The Terrestrial Biodiversity Assessment for the proposed Verbena Solar Photovoltaic (PV) Energy Generation Facility

Lichtenburg, North West Province

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CLIENT

Aristida PV (Pty) Ltd

Prepared by:

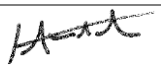
The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**The Terrestrial Biodiversity and Impact Assessment for the proposed Aristida Solar Photovoltaic (PV) Energy Generation Facility**
Reference	**Lichtenburg PV Cluster**
Submitted to	Verbena PV (Pty) Ltd
Report Writer	**Lusanda Matee** 
	Lusanda Matee is a Pr Sci Nat registered (119257/2018) in the fields of Biological Science. He is a specialist terrestrial ecologist and botanist who conducts floral surveys faunal surveys which include mammals, birds, amphibians, and reptiles for projects as per the International Finance Corporation Performance Standards notably IFC PS6, World Bank Operation Guidelines (OP/04.4), World Bank Environmental and Social Standards, in particular, ESS6, Equator Principles and best practice guidelines. He received a Bachelor of Science, Honours, and MSc in Biological Sciences from the University of KwaZulu-Natal.
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.

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to appointed to undertake a fauna and flora baseline assessment for the Elandsfontein Cluster project, which comprises two (2) separate Photovoltaic (PV) facilities development of a Photovoltaic (PV) system (Figure 1-1). For the purposes of this assessment, the Elandsfontein Cluster area has been collectively refered to as the 'project area'. The following information is as provided by the client:

The Applicant Aristida PV (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as Aristida PV) located on a site approximately 5km -north-west of the town of Lichtenburg in the North West Province. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality on Portion 7 of Farm Elandsfontein 34 (SG21 Code: T0IP00000000003400007). The site is accessible via the R503, located south-east of the development area.

Two PV facilities (or clusters) were jointly considered for the scoping assessment, but each PV facility was assessed through a separate Environmental Impact Assessment (EIA) process. This report specifically focuses on the Aristida PV facility. An assessment area of approximately 232 ha for Aristida PV and 197 ha for Themeda PV is assessed as part of each EIA process and the infrastructure associated with each includes:

- *PV modules and mounting structures;*
- *Inverters and transformers;*
- *Battery Energy Storage System (BESS);*
- *Site and internal access roads (up to 8m wide);*
- *Auxiliary buildings (22kV or 33kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);*
- *Temporary and permanent laydown area;*
- *Cabling between the panels, to be laid underground where practical; and*
- *An on-site facility substation stepping up from 22kV or 33kV to 132kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution.*

The PV facilities intend to connect to the National Grid via the Watershed Main Transmission Substation (MTS) (approximately 5 km east of the facility), however, the connection infrastructure associated with this grid solution is being assessed as part of a separate Environmental Application.

This assessment was conducted per 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). This report was compiled to fulfil the requirement for a Terrestrial Biodiversity Assessment as per the 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 NEMA (GNR 320), as gazetted on 20 March 2020. This report is undertaken as

supporting information as part of a greater environmental application process and is compliant in terms of the requirements in the above regulations in terms of Terrestrial Biodiversity. In terms of the 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 NEMA, gazetted on 30 October 2020, relating to requirements relating specifically to the Terrestrial Plant and Animal (species) themes, this report includes these requirements.

The following is deduced from the National Web-based Environmental Screening Tool:

- Terrestrial Biodiversity Theme is “Low” for the proposed project due to traversing the following:
    - According to the spatial dataset, the project area has “Low” terrestrial biodiversity sensitivity;
    - The project area falls in a “Poorly Protected” area;
- The project area is “Medium-Low” Plant Species Theme sensitivity; and
- Animal Species Theme sensitivity is classified as “Low”.

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

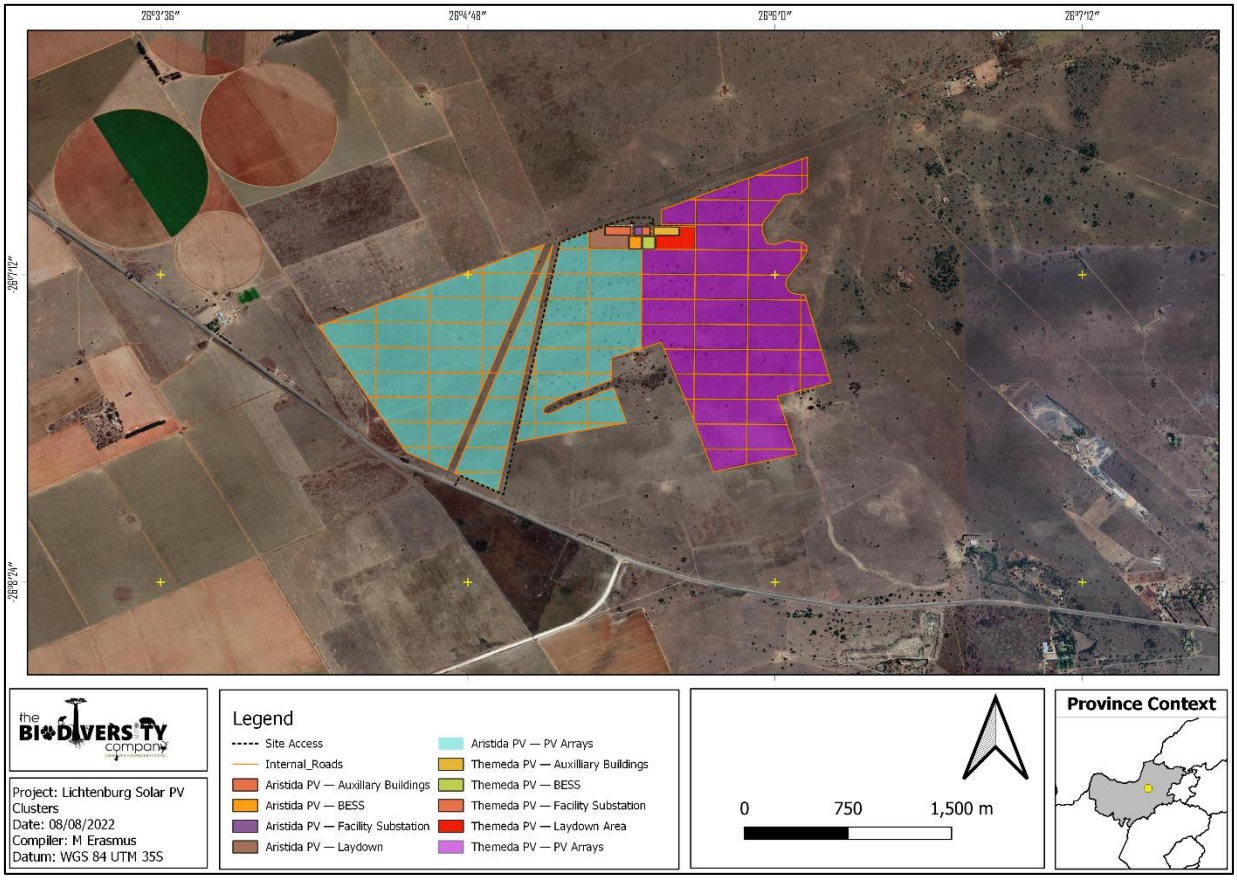

Figure 1-1 Map illustrating the location of the proposed Elandsfontein Cluster

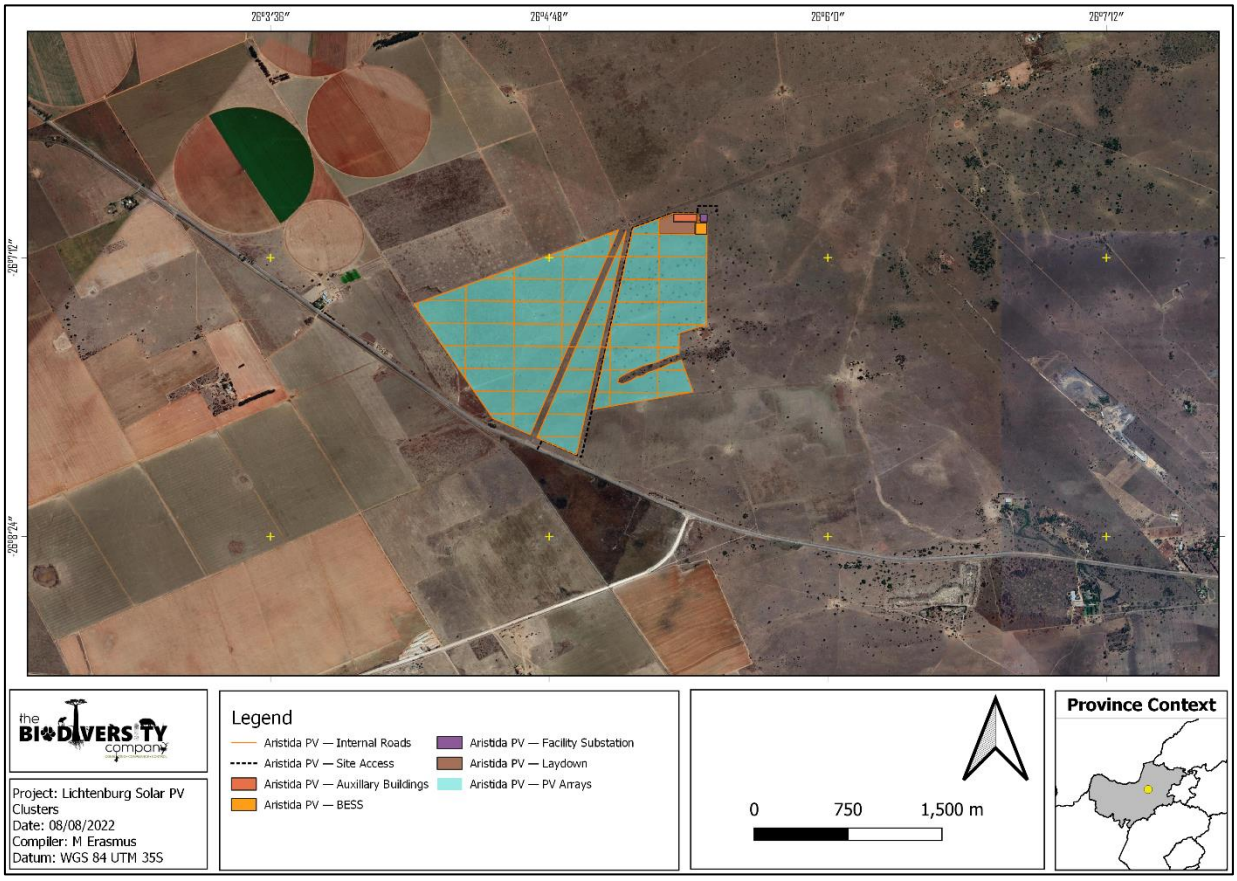

Figure 1-2 Map illustrating the location and specific boundary of the Aristida PV

1.2 Scope of Work

The principal aim of the assessment was to provide information to guide the risk of the activity to the flora and fauna communities of the associated ecosystems 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 possible threatened flora and fauna species that occur within the project area;
- Field survey to ascertain the species composition of the present flora and fauna community within the project area;
- Delineate and map the habitats and their respective sensitivities that occur within the project area; and
- Completion of a risk assessment and the prescription of mitigation measures and recommendations for potential risks.

1.3 Key Legislative Requirements

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

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

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	North-West Biodiversity Sector Plan of 2015 (READ, 2015).
	The North West Biodiversity Management Amendment Bill, 2017
	Bophuthatswana Nature Conservation Act (Act 3 of 1973)
	Transvaal Nature Conservation Ordinance (No. 12 of 1983)

2 Methods

2.1 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.

2.1.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the project might interact with any ecologically important entities. Emphasis was placed on 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 the 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 – 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.
    - Ecosystem Protection Level – 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.
- Protected areas:
    - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The (SAPAD) Database contains spatial data for the conservation of South Africa. It includes spatial and attributes information for both formally protected areas and areas that have less formal protection. SAPAD is updated continuously 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, 2017) – 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.
- The North-West Department of Rural, Environment, and Agricultural Development (READ), as custodian of the environment in the North West, is the primary implementing agent of the Biodiversity Sector Plan. The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by READ. The purpose of

a Biodiversity Sector Plan is to inform land-use planning, environmental assessments, land and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land-use planning and decision-making guidelines (READ, 2015).

- 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; and

- 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.

2.2 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. 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.

2.2.1 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 2427 quarter degree square;

- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2427 quarter degree square; and

- Mammal list from the IUCN spatial dataset (2017).

2.3 Biodiversity Field Assessment

A brief screening assessment was conducted in January while the full field assessment survey was undertaken in March 2022, which is wet season surveys, to determine the presence of Species of Conservation Concern (SCC) and for the identification and assessment of habitat features. An effort was made to cover all the different habitat types, within the limits of time and access.

2.3.1 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, to perform rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the project area.

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

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 was performed based on the original technique described by Goff *et al.* (1982). Suitable habitats 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., livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

2.3.2 Fauna Survey

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

- Visual and auditory searches - This typically comprised of meandering and using binoculars to view species from a distance without them being disturbed, and listening to species calls;
- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.); and
- Utilization of local knowledge.

Relevant field guides and texts consulted for identification purposes including 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); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

2.4 Terrestrial Site Ecological Importance (SEI)

The different habitat types within the project area were delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types were 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 2-1 and Table 2-2, respectively.

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

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of 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 2-2 Summary of Functional Integrity (FI) criteria

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

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

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

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

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

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

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

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of: (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 2-5.

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

Site Ecological Importance (SEI)		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

Site Ecological Importance (SEI)		Biodiversity Importance (BI)				
		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 2-6.

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

Site Ecological Importance (SEI)	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

2.5 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- During the infield assessment the extent of the cluster or rather project areas were assessed however only the Aristida PV was considered for this assessment;
- The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The area was only surveyed during a single site visit and therefore, this assessment does not consider temporal trends;
- Only a single season full survey was conducted for the respective studies, this would constitute a wet season survey; and
- The GPS used in the assessment has an accuracy of 5 m and consequently, any spatial features may be offset by 5 m.

3 Results & Discussion

3.1 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 the relevance of the proposed development to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Renewable Energy Database	Adjacent to project "In Process" with several projects in the area "approved"	3.1.1
Ecosystem Threat Status	Relevant – Located within a Least Concerned ecosystem	3.1.2.1
Ecosystem Protection Level	Relevant: The project area falls in a "Poorly Protected" area.	3.1.2.2
National Threatened Ecosystem	Irrelevant- The project area does not traverse any threatened ecosystem.	-
Protected Areas	Irrelevant –11.5 km from a protected area: SACAD-Marico Biosphere Reserve	-
National Protected Areas Expansion Strategy	Irrelevant – Does not overlap with any NPAES	3.1.5
Critical Biodiversity Area	Irrelevant – Overlaps with aquatic ESA 1 & 2, according to the NWBSP	3.1.3
Important Bird and Biodiversity Areas	Irrelevant: No Important Bird and Biodiversity Areas (IBAs) are situated within the project area.	-
South African Inventory of Inland Aquatic Ecosystems	Relevant – The Aristida PV has a wetland that occurs within 500 meters of the PV area	3.1.4
National Freshwater Priority Area	The NFEPA spatial data indicates that no FEPA wetlands were identified within the project area and the closest river is more than 2 km from the project area (NFEPA 0= None)	3.1.4
Strategic Water Source Areas	Irrelevant – Not located within a SWSA, closest SWSA is more than 200 km away. The project area does overlay the Bo-Molopo Karst Belt groundwater SWSA.	-
Vegetation Type	The project area occurs in the Carletonville Dolomite Grasslands (Gh15) Vulnerable (VU).	3.2.1.1

3.1.1 Renewable Energy Database

The Renewable Energy Database (http://egis.environment.gov.za/), shows that there are other projects in the near vicinity (Figure 3-1). This increases the potential cumulative impact on the habitats in the area.

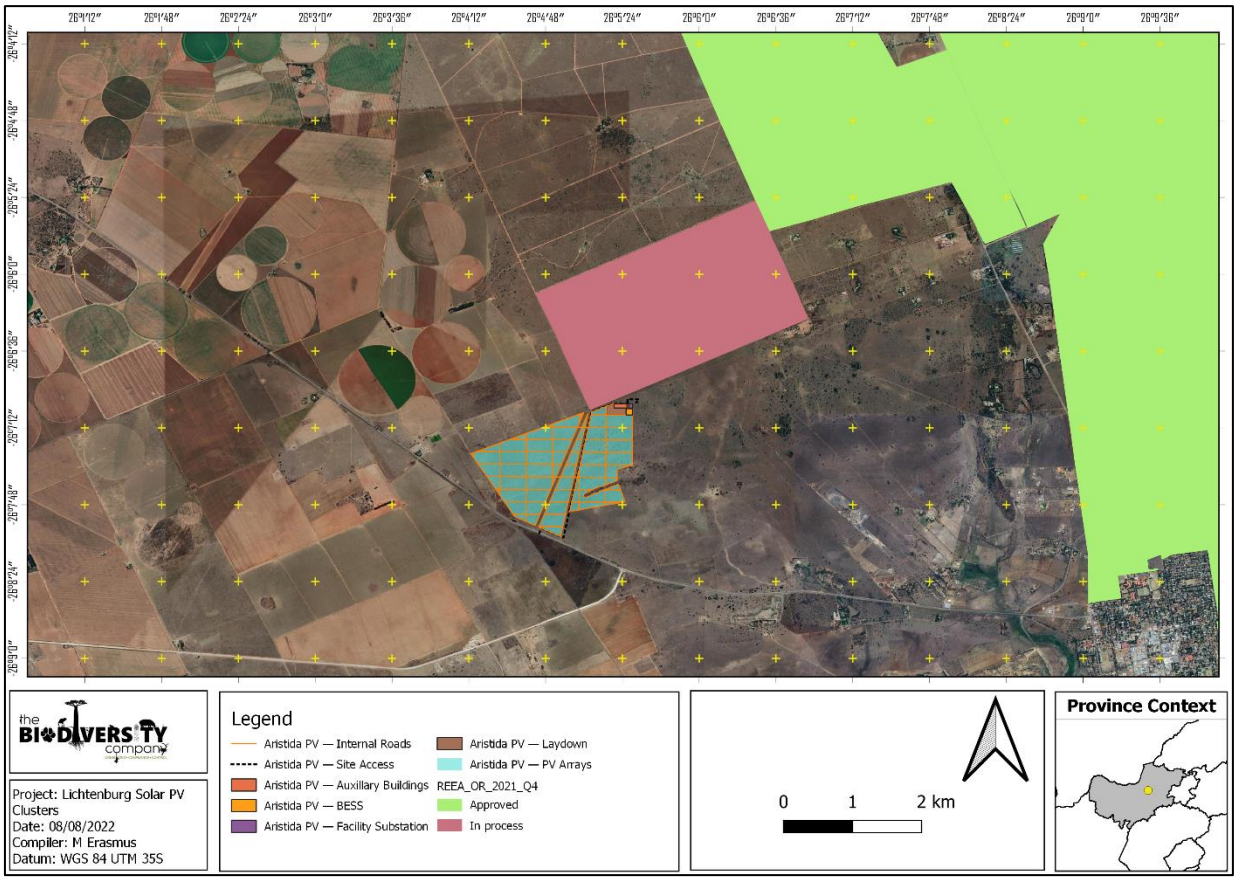

Figure 3-1 The project area in relation to the renewable energy database projects in the area.

3.1.2 The National Biodiversity Assessment 2018

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA and other stakeholders, including scientists and biodiversity management experts throughout the country over three years (Skowno *et al*., 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Skowno *et al*., 2019).

The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al*., 2019). Government Notice No. 320[1] and Government Notice No. 1150[2] require reporting on the description of terrestrial biodiversity and ecosystems on the preferred site as per section 2.3.5 of the ''Theme-Specific Requirements". These procedures are for the assessment and minimum criteria for reporting on identified environmental themes when applying for environmental authorisation.

[1] Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 March 2020

[2] Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Animal Species as published in Government Gazette 43855 dated 30 October 2020

3.1.2.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed development areas overlaps with LC ecosystem Figure 3-2).

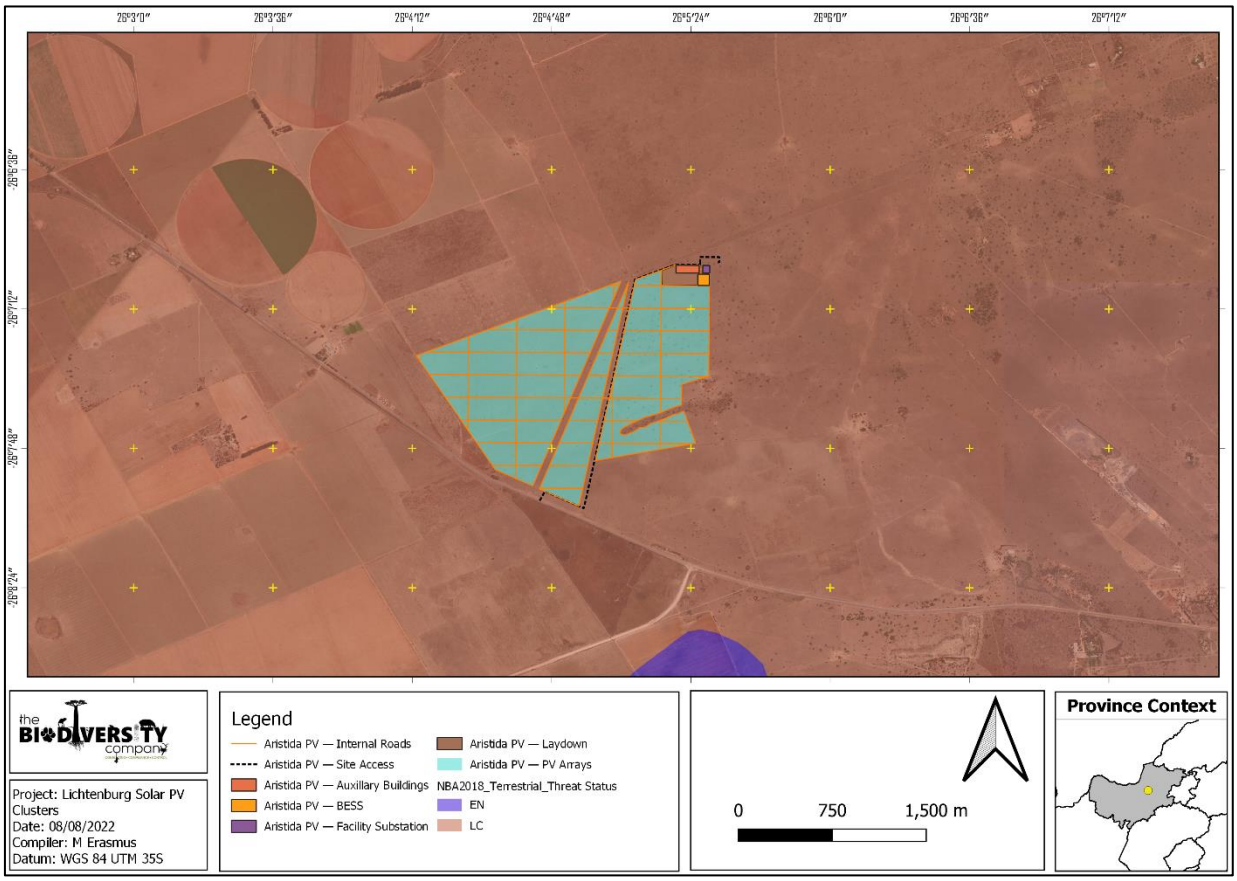

Figure 3-2 Map illustrating the ecosystem threat status associated with the assessment area

3.1.2.1 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 proposed development areas overlap with PP ecosystems (Figure 3-3).

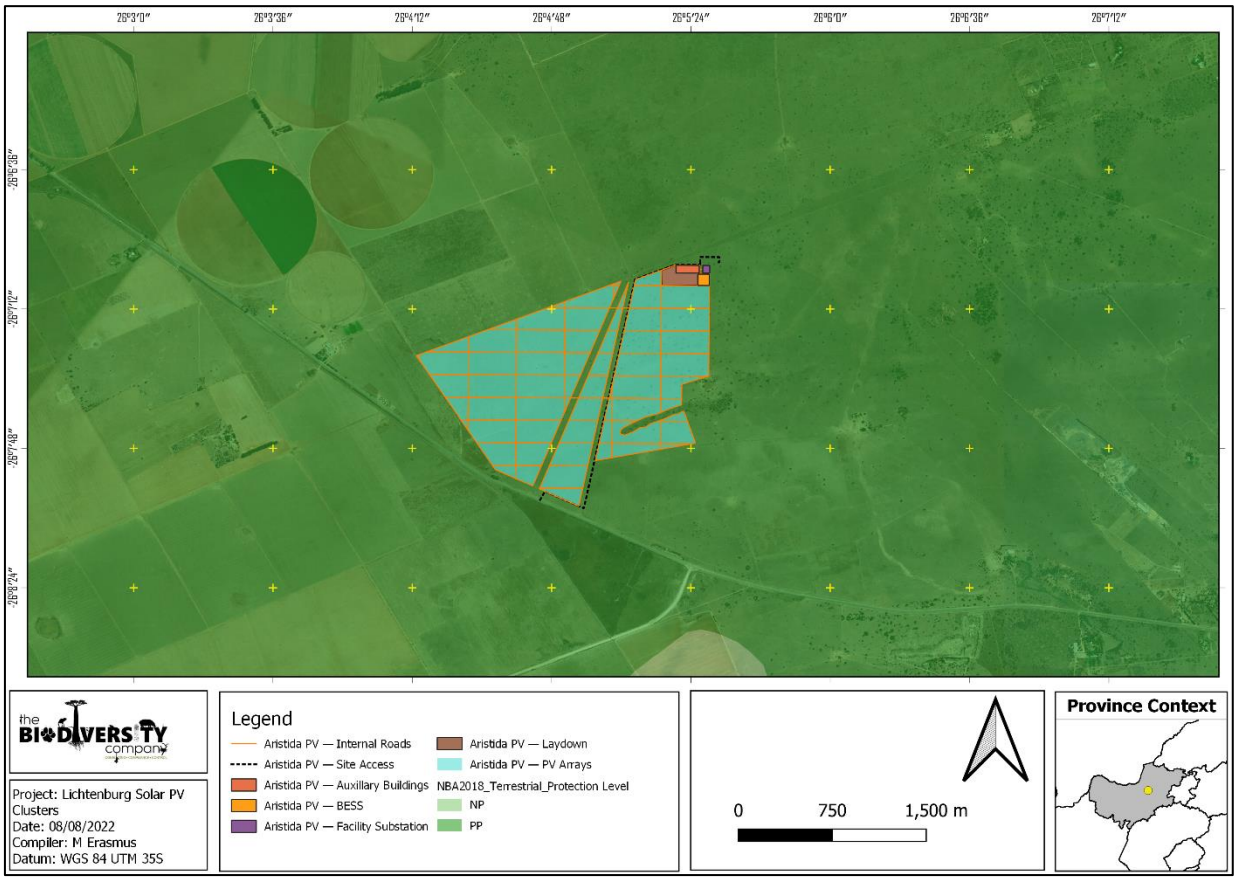

Figure 3-3 Map illustrating the ecosystem protection level associated with assessment area

3.1.3 Biodiversity Sector Plan

Conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation 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). The Aristida PV doesn't overlap any terrestrial CBAs or ESAs (Figure 3-4) although overlaps with aquatic ESA 1 and ESA 2 (Figure 3-5).

According to the BSP the aquatic ESA1 designations for the area refers to dolomite recharge areas (W5).

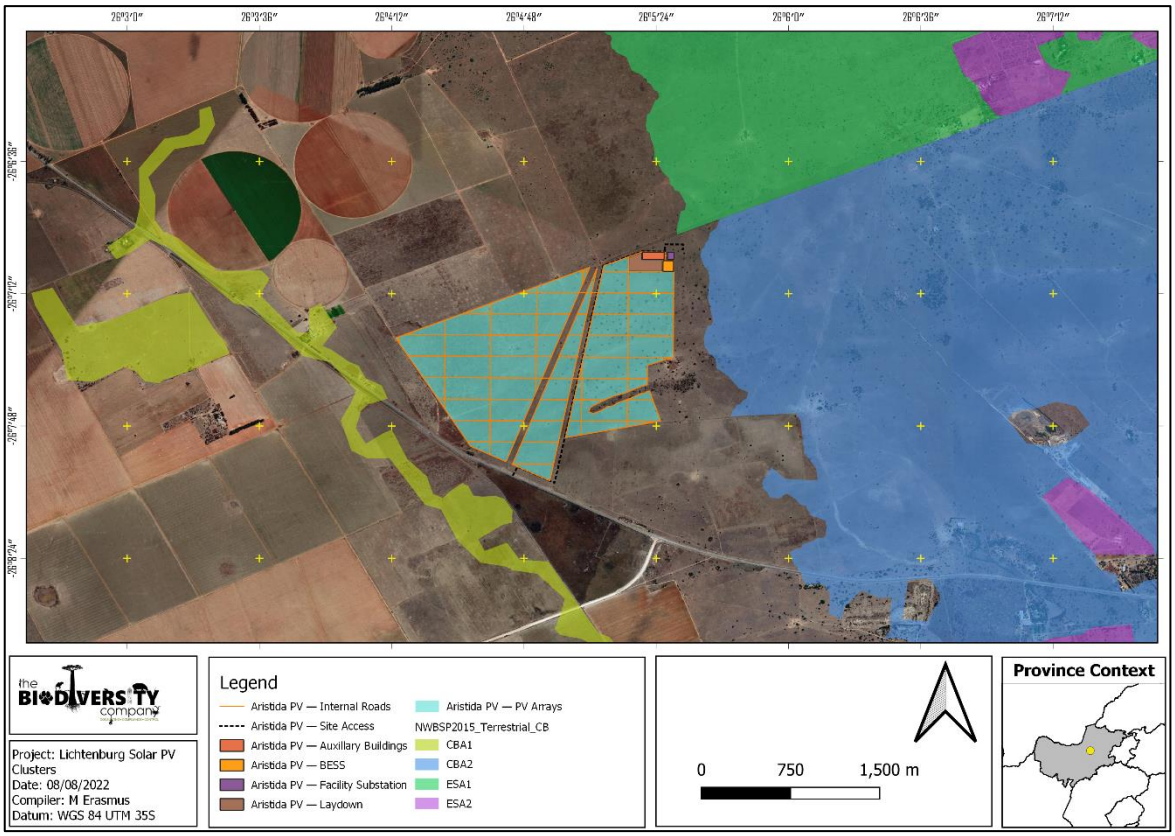

Figure 3-4 Map illustrating the terrestrial Critical Biodiversity Areas associated with the assessment area

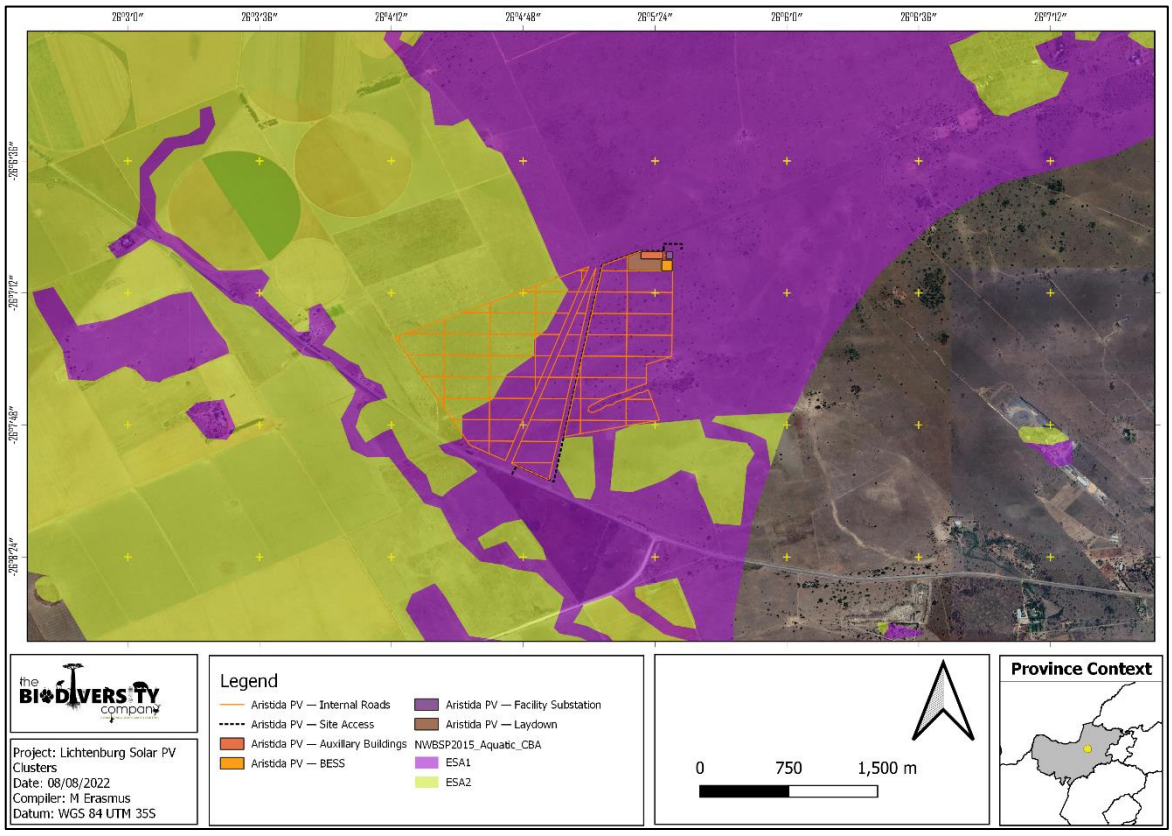

Figure 3-5 Map illustrating the aquatic Ecological Support Areas associated with the assessment area

3.1.4 South African Inventory of Inland Aquatic Ecosystems

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al*., 2019). According to the SAIIAE dataset some potential "unclassified" resources are located within the 500 m regulation area[3], but not within the areas proposed for development. The regulation areas have been delineated (separately) for each facility.

3.1.4.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Skowno *et al*., 2019).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno *et al*., 2019). The project area was superimposed on the aquatic ecosystem threat status (Figure 3-6). As seen in this figure, the project area falls across CR and LC ecosystems (Figure 3-6). The Aristida PV area is nearest to a NBA wetland, but in excess of 250 m from the (LC) resource.

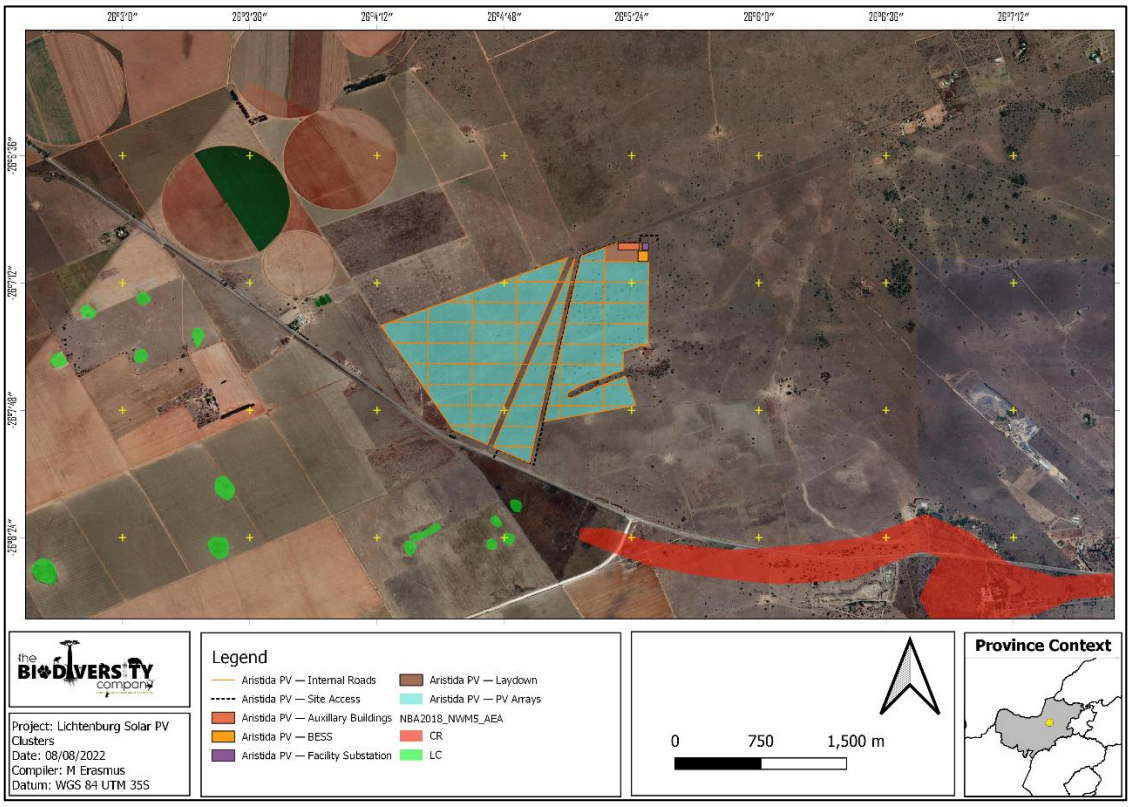

Figure 3-6 The project area showing the regional ecosystem threat status of the associated aquatic ecosystems (NBA, 2018)

[3] The 500 m regulated area refers to a radius for Section 21 (c) and (i) of the NWA.

3.1.4.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al*., 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of aquatic ecosystems associated with the development (Figure 3-7). Based on Figure 3-7 the aquatic ecosystems associated with the project area are rated as *poorly protected / not protected.*

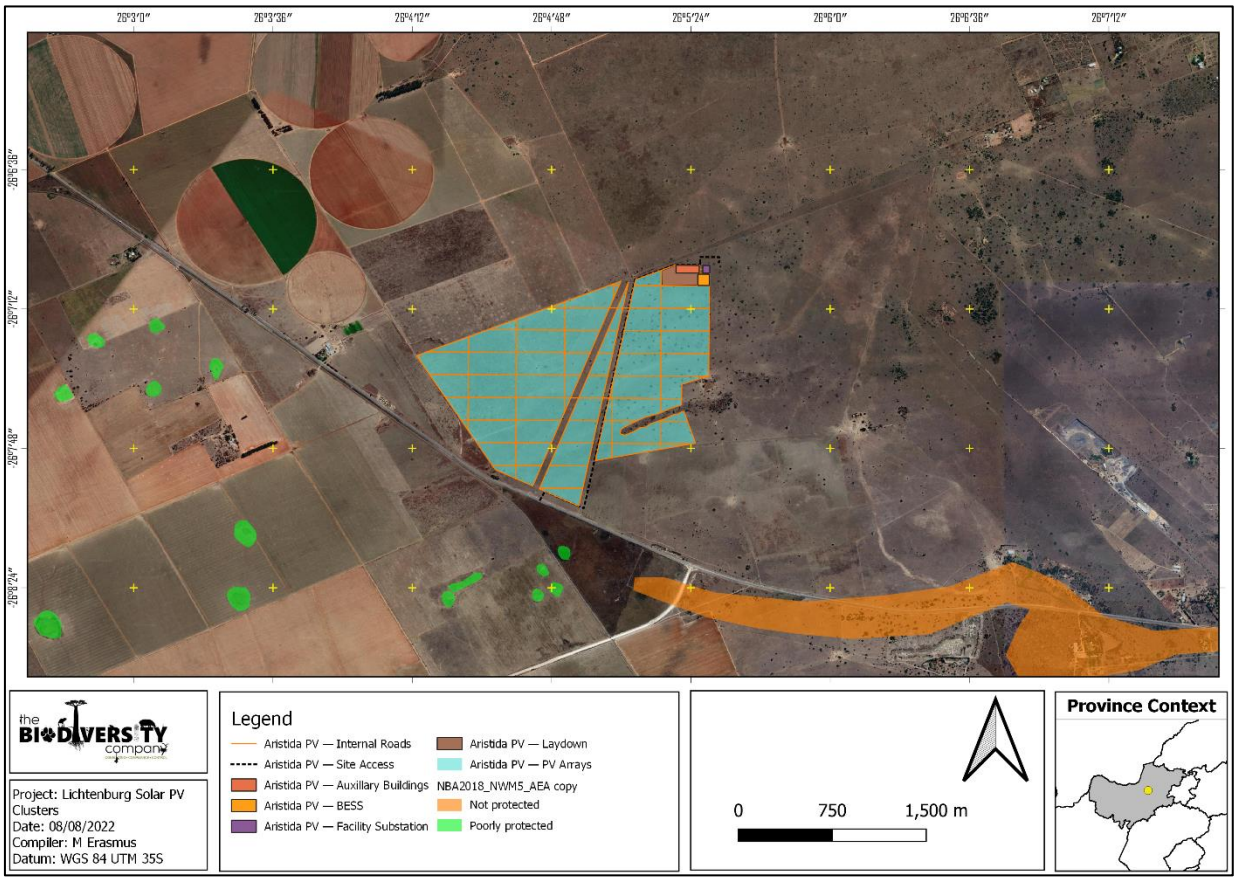

Figure 3-7 The project area showing the regional level of protection of aquatic ecosystems (NBA, 2018)

3.1.5 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2017 (NPAES) focus areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2017).

The Aristida PV doesn't overlap with any NPAES (Figure 3-8).

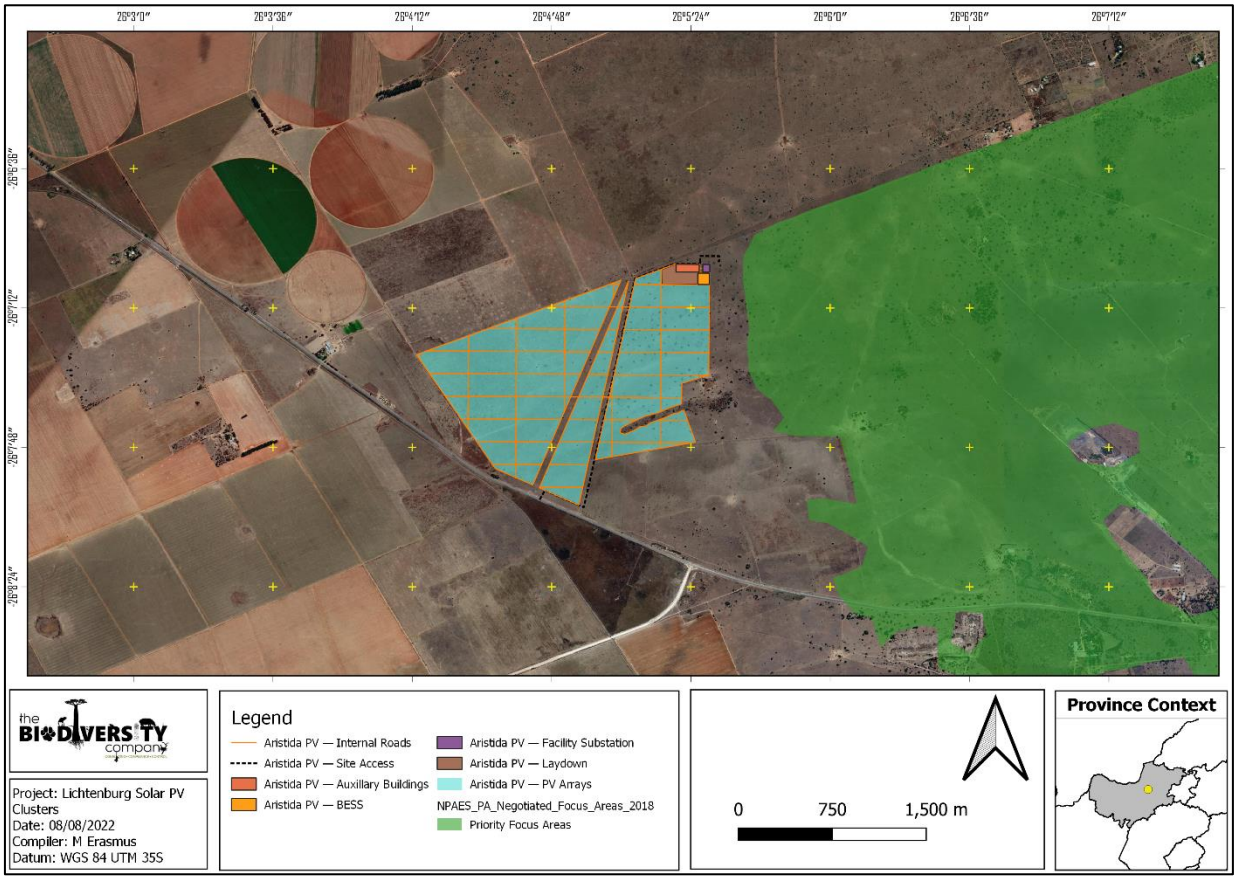

Figure 3-8 The project area in relation to the National Protected Areas Expansion Strategy areas

3.2 Flora Assessment

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

3.2.1 Vegetation Type

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

a) Seasonal precipitation; and

b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

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

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

On a fine-scale vegetation type, the project area overlaps with the Carletonville Dolomite Grassland vegetation type (Figure 3-9).

Figure 3-9 Map illustrating the vegetation type associated with the assessment area

3.2.1.1 Carletonville Dolomite Grassland

This vegetation type occurs on slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Mucina & Rutherford, 2006). This vegetation type occurs in the North-West, Gauteng and marginally into the Free State Province: In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province.

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Carletonville Dolomite Grassland** vegetation type:

Graminoids: *Aristida congesta, Brachiaria serrata, Cynodon dactylon, Digitaria tricholaenoides, Diheteropogon amplectens, Eragrostis chloromelas, E. racemosa, Heteropogon contortus, Loudetia simplex, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra, Alloteropsis semialata subsp. eckloniana, Andropogon schirensis, Aristida canescens, A. diffusa, Bewsia biflora, Bulbostylis burchellii, Cymbopogon caesius, C. pospischilii, Elionurus muticus, Eragrostis curvula, E. gummiflua, E. plana, Eustachys paspaloides, Hyparrhenia hirta, Melinis nerviglumis, M. repens subsp. repens, Monocymbium ceresiiforme, Panicum coloratum, Pogonarthria squarrosa, Trichoneura grandiglumis, Triraphis andropogonoides, Tristachya leucothrix, T. rehmannii.*

Herbs: *Acalypha angustata, Barleria macrostegia, Chamaecrista mimosoides, Chamaesyce inaequilatera, Crabbea angustifolia, Dianthus mooiensis, Dicoma anomala, Helichrysum caespititium, H. miconiifolium, H. nudifolium var. nudifolium, Ipomoea ommaneyi, Justicia anagalloides, Kohautia amatymbica, Kyphocarpa angustifolia, Ophrestia oblongifolia, Pollichia campestris, Senecio coronatus, Vernonia oligocephala.*

Geophytic Herbs: *Boophone disticha, Habenaria mossii.*

Low Shrubs*: Anthospermum rigidum subsp. pumilum, Indigofera comosa, Pygmaeothamnus zeyheri var. rogersii, Searsia magalismontana, Tylosema esculentum, Ziziphus zeyheriana.*

Geoxylic Suffrutices: *Elephantorrhiza elephantina, Parinari capensis subsp. capensis*.

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable (VU). The national target for conservation protection for both these vegetation types is 24%, but only a small extent is conserved in statutory (Sterkfontein Caves — part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams.

3.2.2 Expected Flora Species

The Plants of Southern Africa (POSA) database indicates that 282 species of indigenous plants are expected to occur within the project area (Appendix A). No SCC based on their conservation

status could be expected to occur within the project, however the threatened *Vachellia erioloba* (Camel thorn) is expected. This is a nationally protected tree (Table 3-2).

Table 3-2 Threatened flora species that may occur within the project area.

Family	Taxon	Author	IUCN	Ecology
Fabaceae	*Vachellia erioloba*	(E.Mey.) P.J.H.Hurter	LC	Indigenous

3.3 Faunal Assessment

3.3.1 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 19 amphibian species are expected to occur within the area (Appendix B). One (1) are regarded as threatened (Table 3-3).

Table 3-3 Threatened amphibian species that are expected to occur within the project area

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

Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area, especially in the area with the wetlands. The Giant Bull Frog is listed as near threatened on a regional scale. It is a species of drier savannas where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017).

3.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 42 reptile species are expected to occur within the area (Appendix C). None are regarded as SCC.

3.3.3 Mammals

The IUCN Red List Spatial Data lists 68 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. Ten (10) (smaller non protected area restricted species) of these expected species are regarded as threatened (Table 3-4), five of these have a low likelihood of occurrence based on the lack of suitable habitat and food sources in the project area. Descriptions of species with a moderate likelihood of occurrence are discussed below.

Table 3-4 Threatened mammal species that are expected to occur within the project area.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Low
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low

Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

Atelerix frontalis (South African Hedgehog) has a tolerance to a degree for habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), A. frontalis populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Suitable grasslands occur in the project area, although somewhat disturbed, that can function as habitat for this species, as such the likelihood of occurrence is rated as moderate.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring, is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The highest densities of this species have been recorded in the more arid Karoo region of South Africa. The habitat in the project area can be considered to be somewhat suitable for the species and the likelihood of occurrence is therefore rated as moderate.

4 Field Assessment

4.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the project area. A total of 62 trees, shrubs, herbaceous and graminoid plant species were recorded in the project area during the field assessment (Table 4-1). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text.

The list of plant species recorded is by no means comprehensive, a survey conducted under guard may likely yield up to 40% additional flora species for the project area. However, floristic analysis conducted to date is regarded as a sound representation of the local flora for the project area. Some of the plants recorded can be seen in Figure 4-1.

Table 4-1 Trees, shrubs and herbaceous plant species recorded in the project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Albuca setosa	Soldier-in-the-box	LC	Indigenous, Not Endemic	
Aloe greatheadii	Spotted Aloe	LC	Indigenous, Not Endemic	
Argemone mexicana	Mexican Prickly Poppy	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Aristida bipartita	Rolling grass	LC	Indigenous, Not Endemic	
Aristida congesta subsp barbicollis	Spreading Three-awn	LC	Indigenous, Not Endemic	
Aristida congesta subsp congesta	Tassel Three-awn	LC	Indigenous, Not Endemic	
Asparagus laricinus Burch.	Cluster-leaf asparagus	LC	Indigenous, Not Endemic	
Berkheya onopordifolia	Mohato	LC	Indigenous, Not Endemic	
Bidens pilosa	Blackjack	NE	Not Indigenous; Naturalized exotic weed	
Boophone disticha	Poison Bulb	LC	Indigenous, Not Endemic	
Bothriochloa insculpta	Pinhole Grass	LC	Indigenous, Not Endemic	
Buddleja saligna	Olive Sagewood	LC	Indigenous, Not Endemic	
Bulbine abyssinica	Bushy Bulbine	LC	Indigenous, Not Endemic	
Celtis africana	White Stinkwood	LC	Indigenous, Not Endemic	
Chloris gayana	Rhodes grass	LC	Indigenous, Not Endemic	
Conyza bonariensis	Flax-leaf Fleabane	NE	Not Indigenous; Naturalized exotic weed	Naturalized exotic weed
Cynodon dactylon	Couch gras	LC	Indigenous, Not Endemic	
Datura ferox	Large Thorn Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Dichrostachys cinerea subsp. nyassana	Sickle Bush, Kalahari Christmas Tree	LC	Indigenous, Not Endemic	
Digitaria eriantha	Finger Grass	LC	Indigenous, Not Endemic	
Eragrostis chloromelas	Blue Love Grass	LC	Indigenous, Not Endemic	
Eragrostis curvula	Weeping Love Grass	LC	Indigenous, Not Endemic	
Eragrostis lehmanniana var. lehmanniana	Eastern Province Vlei Grass, Land-Grass, Lehman Love Grass	LC	Indigenous, Not Endemic	
Eragrostis superba	Wilman Lovegrass	LC	Indigenous, Not Endemic	
Flaveria bidentis	Speedyweed	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Gomphocarpus tomentosus Burch. subsp. Tomentosus	Woolly Milkweed	LC	Indigenous, Not Endemic	
Grass Loudetia simplex	Common Russet	LC	Indigenous, Not Endemic	
Grewia flava	Velvet Raisin	LC	Indigenous, Not Endemic	

Grewia monticola	Cross Berry	LC	Indigenous, Not Endemic	
Helichrysum aureum	Bright Yellow Everlasting	LC	Indigenous, Not Endemic	
Heteropogon contortus	Tanglehead, Spear Grass	LC	Indigenous, Not Endemic	
Hyparrhenia hirta	Common Thatching Grass, Blougras (a)	LC	Indigenous, Not Endemic	
Hypoxis hemerocallidea	Star-flower	LC	Indigenous, Not Endemic	
Hypoxis rigidula Baker var. pilosissima Baker	Hypoxis	LC	Indigenous, Not Endemic	
Ipomoea papilio Hallier f.	Morning Glory	LC	Indigenous, Not Endemic	
Lantana camara	Lantana	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Ledebouria revoluta	Common African Hyacinth	LC	Indigenous, Not Endemic	
Loudetia simplex	Russet Grass	LC	Indigenous, Not Endemic	
Melia azedarach	Chinaberry	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Melinis repens	Natal Red Top	LC	Indigenous, Not Endemic	
Ozoroa paniculosa	Bushveld Ozoroa	LC	Indigenous, Not Endemic	
Panicum maximum	Guinea Grass	LC	Indigenous, Not Endemic	
Panicum natalense	Natal Buffalo Grass	LC	Indigenous, Not Endemic	
Pogonarthria squarrosa	Herringbone Grass	LC	Indigenous, Not Endemic	
Polygala hottentotta	Small Purple Broom	LC	Indigenous, Not Endemic	
Schkuhria pinnata	Dwarf Marigold	NE	Not Indigenous; Naturalized exotic weed	
Searsia lancea	Karee	LC	Indigenous, Not Endemic	
Senegalia mellifera (Vahl) Seigel & Ebinger subsp. detinens	Black Thorn	LC	Indigenous, Not Endemic	
Sesbania bispinosa (Jacq.) W.Wight var. bispinosa	Spiny Sesbania	NE	Indigenous, Not Endemic	
Setaria sphacelata var. sphacelata	Common bristle grass; Golden Timothy Grass	LC	Indigenous, Not Endemic	
Solanum aculeatissimum	Love-apple Nightshade	NE	Not Indigenous; Naturalized exotic weed	
Solanum sisymbriifolium	Wild Tomato, Dense; Thorned Bitter Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Sporobolus africanus	Ratstail Dropseed; Rush Grass	LC	Not Endemic	
Tagetes minuta	Khaki Bush, Khaki Weed, African Marigold	NE	Not Indigenous; Naturalized exotic weed	
Themeda triandra	Angle Grass	LC	Indigenous, Not Endemic	
Verbena Brasiliensis	Brazilian Vervain	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Ximenia americana	Blue Sour Plum	LC	Indigenous, Not Endemic	

Ziziphus zeyheriana	Dwarf Buffalothorn	LC	Indigenous, Not Endemic

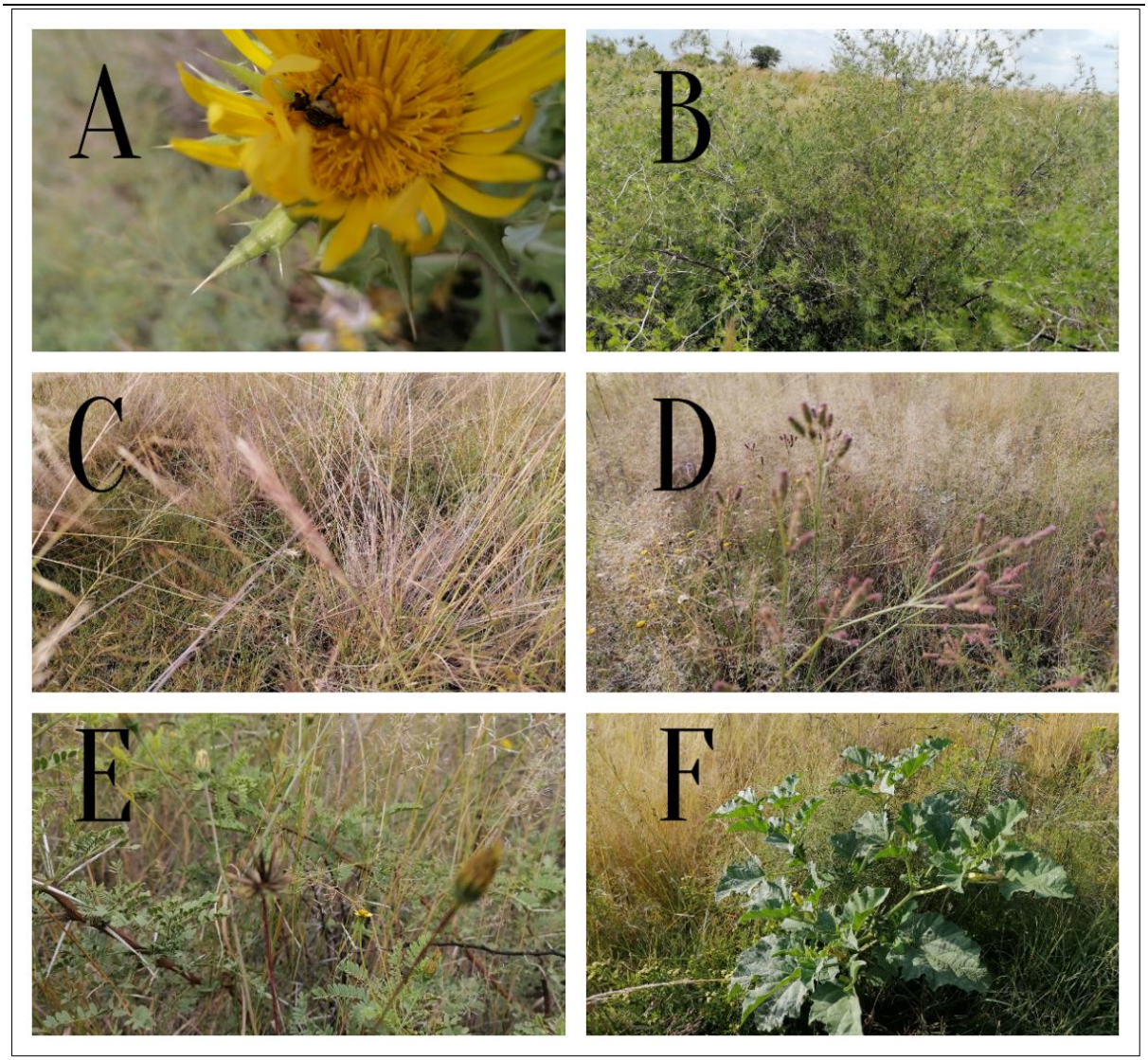

Figure 4-1 A collage of images illustrating some of the species recorded in the project area, A) Berkheya onopordifolia, B) Asparagus laricinus Burch.), C) Aristida congesta subsp congesta, D) Verbena brasiliensis, E) Bidens pilosa and F) Datura ferox.

4.2 Invasive Alien Plants

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

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

3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government-sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- 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 Alien and Invasive Species 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 NEMBA;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEMBA.

Eight (8) IAP species were recorded within the project area. These species are listed under the Alien and Invasive Species List 2021, Government Gazette No. 44182 as Category 1b. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

Table 4-2 IAP species recorded in the project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Argemone mexicana	Mexican Prickly Poppy	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Conyza bonariensis	Flax-leaf Fleabane	NE	Not Indigenous; Naturalized exotic weed	Naturalized exotic weed
Datura ferox	Large Thorn Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Flaveria bidentis	Speedyweed	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Lantana camara	Lantana	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Melia azedarach	Chinaberry	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Solanum sisymbriifolium	Wild Tomato, Dense; Thorned Bitter Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Verbena brasiliensis	Brazilian Vervain	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.

4.3 Ethnobotanical and Red Data Listed Plant Species

Ethnobotany is a branch of botany that places focus on the use of plants for medicines and other practical purposes. The use of native plants for ethnobotanical uses can be detrimental to populations that are overexploited. According to the Department of Agriculture, Forestry and Fisheries (DAFF) medicinal plants are those used in herbalism and thought to have certain extractable/compounds in their leaves, stems, flowers and fruit and used as inputs in the pharmaceutical, nutraceutical, insecticide and other chemical industries (DAFF, 2013). It is estimated that more than 750 plant species in South Africa are actively utilised for their medicinal attributes (Van Wyk and Prinsloo, 2018). Plant species of medicinal importance that were recorded on site are listed in Table 4-3

Species of conservation concern are either categorized as Red Data Listed species (RDL species), according to specific scientifically researched criteria and administered by the South African National Biodiversity Institute (SANBI), as protected trees by the National Forests Act (NFA) (Act No. 84 of 1998), or as Protected Trees and Plants by The NEMBA Threatened or Protected Species Regulations 152 of 2007 ("TOPS Regulations") and the Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (TOPS Lists) and the provincial nature conservation legislation, in the context of this report the North West Biodiversity Management Act (Act No. 4 of 2016) (NWBMA). No species of conservation concern nationally or under the NWBMA (2016) or the Transvaal Nature Conservation Ordinance (Ordinance 12 of 1983) or globally were recorded during the infield assessment.

Table 4-3 Plant species of ethnobotanical importance that were recorded in the project area

Scientific Name	Common Name	Medicinal uses
Dichrostachys cinerea subsp. africana	Small-leaved Sickle Bush	The bark, roots, and leaves are used in the treatment of dysentery, headaches, toothaches, elephantiasis, snakebites and scorpion stings, leprosy, syphilis, coughs, epilepsy, gonorrhoea, boils, and sore eyes. It can also be used as a contraceptive for women, as a laxative, and for massage of fractures
Ziziphus mucronata	Buffalo thorn	Warm bark infusions (sometimes together with roots or leaves added) are used as expectorants (also as emetics) in cough and chest problems, while root infusions are a popular remedy for diarrhoea and dysentery. Decoctions of roots and leaves (or chewed leaves) are applied externally to boils, sores and glandular swellings, to promote healing and as an analgesic.

4.4 Faunal Assessment

Herpetofauna and mammal observations and recordings are addressed in this section.

4.4.1 Amphibians and Reptiles

Five common reptile species (Table 4-4), and no SCC were recorded thus herpetofauna diversity was considered low. The lack of species was likely due to the combination of the disturbed nature of the site and the inherently secretive nature of reptile species.

Table 4-4 Summary of herpetofauna species recorded within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Cacosternum boettgeri	Boettger's Caco	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pyxicephalus edulis	African Bullfrog	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC

4.4.2 Mammals

Three mammal species were observed during the survey based on either direct observation or the presence of visual tracks and signs, these are listed in Table 4-5. Cape Ground Squirrels (*Xerus inauris*) have been recorded to be sharing the burrows with the Yellow Mongoose, luckily all species were recorded in high numbers through visual recording of the species. .

Table 4-5 Summary of mammal species recorded within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Cynictis penicillata	Yellow Mongoose	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

Figure 4-2 Some of the small mammal species recorded in the project area: A) Yellow Mongoose (Cynictis penicillata) and B) Cape ground squirrel (Xerus inauris)

5 Habitat Assessment and Site Ecological Importance

5.1 Habitat Assessment

Figure 5-2 includes habitats within the boundary as well as habitats in adjacent areas, only the habitats described in the text below are specific to the boundary.

Three vegetation units or rather habitat types were recorded within the Aristida PV project area, these include the following Table 5-1 and

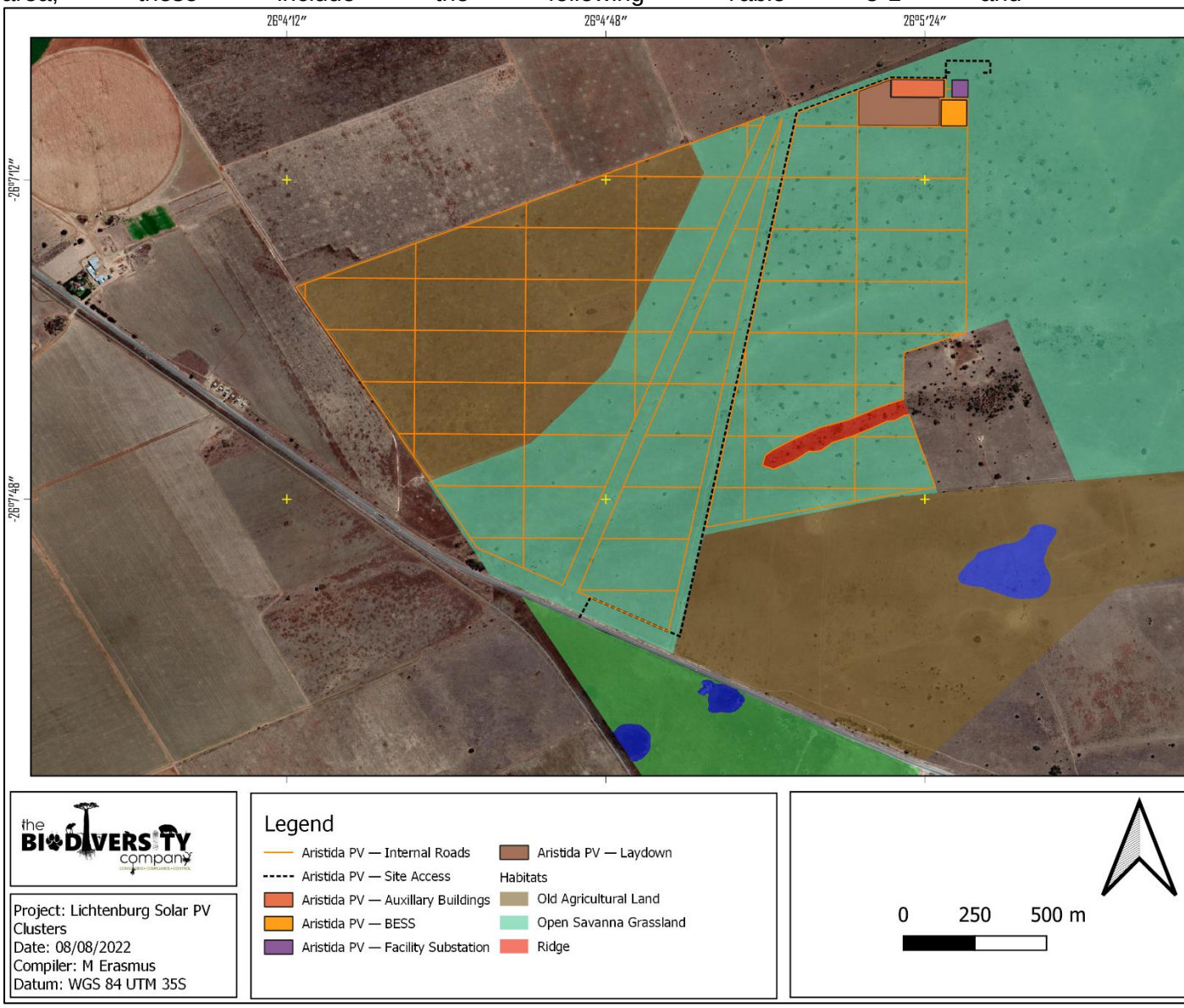

Figure 5-2:

Open Savanna Grassland

The Open Savanna Grassland represents grasslands with a few scattered trees that are typical of savanna landscapes i.e., *Celtis africana, Grewia flava*, *Gymnosporia sp* and *Vachellia sp* an open tree canopy (i.e., scattered trees) above a continuous tall grass understory (the vegetation layer between the forest canopy and the ground). In this particular habitat the Grasses formed the dominant layer, however forbs where also quite prominent and relive high in diversity. Higher shrubs and trees were typically clustered together with such clumps scattered throughout the grassland layer. The Open Savanna Grassland is relatively intact and is suitable to sustain viable populations of floral SCC such as *Vachellia erioloba* although these were not recorded within the Aristida PV project area.

Ridge

This habitat type is regarded as natural 'rocky' grassland, but slightly disturbed due to local land-uses. The current ecological condition of this habitat with regard to the main driving forces is intact, which is evident in the composition and structure of the habitat and the associated plant species. Current agricultural infringement occurs, however limited. The outcrops and rock habitats support a flora assemblage that is unique and diverse within the local landscape. The habitat is used by faunal species as fine-scale habitats.

Although within the project area, the facility footprint won't encroach on this habitat.

Old Agricultural Land

This habitat in the project area represents habitats where the was disturbance that transformed the Open Savanna Grassland layer, in this case, old agriculture, to be dominated by secondary successional grasslands. These grasslands typically do not follow natural succession when left to recover. Trees are very scarce in this habitat unit and what remains is a grassy layer that has established but the plant community does not represent that of the natural Open Savanna Grassland vegetation type.

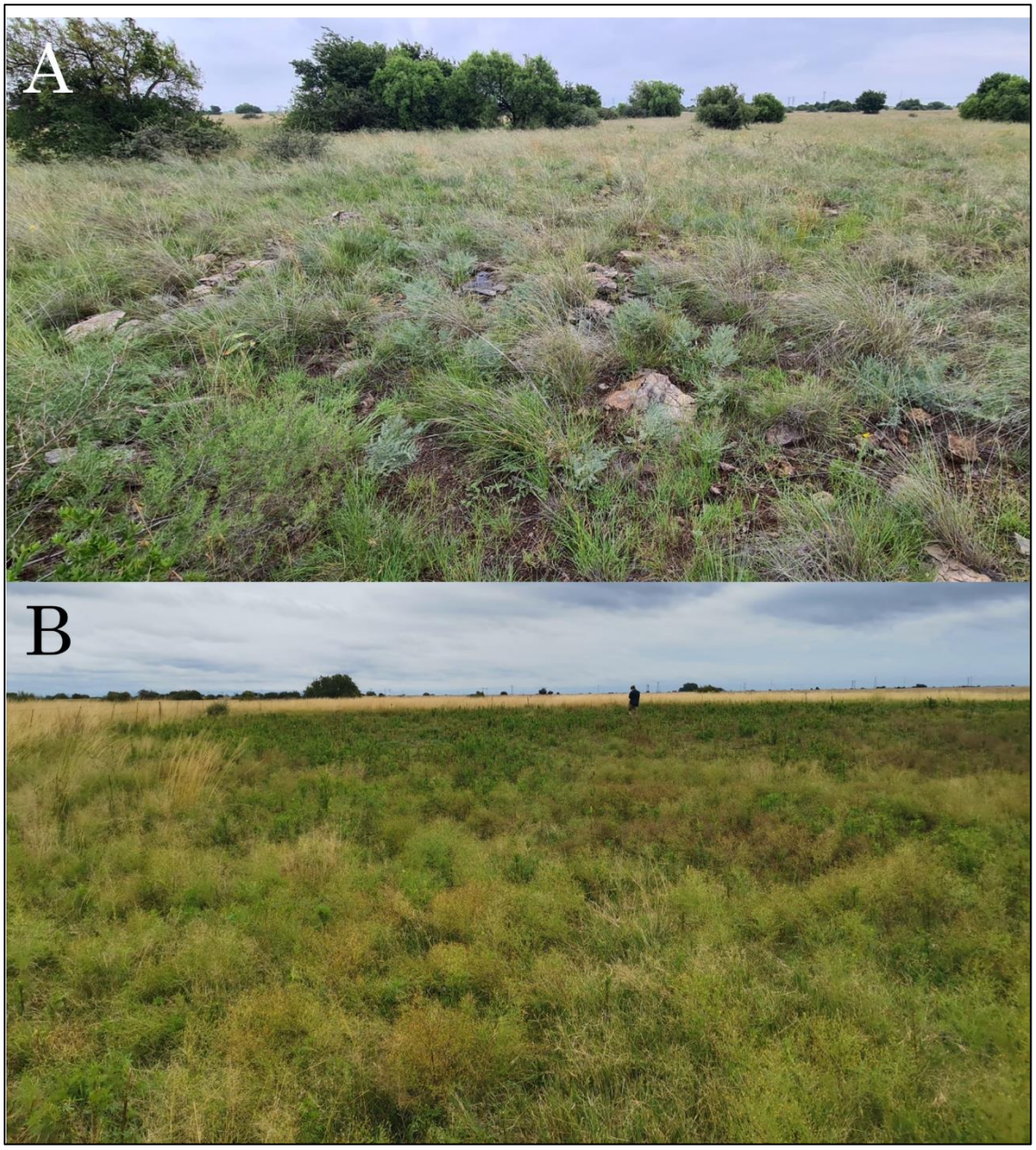

Figure 5-1 Collage illustrating examples of the habitats recorded in the project area, A) Open Savanna Grassland, and B) Old Agricultural Habitat

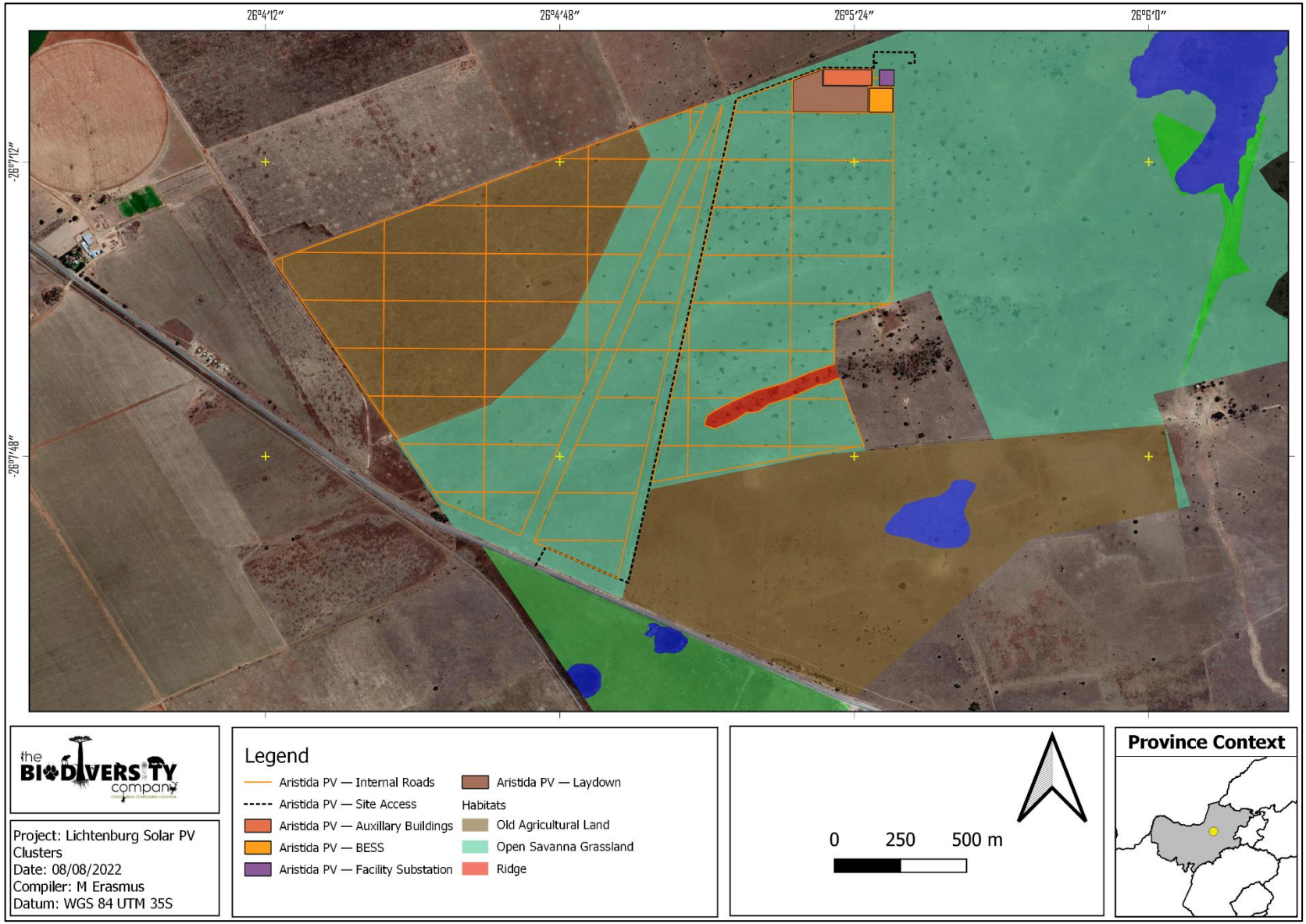

Figure 5-2 Habitats identified in the project area

5.1.1 Screening SensitivityAreas

The following desktop screening sensitivities are associated with the two feasibility areas:

- According to the spatial dataset, the project area has “Low” terrestrial biodiversity sensitivity;
- The project area falls in a “Poorly Protected” area;
- The project area is “Medium-Low” Plant Species Theme sensitivity; and
- Animal Species Theme sensitivity is classified as “Low”.

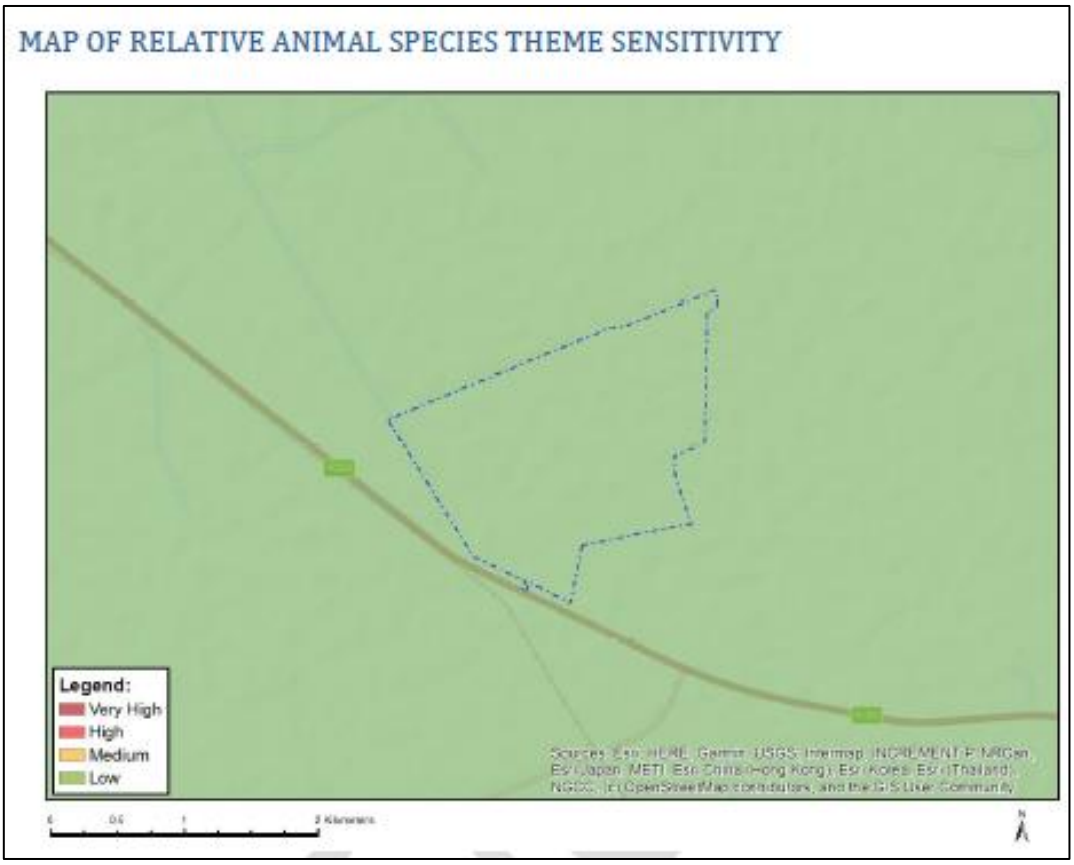

Figure 5-3 Animal species Theme Sensitivity, National Web based Environmental Screening Tool.

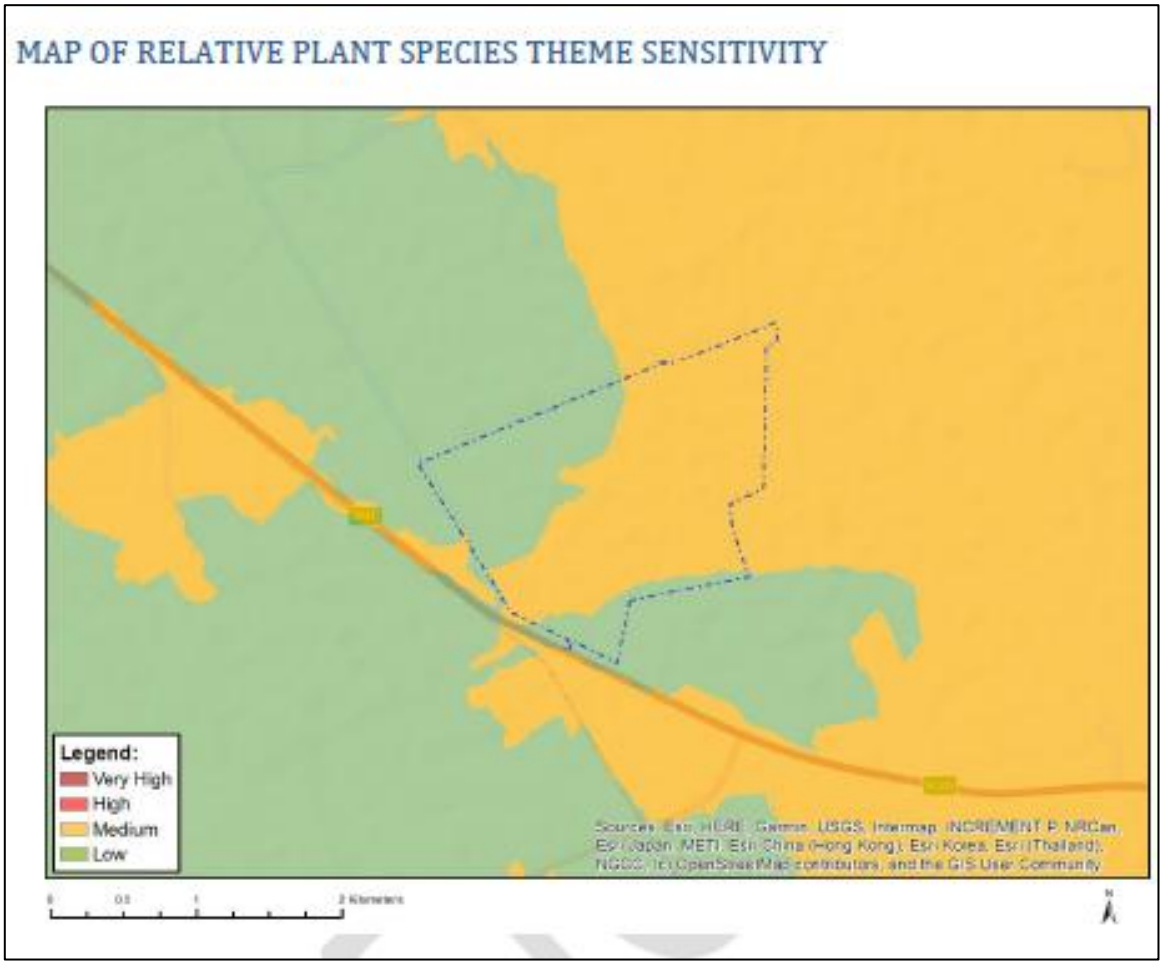

Figure 5-4 Plant species Theme Sensitivity, National Web based Environmental Screening Tool.

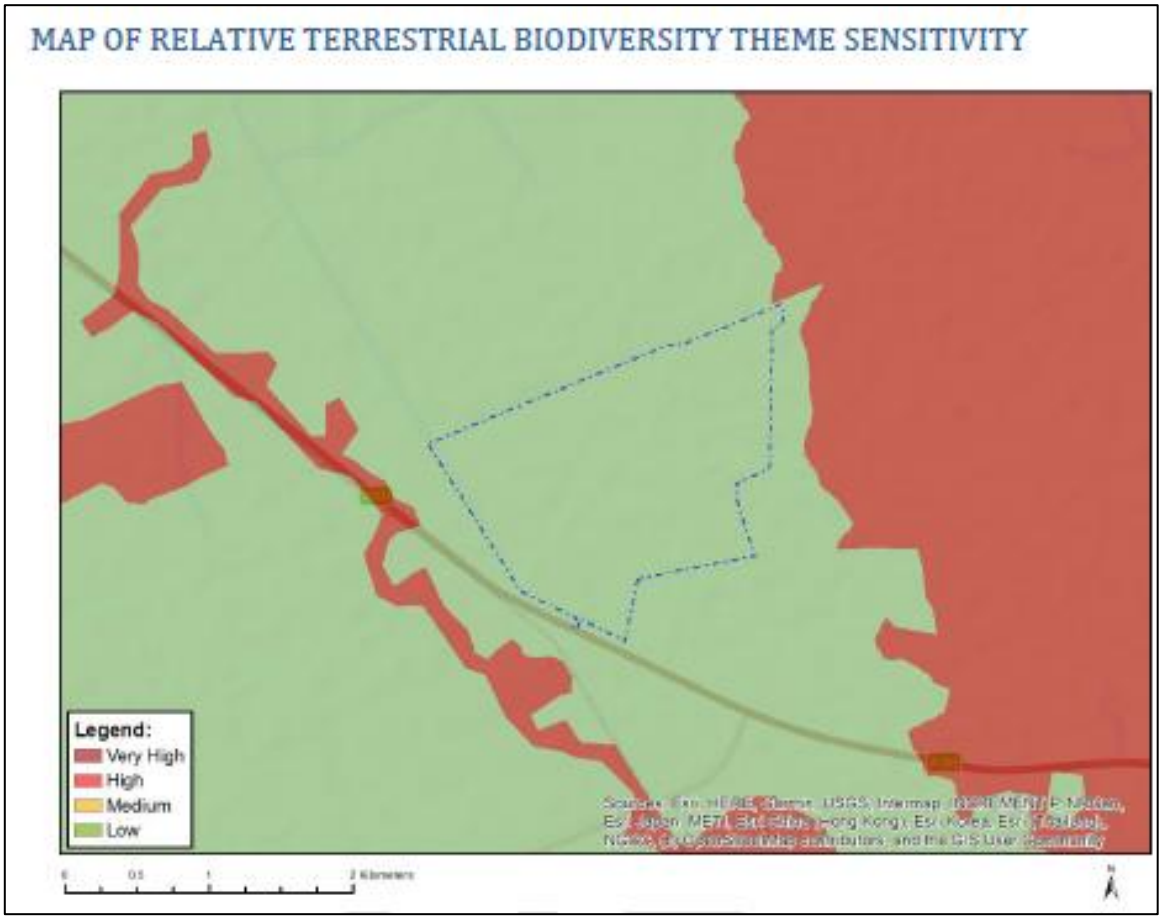

Figure 5-5 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool.

5.1.2 Confirmation of Site Sensitivity

The low sensitivity for the Plant Species Theme is disputed. The medium Animal Species Theme sensitivity is disputed as no sensitive faunal species or signs of any were recorded in the project area and faunal diversity was reported to be low. The low sensitivity terrestrial biodiversity for the entire project area is only confirmed for the Old Agricultural Land habitat unit. The Open Savanna Grassland habitat unit is confirmed to have “Medium” SEI and the ridge “High” SEI (see Table 5-1).

5.2 Site Ecological Importance

Based on the criteria provided in Section 2.4 of this report, all habitats within the assessment area of the project were allocated a sensitivity category (Table 5-1). The sensitivities of the habitat types delineated are illustrated in Figure 5-6 below.

Table 5-2 provides guidelines for interpreting Site Ecological Importance in the context of the development activities. The SEI matrix approach links ecosystem types or habitat types to ecosystem services, species present and ecological condition by providing a score for to the sensitivity based on the matrices as per section 2.4. The table above should be read with the habitat descriptions above, vegetation condition in each habitat and species present as well as the methodology provided in section 2.2.

Table 5-1 Summary of habitat types delineated within the field assessment area of the Aristida Solar Photovoltaic (PV) and their respective SEI

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Open Savanna Grassland	Medium (Confirmed or highly likely occurrence of populations of Near Threatened (NT) species)	High (Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type)	Medium	Medium	Medium
Ridge	Medium	High	Medium	Very Low	High
Old Agricultural Land	Medium	Low	Medium	Low	Low

Table 5-2 Guidelines for interpreting Site Ecological Importance in the context of the development activities

Site Ecological Importance	Interpretation in relation to development activities
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
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.

Figure 5-6 Ecological sensitivity map of the project area.

6 Impact Risk Assessment

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed development footprint area. The relevant impacts were then subjected to a prescribed impact assessment methodology. The details of this methodology can be provided on request.

6.1 Alternatives considered

No alternatives were considered for this project. During the screening phase the design and layout were adapted to take into account the sensitive areas identified. .

6.2 Current Impacts

Multitemporal aerial imagery as well as site observations were used to record current and historical impacts in the project area. Both these show that the site has experienced quite a number of anthropogenically conditioned landscape changes, there is evidence of informal and mechanised prospective digging throughout the area as well as edge effects of mining as well as current mining related impacts. The current impacts observed during surveys are listed below. Photographic evidence of a selection of these impacts is shown in Figure 6-1.

- Livestock grazing and over trampling;
- Footpaths and litter associated with the human infringement;
- Small access roads within the property
- Erosion;
- Alien and/or invasive plants ;
- Litter and rubble dumping;
- Soil waste dumping; and
- Vegetation removal.

Figure 6-1 Some of the identified impacts within the project area.

6.2.1 Terrestrial Impact Assessment

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the project area. The relevant impacts associated with the proposed development were then subjected to a prescribed impact assessment methodology which is available on request.

Table 6-1 presents the aspects anticipated for the proposed infrastructure as well as fencing are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity.

Table 6-1 Anticipated impacts for the proposed development on terrestrial biodiversity

Main Impact	Project activities that can cause loss/impacts to habitat (especially with regard to the proposed infrastructure areas):	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species.	Displacement/loss of flora & fauna (including possible SCC)
	Proposed grids	Increased potential for soil erosion Habitat fragmentation
	Soil dust precipitation	Increased potential for establishment of alien & invasive vegetation
	Dumping of waste products	Erosion
	Random events such as fire (cooking fires or cigarettes)	Increased potential for establishment of alien & invasive vegetation
	Water leakages	
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**

2. Spread and/or establishment of alien and/or invasive species	Vegetation removal Vehicles potentially spreading seed Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	Habitat loss for native flora & fauna (including SCC) Spreading of potentially dangerous diseases due to invasive and pest species Alteration of fauna assemblages due to habitat modification
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation Roadkill due to vehicle collision Pollution of water resources due to dust effects, chemical spills, etc. Intentional killing of fauna for food (hunting)	Loss of habitat Loss of ecosystem services Increase in rodent populations and associated disease risk
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor Compacted roads Removal of vegetation	Reduced dispersal/migration of fauna Loss of ecosystem services Reduced plant seed dispersal
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills Erosion	Pollution in watercourses and the surrounding environment Faunal mortality (direct and indirectly) Groundwater pollution Loss of ecosystem services
Main Impact	**Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.**	**Secondary impacts anticipated**
6.Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light pollution.	Operation of machinery (Large earth moving machinery, vehicles) Project activities that can cause disruption/alteration of ecological life cycles due to dust Vehicles	Disruption/alteration of ecological life cycles due to noise Loss of ecosystem services Secondary impacts associated with disruption/alteration of ecological life cycles due to dust Loss of ecosystem services
Main Impact	**Project activities that can cause staff to interact directly with potentially dangerous fauna**	**Secondary impacts anticipated**
8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	All unregulated/supervised activities outdoors	Loss of SCCs

6.2.2 Loss of Irreplaceable Resources

No loss expected.

6.2.3 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 6-2 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 6-2 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of habitat as well as water resources associated with the spillage.	A spill response kit must be available at all times. 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 grassland and ridges	Appropriate/Adequate fire management plan need to be implemented.
Wind erosion	Reduce habitat and remove topsoil layer	Rehabilitation and erosion monitoring plan

6.2.4 Identification of Potential Impacts

6.2.4.1 Construction Phase

The following potential impacts on the biodiversity were considered for the construction phase (Table 6-3). This phase refers to the period during construction when the proposed infrastructure is constructed. The impacts of construction phase on ecology can be both direct in terms of vegetation and habitat loss/displacement and indirect due to increased noise and heavy equipment and vehicular movement which will be limited to construction phase only. The clearing of vegetation will result in a further transformation of the already limited existing natural habitat, thus will ultimately lead to the proliferation of alien plant species along the roads and cleared areas as well as the severing of movement corridors for fauna, loss of fauna and flora SCCs and the fragmentation of habitat. The following potential impacts were considered:

- Roadkill;
- Destruction, fragmentation and degradation of habitats and ecosystems;
- Spread and/or establishment of alien and/or invasive species;
- Displacement of faunal community (possibly including SCC) due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, vibration);
- Mortalities and displacements of fauna and flora SCCs; and
- Chemical pollution associated with dust suppressants.

6.2.4.2 Operational phase

The operational phase of the impact of daily activities is anticipated to further spread the alien invasive plants, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts (Table 6-4). Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld.

The use of non-environmentally friendly chemical for the cleaning of the PV panels can lead to the pollution of water sources and ultimately death of fauna and flora. The following potential impacts were considered:

- Continued encroachment and displacement of the natural vegetation community due to alien invasive plant species and erosion;
- Continued encroachment and displacement of the natural vegetation community due to alien invasive plant species and erosion;

- Continued displacement and fragmentation of the faunal community, particularly the disruption of natural faunal movement corridors;
- Entrapment of fauna and avifauna in perimeter fences;
- Chemical pollution from cleaning panels;
- Increased anthropogenic disturbances (noise, human presence, litter and poaching/snaring); and
- Loss of faunal species due to road mortalities and vehicle collisions.

6.2.4.3 Decommissioning phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until of the activity reduces and the rehabilitation measures are implemented. The following potential impacts were considered (Table 6-5):

- Continued fragmentation and degradation of habitats;
- Displacement of the faunal community (including SCC) due to disturbance (road collisions, noise, dust, vibration, electrocution and collision) and;
- Continued spread of IAPs.

Table 6-3 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the construction phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, fragmentation and degradation of habitats and ecosystems.	5	3	4	4	5		4	2	3	4	3	
	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	**High**	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 highly sensitive /important	Likely	**Moderate**
Disruption/alteration of species activities due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, vibration).	5	3	4	4	3		4	2	4	4	2	
	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	Likely	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Possible	**Moderate**
Mortalities and displacements of fauna and flora SCCs	5	3	4	3	5		5	2	3	3	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted /	Great / harmful/ ecosystem structure and function	Ecology moderately sensitive/ /important	Definite	**Moderately High**	Permanent	Development specific/ within the site boundary / < 100 ha	Significant / ecosystem structure and function	Ecology moderately sensitive/ /important	Highly likely	**Moderate**

		Linear features affected < 1000m	largely altered					impacted / Linear features affected < 100m	moderately altered			
Spilling of hazardous chemicals into the receiving environment and penetrating into sensitive habitats	3	3	3	3	5		1	2	5	3	1	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Definite	**Moderate**	One day to one month: Temporary	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology moderately sensitive/ /important	Highly unlikely	**Low**
Chemical pollution associated with dust suppressants	3	3	3	3	3		1	2	5	3	1	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One day to one month: Temporary	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology moderately sensitive/ /important	Highly unlikely	**Low**
Spread and/or establishment of alien and/or invasive species	5	3	4	3	5		4	2	2	3	2	
	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 moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Possible	**Low**

								affected < 100m				

Table 6-4 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the operational phase of the project.

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued IAP encroachment into disturbed areas arising from construction activity	5	3	4	3	5		4	2	2	3	2	
	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 moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Possible	**Low**
Habitat fragmentation of habitats due to barrier effect of security fencing	5	3	4	3	5		4	3	3	3	3	
	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 moderately sensitive/ /important	Definite	**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 affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)	5	3	4	3	3		4	2	4	3	3	
	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 moderately sensitive/ /important	Likely	**Moderate**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**

								affected < 100m				
Chemical pollution associated with measures to keep PV clean	5	3	4	3	5		1	3	4	3	1	
	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 moderately sensitive/ /important	Definite	**Moderately High**	One day to one month: Temporary	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly unlikely	**Low**
Entrapment in perimeter fences	5	3	4	3	3		4	3	2	3	1	
	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 moderately sensitive/ /important	Likely	**Moderate**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Highly unlikely	**Low**

Table 6-5 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the decommissioning phase of the project.

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued destruction, fragmentation and degradation of habitats and ecosystems.	5	3	4	3	5		4	2	4	3	2	
	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 moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Possible	**Low**
Disruption/alteration of species activities due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, vibration).	5	3	4	3	3		4	2	4	3	2	
	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 moderately sensitive/ /important	Likely	**Moderate**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Possible	**Low**
Continued spread and/or establishment of alien and/or invasive species	5	3	4	3	5		4	2	4	3	2	
	Permanent	Local area/ within 1 km of the	Great / harmful/ ecosystem structure	Ecology moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20	Development specific/ within the site boundary / <	Great / harmful/ ecosystem structure	Ecology moderately sensitive/ /important	Possible	**Low**

		site boundary / < 5000ha impacted / Linear features affected < 1000m	and function largely altered				years: Long Term	100 ha impacted / Linear features affected < 100m	and function largely altered			

6.2.5 Potential Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for terrestrial fauna and flora.

Solar energy projects as part of the at Renewable Energy Database indicated that the region will experience surface clearing for several PV projects, projects that were considered in terms of their potential cumulative terrestrial ecological impacts that are in an approximate 30 km radius of the Aristida PV facility. Eleven PV Solar projects (including Themeda) are located within the 30 km radius and as such the cumulative impacts in the area is expected to be high if all these projects are approved. Cumulatively these developments will be responsible for the destruction of a large portion of relatively intact grasslands that are home to several SCC species including *Vachellia erioloba, Parahyaena brunnea*.

7 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that the can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring. Table 7-1 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial assessment.

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 and the ecologically sensitive areas in the vicinity of the project area;
- As far as possible, reduce the negative fragmentation effects of the development and enable safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially occurring species of conservation concern).

Table 7-1 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial study

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. Brush cutting of vegetation beneath the panels should be, implemented, otherwise controlled grazing by small livestock like sheep. No topsoil stripping or complete vegetation removal beneath the panels. No imported material to be placed under the modules.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
All laydown, chemical toilets etc. should be restricted to low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Operational and Decommissioning phase	Environmental Officer & Contractor	Woody material around footprint	During Phase
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals for cleaning of panels during the operational phase	Life of operation	Environmental Officer & Design Engineer	Water Quality and presence of erosion	Ongoing

It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Rocks removed in the construction phased may not be dumped, but can be used in areas where erosion control needs to be performed	Operational phase	Environmental Officer & Contractor	Rock piles	During Phase
Any individual of the nationally protected trees or protected plants that was observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants can be relocated within the property without a permit or otherwise left unharmed. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer Lodge Manager	Protected Tree/Plant species	Ongoing
The Solar panel surfaces may not have reflective surfaces which can lead to veld fires	Operational phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, • Signs must be put up to enforce this	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed • Signs must be put up to enforce this;	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods or louvres to also be used to reduce light spill	Construction Phase	Environmental Officer & Design Engineer	Light pollution	Ongoing
Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing

areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.				
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna	Life of operation	Environmental Officer & Contractor	Heat generated by substations	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
Any holes/deep excavations must be dug and planted in a progressive manner; Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Ensure that cables and connections are insulated successfully to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Fencing mitigations: • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 30cm between wires • Place markers on fences	Planning, construction and operation	Environmental Officer & Contractor, Engineer	Monitor fences for slack wires	Ongoing
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing

Management outcome: Alien species

Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
An alien management plan must be implemented quarterly for 2 years after phase	Construction phase and Decommissioning phase	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly for 2 years after phase
Management outcome: Dust				
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. This includes wetting of exposed soft soil surfaces. • No non environmentally friendly suppressants may be used as this could result in pollution of water sources	Life of operation	Contractor	Dustfall	Dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
Management outcome: Environmental awareness training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

Management outcome: Erosion

Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Speed limits must be put in place to reduce erosion. • Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds; • Signs must be put up to enforce this.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Life of operation	Project manager, Environmental 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 and strong winds.	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

8 Conclusion and Impact Statement

It is the opinion of the ecologists that this study provides the relevant information required in order to implement an Integrated Environmental Management plan. As well as to ensure that the best long-term use of the ecological resources in the project area are made in support of the principle of sustainable development. The construction and operation of the infrastructure are not anticipated to pose significant threats to the receiving environment provided the mitigation measures are effectively applied, thus the proposed development can obtain approval.

Through the analysis of various database and satellite imagery as well as the infield screening assessment it was determined that although the project area has been impacted by historical impacts and current livestock grazing regimes as well as trampling and overstocking, majority of the project area is still relatively intact and also possess several sensitive receptors. From a provincial conservation perspective, the entire site is located within Aquatic ESA 1 and ESA 2 areas thus these sensitivities may not pose too much of an issue for authorisation purposes.

The project area has a long association with anthropogenic activities, mainly agricultural practices historically, with AIP proliferation and recreational activities forming the current main driving forces of disturbances within the project area. The Ridge habitat was assigned a high sensitivity whereas the old agricultural area was assigned a low sensitivity. The habitat within the Open Savanna Grassland is relatively intact and is suitable to sustain viable populations of floral SCC such as *Vachellia erioloba* although these were not recorded within the Aristida PV project area, and was assigned a medium sensitivity. The main habitat type that the proposed project and related infrastructure will mainly impact is the Open Savanna Grassland habitat unit which is relatively intact and is home to a number of faunal and avifaunal species. No CBAs or ESAs are mapped within this habitat unit and thus no constraints on development are recognised for this habitat unit in the land-use guideline for terrestrial critical biodiversity areas as presented in the NWBSP (2015). However, if development will take place in this habitat unit, it will be important to manage edge effects (such as AIP proliferation) to surrounding sensitive habitat that falls outside of the direct footprint areas. The area is already exposed to disturbances and edge effect impacts from livestock grazing agricultural practices, which makes this habitat unit and adjacent sites susceptible to AIP proliferation.

Although no RDL species were recorded on site, there is suitable habitat for several species and thus the potential for threatened plant species as well as faunal SCC to occur within the proposed project footprint as a number of SCC species were recorded in the grid connection as well as the North Cluster area. As such, it is recommended that a walkdown of the site take place prior to vegetation clearance activities. A protected tree assessment prior to clearing commencing is recommended to georeferenced and mark any protected trees that may occur within the assessment area to facilitate application for permit application for removal of the trees or possible realignment to avoid the trees.

The proposed Solar PV project activities will impact on the two habitat units to varying degrees and is discussed in more detail throughout the report in relation to their SEI as well as the level of current disturbance in each habitat unit. The greatest impact on the overall habitat is expected to be the loss of vegetation cover leads to habitat loss for faunal species as well as poor native vegetation performance beneath the rays. Without the vegetation, the soil will be prone to accelerated erosion and further loss of organic material and soil seed reserves from the local environment. Likely more severely limiting than lack of light beneath panels is

moisture unavailability. The second biggest impact would be an increase in alien plant infestations as a result of the construction disturbances, through the implementation of an alien management plan this impact can successfully be mitigated.

8.1 Impact Statement

The main expected impacts of the proposed infrastructure will include the following:

- Habitat loss and fragmentation;
- Degradation of surrounding habitat;
- Entrapment in perimeter fences;
- Sensory disturbance and possible extirpation of SCC;
- Disturbance and displacement caused during the construction and maintenance phases; and
- Direct mortality during the construction phase.

Mitigation measures as described in this report can be implemented to reduce the significance to an acceptable level of significance.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. The average post-mitigation impact significance for the project is moderately low. It is the opinions of the specialists that the project, may be favourably considered, on condition that all prescribed mitigation measures and supporting recommendations are implemented.

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10 Appendices

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

Family	Species Name	Author1	IUCN	Ecology
Oleaceae	*Olea europaea subsp. cuspidata*	L.		Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Ranunculaceae	*Clematis brachiata*	Thunb.	LC	Indigenous
Poaceae	*Triraphis andropogonoides*	(Steud.) Phillips	LC	Indigenous
Verbenaceae	*Verbena bonariensis*	L.		Not indigenous; Naturalised; Invasive
Cactaceae	*Cylindropuntia imbricata*	(Haw.) F.M. Knuth		Not indigenous; Naturalised; Invasive
Apiaceae	*Pastinaca sativa*	L.		Not indigenous; Naturalised
Fabaceae	*Indigastrum costatum subsp. macrum*	(Guill. & Perr.) Schrire	LC	Indigenous
Poaceae	*Eustachys paspaloides*	(Vahl) Lanza & Mattei	LC	Indigenous
Aizoaceae	*Nananthus vittatus*	(N.E.Br.) Schwantes	DD	Indigenous
Apocynaceae	*Raphionacme hirsuta*	(E. Mey.) R.A. Dyer	LC	Indigenous
Fabaceae	*Leobordea hirsuta*	(Schinz) B.-E.van Wyk & Boatwr.	LC	Indigenous; Endemic
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Fabaceae	*Pearsonia cajanifolia subsp. cajanifolia*	(Harv.) Polhill	LC	Indigenous; Endemic
Fabaceae	*Indigofera oxytropis*	Benth. ex Harv.	LC	Indigenous
Casuarinaceae	*Casuarina cunninghamiana*	Miq.	NE	Not indigenous; Naturalised; Invasive
Boraginaceae	*Cynoglossum austroafricanum*	Hilliard & B.L. Burtt	LC	Indigenous
Verbenaceae	*Lantana rugosa*	Thunb.	LC	Indigenous
Lamiaceae	*Mentha aquatica*	L.	LC	Indigenous
Poaceae	*Setaria incrassata*	(Hochst.) Hack.	LC	Indigenous
Malvaceae	*Brachychiton populneus*	(Schott & Endl.) R.Br.		Not indigenous; Naturalised
Asteraceae	*Senecio digitalifolius*	DC.	LC	Indigenous
Asteraceae	*Berkheya onopordifolia var. onopordifolia*	(DC.) O. Hoffm. ex Burtt Davy	LC	Indigenous
Cannabaceae	*Cannabis sativa var. sativa*	L.	NE	Not indigenous; Naturalised
Ebenaceae	*Diospyros lycioides subsp. lycioides*	Desf.	LC	Indigenous
Poaceae	*Eragrostis barbinodis*	Hack.	LC	Indigenous
Santalaceae	*Viscum verrucosum*	Harv.	LC	Indigenous
Menispermaceae	*Antizoma angustifolia*	(Burch.) Miers ex Harv.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Poaceae	*Oropetium capense*	Stapf	LC	Indigenous
Poaceae	*Schizachyrium sanguineum*	(Retz.) Alston	LC	Indigenous
Chrysobalanaceae	*Parinari capensis subsp. capensis*	Harv.	LC	Indigenous
Cucurbitaceae	*Cucumis zeyheri*	Sond.	LC	Indigenous

Poaceae	*Brachiaria marlothii*	(Hack.) Stent	LC	Indigenous
Convolvulaceae	*Ipomoea bathycolpos*	Hallier f.	LC	Indigenous; Endemic
Acanthaceae	*Blepharis squarrosa*	(Nees) T. Anderson	LC	Indigenous; Endemic
Poaceae	*Andropogon schirensis*	Hochst. ex A. Rich.	LC	Indigenous
Aizoaceae	*Drosanthemum sp.*			
Scrophulariaceae	*Chaenostoma patrioticum*	(Hiern) Kornhall	LC	Indigenous
Aizoaceae	*Delosperma sp.*	L.Bolus		
Asteraceae	*Geigeria aspera var. aspera*	Harv.	LC	Indigenous
Commelinaceae	*Cyanotis speciosa*	(L.f.) Hassk.	LC	Indigenous
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Orobanchaceae	*Striga gesnerioides*	(Willd.) Vatke	LC	Indigenous
Poaceae	*Trichoneura grandiglumis*	(Nees) Ekman	LC	Indigenous
Poaceae	*Aristida vestita*	Thunb.	LC	Indigenous
Rubiaceae	*Kohautia amatymbica*	Eckl. & Zeyh.	LC	Indigenous
Asteraceae	*Nidorella hottentotica*	DC.	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.	LC	Indigenous
Agavaceae	*Chlorophytum cooperi*	(Baker) Nordal	LC	Indigenous
Asteraceae	*Tarchonanthus parvicapitulatus*	P.P.J. Herman	LC	Indigenous
Poaceae	*Aristida stipitata subsp. graciliflora*	Hack.	LC	Indigenous
Caryophyllaceae	*Silene undulata*	Aiton		Indigenous
Fabaceae	*Tephrosia lupinifolia*	DC.	LC	Indigenous
Cyperaceae	*Cyperus congestus*	Vahl	LC	Indigenous
Asteraceae	*Cirsium vulgare*	(Savi) Ten.		Not indigenous; Naturalised; Invasive
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. atropurpurea*	(Benth.) Hilliard	LC	Indigenous
Gentianaceae	*Chironia palustris subsp. palustris*	Burch.	LC	Indigenous
Fabaceae	*Vachellia erioloba*	(E. Mey.) P.J.H. Hurter	LC	Indigenous
Crassulaceae	*Crassula natans var. natans*	Thunb.	LC	Indigenous
Orchidaceae	*Habenaria epipactidea*	Rchb.f.	LC	Indigenous
Fabaceae	*Senegalia hereroensis*	(Engl.) Kyal. & Boatwr.	LC	Indigenous
Lamiaceae	*Stachys spathulata*	Burch. ex Benth.	LC	Indigenous
Scrophulariaceae	*Nemesia fruticans*	(Thunb.) Benth.	LC	Indigenous
Malvaceae	*Grewia flava*	DC.	LC	Indigenous
Solanaceae	*Solanum lichtensteinii*	Willd.	LC	Indigenous
Hyacinthaceae	*Albuca prasina*	(Ker Gawl.) J.C. Manning & Goldblatt		Indigenous
Asteraceae	*Litogyne gariepina*	(DC.) Anderb.	LC	Indigenous
Poaceae	*Eragrostis superba*	Peyr.	LC	Indigenous
Acanthaceae	*Barleria macrostegia*	Nees	LC	Indigenous

Scrophulariaceae	*Selago sp.*			
Asteraceae	*Helichrysum harveyanum*	Wild	LC	Indigenous
Acanthaceae	*Crabbea angustifolia*	Nees	LC	Indigenous; Endemic
Asteraceae	*Nicolasia stenoptera subsp. stenoptera*	(O. Hoffm.) Merxm.	LC	Indigenous
Onagraceae	*Oenothera rosea*	L'Her. ex Aiton		Not indigenous; Naturalised; Invasive
Rubiaceae	*Vangueria pygmaea*	Schltr.	LC	Indigenous
Geraniaceae	*Pelargonium dolomiticum*	R. Knuth	LC	Indigenous
Lamiaceae	*Salvia runcinata*	L.f.	LC	Indigenous
Poaceae	*Leptochloa fusca*	(L.) Kunth	LC	Indigenous
Convolvulaceae	*Convolvulus ocellatus var. ocellatus*	Hook.	LC	Indigenous
Cupressaceae	*Cupressus sempervirens*	L.		Not indigenous; Cultivated; Naturalised
Ricciaceae	*Riccia argenteolimbata*	O.H. Volk & Perold		Indigenous
Plantaginaceae	*Plantago lanceolata*	L.	LC	Indigenous
Cyperaceae	*Cyperus sp.*			
Fabaceae	*Chamaecrista biensis*	(Steyaert) Lock	LC	Indigenous
Asphodelaceae	*Bulbine abyssinica*	A. Rich.	LC	Indigenous
Fabaceae	*Leobordea divaricata*	Eckl. & Zeyh.	LC	Indigenous
Lamiaceae	*Salvia radula*	Benth.	LC	Indigenous
Boraginaceae	*Trichodesma angustifolium subsp. angustifolium*	Harv.	LC	Indigenous
Meliaceae	*Melia azedarach*	L.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Cynanchum virens*	(E. Mey.) D.Dietr.	LC	Indigenous
Convolvulaceae	*Ipomoea obscura var. obscura*	(L.) Ker Gawl.	LC	Indigenous
Poaceae	*Tragus berteronianus*	Schult.	LC	Indigenous
Celastraceae	*Gymnosporia buxifolia*	(L.) Szyszyl.	LC	Indigenous
Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous
Polygalaceae	*Polygala producta*	N.E.Br.	LC	Indigenous
Rubiaceae	*Breonadia sp.*			
Poaceae	*Microchloa kunthii*	Desv.	LC	Indigenous
Poaceae	*Calamagrostis epigejos var. capensis*	(L.) Roth	LC	Indigenous
Cupressaceae	*Cupressus arizonica*	Greene		Not indigenous; Cultivated; Naturalised
Fabaceae	*Lessertia frutescens subsp. microphylla*	(L.) Goldblatt & J.C. Manning	LC	Indigenous
Potamogetonaceae	*Potamogeton pectinatus*	L.	LC	Indigenous
Poaceae	*Brachiaria serrata*	(Thunb.) Stapf	LC	Indigenous
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Polygonaceae	*Oxygonum dregeanum subsp. canescens*	Meisn.	NE	Indigenous
Cyperaceae	*Abildgaardia ovata*	(Burm.f.) Kral	LC	Indigenous

Poaceae	*Eragrostis pseudobtusa*	De Winter	NE	Indigenous; Endemic
Poaceae	*Pogonarthria squarrosa*	(Roem. & Schult.) Pilg.	LC	Indigenous
Solanaceae	*Lycium hirsutum*	Dunal	LC	Indigenous
Poaceae	*Panicum stapfianum*	Fourc.	LC	Indigenous
Malvaceae	*Sida chrysantha*	Ulbr.	LC	Indigenous
Asteraceae	*Ursinia nana subsp. leptophylla*	DC.	LC	Indigenous
Dipsacaceae	*Scabiosa columbaria*	L.	LC	Indigenous
Fabaceae	*Zornia milneana*	Mohlenbr.	LC	Indigenous
Poaceae	*Melinis repens subsp. grandiflora*	(Willd.) Zizka	LC	Indigenous
Fabaceae	*Rhynchosia monophylla*	Schltr.	LC	Indigenous
Asteraceae	*Geigeria brevifolia*	(DC.) Harv.	LC	Indigenous
Asteraceae	*Flaveria bidentis*	(L.) Kuntze		Not indigenous; Naturalised; Invasive
Poaceae	*Cymbopogon pospischilii*	(K. Schum.) C.E. Hubb.	NE	Indigenous
Caryophyllaceae	*Dianthus mooiensis subsp. mooiensis*	F.N. Williams	NE	Indigenous; Endemic
Anacardiaceae	*Ozoroa paniculosa var. paniculosa*	(Sond.) R. Fern. & A. Fern.	LC	Indigenous
Amaranthaceae	*Hermbstaedtia odorata var. odorata*	(Burch.) T. Cooke	NE	Indigenous
Santalaceae	*Thesium goetzeanum*	Engl.	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous
Fabaceae	*Eriosema salignum*	E. Mey.	LC	Indigenous
Solanaceae	*Lycium cinereum*	Thunb.	LC	Indigenous
Verbenaceae	*Chascanum adenostachyum*	(Schauer) Moldenke	LC	Indigenous
Cannabaceae	*Celtis africana*	Burm.f.	LC	Indigenous
Poaceae	*Brachiaria nigropedata*	(Ficalho & Hiern) Stapf	LC	Indigenous
Boraginaceae	*Ehretia alba*	Retief & A.E.van Wyk	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Fabaceae	*Melilotus albus*	Medik.	NE	Not indigenous; Naturalised; Invasive
Hyacinthaceae	*Dipcadi marlothii*	Engl.	LC	Indigenous
Apiaceae	*Deverra burchellii*	(DC.) Eckl. & Zeyh.	LC	Indigenous
Cucurbitaceae	*Cucumis myriocarpus subsp. myriocarpus*	Naudin	LC	Indigenous
Ricciaceae	*Riccia albolimbata*	S.W. Arnell		Indigenous
Asteraceae	*Helichrysum nudifolium var. nudifolium*	(L.) Less.	LC	Indigenous
Ranunculaceae	*Ranunculus multifidus*	Forssk.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Asteraceae	*Xanthium spinosum*	L.		Not indigenous; Naturalised; Invasive
Poaceae	*Loudetia simplex*	(Nees) C.E. Hubb.	LC	Indigenous
Asteraceae	*Chrysocoma obtusata*	(Thunb.) Ehr.Bayer	LC	Indigenous
Poaceae	*Diheteropogon amplectens var. amplectens*	(Nees) Clayton	LC	Indigenous

Poaceae	*Stipagrostis uniplumis var. neesii*	(Licht.) De Winter	LC	Indigenous
Agavaceae	*Chlorophytum sp.*			
Anacardiaceae	*Schinus molle*	L.	NE	Not indigenous; Naturalised; Invasive
Ebenaceae	*Diospyros austroafricana var. microphylla*	De Winter	LC	Indigenous
Lobeliaceae	*Lobelia erinus*	L.	LC	Indigenous
Cyperaceae	*Kyllinga alba*	Nees	LC	Indigenous
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	DC.	LC	Indigenous
Asphodelaceae	*Trachyandra laxa var. rigida*	(N.E.Br.) Oberm.	LC	Indigenous
Fabaceae	*Medicago laciniata var. laciniata*	(L.) Mill.	NE	Not indigenous; Naturalised
Poaceae	*Sporobolus festivus*	Hochst. ex A. Rich.	LC	Indigenous
Iridaceae	*Gladiolus permeabilis subsp. edulis*	D.Delaroche	LC	Indigenous
Poaceae	*Hyparrhenia filipendula var. pilosa*	(Hochst.) Stapf	LC	Indigenous
Poaceae	*Aristida diffusa subsp. burkei*	Trin.	LC	Indigenous
Malvaceae	*Triumfetta sonderi*	Ficalho & Hiern	LC	Indigenous; Endemic
Orobanchaceae	*Striga elegans*	Benth.	LC	Indigenous
Poaceae	*Melinis repens subsp. repens*	(Willd.) Zizka	LC	Indigenous
Iridaceae	*Tritonia nelsonii*	Baker	LC	Indigenous
Fabaceae	*Trifolium africanum var. africanum*	Ser.	NE	Indigenous
Poaceae	*Leersia denudata*	Launert	LC	Indigenous
Orobanchaceae	*Cycnium adonense*	E. Mey. ex Benth.	LC	Indigenous
Poaceae	*Chrysopogon serrulatus*	Trin.	LC	Indigenous
Cleomaceae	*Cleome maculata*	(Sond.) Szyszyl.	LC	Indigenous
Poaceae	*Microchloa caffra*	Nees	LC	Indigenous
Fabaceae	*Vachellia hebeclada subsp. hebeclada*	(DC.) Kyal. & Boatwr.	LC	Indigenous
Cucurbitaceae	*Acanthosicyos naudinianus*	(Sond.) C.Jeffrey	LC	Indigenous
Cyperaceae	*Cyperus rubicundus*	Vahl	LC	Indigenous
Convolvulaceae	*Falkia oblonga*	Bernh. ex C. Krauss	LC	Indigenous
Poaceae	*Digitaria sanguinalis*	(L.) Scop.	NE	Not indigenous; Naturalised
Poaceae	*Sporobolus fimbriatus*	(Trin.) Nees	LC	Indigenous
Iridaceae	*Gladiolus sp.*			
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. anomala*	Sond.	LC	Indigenous
Onagraceae	*Oenothera glazioviana*	Micheli		Not indigenous; Naturalised; Invasive
Asteraceae	*Anthemis cotula*	L.		Not indigenous; Naturalised
Poaceae	*Urochloa brachyura*	(Hack.) Stapf	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous

Iridaceae	*Moraea pallida*	(Baker) Goldblatt	LC	Indigenous
Acanthaceae	*Blepharis angusta*	(Nees) T. Anderson	LC	Indigenous; Endemic
Lamiaceae	*Salvia stenophylla*	Burch. ex Benth.		Indigenous
Marsileaceae	*Marsilea macrocarpa*	C.Presl	LC	Indigenous
Verbenaceae	*Chascanum pinnatifidum var. pinnatifidum*	(L.f.) E. Mey.	LC	Indigenous
Asteraceae	*Chrysocoma ciliata*	L.	LC	Indigenous
Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Poaceae	*Eragrostis sp.*			
Malvaceae	*Hermannia stellulata*	(Harv.) K. Schum.	LC	Indigenous
Myrtaceae	*Eucalyptus sideroxylon*	A. Cunn. ex Woolls		Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Setaria sphacelata var. torta*	(Schumach.) Stapf & C.E. Hubb. ex M.B. Moss	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B. Clarke	LC	Indigenous
Polygonaceae	*Rumex lanceolatus*	Thunb.	LC	Indigenous
Lamiaceae	*Acrotome inflata*	Benth.	LC	Indigenous
Poaceae	*Eragrostis biflora*	Hack. ex Schinz	LC	Indigenous
Poaceae	*Paspalum dilatatum*	Poir.	NE	Not indigenous; Naturalised; Invasive
Malvaceae	*Hibiscus trionum*	L.		Not indigenous; Naturalised
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Asphodelaceae	*Trachyandra burkei*	(Baker) Oberm.	LC	Indigenous
Fabaceae	*Gleditsia triacanthos*	L.	NE	Not indigenous; Naturalised; Invasive
Asphodelaceae	*Bulbine frutescens*	(L.) Willd.	LC	Indigenous
Amaranthaceae	*Cyphocarpa angustifolia*	(Moq.) Lopr.	LC	Indigenous
Poaceae	*Urochloa panicoides*	P. Beauv.	LC	Indigenous
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	Schnizl.	LC	Indigenous
Fabaceae	*Indigastrum parviflorum subsp. parviflorum*	(B. Heyne ex Wight & Arn.) Schrire	NE	Indigenous
Apocynaceae	*Pentarrhinum insipidum*	E. Mey.	LC	Indigenous
Polygalaceae	*Polygala gracilenta*	Burtt Davy	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Campanulaceae	*Wahlenbergia denticulata var. denticulata*	(Burch.) A.DC.	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Asparagaceae	*Asparagus laricinus*	Burch.	LC	Indigenous
Fabaceae	*Vigna unguiculata subsp. stenophylla*	(L.) Walp.	LC	Indigenous
Convolvulaceae	*Convolvulus thunbergii*	Roem. & Schult.	LC	Indigenous
Poaceae	*Urelytrum agropyroides*	(Hack.) Hack.	LC	Indigenous

Poaceae	*Fingerhuthia africana*	Lehm.	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. rigidum*	Eckl. & Zeyh.	LC	Indigenous
Rubiaceae	*Galium capense subsp. capense*	Thunb.	LC	Indigenous
Poaceae	*Panicum coloratum*	L.	LC	Indigenous
Poaceae	*Anthephora pubescens*	Nees	LC	Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Fabaceae	*Ophrestia oblongifolia var. oblongifolia*	(E. Mey.) H.M.L. Forbes	LC	Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Poaceae	*Tragus racemosus*	(L.) All.	LC	Indigenous
Apocynaceae	*Brachystelma foetidum*	Schltr.	LC	Indigenous
Polygalaceae	*Polygala rehmannii*	Chodat	LC	Indigenous
Lobeliaceae	*Cyphia stenopetala*	Diels	LC	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Lamiaceae	*Teucrium trifidum*	Retz.	LC	Indigenous
Poaceae	*Echinochloa holubii*	(Stapf) Stapf	LC	Indigenous
Rubiaceae	*Pygmaeothamnus zeyheri var. zeyheri*	(Sond.) Robyns	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Fabaceae	*Indigofera heterotricha*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Geraniaceae	*Monsonia burkeana*	Planch. ex Harv.	LC	Indigenous
Poaceae	*Elionurus muticus*	(Spreng.) Kunth	LC	Indigenous
Lamiaceae	*Plectranthus neochilus*	Schltr.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A. Dyer	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	Salm-Dyck	LC	Indigenous
Fabaceae	*Erythrostemon gilliesii*	Klotzsch		Not indigenous; Naturalised; Invasive
Malvaceae	*Hermannia tomentosa*	(Turcz.) Schinz ex Engl.	LC	Indigenous
Poaceae	*Eragrostis micrantha*	Hack.	LC	Indigenous
Poaceae	*Phragmites australis*	(Cav.) Steud.	LC	Indigenous
Poaceae	*Eragrostis plana*	Nees	LC	Indigenous
Amaryllidaceae	*Crinum macowanii*	Baker	LC	Indigenous
Fabaceae	*Melilotus indicus*	(L.) All.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	(L.) W.T. Aiton	LC	Indigenous
Poaceae	*Aristida congesta subsp. barbicollis*	Roem. & Schult.	LC	Indigenous
Lobeliaceae	*Lobelia thermalis*	Thunb.	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Boraginaceae	*Cynoglossum lanceolatum*	Forssk.	LC	Indigenous

Commelinaceae	*Commelina africana var. krebsiana*	L.	LC	Indigenous
Poaceae	*Chloris virgata*	Sw.	LC	Indigenous
Rubiaceae	*Rubia petiolaris*	DC.	LC	Indigenous
Asteraceae	*Gnaphalium filagopsis*	Hilliard & B.L. Burtt	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Crassulaceae	*Crassula lanceolata subsp. transvaalensis*	(Eckl. & Zeyh.) Endl. ex Walp.	LC	Indigenous
Poaceae	*Eragrostis trichophora*	Coss. & Durieu	LC	Indigenous
Cucurbitaceae	*Coccinia sessilifolia*	(Sond.) Cogn.	LC	Indigenous
Poaceae	*Setaria sp.*			
Onagraceae	*Epilobium hirsutum*	L.	LC	Indigenous
Asteraceae	*Nolletia ciliaris*	(DC.) Steetz	LC	Indigenous
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Malvaceae	*Sida cordifolia subsp. cordifolia*	L.	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Nyctaginaceae	*Commicarpus pentandrus*	(Burch.) Heimerl	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Poaceae	*Aristida scabrivalvis subsp. scabrivalvis*	Hack.	LC	Indigenous
Asteraceae	*Berkheya pinnatifida subsp. stobaeoides*	(Thunb.) Thell.	LC	Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Amaranthaceae	*Aerva leucura*	Moq.	LC	Indigenous
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Poaceae	*Setaria nigrirostris*	(Nees) T. Durand & Schinz	LC	Indigenous
Solanaceae	*Solanum campylacanthum*	Hochst. ex A. Rich.		Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B. Clarke	LC	Indigenous
Verbenaceae	*Lippia scaberrima*	Sond.	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E. Mey. ex Choisy	LC	Indigenous
Poaceae	*Triraphis schinzii*	Hack.	LC	Indigenous
Scrophulariaceae	*Selago densiflora*	Rolfe	LC	Indigenous

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys poweri	Power's Toad	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis	Common Dwarf Gecko	LC	Unlisted
Monopeltis capensis	Cape Worm Lizard	LC	LC
Naja nivea	Cape Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis trinasalis	Fork-marked Sand Snake	LC	Unlisted
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC

Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis punctulata	Speckled Sand Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Gerbillurus paeba	Hairy-footed Gerbil	LC	LC
Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC

Lemniscomys rosalia	Single-striped Mouse	LC	LC
Lepus capensis	Cape Hare	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Malacothrix typica	Gerbil Mouse	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus indutus	Desert Pygmy Mouse	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Procavia capensis	Rock Hyrax	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sauromys petrophilus	Flat-headed Free-tail Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Thallomys paedulcus	Tree Rat	LC	LC

Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

10.5 Appendix E – Protocol Checklist

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

Paragraph	Item	Section	Comment
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Page i	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these.	Section 6 and 9	
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site	Section 6 and 9	
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna.	Section 6	
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments.	Section 4. 1.7 an 4.1.8	
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types; (b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified.	Section 4.2.1	
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	-	Site contains small portions of low sensitivity areas, however the majority of the area is medium-high sensitivity.
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: (a) the reasons why an area has been identified as a CBA; (b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; (c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); (d) the impact on ecosystem threat status; (e) the impact on explicit subtypes in the vegetation;	-	No CBAs recorded within the assessment area. only ESA areas

	(f) the impact on overall species and ecosystem diversity of the site; and (g) the impact on any changes to threat status of populations of species of conservation concern in the CBA.		
2.3.7.2	Terrestrial ecological support areas (ESAs), including: (a) the impact on the ecological processes that operate within or across the site; (b) the extent the proposed development will impact on the functionality of the ESA; and (c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna.	Section 4.1.7	The project area traverses ESA1 areas and these ESA 1 areas function as linkages/corridors (comprising of natural vegetation) between the important biodiversity areas and major freshwater resource and their fringing terrestrial habitats
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- (a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan.	Section 4.1.5	
2.3.7.4	Priority areas for protected area expansion, including- (a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.	Section 4.1.6	
2.3.7.5	SWSAs including: (a) the impact(s) on the terrestrial habitat of a SWSA; and (b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses)	Section 4.1.9-	
2.3.7.6	FEPA sub catchments, including- (a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment	Section 4.1.10	
2.3.7.7	indigenous forests, including: (a) impact on the ecological integrity of the forest; and (b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	-	No forest habitats within the area
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Page i	
3.1.2	A signed statement of independence by the specialist.	Appendix F	
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 2	
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant.	Section 2	

3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations.	Section 3	
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	-	No areas unsuitable for development identified
3.1.7	Additional environmental impacts expected from the proposed development.	Section 7	
3.1.8	Any direct, indirect and cumulative impacts of the proposed development.	Section 7	
3.1.9	The degree to which impacts and risks can be mitigated.	Section 8	
3.1.10	The degree to which the impacts and risks can be reversed.	Section 7 and 8	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 7.2.2	
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	Section 8	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate.	-	N/A
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not;	Section 9.1.1	
3.1.15	any conditions to which this statement is subjected	Section 9	

10.6 Appendix F – Specialist Declaration of Independence

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 2022

I, Lusanda Matee, 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.

Lusanda Matee

Terrestrial Ecologist

The Biodiversity Company

April 2022

The Wetland Assessment for the proposed Aristida Solar Photovoltaic (PV) Energy Generation Facility

Lichtenburg, North West Province

April 2022

CLIENT

Aristida PV (Pty) Ltd

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

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Tables

Declaration

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;
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- 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

April 2022

Declaration

I, Rowan Buhrmann 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.

Rowan Buhrmann

Ecologist

The Biodiversity Company

April 2022

1 Introduction

The Biodiversity Company was commissioned to conduct a wetland baseline and impact assessment, in support of the Environmental Authorisation application process for the proposed activities associated with a new Photovoltaic (PV) system. The Elandsfontein PV Cluster project which comprises two (2) separate Photovoltaic (PV) facilities. For the purposes of this assessment, the 500 m regulation area and the Elandsfontein Cluster area have been collectively refered to as the 'project area'. One wetland site visit was conducted between the 28th February to the 3rd March 2022, which constitutes a wet season survey. The following information is as provided by the client:

The Applicant, Aristida PV (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as the Aristida PV facility) located on a site approximately 5km north west of the town of Lichtenburg in the North West Province. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 100 MW. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality on Portion 7 of Farm Elandsfontein 34. The site is accessible via the R503, located south east of the development area.

An additional 100 MW PV facility (Themeda PV) is concurrently being considered on the project site (within Portion 7 of Farm Elandsfontein 34) and is being assessed through a separate Environmental Impact Assessment (EIA) process.

An assessment area of approximately 200 ha is being assessed as part of this EIA process and the infrastructure associated with the 100 MW facility includes:

- *PV modules and mounting structures;*
- *Inverters and transformers;*
- *Battery Energy Storage System (BESS);*
- *Site and internal access roads (up to 8m wide);*
- *Auxiliary buildings (22kV or 33kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);*
- *Temporary and permanent laydown area;*
- *Cabling between the panels, to be laid underground where practical; and*
- *An on-site facility substation stepping up from 22kV or 33kV to 132kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution.*

The Aristida PV facility intends to connect to the National Grid via the Watershed Main Transmission Substation (MTS) (approximately 5 km east of the facility), however, the connection infrastructure associated with this grid solution is being assessed as part of a separate Environmental Application.

The approach of this study has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the aquatic biodiversity theme sensitivity for the project area as “Very High” sensitivity.

The purpose of these specialist studies is to provide relevant input into the Environmental Authorisation application process for the proposed activities associated with the solar PV facility. 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 viability of the proposed project from a wetland perspective.

1.1 Specialist Details

Report Name	**The Wetland Baseline Assessment for the proposed Aristida Solar Photovoltaic (PV) Energy Generation Facility**
Reference	**Aristida PV Solar Facility**
Submitted to	ATLANTIC ENERGY PARTNERS
Report Writer and Site Assessment	**Rowan Buhrmann**  Rowan Buhrmann has experience in terrestrial ecology (specialised in grassland ecology) and climate change. He obtained his M.Sc in Plant EcoPhysiology, specifically assessing the effects of elevated temperatures on the Sandstone Sourveld grasslands in eThekwini.
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.

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- The delineation, classification and assessment of wetlands within the project area and surrounding 500 m regulated area;
- Conduct a functional assessment of wetland systems;
- Conduct a risk assessment relevant to the proposed activity;
- Recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

2 Key Legislative Requirements

2.1 National Water Act (NWA, 1998)

The Department of Water and Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means;

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

2.2 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an Environmental Authorisation process needs to be followed. This

could follow either the Basic Assessment Report (BAR) process or the Scoping & Environmental Impact Assessment (S&EIA) process depending on the scale of the impact.

3 Methodology

3.1 Wetland Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines. A cross section of a typical wetland is presented in Figure 3-1. The outer edges of the wetland areas were 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;
- The 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);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The 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.

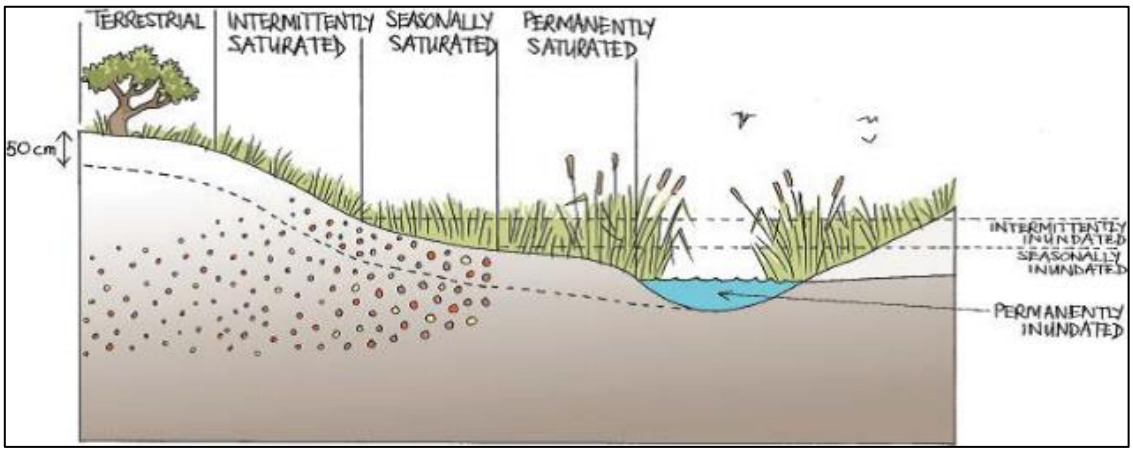

Figure 3-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

3.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project site. These delineations are then illustrated by means of maps accompanied by descriptions.

3.3 Functional Assessment

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

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 2008). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 3-1).

Table 3-1 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

3.4 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 Ecological Status categories are provided in Table 3-2.

Table 3-2 The Present Ecological Status categories (Macfarlane, et al., 2008)

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

3.5 Importance and Sensitivity

The importance and sensitivity of water resources is determined in order 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 3-3.

Table 3-3 Description of Importance and Sensitivity categories

IS 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

3.6 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al.,* 2013).

3.7 Buffer Requirements

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

3.8 Impact Assessment Methodology

Direct, indirect and cumulative impacts will be assessed using the following criteria;

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes;

- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures);
- the significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;
- the status, which will be described as either positive, negative or neutral;
- the degree to which the impact can be reversed;
- the degree to which the impact may cause irreplaceable loss of resources; and
- the degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated); and
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Assessment of Cumulative Impacts

As per DFFE's requirements, specialists are required to assess the cumulative impacts. In this regard, please refer to the methodology below that will need to be used for the assessment of Cumulative Impacts.

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk;
- Unacceptable loss;
- Complete or whole-scale changes to the environment or sense of place; and
- Unacceptable increase in impact.

The specialist is required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

3.9 Assumptions and Limitations

The following aspects were considered as limitations:

- The area was only surveyed during a single site visit and therefore, this assessment does not consider temporal trends;
- The project area was extensively ground truthed with only wetlands at an appreciable level of risk further assessed. The remainder of the 500 m regulated area has been delineated by means of desktop delineations; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

4 Results and Discussion

4.1 Desktop Results

The project area is located approximately 6 km north-west of Lichtenburg, and north of the R503, North West Province (see Figure 4-1). The surrounding land-use predominantly includes agriculture, grazing pastures and regional roads.

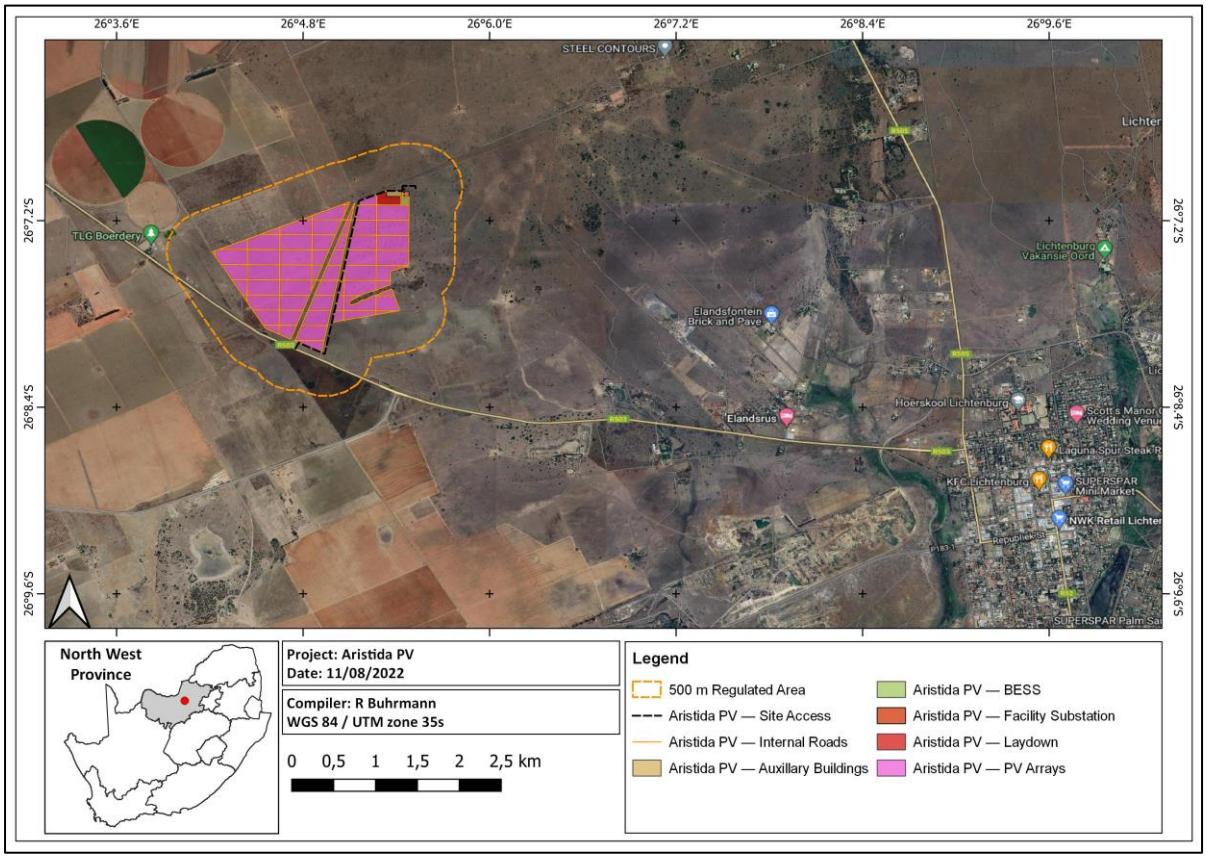

Figure 4-1 Locality of proposed development

4.1.1 Vegetation Types

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

a) Seasonal precipitation; and

b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

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

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically

absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

On a fine-scale vegetation type, the project area overlaps with the Carletonville Dolomite Grassland vegetation type. This vegetation type occurs on slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Mucina & Rutherford, 2006). This vegetation type occurs in the North-West, Gauteng and marginally into the Free State Province: In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province.

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable (VU). The national target for conservation protection for both these vegetation types is 24%, but only a small extent is conserved in statutory (Sterkfontein Caves — part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams.

4.1.2 Soils and Geology

The geology of this area is characterised by the dolomite and chert of the Malmani Subgroup (Transvaal Supergroup) which mostly supports shallow Mispah and Glenrosa soil forms, typical of the Fa land type. Deeper red to yellow apedal soils (Hutton and Clovelly forms) occur sporadically within the area, which represent the Ab land type (Mucina and Rutherford, 2006).

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Fa 11, Fb 4, and Bc 11 land types. The Fa and Fb land types consists of Glenrosa and / or Mispah, while the Bc land type consists of plinthic catena.

4.1.3 Climate

The mean annual precipitation for this region reaches approximately 593 mm and is characterised by summer rainfall (Mucina & Rutherford, 2006). This area is characterised by frequent severe frost during winter (see Figure 4-2).

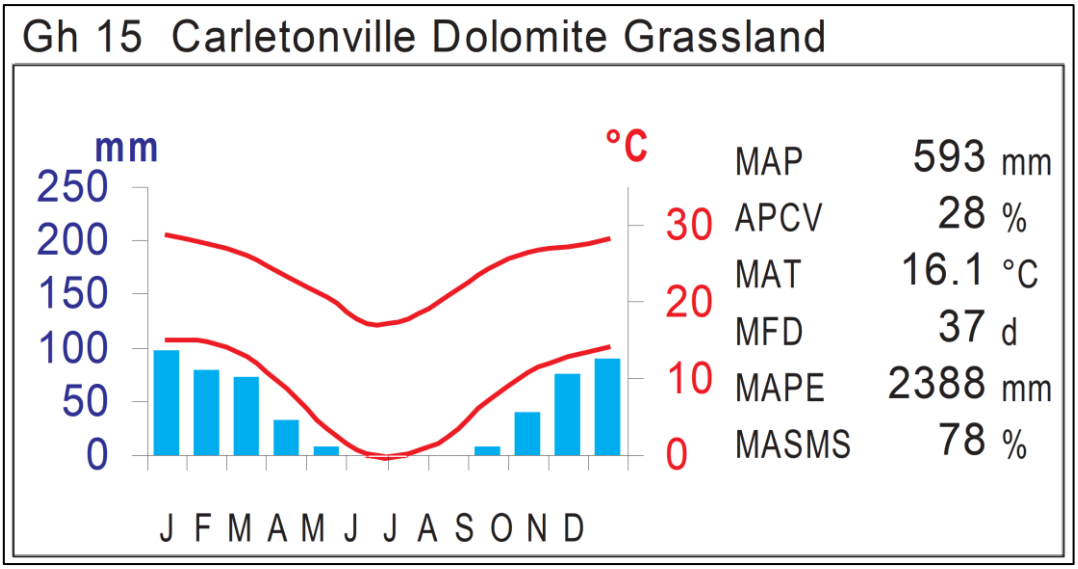

Figure 4-2 Climate diagram for the region (Mucina & Rutherford, 2006)

4.1.4 Biodiversity Sector Plan

Conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation 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 categories into ESA1, natural areas, or ESA2, areas where no natural habitat is remaining.

The proposed Aristida PV overlaps with ESA1 and ESA2 (Figure 4-3). According to the North West BSP, the aquatic designation of ESA1 and ESA2 is that of a dolomite recharge area (W5)[1]. A wetland cluster (W4)[2] area is located within the project area.

[1] The karst landscape of central North West around which all major eyes emerge and based on topography is the most likely area for the dolomitic aquifer recharge zone.
[2] Clusters of larger wetlands and pans and their collective buffer (500 m)

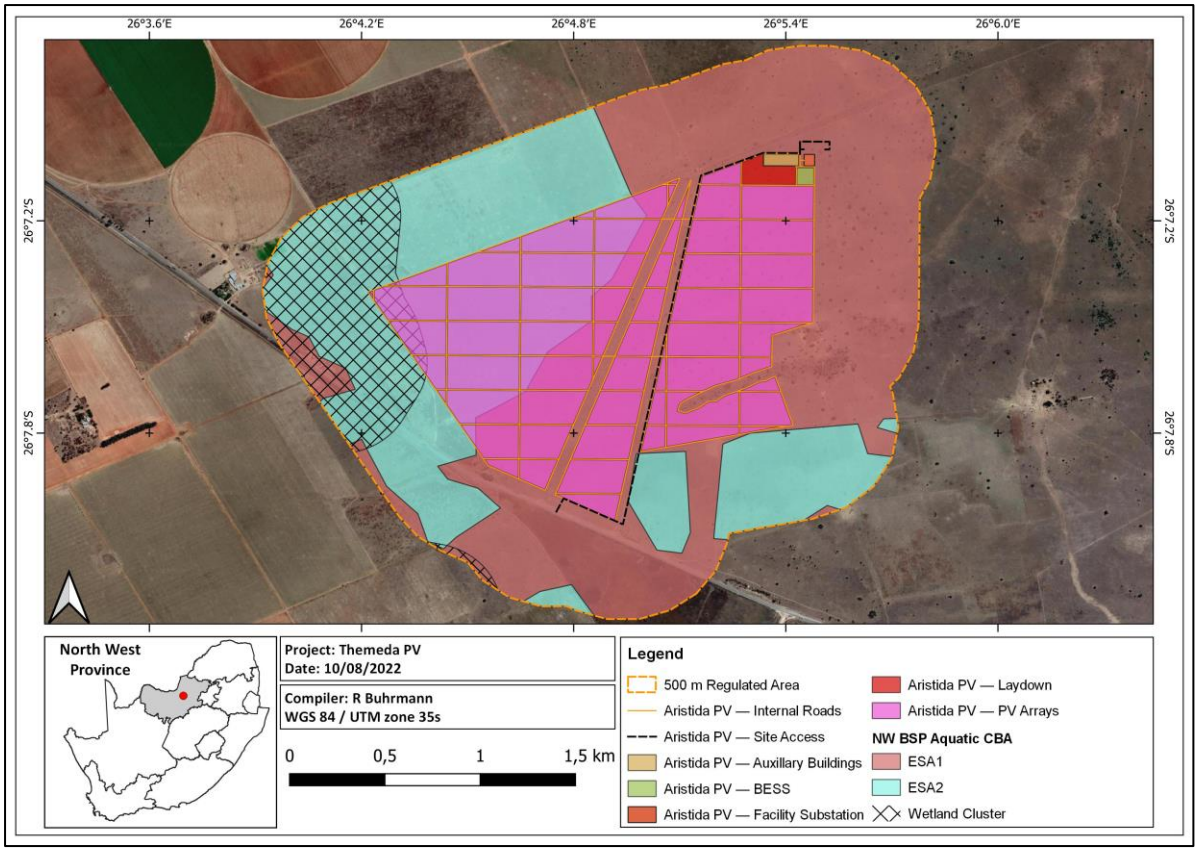

Figure 4-3 North West BSP Aquatic ESAs located within the 500 m regulated area

4.1.5 Topographical River Lines

According to the topographical river line data from the "2626" quarter degree square, various non-perennial river lines are located throughout the 500 m regulated area and are likely to represent wetland indicators. One of these systems is located within the project site (Figure 4-4).

4.1.6 National Freshwater Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach for the sustainable and equitable development of South Africa's scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the NWA. This directly applies to the NWA, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel *et al*. 2011). The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (Act No.10 of 2004) (NEM:BA), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.,* 2011).

According to Nel *et al.* (2011), No NFEPA wetland systems are located within the 500 m regulated area.

4.1.7 South African Inventory of Inland Aquatic Ecosystems

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other datasets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE, 2018).

One wetland type, a depression wetland, has been identified by means of this dataset (see Figure 4-4). The depression wetland is classified as “Least Concerned”.

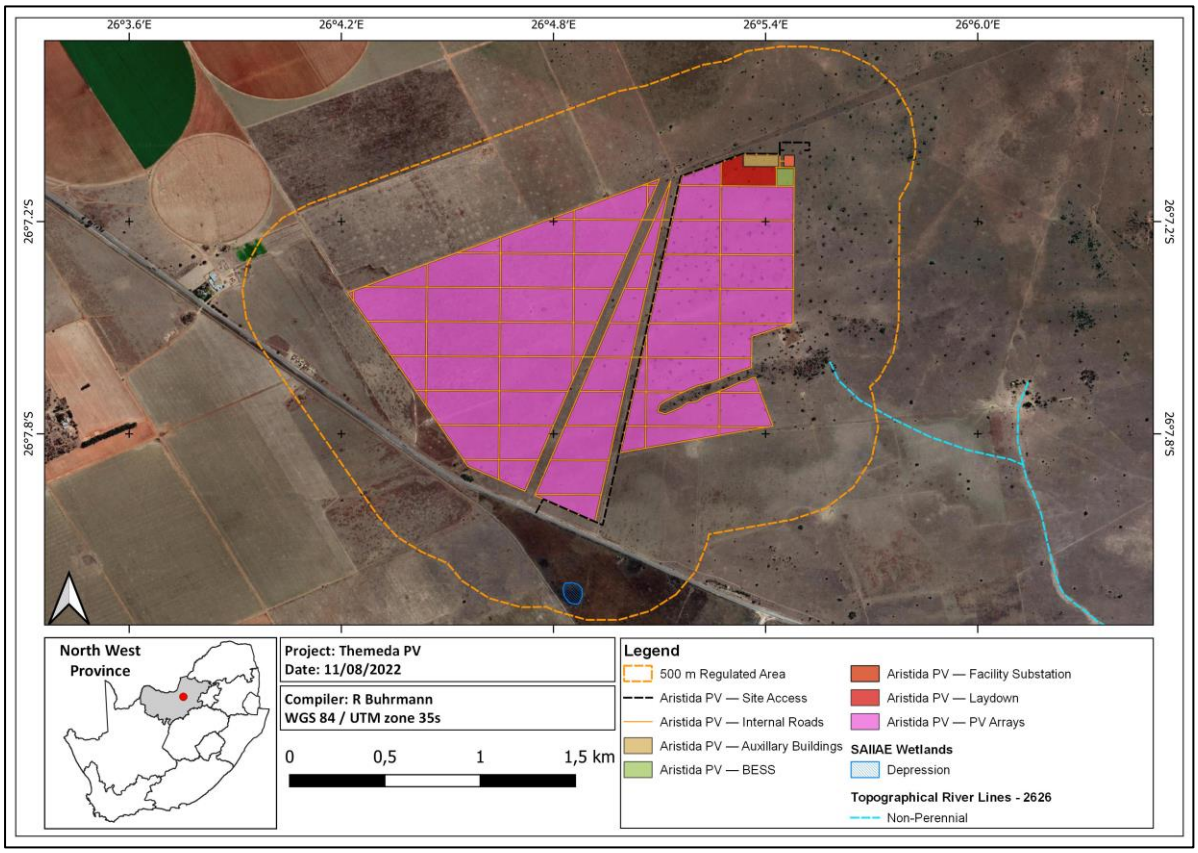

Figure 4-4 SAIIAE Wetlands located within the 500 m regulated area

4.2 National Freshwater Ecosystem Priority Area Status

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach for the sustainable and equitable development of South Africa’s scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998). This directly applies to the National Water Act, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel *et al*. 2011). The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act’s biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al*., 2011). According to Nel et al. (2011), the proposed

PV systems falls within the C31A-01176 SQR (Figure 4-5) which is classified as a sub-quaternary catchment.

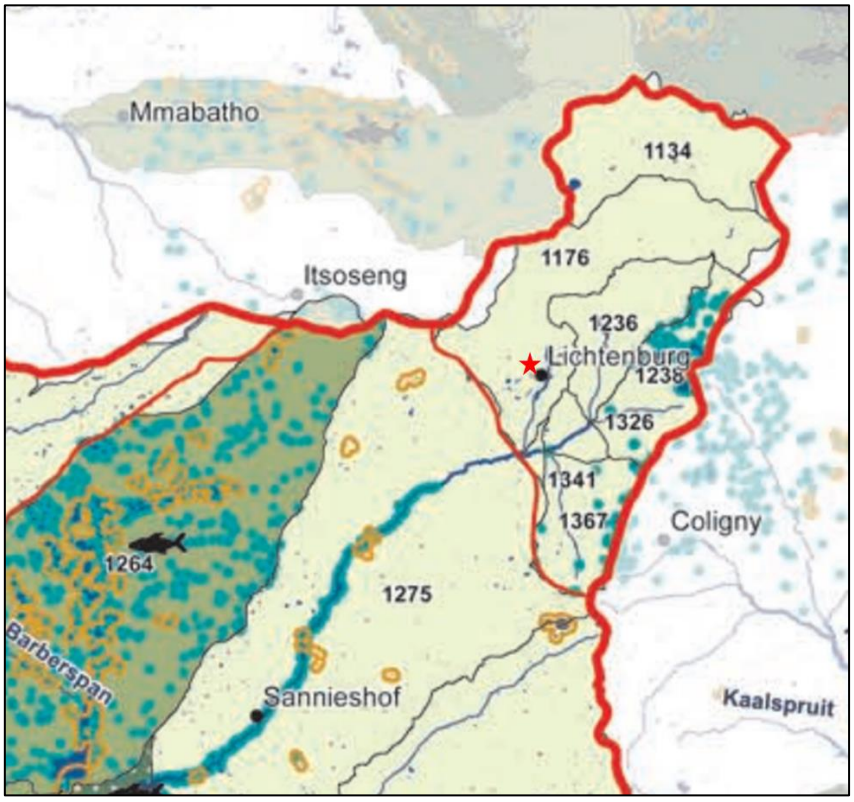

Figure 4-5 Map illustrating fish and river FEPAs for the project area, the project area is represented by the red star symbol (Nel et al., 2011)

4.3 Status of sub-quaternary reach C31A-01176

Desktop information for SQR's was obtained from DWS, 2021. The C31A-01176 SQR spans 14.97 km of the unnamed tributary of the Harts River, with the nearest watercourse more than 5 km from the project area. The PES category of the reach is classed as seriously modified (class E) (Table 4-1). The modified state of the reach can be attributed to the seriously and largely significant impacts towards the system, including instream dams, urban areas (Lichtenburg), and waste water treatment works. The mean ecological importance and sensitivity has been determined to be "Low" (DWS, 2020) with the default ecological category rated as "D".

Table 4-1 Summary of the status of sub-quaternary reach C31A-01176

Present Ecological Status	Seriously Modified (class E)
Mean Ecological Importance	Low
Mean Ecological Sensitivity	Low
Default Ecological Category	Largely Modified (class D)

4.3.1 Terrain

The terrain of the 500 m regulated area has been analysed to determine potential areas where wetlands are more likely to accumulate (due to convex topographical features, preferential pathways or more gentle slopes).

4.3.1.1 Digital Elevation Model

A Digital Elevation Model (DEM) has been created to identify lower laying regions as well as potential convex topographical features which could point towards preferential flow paths. The 500 m regulated area ranges from 1 494 to 1 511 Metres Above Sea Level (MASL). The lower laying areas (generally represented in dark blue) represent areas that will have the highest potential to be characterised as wetlands (see Figure 4-6).

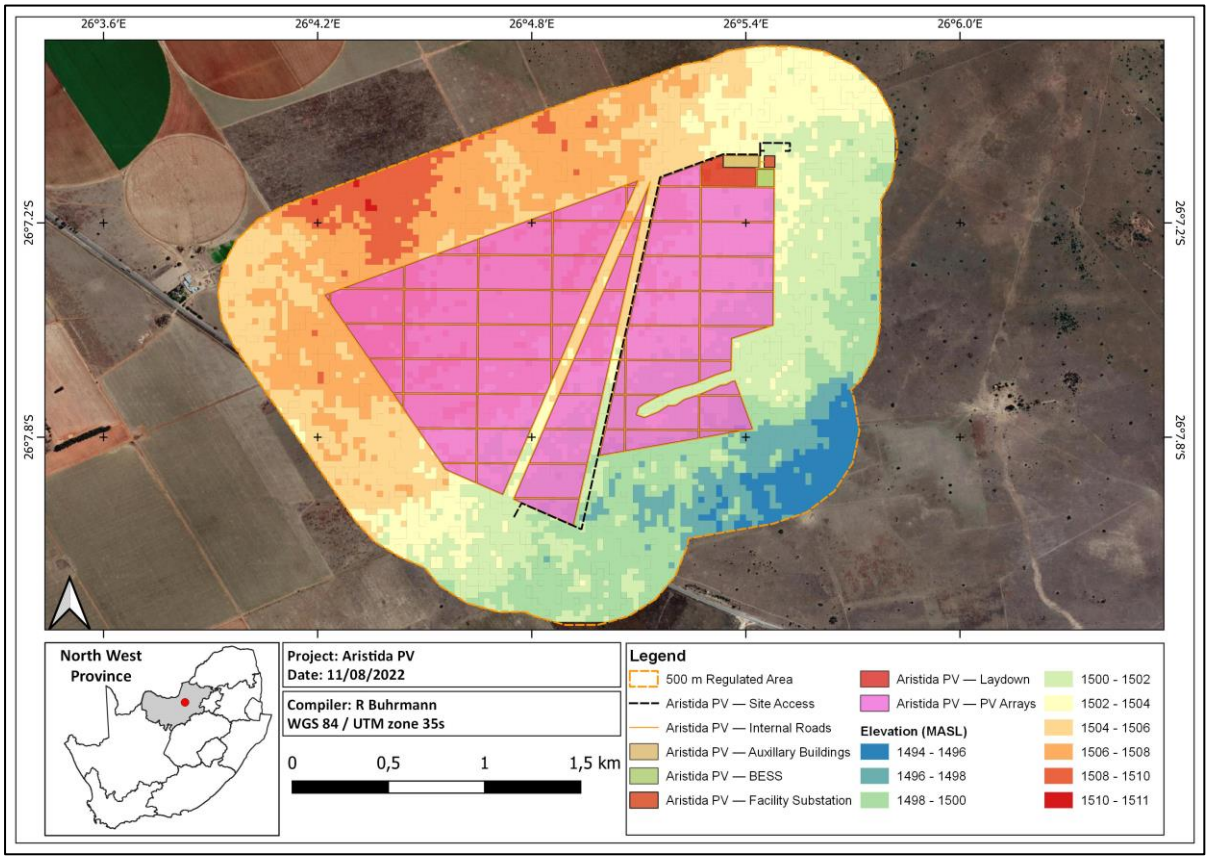

Figure 4-6 Digital Elevation Model of the 500 m regulated area

4.3.1.2 Slope Percentage

The slope percentage of the 500 m regulated area is illustrated in Figure 4-7. The slope percentage ranges from 0 to 7 %, with the majority of the 500 m regulated area being characterised by a gentler slope (between 0 and 3 %). Besides the fact that hillslope seeps are likely to occur on any slope percentage, wetlands in general tend to accumulate in flatter areas.

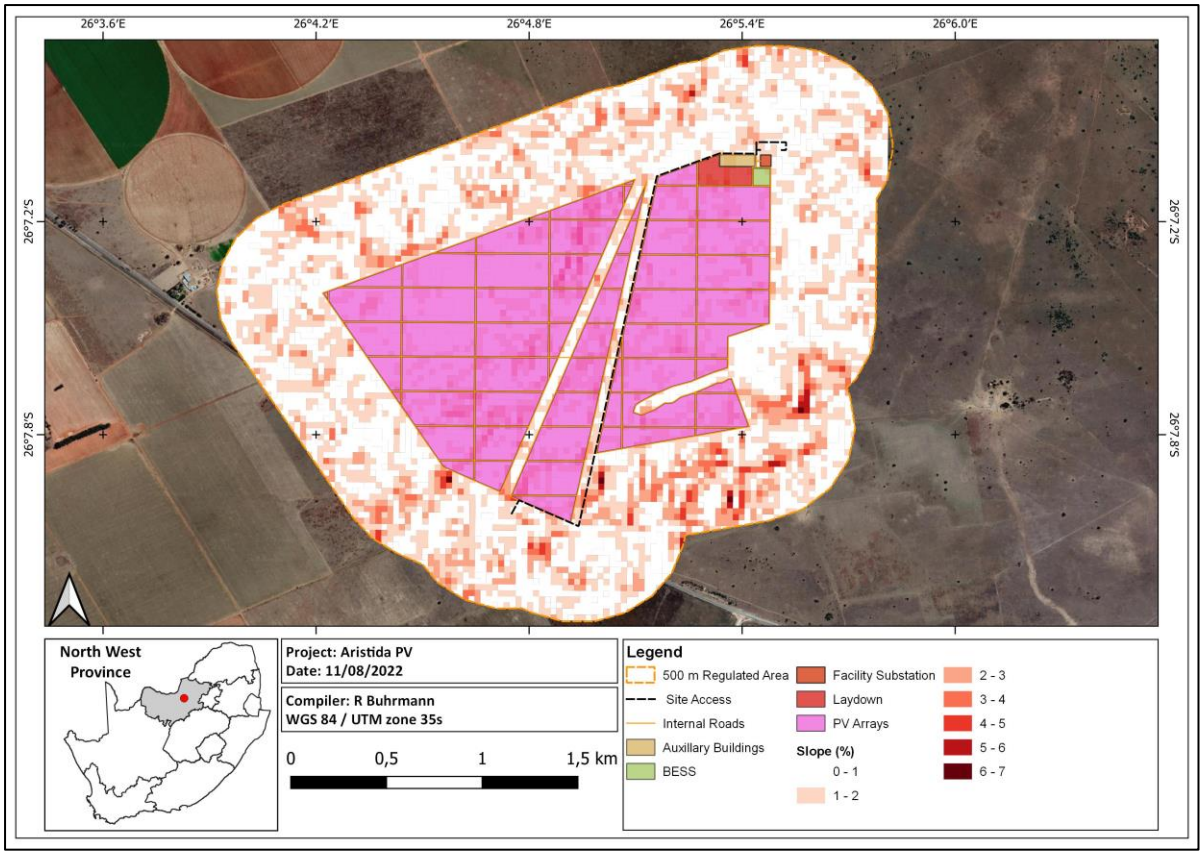

Figure 4-7 Slope percentage of the 500 m regulated area

4.4 Baseline Findings

4.4.1 Delineation and Description

The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 4-8 and Figure 4-9). Two HGM units were identified within the 500 m regulated area, which has been classified as a depression wetland (HGMs 1 and 6). Of these wetland systems, only HGM 1 is expected to be at an appreciable level of risk due to the locality of this systems being within close proximity to the proposed PV area. HGM 6 is located adjacent the proposed PV area, where the R503 Road and its associated stormwater infrastructure separates this system. Therefore, only HGM 1 will be assessed as part of the functional component.

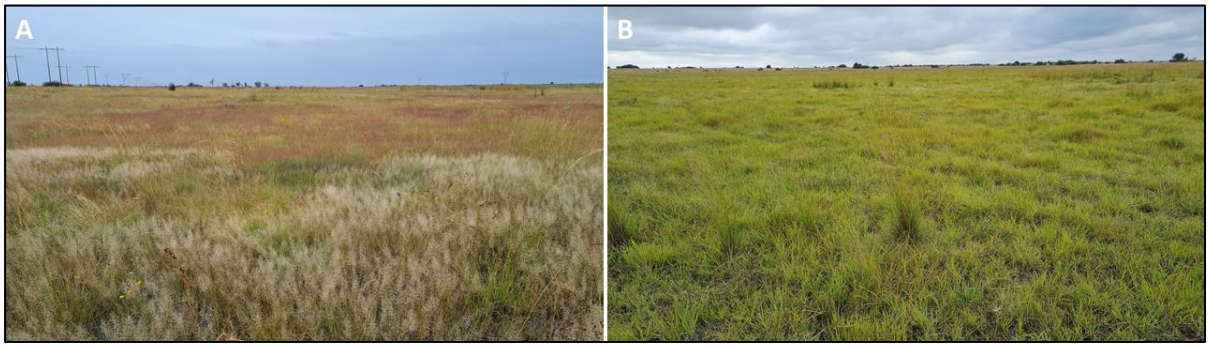

Figure 4-8 Examples of water resources identified. A) Depression (HGM6); B) Depression (HGM1).

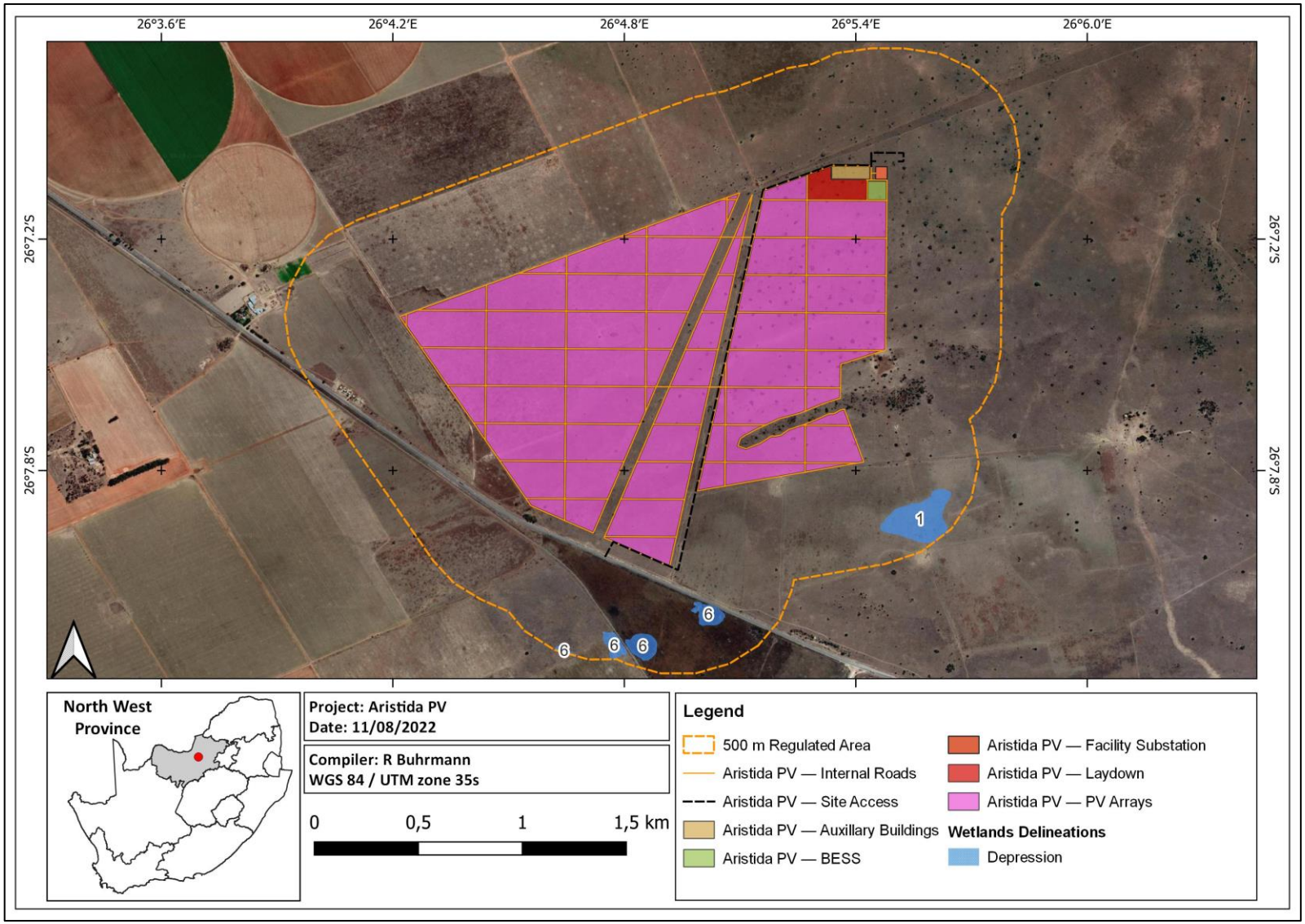

Figure 4-9 Delineation of wetlands within the 500 m regulated area

4.4.2 Unit Identification

The wetland classification as per SANBI guidelines (Ollis *et al.,* 2013) is presented in Table 4-2. All three systems share the same level 1, 2, 3 and 4 classifications.

Table 4-2 Wetland classification as per SANBI guideline (Ollis et al. 2013)

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Highveld	Dry Highveld Grassland Group 5	Bench	Depression	Exorheic	Without channelled inflow
HGM 6							

4.4.3 Unit Setting

The relevant depression, as mentioned in Figure 4-10, is located on the “bench” landscape unit. Depressions are inward draining basins with an enclosing topography which allows for water to accumulate within the system. Depressions, in some cases, are also fed by lateral sub-surface flows in cases where the dominant geology allows for these types of flows. Figure 4-10 presents a diagram of the relevant HGM unit, showing the dominant movement of water into, through and out of the system.

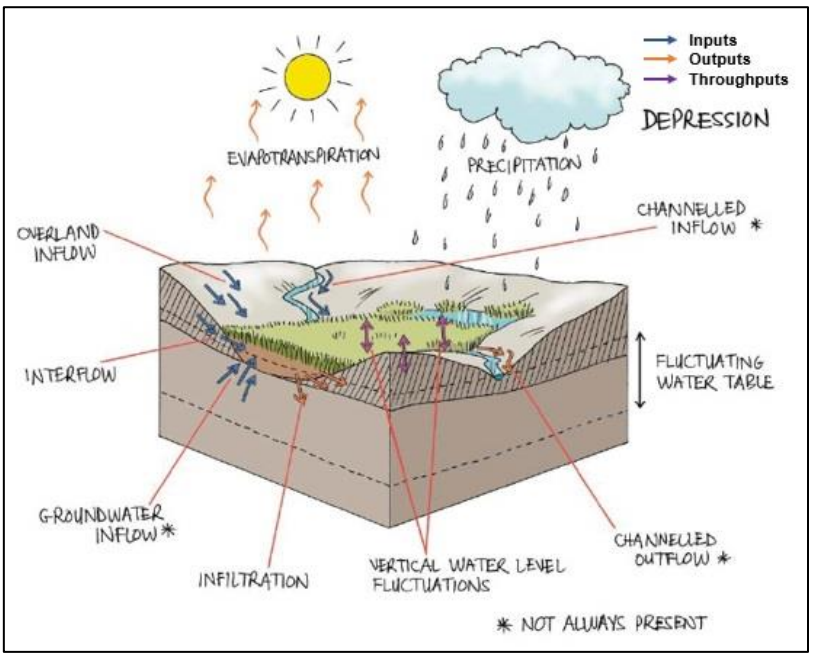

Figure 4-10 Amalgamated diagram of the HGM unit, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

4.4.4 Wetland Indicators

4.4.4.1 Hydromorphic Soils

According to (DWAF, 2005), soils are the most important characteristic of wetlands in order to accurately identify and delineate wetland areas. One dominant soil form was identified, namely the Katspruit soil form.

The Katspruit soil form consists of an orthic topsoil on top of a gleyic horizon. The 2210 family group is applicable to this soil form given the grey colours, the firm texture and structure of the soil form and the absence of lime.

The red apedal diagnostic soil horizon has no well-formed peds, but rather small porous aggregates. The poor structure associated with this diagnostic profile is a result of weathering processes under well drained oxidising conditions. Iron-oxide precipitations form on the outside of soil particles (hence the red colour) and non-swelling clays dominate the clay particles. This diagnostic soil horizon is widely spread across South Africa and can be associated with any parent material expected (Soil Classification Working Group, 1991).

Vertic topsoil's have high clay content with smectic clay particles being dominant (Soil Classification Working Group, 2018). The smectic clays have swell and shrink properties during wet and dry periods respectively. Peds will be shiny, well-developed with a highly plastic consistency during wet periods as a result of the dominance of smectic clays. During shrinking periods, cracks form on the surface and rarely occurs in shallow vertic clays.

Gley horizons that are well developed and have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a Gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a Gley horizon. The structure of a Gley horizon mostly is characterised as strong pedal, with low hydraulic conductivities and a clay texture, although sandy Gley horizons are known to occur. The Gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The Gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths (Soil Classification Working Group, 2018).

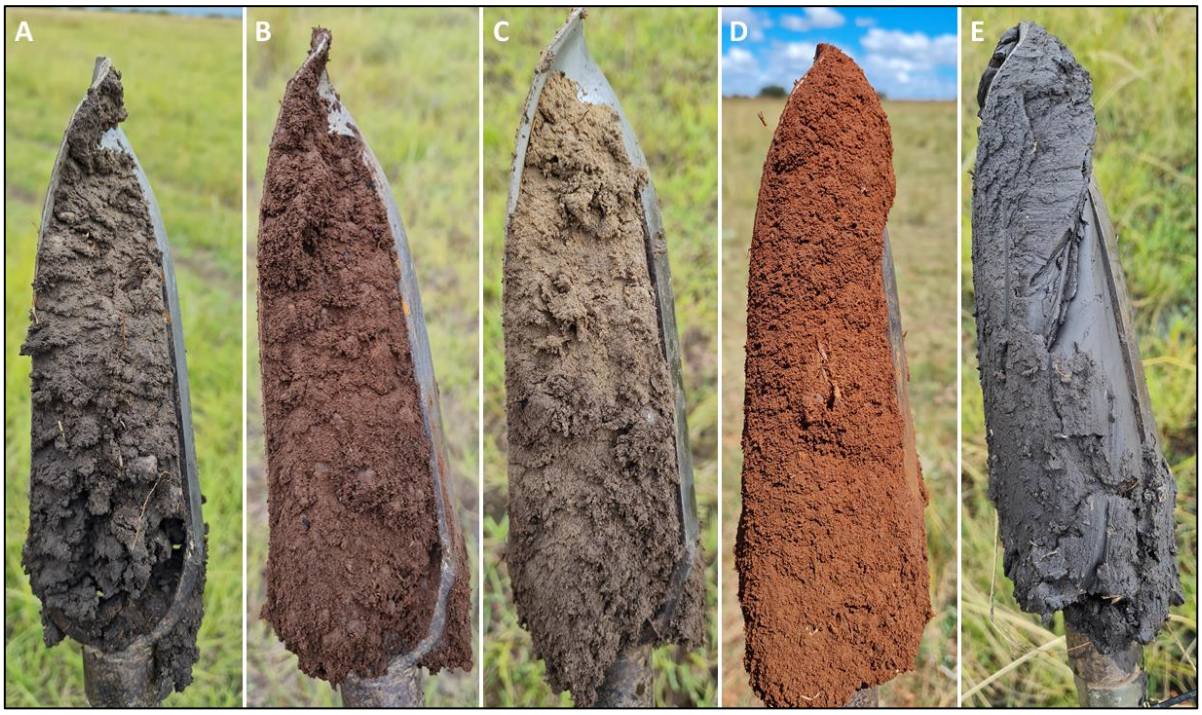

Figure 4-11 Soils identified on site. A) Albic horizon with signs of wetness. B) Neocutanic. C) Gley horizon from the Katspruit soil form (wetland soils). D) Red Apedal horizon. E) Vertic soils with signs of wetness.

4.4.4.2 Hydrophytes

Vegetation plays a considerable role in identifying, classifying and accurately delineating wetlands (DWAF, 2005). During the site visit, two main hydrophytic species was identified within the project area, namely *Juncus effusus and Cyperus marginatus*.

Figure 4-12 Example of wetland vegetation within the project area. A) Wetland areas seen on site. B) Juncus effusus. C) Cyperus marginatus.

4.4.5 General Functional Description

The generally impermeable nature of depressions and their inward draining features are the main reasons why the streamflow regulation ability of these systems is mediocre. Regardless of the nature of depressions in regard to trapping all sediments entering the system, sediment trapping is another Eco Service that is not deemed as one of the essential services provided

by depressions, even though some systems might contribute to a lesser extent. The reason for this phenomenon is due to winds picking up sediments within pans during dry seasons which ultimately leads to the removal of these sediments and the deposition thereof elsewhere. The assimilation of nitrates, toxicants and sulphates are some of the higher rated Eco Services for depressions. This latter statement can explain the precipitation as well as continues precipitation and dissolving of minerals and other contaminants during dry and wet seasons, respectively (Kotze *et al.,* 2009).

It is however important to note that the descriptions of the above-mentioned functions are merely typical expectations. All wetland systems are unique and therefore, the ecosystem services rated high for these systems on site might differ slightly to those expectations.

4.4.6 Ecological Function

The ecosystem services provided by the wetland units identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2008). The summarised results for HGM 1 are shown in Table 4-3. The average ecosystem score for HGM 1 has been determined to be “Moderately Low”.

HGM 1 offers the following indirect benefits; erosion control and flood attenuation scoring “Moderately High” for the depression wetlands. The direct benefits for this system decrease the overall average ecosystem service scores significantly. No signs were identified on-site concerning using water to irrigate crop fields. Similarly, no harvesting is expected to take place, predominantly due to the fact that no signs of poverty can be noted within the area.

The direct scores were further reduced because the identified wetlands were not within the SAIIAE or NFEPA wetland datasets, and not easily accessible. Biodiversity maintenance has been scored as “Low”.

Table 4-3 The ecosystem services being provided by the HGM units

			Wetland Unit		HGM 1
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2.2
			Streamflow regulation		1.0
			Water Quality enhancement benefits	Sediment trapping	1.4
				Phosphate assimilation	1.8
				Nitrate assimilation	2.0
				Toxicant assimilation	1.8
				Erosion control	2.2
			Carbon storage		1.1
			Biodiversity maintenance		1.3
	Direct Benefits	Provisioning benefits	Provisioning of water for human use		0.5
			Provisioning of harvestable resources		0.2
			Provisioning of cultivated foods		0.0
		Cultural benefits	Cultural heritage		0.0
			Tourism and recreation		0.4
			Education and research		0.5

Average Eco Services Score	1.1

4.4.7 Ecological Health

The PES for the assessed HGM unit is presented in Table 4-4. The overall PES score for HGM 1 has been calculated to be “Largely Modified”. The main impacts associated with this HGM includes the fact that this wetland (and catchment) have been transformed to such an extent that indigenous hydrophytic vegetation has been removed to make way for grazing, and historically crops.

Table 4-4 Summary of the scores for the wetland PES

Wetland	Hydrology		Geomorphology		Vegetation	
	Rating	Score	Rating	Score	Rating	Score
HGM 1	Largely Modified (D)	4.0	Largely Modified (D)	5.3	Seriously Modified (E)	6.4
Overall PES Score	5.1		Overall PES Class		Largely Modified (D)	

4.4.8 Ecological Importance & Sensitivity

The results of the ecological IS assessment are shown in Table 4-5. Various components pertaining to the protection status of a wetland are considered for the IS, including Strategic Water Source Areas (SWSA), the NFEPA wet vegetation protection status and the protection status of the wetland itself considering the NBA wetland dataset. The IS for HGM 1 has been calculated to be “Moderate”, which combines all parameters listed in Table 4-5.

It is worth noting that the DFFE screening tool report (2021) was used to further refine the sensitivity of wetland features by means of the aquatic biodiversity theme. These HGMs are associated with “Inland Waters, Wetland and Estuaries”, which have been allocated a “Very High” sensitivity (see Figure 4-13).

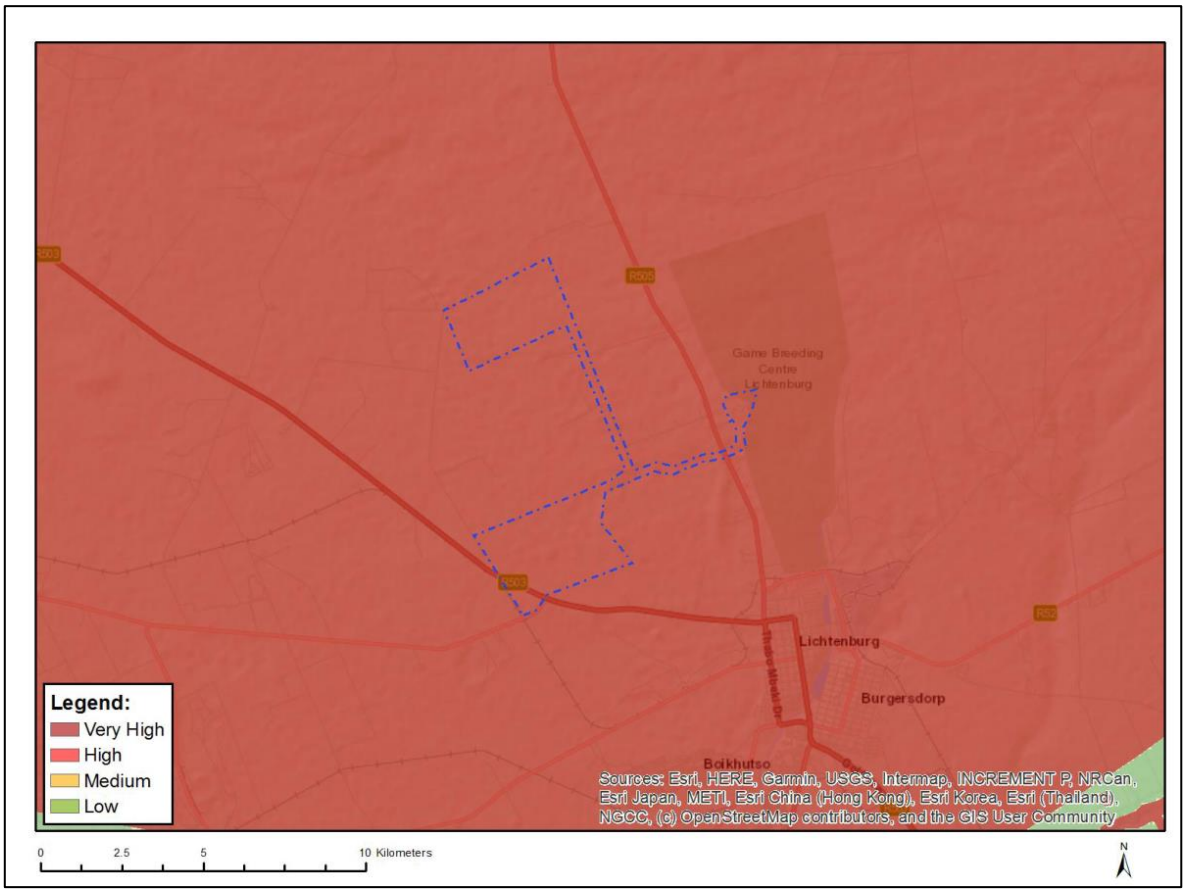

Figure 4-13 Illustration of DFFE aquatic biodiversity theme

Table 4-5 The IS results for the delineated HGM unit

HGM Type	Wet Veg			NBA Wetlands		SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018		
HGM 1	Mesic Highveld Grassland Group 3	Least Concerned	Poorly Protected	D/E/F Seriously Modified	Least Concerned	N/A	Moderate

4.5 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity. A pre-mitigation buffer zone of 30 m is recommended for the identified wetland, which can likely be decreased to 20 m if suitable avoidance and mitigation measures are implemented (see Table 4-6 and Figure 4-14). Even though the artificial wetlands and drainage lines have not been assigned any buffer zones, it is worth noting that the major drainage lines delineated need to be conserved throughout the construction and operational phases. Various mitigation measures of relevance will be prescribed.

Table 4-6 Pre-and post-mitigation buffer sizes

	Buffer Widths
Pre-mitigation buffer	30 m
Post-mitigation buffer	20 m

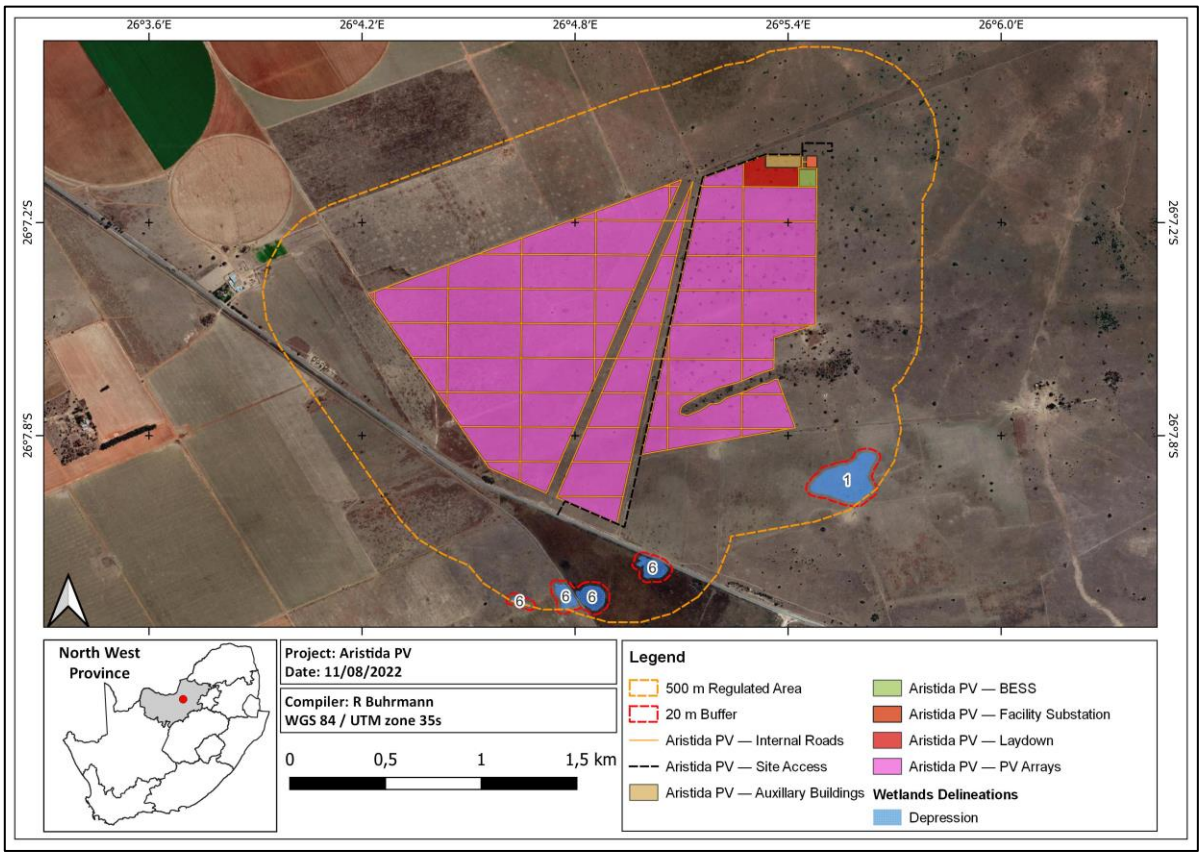

Figure 4-14 Illustration of recommended buffer requirement

5 Risk Assessment

A risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998, (Act 36 of 1998) to investigate the level of risk posed by proposed project, namely the installation of a solar PV facility. The risks posed by the proposed development to wetlands within the project areas are provided in Table 5-1 for scenarios with and without mitigation. Three levels of risk have been identified and determined for the overall risk assessment, these include low, medium and high risk. High risks are not applicable based on the fact that wetlands will not be directly impacted on by the proposed development. It has been assumed the wetland buffer (of 20 m) will be implemented. Medium risk refers to wetland areas that are either on the periphery of the infrastructure and at an indirect risk. However, the wetlands are well buffered from the proposed development, and therefore the medium risks are not applicable. Low risks are wetland systems beyond the project area that would be avoided, or wetland areas that could be avoided if feasible. The significance of all post-mitigation risks was determined to be low. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 5-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts.

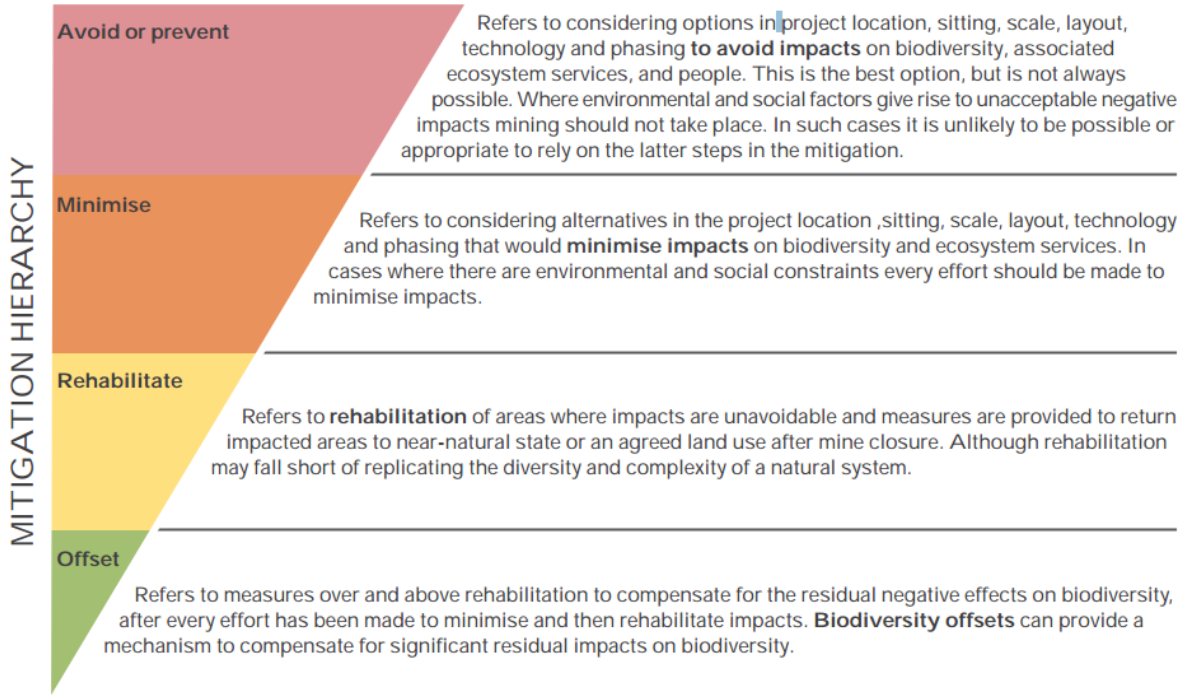

Figure 5-1 The mitigation hierarchy as described by the DEA (2013)

Table 5-1 DWS Risk Impact Matrix for the proposed development (Andrew Husted Pr Sci Nat 400213/11)

Activity	Aspect	Impact	Severity: Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
Construction																			
Site clearing and preparation.	Wetland disturbance / loss.	Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility.	Without	2	2	2	2	2	1	2	5	3	3	1	2	9	45	L	• Clearly demarcate the construction footprint and restrict all construction activities to within the proposed development area. • When clearing vegetation, allow for some vegetation cover as opposed to bare areas. • Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Use the wetland shapefiles to signpost the edge of the wetlands closest to site. Place the sign 20 m from the edge (this is the buffer zone). Label these areas as environmentally sensitive areas, keep out. • Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan. • All activities (including driving) must adhere to the 20 m buffer area. • Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • All alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. By this Eskom is obliged to control. • Landscape and re-vegetate all denuded areas as soon as possible.
			With	2	2	1	1	1.5	1	2	4.5	1	1	1	2	5	23	L	

Activity	Aspect	Impact	Severity															Control Measures
			Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	
	Water runoff from construction site.	Increased erosion and sedimentation.	Without	1	2	1	1	1.25	2	3	6.25	3	2	1	2	8	50	L	• Limit construction activities near wetlands (< 50m) to winter (as much as possible) when rain is least likely to wash concrete and sand into the wetland. Activities in black turf soils can become messy during the height of the rainy season and construction activities should be minimised during these times to minimise unnecessary soil disturbances.
			With	1	2	1	1	1.25	1	2	4.25	2	1	1	2	6	26	L	• Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • No activities are permitted within the wetland and associated buffer areas. • Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.
		Potential contamination of wetlands with machine oils and construction materials.	Without	1	2	2	2	1.75	2	2	5.75	2	1	1	2	6	35	L	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately stockpile topsoil cleared from the project area.
			With	1	2	1	1	1.25	1	2	4.25	1	1	1	2	5	21	L	• Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the wetlands. • No activities are permitted within the wetland and associated buffer areas.
Operation																			
Operation of the solar facility.	Hardened surfaces.	Potential for increased stormwater runoff leading to	Without	2	1	1	1	1.25	2	2	5.25	3	1	1	2	7	36.75	L	• Design and Implement an effective stormwater management plan. • Promote water infiltration into the ground beneath the solar panels.

Activity	Aspect	Impact	Severity															Control Measures
			Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	
		Increased erosion and sedimentation.	With	1	1	1	1	1	2	2	5	1	2	1	1	5	25	L	• Release only clean water into the environment. • Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). • Re-vegetate denuded areas as soon as possible. • Regularly clear drains. • Minimise the extent of concreted / paved / gravel areas. • A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible then gravel is preferable over concrete or paving. • Avoid excessively compacting the ground beneath the solar panels.
	Contamination.	Potential for increased contaminants entering the wetland systems.	Without	1	2	1	2	1.5	2	2	5.5	2	1	1	2	6	33	L	• Where possible minimise the use surfactants to clean solar panels and herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used do so well prior to any significant predicted rainfall events.
			With	1	1	1	1	1	2	2	5	1	2	1	1	5	25	L	
Closure																			
Decommissioning of the solar facility.	Rehabilitation.	Potential loss or degradation of nearby wetlands through inappropriate closure.	Without	2	2	2	2	2	2	3	7	2	1	1	1	5	35	L	• Develop and implement a rehabilitation and closure plan. • Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.
			With	1	1	1	1	1	2	2	5	1	2	1	1	5	25	L	

6 Conclusion and Impact Statement

6.1 Baseline Ecology

Three HGM units were identified, with two assessed due to the systems being at an appreciable level of risk posed by the proposed development. HGM 1 was determined to have a “Moderately Low” average ecosystem service score. The overall present ecological state of the systems was “Largely Modified”. The importance and sensitivity score of HGM 1 was calculated to be “Moderate”. A 20 m buffer zone has been recommended for the conservation of the delineated wetlands.

A risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998, (Act 36 of 1998). It has been assumed that the delineated wetland areas will be avoided, and the 20 m buffer width implemented for the project. The post-mitigation residual risk significance was determined to be low and a General Authorisation is required. However, it is the specialist’s opinion that the wetland is well buffered from the proposed PV system, and that there is very limited possible risk to the delineated wetlands.

7 References

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