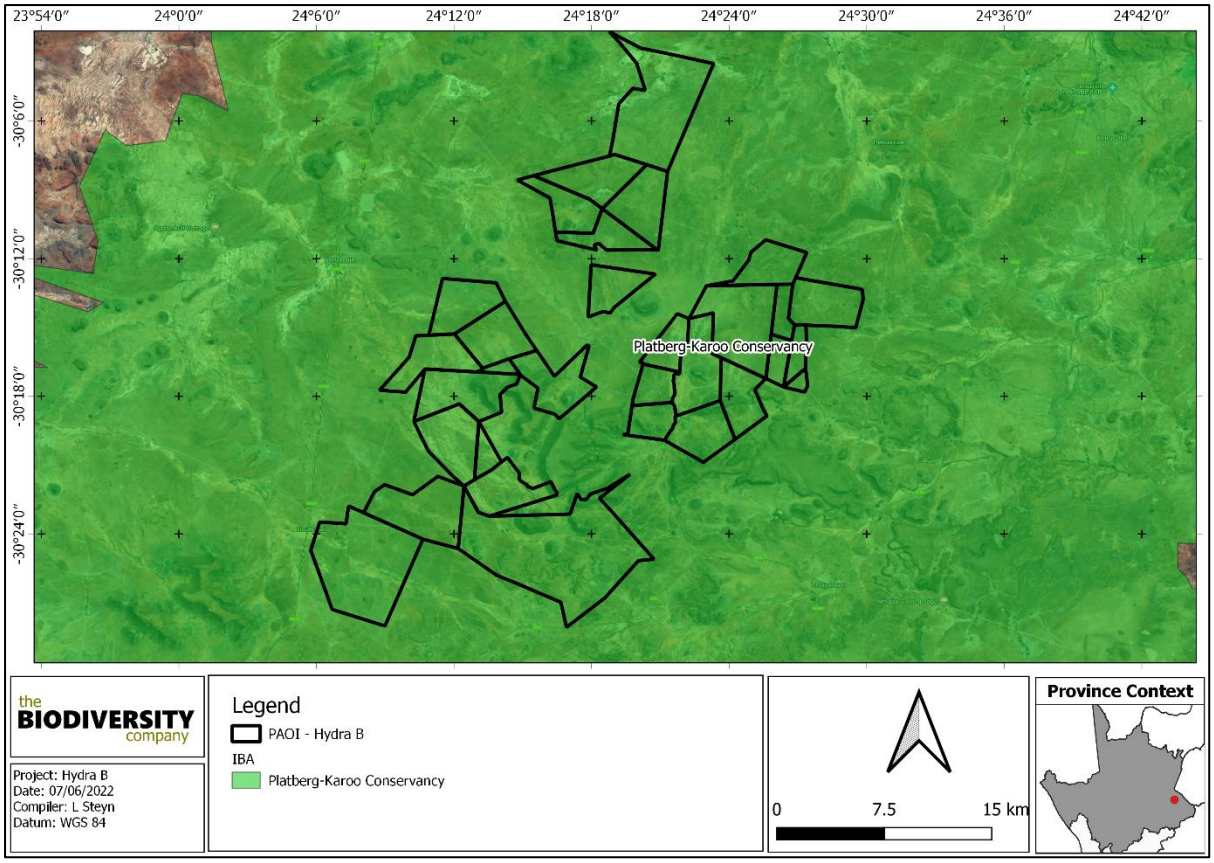


Figure 5-4 The extent of the PAOI in respect of the associated IBA

5.1.5 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The PAOI overlaps with EN and LT NBA rivers (Figure 5-5). The expected wetlands include depressions in isolated areas, which are classified as VU (Figure 5-6).

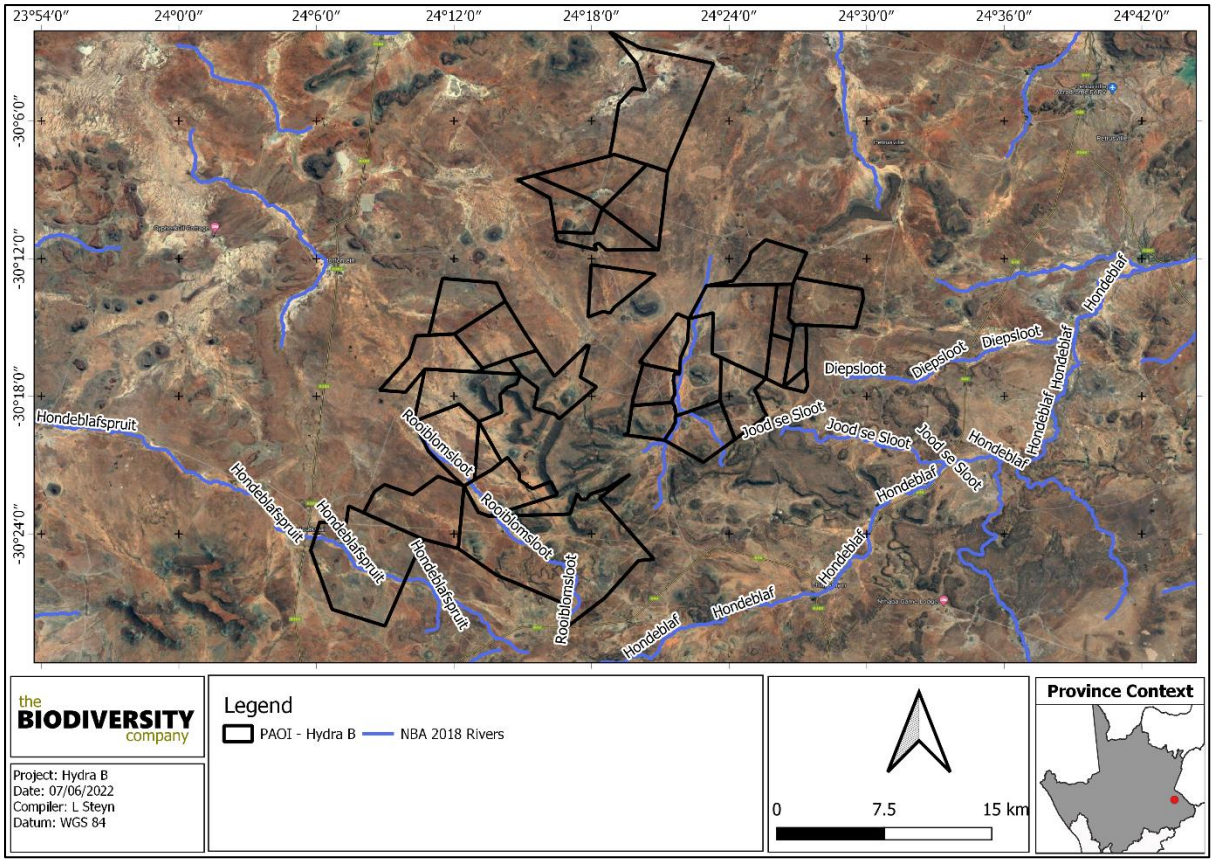


Figure 5-5 Map illustrating ecosystem threat status of rivers in the PAOI

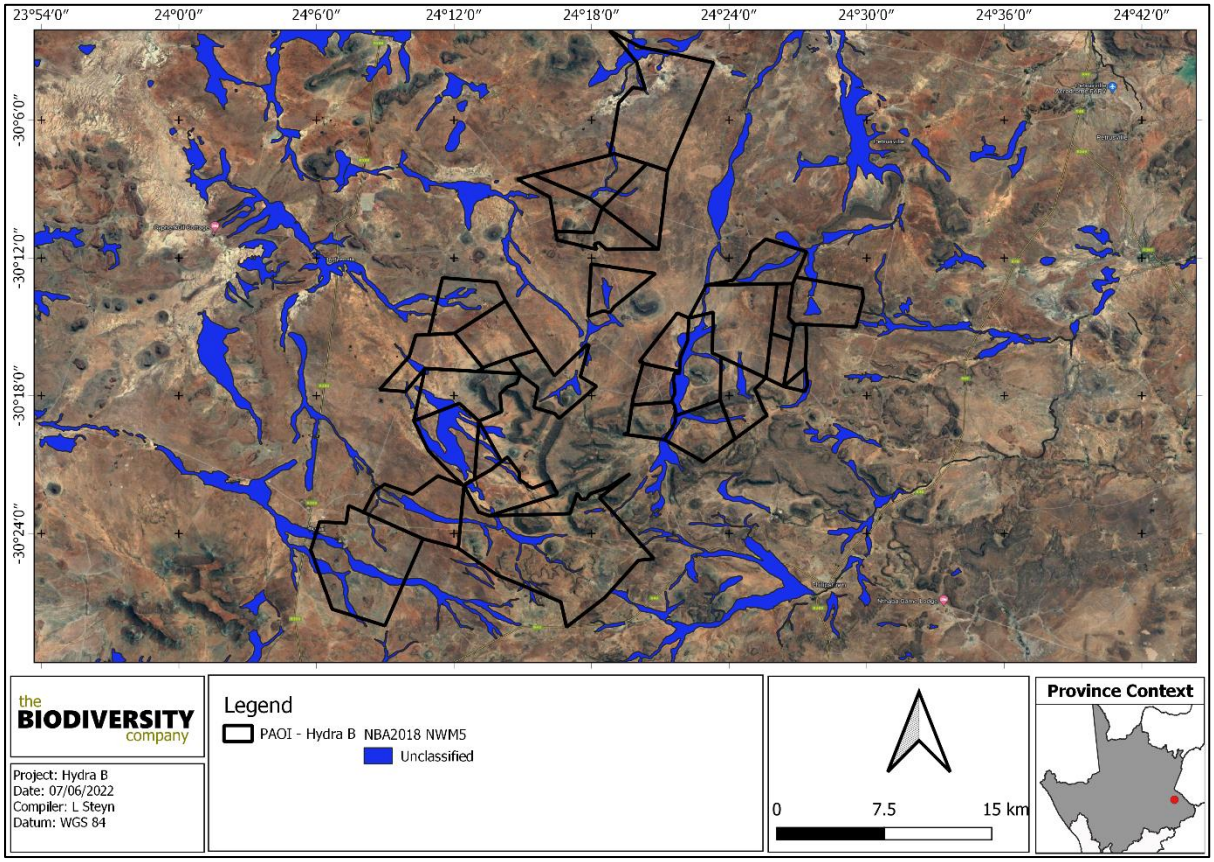


Figure 5-6 Map illustrating ecosystem threat status of wetland ecosystems in the PAOI

5.1.6 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).

Figure 5-7 shows the PAOI predominantly overlaps with unclassified FEPA wetlands, with classified (or priority) wetlands located predominantly to the north of the PAOI.

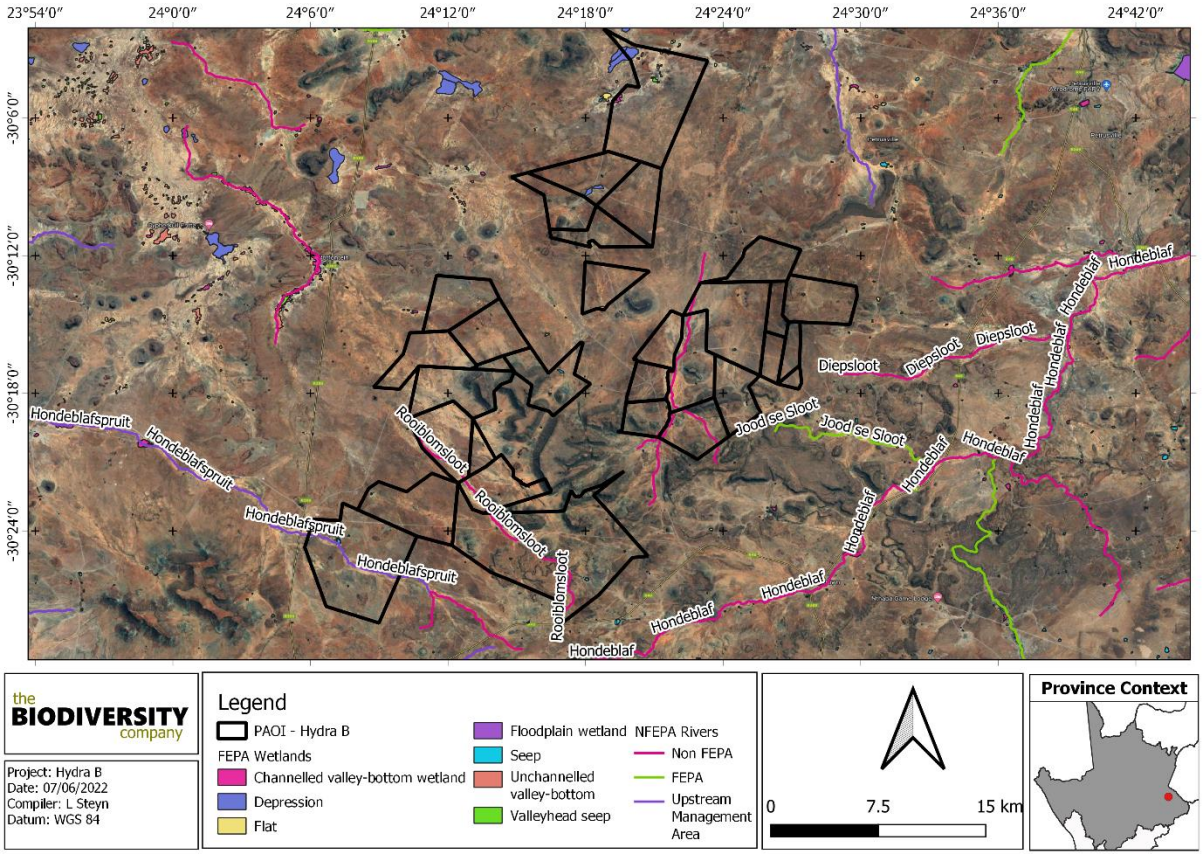


Figure 5-7 The PAOI in relation to the National Freshwater Ecosystem Priority Areas

5.1.7 Vegetation

The project area is situated in the Nama-Karoo Biome. It is a large, landlocked region that lies on the central plateau of the western half of South Africa and extends into southeastern Namibia. In terms of climate, the Nama-Karoo Biome is arid and characterised by the presence of mostly nonperennial rivers, highly variable and unreliable low rainfall, and unpredictable and sometimes prolonged droughts (Booysen & Rowswell 1983; Mucina & Rutherford, 2006). On the plains to the northeast, there are gradual transitions between the Nama-Karoo and Grassland Biomes, making the border between the two biomes difficult to map (Mucina & Rutherford, 2006).

Generally, the vegetation of the Nama-Karoo Biome are a filtered subset of the vegetation of surrounding biomes, including Savanna, Grassland, Fynbos, Succulent Karoo and Albany Thicket Biomes (Hilton-Taylor, 1987). The three most dominant floral families are Asteraceae, Fabaceae and Poaceae, similar to the vegetation structure of other arid and semi-arid areas (Mucina & Rutherford).

On a fine-scale vegetation type, the project area overlaps with three vegetation types, namely the Northern Upper Karoo (Nku 3), The Eastern Upper Karoo (Nku 4) and the Besemkaree Koppies Shrubland (Gh 4), with the conservation status of all vegetation types classified as Least Threatened.

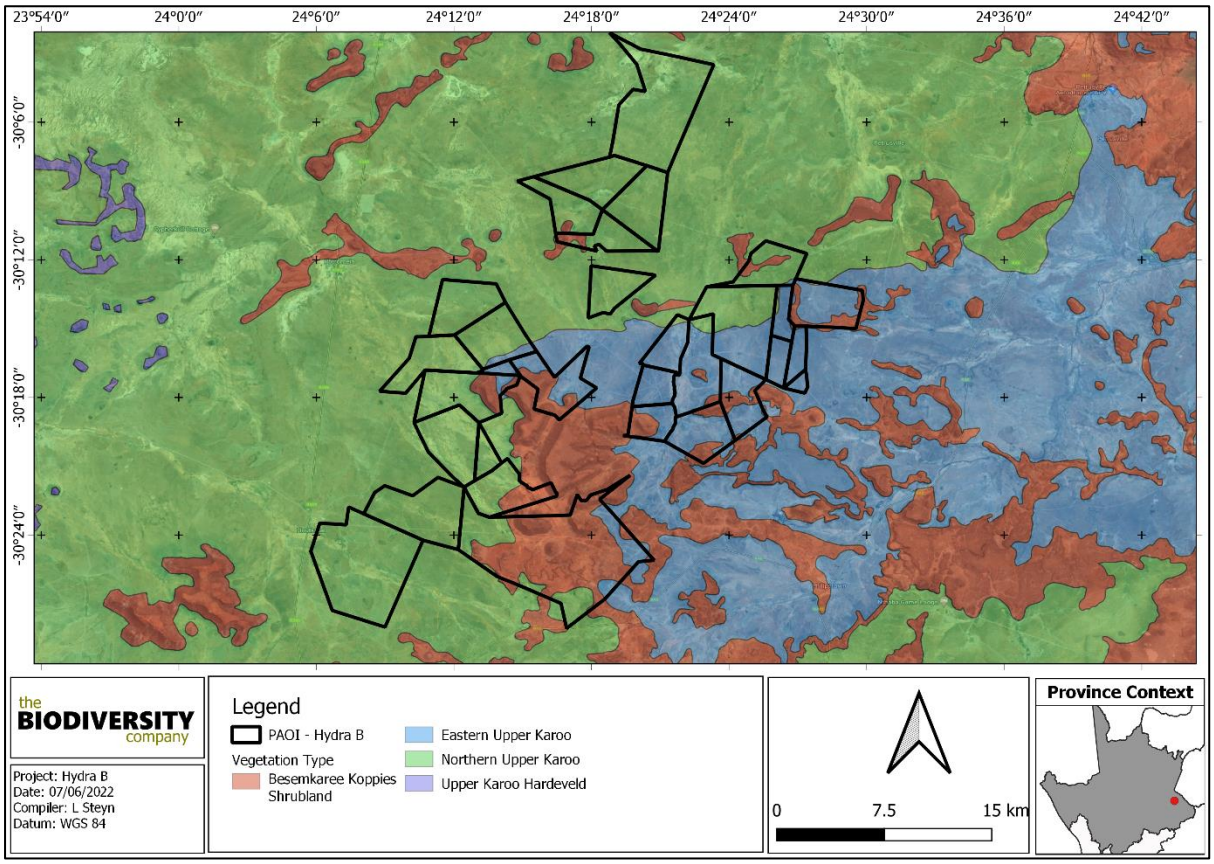


Figure 5-8 Vegetation types associated with the PAOI

5.1.8 Flora Description

The POSA database indicates that 507 species of indigenous plants are expected to occur within the project area (The full list of species will be provided in the final EIA report). No SCCs are expected in the project area, however protected tree such as camel thorn trees (*Vachellia erioloba*) might occur.

5.1.9 Faunal Description

5.1.9.1 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 14 amphibian species are expected to occur within the area (The full list will be provided in the final assessment). One (1) is regarded as threatened (Table 5-1).

Table 5-1 Threatened amphibian species that are expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Pyxicephalus adspersus	Giant Bullfrog	NT	LC

5.1.9.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 42 reptile species are expected to occur within the area (The full list will be provided in the final assessment). One (1) is regarded as threatened (Table 5-2).

Table 5-2 Threatened reptile species that are expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Psammophis leightoni	Cape Sand Snake	VU	LC

5.1.9.3 Mammals

The IUCN Red List Spatial Data lists 58 mammal species that could be expected to occur within the area (The full list will be provided in the final assessment). This list includes large mammal species that are normally restricted to protected areas, as these were observed during the screening assessment. Eight (8) (smaller non protected area restricted species) of these expected species are regarded as threatened (Table 5-3).

Table 5-3 Threatened mammal species that are expected to occur within the project area.

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Leptailurus serval	Serval	NT	LC
Panthera pardus	Leopard	VU	VU
Parahyaena brunnea	Brown Hyaena	NT	NT
Parotomys littledalei	Littledale's Whistling Rat	NT	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Redunca fulvorufula	Mountain Reedbuck	EN	EN

5.1.9.4 Avifauna

The SABAP2 Data lists 227 avifauna species that could be expected to occur within the area (The full list will be provided in the final assessment). Twelve (12) of these expected species are regarded as threatened (Table 5-4).

Table 5-4 Threatened avifauna species that are expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Anthus crenatus	Pipit, African Rock	NT	NT
Aquila verreauxii	Eagle, Verreaux's	VU	LC
Ardeotis kori	Bustard, Kori	NT	NT
Ciconia abdimii	Stork, Abdim's	NT	LC
Cursorius rufus	Courser, Burchell's	VU	LC
Eupodotis vigorsii	Korhaan, Karoo	NT	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Grus paradisea	Crane, Blue	NT	VU
Neotis ludwigii	Bustard, Ludwig's	EN	EN
Phoeniconaias minor	Flamingo, Lesser	NT	NT
Phoenicopterus roseus	Flamingo, Greater	NT	LC

Sagittarius serpentarius	Secretarybird	VU	EN

5.1.10 Land Capability

As part of the desktop assessment, soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. The overall land capability sensitivity for the area ranges from low to medium (Figure 5-9).

Figure 5-9 The land capability sensitivity for the PAOI

5.1.11 Geology and Soil

According to the land type database (Land Type Survey Staff, 1972 - 2006), the PAOI is located in the Ae, Da, Fb and Ib broad land types. The Ae land type consists of red-yellow apedal soils which are freely drained. The soils tend to have a high base status and is deeper than 300 mm. The Da land type is characterised by prismacutanic and/or pedocutanic horizons with the possibility of red apedal B-horizons occurring. The Fb land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is generally present within the entire landscape. The Ib land type consists of miscellaneous land classes including rocky areas with miscellaneous soils.

The broad land types for the area are illustrated in Figure 5-10 with a description of the land types listed in Table 5-5.

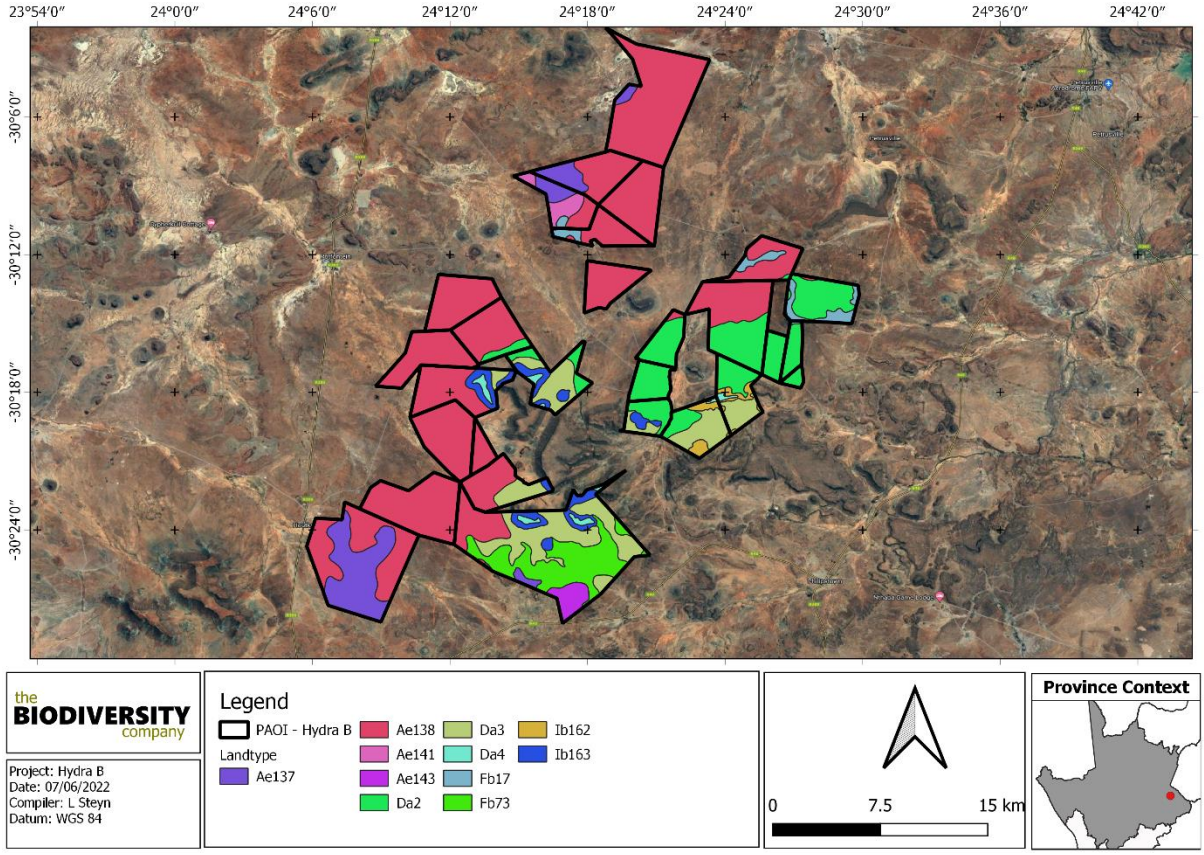


Figure 5-10 Illustration of broad land types for the PAOI (Land Type Survey Staff, 1972 - 2006)

Table 5-5 The descriptions for the broad land types (Land Type Survey Staff, 1972 - 2006)

Land Type	Description
Ae	RED-YELLOW APEDAL, FREELY DRAINED SOILS; Red, high base status > 300 mm deep (no dunes)
Da	PRISMACUTANIC AND/OR PEDOCUTANIC DIAGNOSTIC HORIZONS DOMINANT; Red B horizons
Fb	GLENROSA AND/OR MISPAH FORMS (other soils may occur); Lime rare or absent in upland soils but generally present in low-lying soils
Ib	MISCELLANEOUS LAND CLASSES;Rock areas with miscellaneous soils

5.1.12 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 5-11. Most of the area is characterised by a slope percentage between 0 and 2%. This illustration indicates a uniform topography with gentle slopes being present within the project area. Steep slopes (> 4%) are associated with the mountains and ridges (Mesas and Inselbergs).

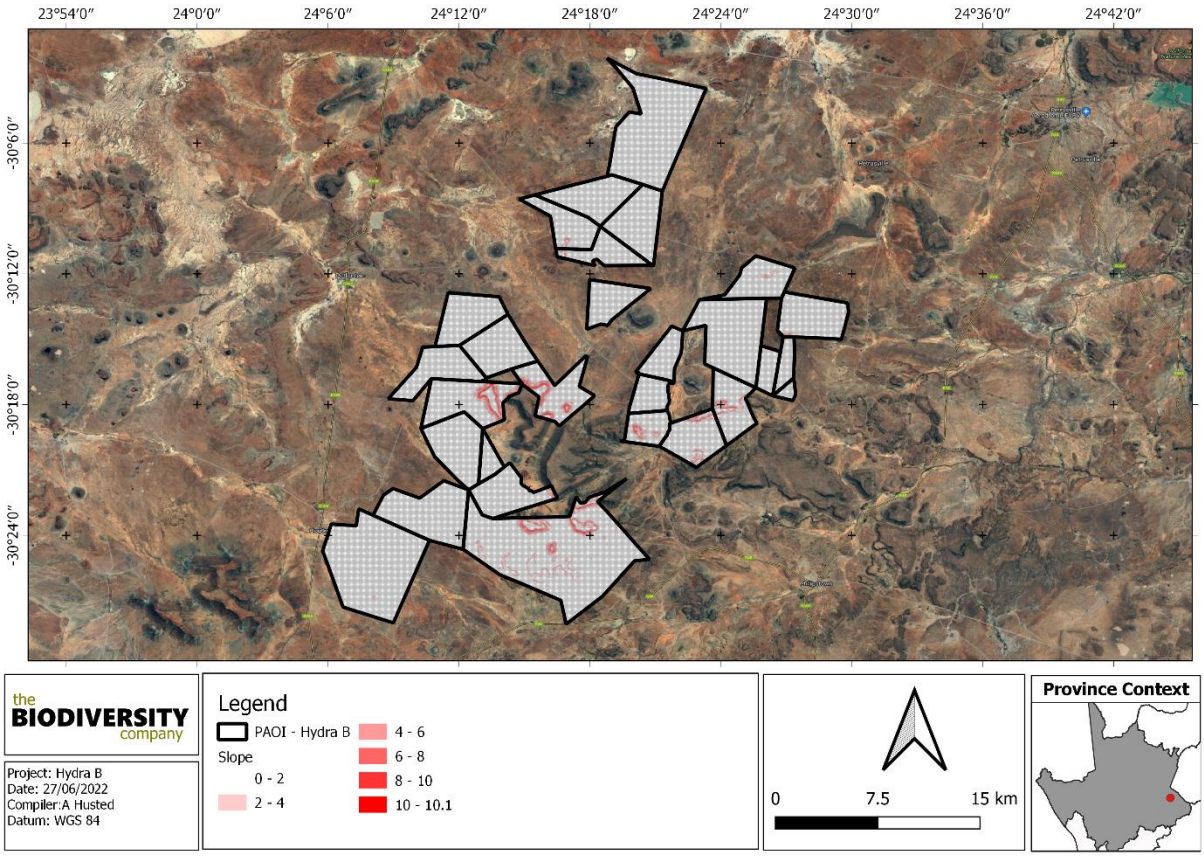


Figure 5-11 Slope percentage map for the PAOI

5.2 Vrede Solar PV Facility Summary

A summary of ecological features and habitat characteristics pertinent to the PAOI is summarised in Table 5-6. A summary of ecological features and habitat characteristics pertinent to the facility is summarised in the subsequent table. These ecological features pertain to the respective farm portions (Figure 5-12).

Table 5-6 Summary of relevance of the PAOI to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant
Ecosystem Threat Status	Relevant – Overlaps with a Least Concern ecosystem
Protected Areas	Irrelevant – The project area does not overlap with a protected area
Renewable Energy Development Zones	Irrelevant - The project area is not within a REDZ
Powerline Corridor	Relevant- The project area falls within the Central Corridor
National Protected Areas Expansion Strategy	Irrelevant – The project area does not overlap with a NPAES protected area
Important Bird and Biodiversity Areas	Relevant – The project area is located in the Platberg-Karoo Conservancy IBA
Strategic Water Source Areas	Irrelevant- The project area is not located in a SWSA

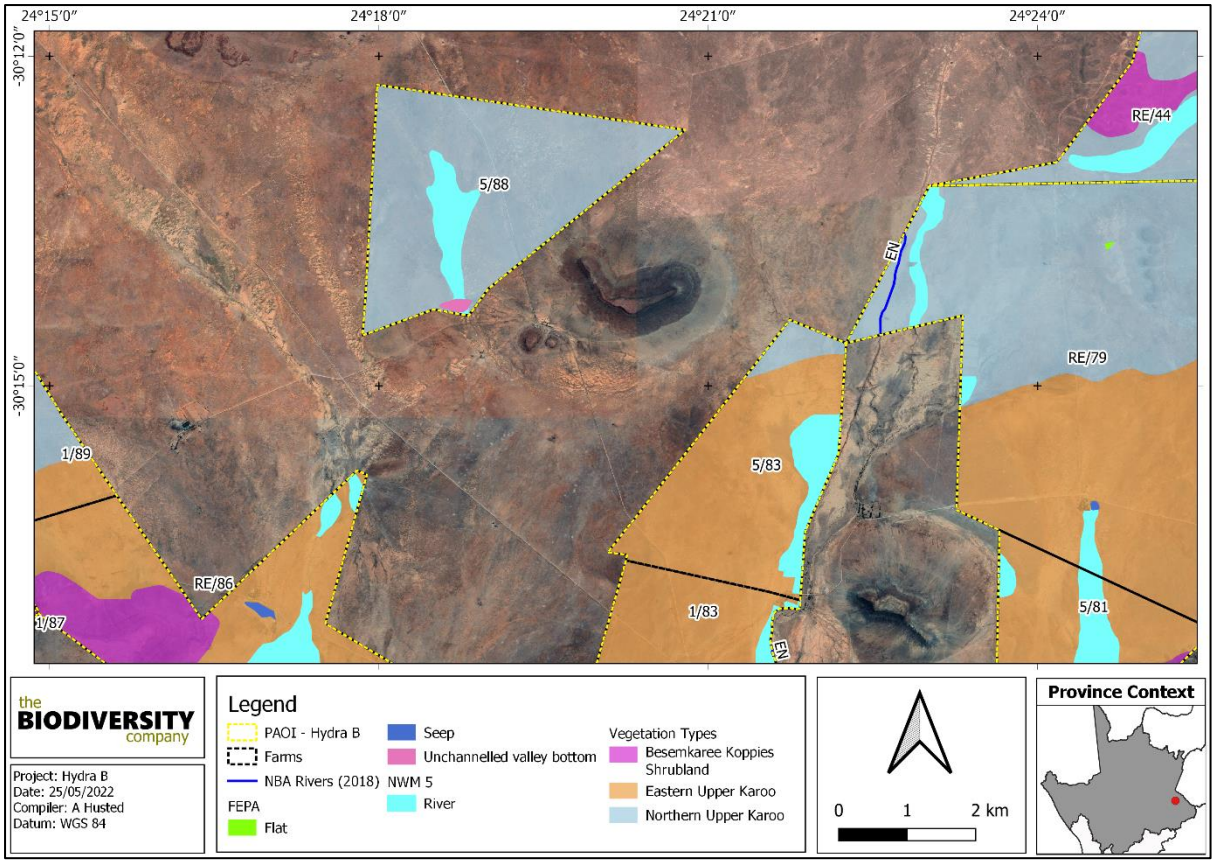


Figure 5-12 The respective farm portions in consideration of the ecological features

Table 5-7 Summary of relevance of the proposed facility to ecologically important landscape features

Project	Land Type	NWM5			C-Plan	FEPA Type	Vegetation Type		NBA 2018 Rivers		Ecosystem	
		System	Threat Status	Protection Level	Category	-	Threat Status	Protection Level	Threat Status	Protection Level	Threat Status	Protection Level
Vrede Solar PV Facility – 150MW	Ae138	River	-	-	ESA	Unchannelled valley bottom	NP	LC	-	-	LC	NP

6 Impact Risk Assessment

6.1 Terrestrial Impact Assessment

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

Table 6-1 Scoping evaluation table summarising the impacts identified to terrestrial biodiversity

Impact **Biodiversity loss/disturbance**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Destruction, fragmentation and degradation of habitats and ecosystems	Direct impacts: » Disturbance / degradation / loss to vegetation and habitats » Ecological corridors are disrupted » Habitat fragmentation Indirect impacts: » Erosion risk increases » Fire risk increases » Increase in invasive alien species	Regional	None identified at this stage
Spread and/or establishment of alien and/or invasive species	Direct impacts: » Loss of vegetation and habitat due to increase in alien species Indirect impacts: » Creation of infrastructure suitable for breeding activities of alien and/or invasive species » Spreading of potentially dangerous diseases due to invasive and pest species	Regional	None identified at this stage
Direct mortality of fauna	Direct impacts: » Loss of SCC species » Loss of fauna diversity Indirect impacts: » Loss of diversity and species composition in the area. » Possible impact on the food chain	Regional/International	None identified at this stage
Reduced dispersal/migration of fauna	Direct impacts: » Loss of genetic diversity » Isolation of species and groups leading to inbreeding Indirect impacts: » Reduced seed dispersal » Loss of ecosystem services	Regional/National	None identified at this stage
Environmental pollution due to water runoff, spills from vehicles and erosion	Direct impacts: » Pollution in watercourses and the surrounding environment » Faunal mortality (direct and indirectly) Indirect impacts: » Ground water pollution » Loss of ecosystem services	Regional	None identified at this stage
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, heat radiation and light pollution.	Direct impacts: » Disruption/alteration of ecological life cycles due to noise » Reduced pollination and growth of vegetation due to dust	Regional	None identified at this stage

	» Faunal mortality due to light pollution (nocturnal species becoming more visible to predators) » Heat radiation could lead to the displacement of species Indirect impacts: » Loss of ecosystem services		
Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	Direct impacts: » Loss of SCCs or TOPS species Indirect impacts: » Loss of ecosystem service » Loss of genetic diversity	Regional	None identified at this stage

Description of expected significance of impact

The development of the area could result in the loss or degradation of the habitat and vegetation, most of which is still in a natural condition and supports a number of fauna species. The construction of the facility could also lead to the displacement/mortalities of the fauna and more specifically SCC fauna species. The operation of the facility could result in the disruption of ecological life cycles. This could be as a result of a number of things, but mainly due to dust, noise and light pollution. The disturbance of the soil/vegetation layer will allow for the establishment of flora alien invasive species, the new infrastructure in turn will provide refuge for invasive/feral fauna species. Erosion is another possible impact that could result from the disturbance of the top soil and vegetation cover. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota.

Gaps in knowledge & recommendations for further study

- This study is completed at a desktop level only.
- Identification and descriptions of habitats.
- Identification of the Site Ecological Importance.
- Location and identification of SCCs as well as in the case of fauna their location of the nests/dens.
- Determine a suitable buffer width for the identified features.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas, but also consider the 500 m PAOI.
- Fieldwork to be undertaken during the wet season period.
- Avifauna assessment field work to be conducted over two seasons to ensure migratory species are considered.

6.2 Freshwater Impact Assessment

The following potential main impacts on the water resources were considered for the construction phase of the proposed project. Construction could result in the encroachment into water resources and result in the loss or degradation of these system, most of which are functional and provide ecological services. Water resources are also likely to be traversed by roads and other linear infrastructure which might create a barrier to flow and biotic movement across the systems. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. During construction earthworks will expose and mobilise earth materials which could result in sedimentation of the receiving systems. A number of machines, vehicles and equipment will be required for the phase, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. The following potential impacts during site clearing and preparation were considered:

- Water resource disturbance / loss.
    - Direct disturbance / degradation / loss to soils or vegetation due to the construction of the facility and associated infrastructure; and
- Water runoff from construction site;
    - Increased erosion and sedimentation; and
    - Contamination of receiving water resources.

During the operational phase an increase in stormwater runoff is anticipated due to the hardened surfaces, resulting in an increase in run-off volume and velocities due to the altered flow regimes. The

changes could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems. The reporting of surface run-off to the systems could also result in the contamination of the systems, transporting (in addition to sediment) diesel, hydrocarbons and soil from the operational areas. The following potential impacts were considered:

- Hardened surfaces;
    - Potential for increased stormwater runoff, leading to increased erosion and sedimentation; and
- Contamination;
    - Potential for increased contaminants entering the wetland systems.

Table 6-2 Scoping evaluation table summarising the impacts identified to wetlands

Impact **Water resource disturbance / loss**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance / degradation / loss to wetland soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings	Direct impacts: » Disturbance / degradation / loss to wetland soils or vegetation Indirect impacts: » Loss of ecosystem services	Regional	None identified at this stage
Increased erosion and sedimentation & contamination of resources	Direct impacts: » Erosion and structural changes to the systems Indirect impacts: » Sedimentation & contamination of downstream reaches	Regional	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into water resources and result in the loss or degradation of these system, most of which are functional and provide ecological services. Water resources are also likely to be traversed by roads and other linear infrastructure which might create a barrier to flow and biotic movement across the systems. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. Earthworks will expose and mobilise earth materials which could result in sedimentation of the receiving systems. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. It is anticipated to increase stormwater runoff due to the hardened surfaces and the crossings will result in an increase in run-off volume and velocities, resulted in altered flow regimes. The changes could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems. The reporting of surface run-off to the systems could also result in the contamination of the systems, transporting (in addition to sediment) diesel, hydrocarbons and soil from the operational areas.			
Gaps in knowledge & recommendations for further study » This study is completed at a desktop level only. » Identification, delineation and characterisation of water resources. » Undertake a functional assessment of systems where applicable. » Determine a suitable buffer width for the resources. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas, but also consider the 500 m regulation area. » Beneficial to undertake fieldwork during the wet season period.			

6.3 Soil Impact Assessment

Construction could result in the encroachment into areas characterised by high land potential properties, which can ultimately result in the loss of land capability. These disturbances could also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. During construction earthworks will expose and mobilise earth materials which could result in compaction and/or erosion.

A number of machines, vehicles and equipment will be required for the phase, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of soil resources, which could affect the salinity or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants. The following potential impacts during site clearing and preparation were considered:

- Loss of land capability
    - Erosion which results in the loss of topsoil and valuable macro nutrients;
    - Compaction, which will ultimately reduce infiltration, aeration, micro-biological activities etc.; and
    - Soil stripping and stockpiling, which, if not treated and ameliorated, could degrade significantly over time.

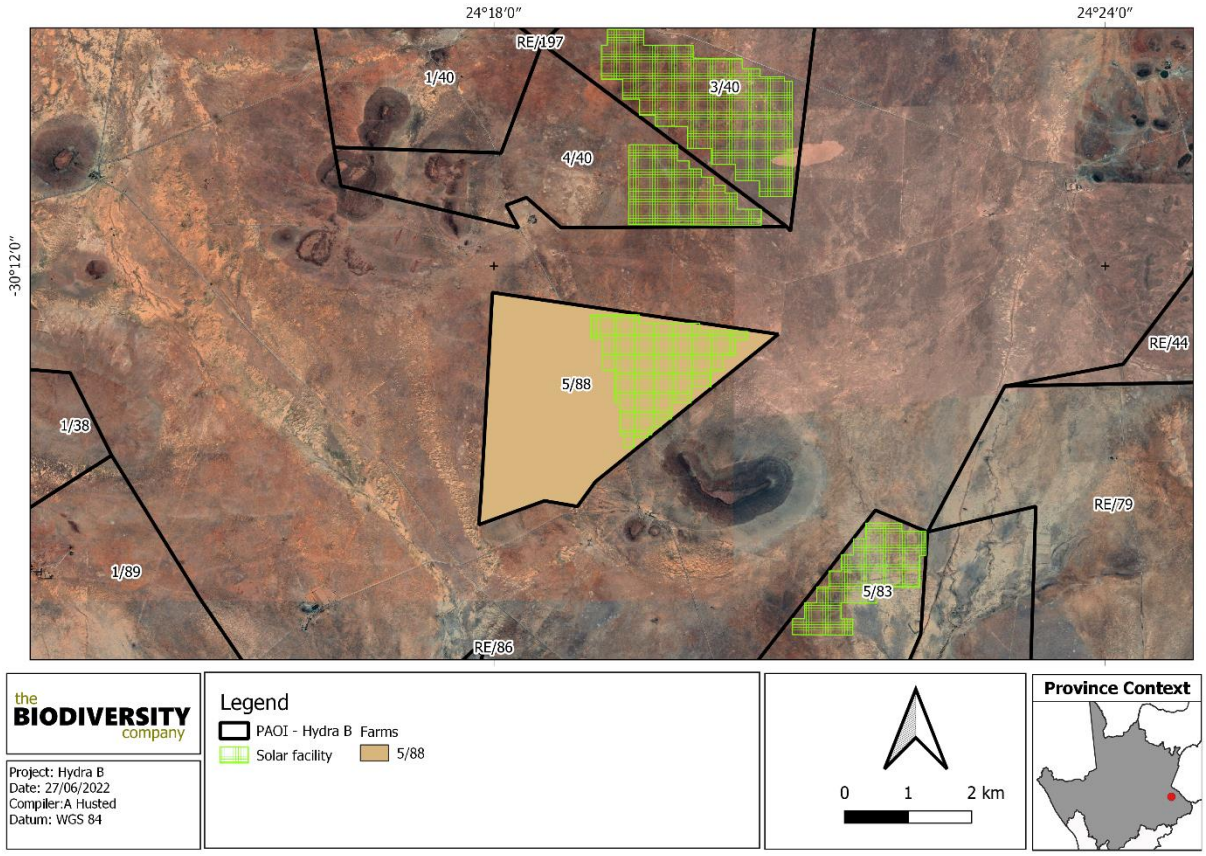
During the operational phase, the impacts can be easily managed by best "housekeeping" practices. This phase will be permanent, which emphasises the need to conserve resources in the direct surroundings of the associated footprint areas.

Table 6-3 Scoping evaluation table summarising the impacts identified to soils

Impact **Loss of land capability**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Compaction/soil stripping/transformation of land use which leads to loss of land capability	Direct impacts: » Loss of soil / land capability Indirect impacts: » Loss of land capability	Regional	None identified at this stage
Erosion	Direct impacts: » Loss of soil / land capability Indirect impacts: Loss of land capability	Local	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into areas characterised by high land potential properties, which can ultimately result in the loss of land capability. These disturbances could also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. Earthworks will expose and mobilise earth materials which could result in compaction and/or erosion. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of soil resources, which could affect the salinity or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants. During the operational phase, the impacts associated with the substation and collector sub will be easily managed by best "housekeeping" practices.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification and delineation of soil forms. » Determine of soil sensitivity.			
Recommendations with regards to general field surveys » Field surveys to prioritise the development areas.			

7 Conclusion

The below figure presents the planned development for the project area. The table below provides a summary of the pertinent ecological features:



Project	Land Type	NWM5			C-Plan	FEPA Type	Vegetation Type		NBA 2018 Rivers		Ecosystem	
		System	Threat Status	Protection Level	Category	-	Threat Status	Protection Level	Threat Status	Protection Level	Threat Status	Protection Level
Vrede Solar PV Facility – 150MW	Ae138	River	-	-	ESA	Unchannelled valley bottom	NP	LC	-	-	LC	NP

7.1 Terrestrial Ecology

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

7.2 Wetlands

A key consideration for the impact assessment is the presence of the water resources in proximity to the project area. The available data also suggests the presence of drainage features in the area, with an expected low to medium sensitivity for these systems.

Construction could result in the encroachment into water resources and result in the loss or degradation of these system, most of which are functional and provide ecological services. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. Leaks and/or spillages could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. An increase in stormwater runoff could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems.

7.3 Agricultural Potential

Various soil forms are expected throughout the project area, of which some are commonly associated with high land capabilities. Even though the soil depth, texture and permeability of these soils ensure high land capability, the climatic capability of the area often reduces the land potential considerably. Areas characterised by “High” land potential are expected for selected areas.

The proposed development can result in the loss of land capability. The disturbances could further also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. The development of the area could also result in compaction and/or erosion. Further to this, these activities could also cause leaks and/or spillages resulting in contamination of soil resources, which could affect the salinity or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants.

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9 Appendix Items

9.1 Appendix A – Specialist Declaration of Independence

I, Lindi Steyn, 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.

Lindi Steyn

Biodiversity Specialist

The Biodiversity Company

June 2022

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

Freshwater Ecologist

The Biodiversity Company

June 2022