TERRESTRIAL ECOLOGY & WETLAND BASELINE IMPACT ASSESSMENTS FOR THE PROPOSED SIBANYE RUSTENBURG PLATINUM MINES (SRPM) SOLAR PROJECT

Rustenburg, North-West Province

June 2022

CLIENT

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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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial ecology and wetland assessment for the proposed up to 80MW SRPM Solar Photovoltaic (PV) Energy Facility located on portions 5, 6, 8, 16, and 48 of the Farm Waterval No. 303 near Rustenburg, North-West Province, referred to as the project area from herein (Figure 1-1). The project area is located approximately 4 km east of Rustenburg, within jurisdiction of the Rustenburg Local Municipality and the Bojanala Platinum District Municipality in the North-West Province (Figure 1-2).

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 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 both the terrestrial and aquatic themes for the project area as “very high sensitivity”.

This assessment has also been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS), and Appendix 6 of the EIA Regulations, 2014 (Government Notice (GN) R 982 of 2014, as amended). GN509 was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016 and provides for the authorisation of Section 21(c) & (i) water uses in terms of a General Authorisation (GA) as opposed to a full water use license. A water use qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), and the risk class is determined to be Low. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation going forward.

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

1.2 Project Information

The development of renewable energy facilities is proposed by various Special Purpose Vehicles (SPVs). The project entails the development of a solar PV facility with a contracted capacity of up to 80MW and will be known as the SRPM Solar PV and will include a grid connection and other associated infrastructure. The Solar PV facility is based near current Sibanye Stillwater mining operations. The project will tie-in to the electricity grid behind the Eskom meter at the Sibanye customer substation.

A development footprint of approximately 230 ha for SRPM Solar PV has been identified within the broader combined project site for the development of the Rustenburg Solar facilities. Infrastructure associated with each solar PV facility will include the following:

The onsite infrastructure will include:

- Solar PV array comprising bifacial PV modules and mounting structures, using single axis tracking technology. Once installed, the entire structure will stand up to 5m above ground level;
- Inverters and transformers;
- Cabling between the project components;
- Balance of Plant;

- An onsite Medium Voltage (MV) switching station forming part of the collector substation;
- On-site facility substation to facilitate the connection between the solar PV facility and Eskom electricity grid. The size and capacity of the on-site station will be 80MVA;
- 100MWh Battery Energy Storage System (BESS) per site;
- Temporary Laydown areas;
- Access roads, internal roads and fencing around the development area;
- Up to 132kV Overhead Power Lines (OHPL) – maximum of 30m height with a 15m servitude width; and
- Underground LV cabling will be used on the PV sites.

The Grid connection infrastructure is as follows:

Table 1-1 Grid Connection Infrastructure

Applicant	Project Name	Capacity	Farm Name/s and no/s.	Alternatives	Infrastructure components
SRPM Solar (Pty) Ltd	SRPM Solar PV	Up to 132 kV	Farm Waterval No. 303	» Alternative 1: Farm Waterval 303, RE/16, 14, 9, RE10 RE303,19 » Alternative 2: RE16, 14, 9, RE10, RE303, 19 » Alternative 3: RE16, 14, 9, RE10, RE303, 19 » Alternative to option 2, of both MV rooms with an OHL RE16, 14	Power line to the Paardekraal and UG2 sub-station

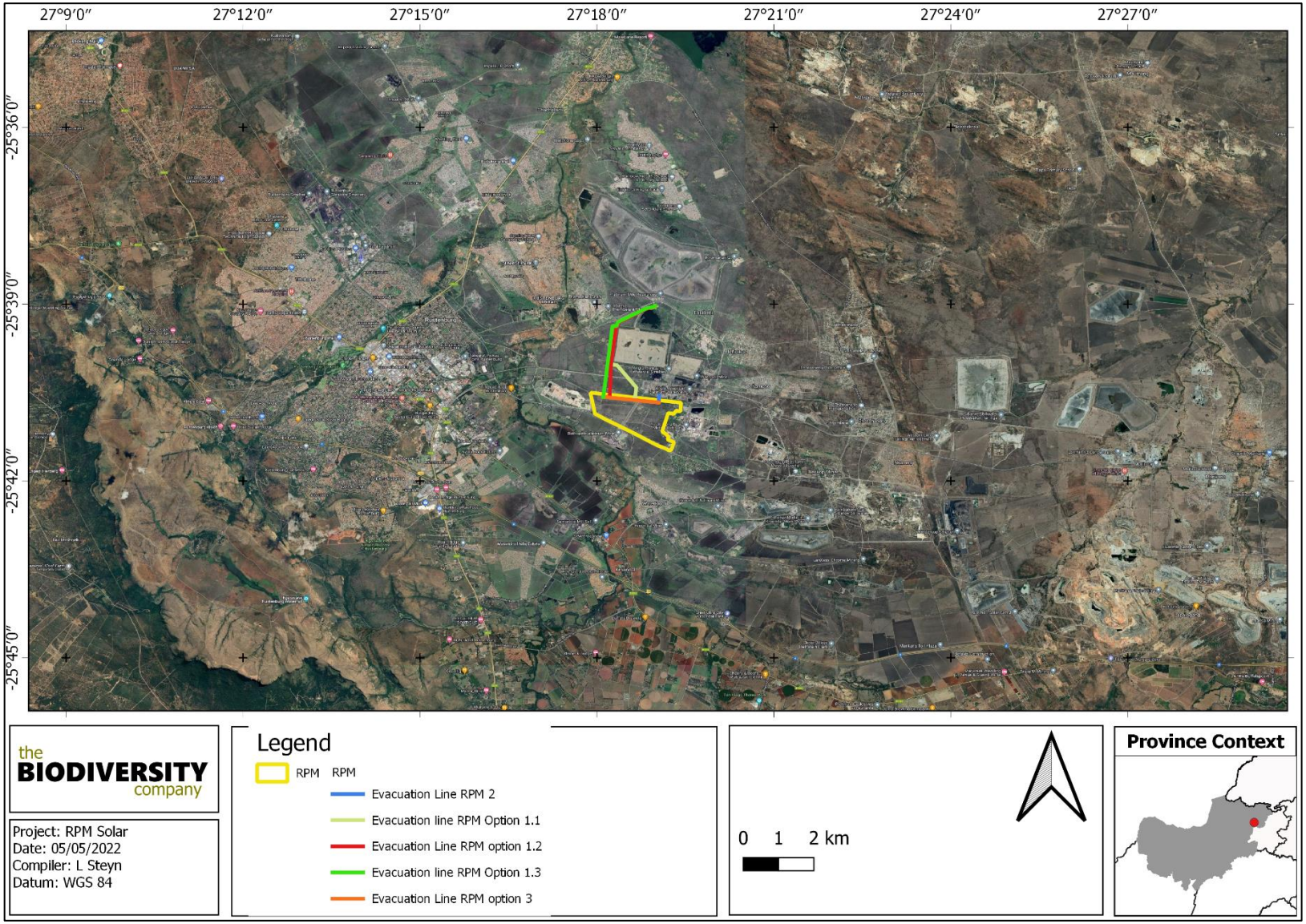


Figure 1-1 Map showing the proposed location of the project area in relation to the nearby towns

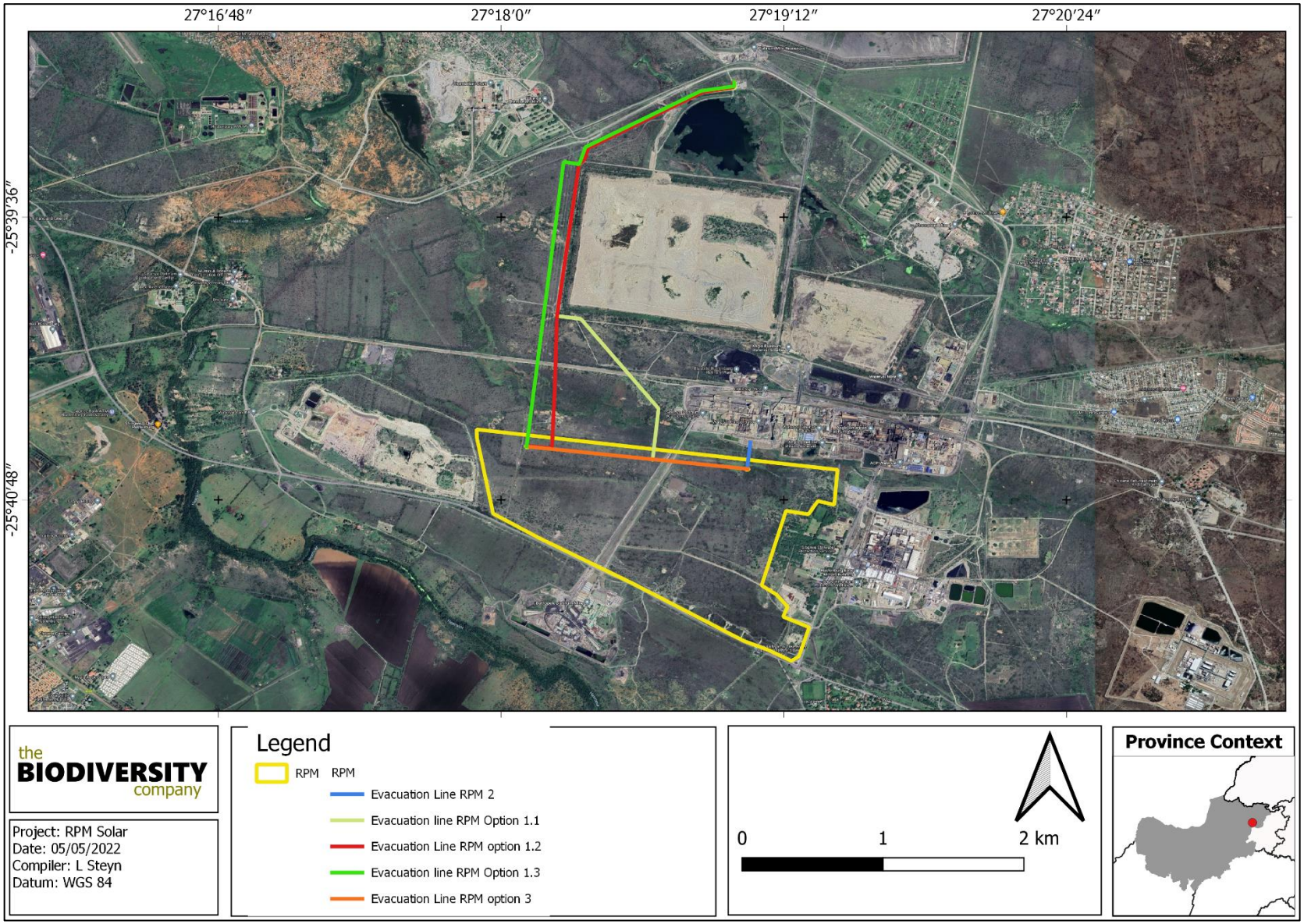


Figure 1-2 Map of the project area

1.3 Specialist Details

Report Name	**TERRESTRIAL ECOLOGY & WETLAND BASELINE IMPACT ASSESSMENTS FOR THE PROPOSED SIBANYE RUSTENBURG PLATINUM MINES (SRPM) SOLAR PROJECT**
Reference	**SRPM Solar PV**
Submitted to	savannah environmental
Report Writer and Fieldwork	**Carami Burger** 
	Carami Burger has completed her Bachelor of Science Honours degree in Ecological Interactions and Ecosystem Resilience. Carami is an ecologist and has completed various studies as part of Basic Assessments and Environmental Impact Assessments.
Writer / Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.4 Scope of Work

The principle aim of the assessment was to provide information to identify the risks stemming from the proposed activity and to identify potential ecological constraints within the project area/corridor. 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;
- Field survey for the delineation, classification and assessment of wetlands within the 500 m regulated area;
- Delineate and map the habitats and their respective sensitivities that occur within the project area;
- Identify the manner that the proposed project impacts the ecological considerations and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

1.5 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the spatial data 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 assessment area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends;
- Due to the time of sampling (autumn, early dry-season) some of the vegetation was dry and most plants had already lost the green winter flush. Also, the spring dominant non-succulent annuals were not detectable;
- A separate avifauna assessment was conducted for the proposed project;
- The wetland delineations utilised were done by Wetland Consulting Services; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 5 m.

1.6 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-2 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-2 A list of key legislative requirements relevant to biodiversity and conservation in the North West Province

Region	Legislation
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)

	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	North West Biodiversity Sector Plan of 2015 (READ, 2015)
	North West Biodiversity Management Act (Act No. 4 of 2016)

2 Methods

2.1 Desktop Baseline

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 proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

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

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

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

- Protected areas - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The SAPAD Database contains spatial data pertinent to the conservation of South African biodiversity. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
- National Protected Areas Expansion Strategy (NPAES) (SANBI, 2016) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Conservation/Biodiversity Sector Plan:
    - The North-West Department of Rural, Environment, and Agricultural Development (NWREAD), 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 NWREAD. 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 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 (NWREAD, 2015). As part of this plan, sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration, and requirement for meeting targets for both biodiversity pattern and ecological processes:
        - Critical Biodiversity Area 1 (CBA1);
        - Critical Biodiversity Area 2 (CBA2);
        - Ecological Support Area 1 (ESA1); and
        - Ecological Support Area 2 (ESA2);
    - Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2013).
    - Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity

Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2017) – 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;

- Hydrological Setting:

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

    - Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2018) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water SWSAs areas is vital for national security because a lack of water security will compromise national security and human wellbeing.

    - National Freshwater Ecosystem Priority Areas (NFEPA) – The NFEPA spatial data has been incorporated in the above mentioned SAIIAE spatial data set. However, to ensure that this data sets are considered we included it as the Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011) are intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

2.1.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) and SANBI (2019) was used to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was

accessed to compile a list of expected flora species within the project area (

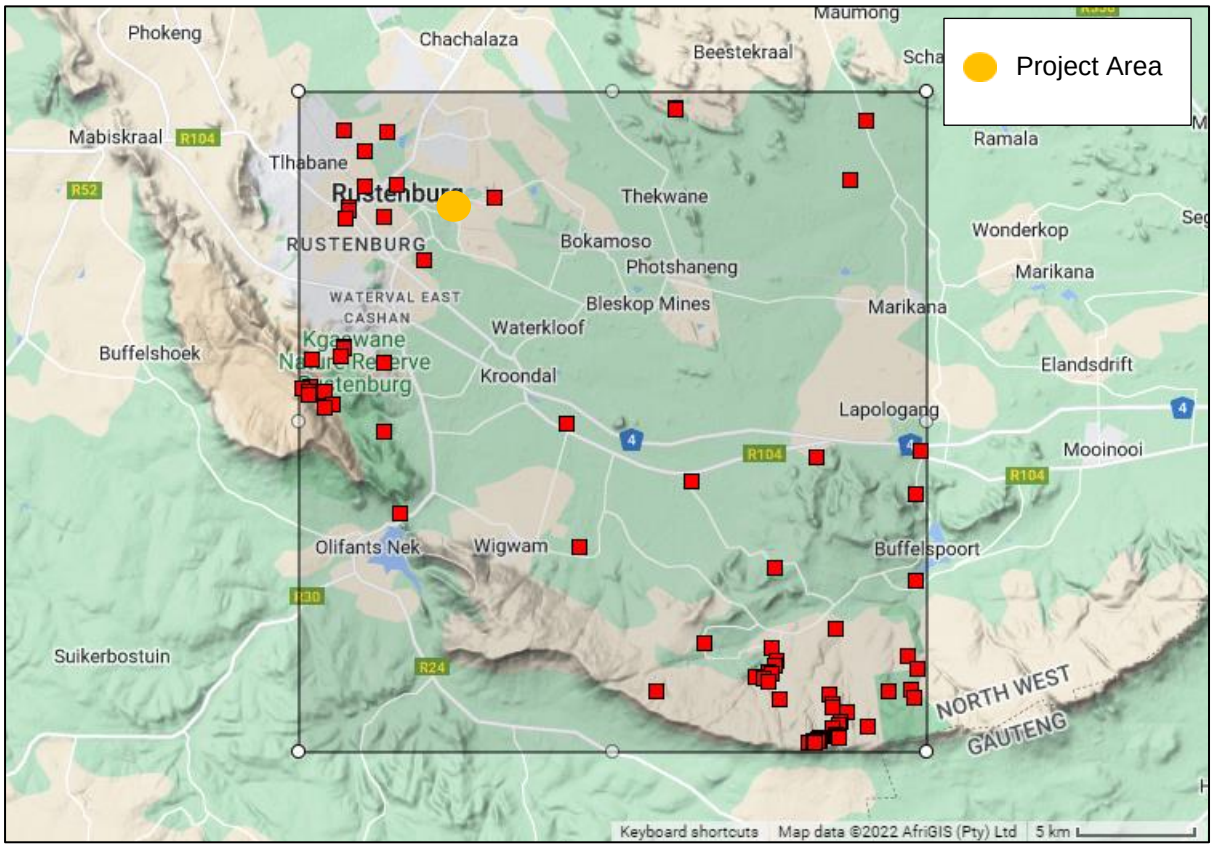


Figure 2-1). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

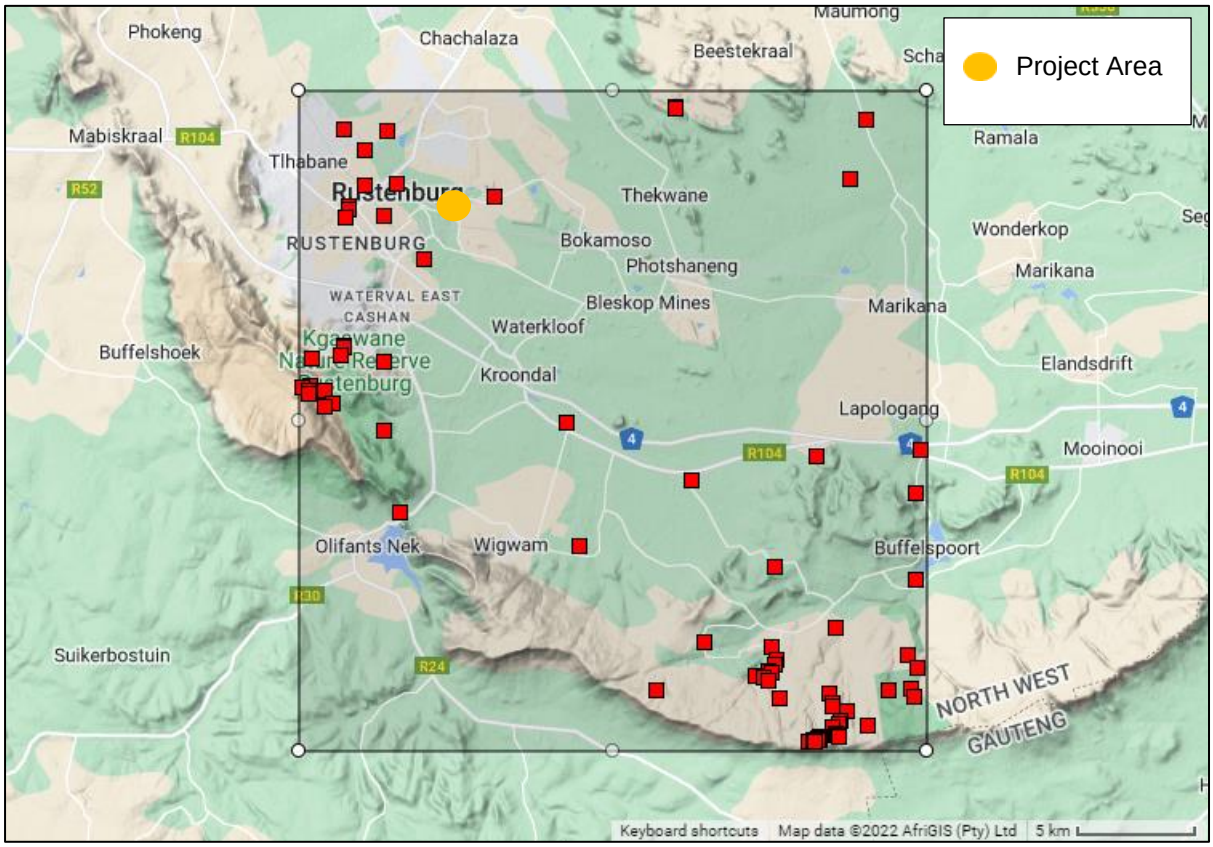


Figure 2-1 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Orange dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data.***

2.1.3 Desktop Faunal Assessment

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

- Amphibian list, generated from the IUCN spatial dataset (2017) and FrogMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2527 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2527 quarter degree square; and
- Mammal list from the IUCN spatial dataset (2017).

2.2 Field Baseline Assessment

A single field survey was undertaken in May 2022 (autumn), which is an early dry-season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types within the limits of time and access.

2.2.1 Flora Survey

2.2.2 Botanical baseline

The botanical assessment will encompass an assessment of all the vegetation units and habitat types within the project area. The focus will be on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. Relevant field guides and texts that will be consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A field guide to Wild flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Mesembs of the World (Smith *et al*., 1998);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification guide to southern African grasses. An identification manual with keys, descriptions and distributions (Fish *et al*., 2015).

Additional information regarding ecosystems, vegetation types, and Species of Conservation Concern (SCC) will include the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012); and
- Red List of South African Plants (Raimondo *et al*., 2009; SANBI, 2016).

The field work methodology will include the following survey techniques:

- Timed meanders;

- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

2.2.2.1 Floristic Analysis

The fieldwork and sample sites will be placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork will therefore be to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site. Emphasis will be placed on sensitive habitats, especially those overlapping with the proposed project area.

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

The timed random meander method is a highly efficient method 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 habitat for SCC will be identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

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

2.2.3 Fauna Survey

The faunal assessment within this report pertains to mammals and herpetofauna (amphibians and reptiles). 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 as well as listening to species calls; and
- 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.);

Field guides and texts consulted for identification purposes included the following:

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

2.3 Terrestrial Site Ecological Importance (SEI)

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned 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 CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

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

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

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

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

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

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

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

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

Resilience	**Fulfilling Criteria**
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 2-5.

Table 2-5 Matrix used to derive Site Ecological Importance (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
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 2-6.

Table 2-6 Guidelines for interpreting Site Ecological Importance (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.

2.4 Wetland Assessment

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 2-2. 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 because 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.

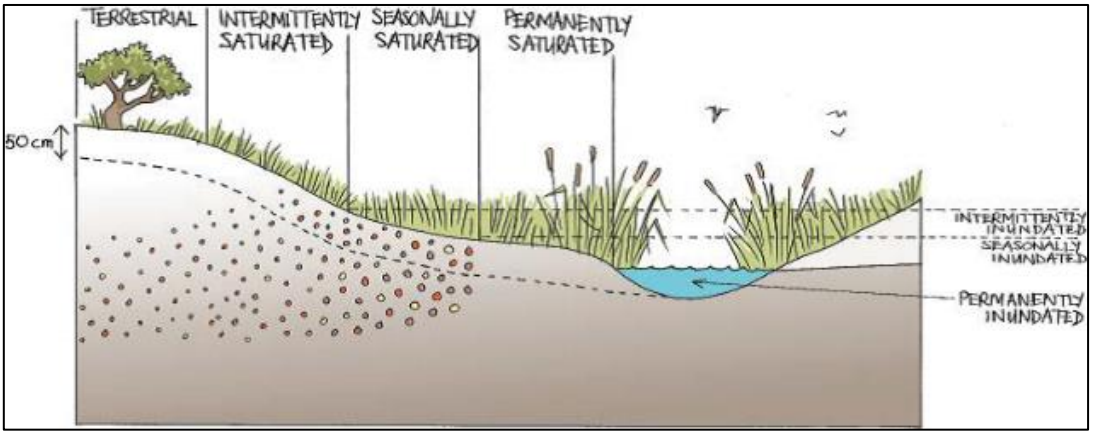


Figure 2-2 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

2.4.1 Delineation

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

2.4.2 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 also includes structural features at the lower levels of classification (Ollis et al., 2013).

2.4.3 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 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 2-7).

Table 2-7 Classes for determining the likely extent to which a benefit is being supplied

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

2.4.4 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 State categories are provided in Table 2-8.

Table 2-8 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 recognisable.	**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**

2.4.5 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 are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 2-9 (Rountree and Kotze, 2013).

Table 2-9 Description of Importance and Sensitivity categories

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

2.4.6 Determining 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.

2.4.7 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is calculated according to Table 2-10.

Table 2-10 Significance ratings matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.

56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s)impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

3 Results & Discussion

3.1 Desktop Baseline

3.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 3-1.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Relevant – Overlaps with an Endangered ecosystem.	3.1.1.1
Ecosystem Protection Level	Relevant – Overlaps with a Poorly Protected Ecosystem.	3.1.1.2
Critical Biodiversity Area	Irrelevant – The project area does not overlap with a CBA or an ESA1.	3.1.1.3
Protected Areas	Relevant – The project area is located 2km north of the Magaliesberg Biosphere Reserve.	3.1.1.4
National Protected Areas Expansion Strategy	Irrelevant – The project area does not overlap with a NPAES Area.	3.1.1.5
Important Bird and Biodiversity Areas	Relevant – The project area is located 2km north of the Magaliesberg IBA.	3.1.1.6
South African Inventory of Inland Aquatic Ecosystems	Relevant – The project area and its 500 m regulated zone overlaps with a CR and LC Wetland.	3.1.1.7
National Freshwater Priority Area	Relevant – The project area and its 500 m regulated zone overlaps with twelve unclassified NFEPA wetlands.	3.1.1.8
Strategic Water Source Areas	Irrelevant – The project area is 125 km from the closest SWSA.	-
REDZ	Irrelevant – Does not overlap with any Renewable Energy Development Zones.	
Powerline Corridor	Irrelevant – Lies 10 km North from the Northern Corridor.	

3.1.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed project overlaps with an EN ecosystem (Figure 3-1).

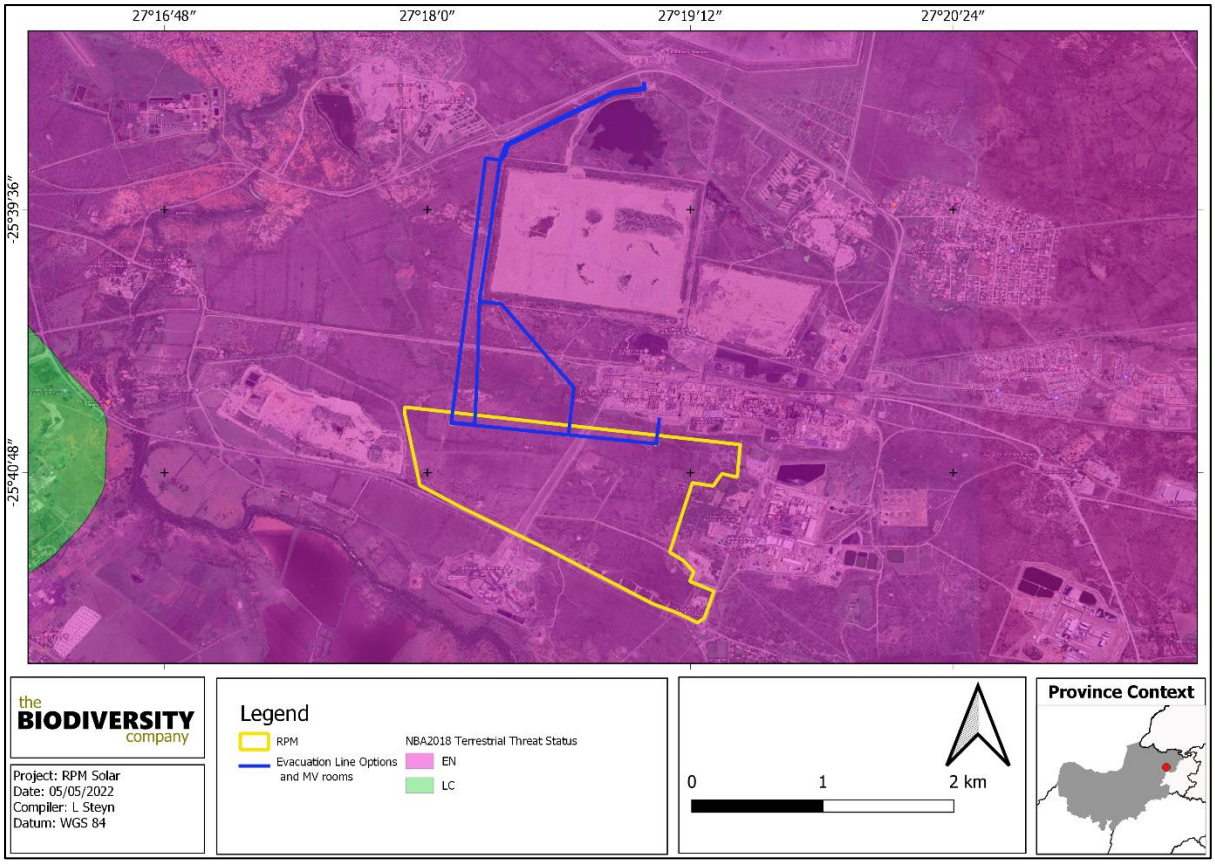


Figure 3-1 Map illustrating the ecosystem threat status associated with the project area

3.1.1.2 Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps with a PP ecosystem (Figure 3-2).

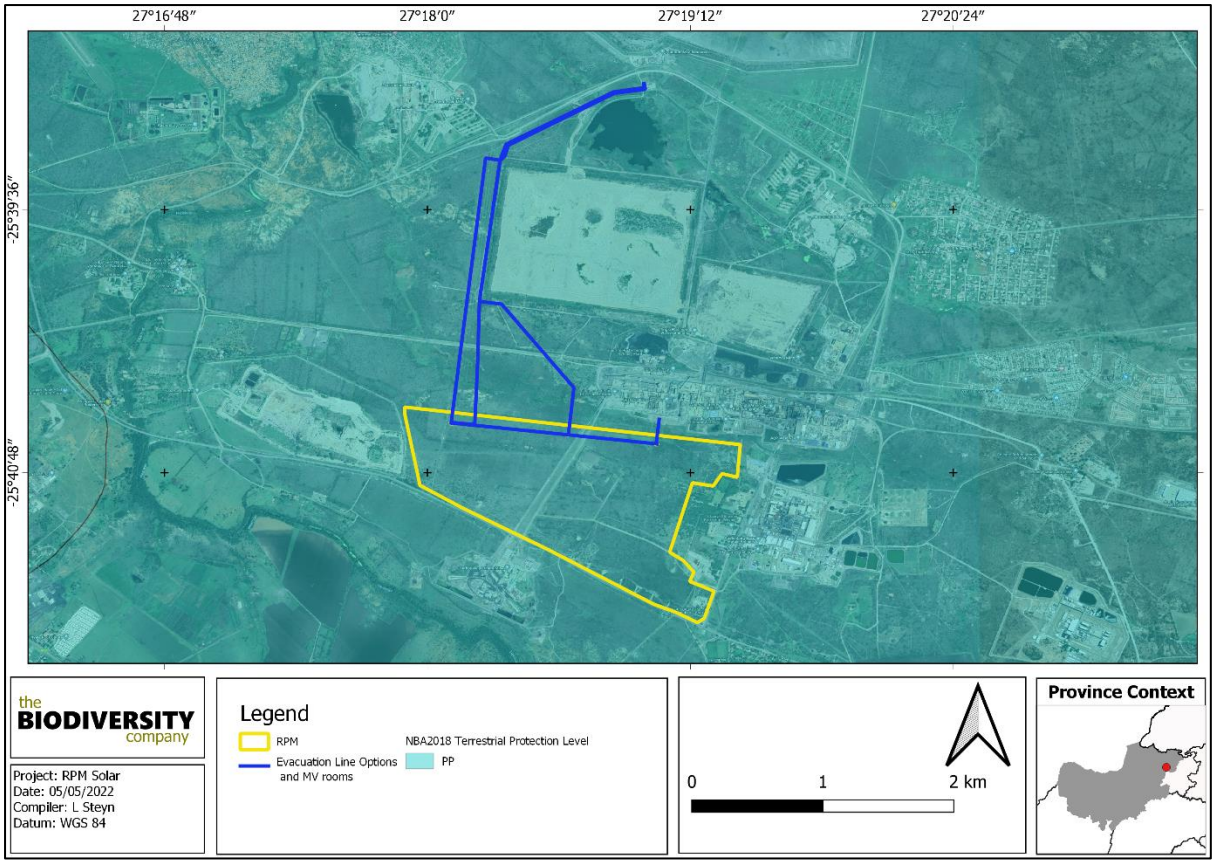


Figure 3-2 Map illustrating the ecosystem protection level associated with the project area

3.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

The 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 purpose of the North-West Biodiversity Sector Plan (NWBSP) (2015) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely CBA1 areas, CBA2 areas, ESA1 areas and ESA2 areas based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

Figure 3-3 shows the project area superimposed on the Terrestrial CBA maps. The project area does not overlap with any CBAs or ESAs.

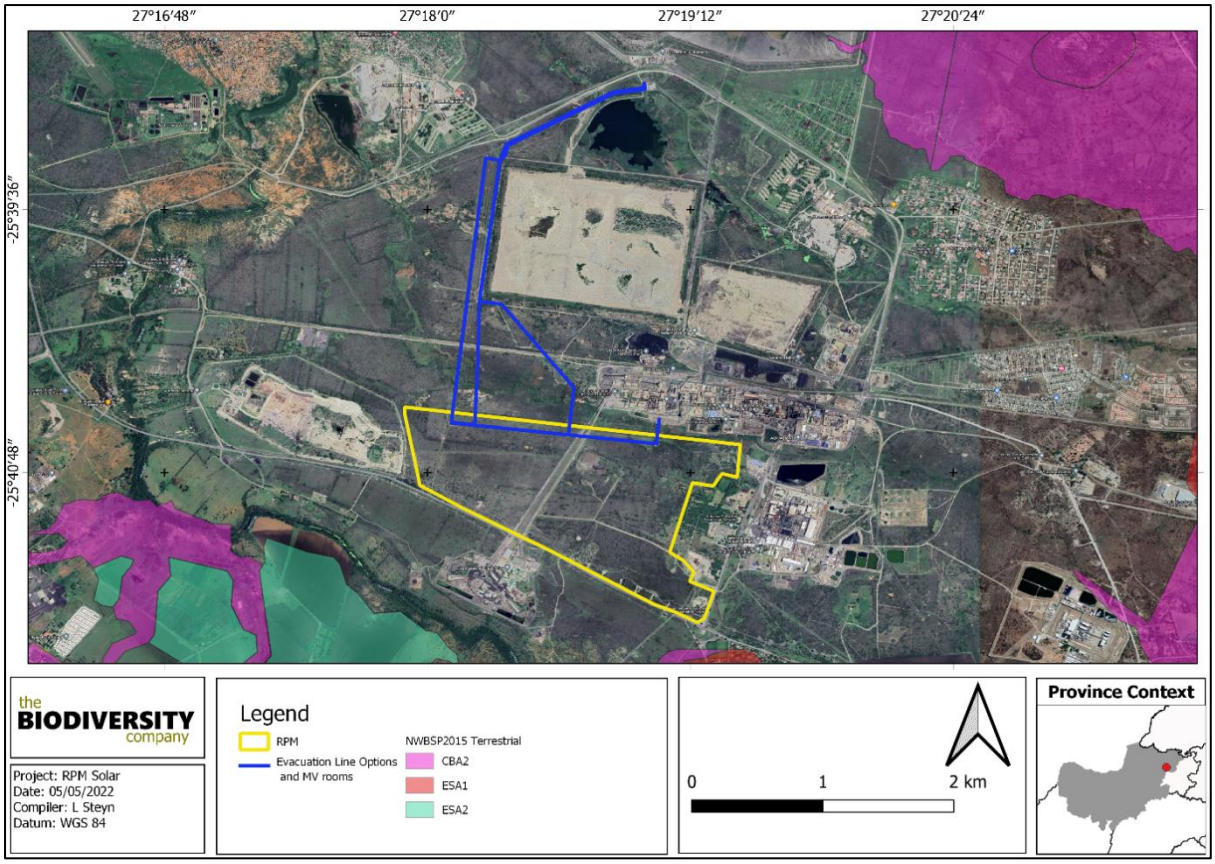


Figure 3-3 Map illustrating the locations of CBAs in the project area

3.1.1.4 Protected Areas

According to the protected area spatial datasets from SAPAD (2021) and SACAD (2021), the project area is located approximately 2km north of the Magaliesberg Biosphere Reserve (Figure 3-4), and approximately 6km northeast of the Kgaswane Mountain Nature Reserve and the Magaliesberg Protected Natural Environment.

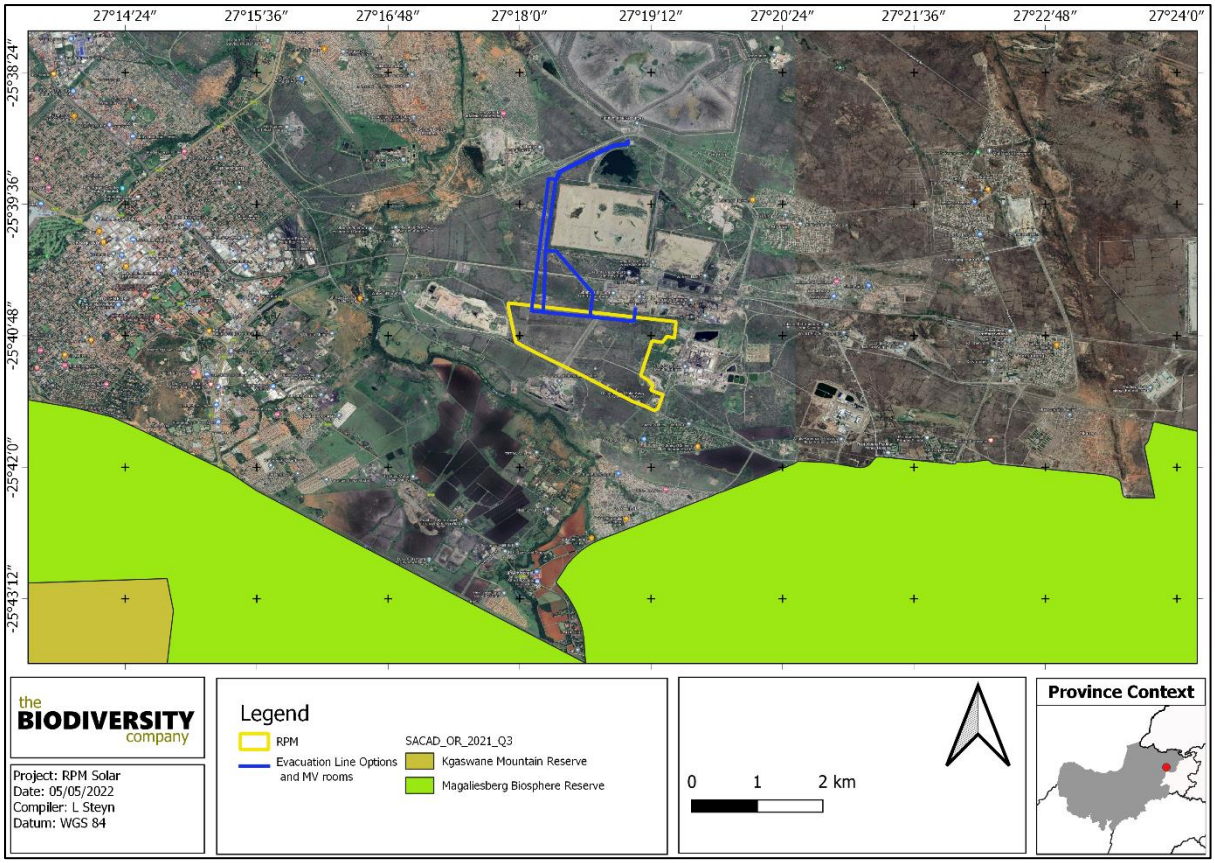


Figure 3-4 The project area in relation to the protected areas

3.1.1.5 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) 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 a 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 finescale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016).

The project area does not overlap any NPAES areas (Figure 3-5).

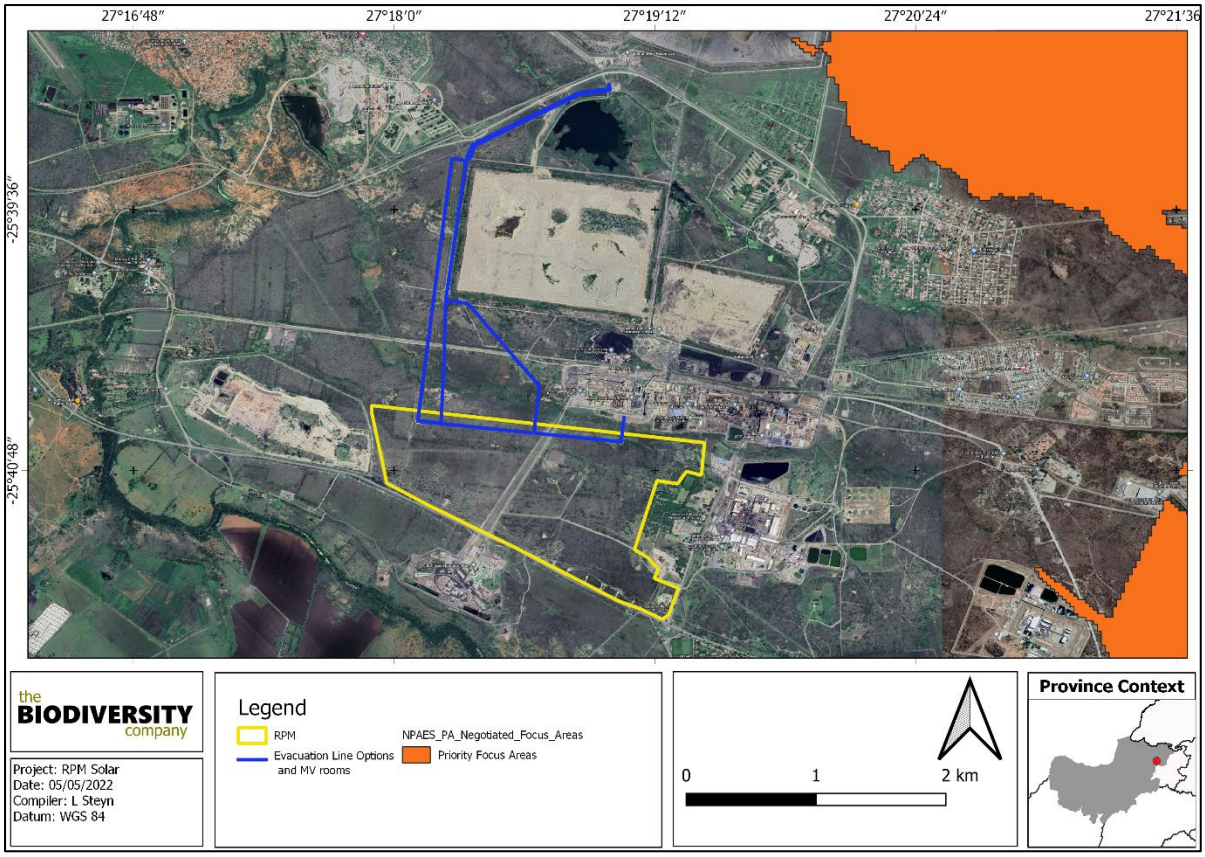


Figure 3-5 The project area in relation to the National Protected Area Expansion Strategy

3.1.1.6 Important Bird and Biodiversity Area

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

According to Birdlife South Africa (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 3-6 shows that the project area is located approximately 2km north of the Magaliesberg IBA.

The Magaliesberg IBA was previously known as the Magaliesberg and Witwatersberg IBA, and consists mainly of the Magaliesberg range which extends from North-West of Rustenburg in the West to the N1 in the East near Pretoria (Birdlife South Africa, 2015). Several large rivers have their headwaters in these mountains, such as the Crocodile, Sterkstroom, Magalies and Skeerpoort rivers (Birdlife South Africa, 2015). Three major impoundments have been built along the Magaliesberg, namely the Hartbeespoort Dam in the East, Buffelspoort Dam in the centre and Olifantsnek Dam about 7 km south of Rustenburg (Birdlife South Africa, 2015).

IBA trigger species in the Magaliesberg IBA include two globally threatened species, namely Cape Vulture (*Gyps coprotheres*) and Secretarybird (*Sagittarius serpentarius*), of which the former is considered to be the most important (Birdlife South Africa, 2015). Regionally threatened species include the Lanner Falcon (*Falco biarmicus*), Half-collared Kingfisher (*Alcedo semitorquata*), African Grass Owl (*Tyto capensis*), African Finfoot (*Podica senegalensis*) and Verreaux's Eagle (*Aquila verreauxii*) (Birdlife

South Africa, 2015). Biome-restricted species include the White-bellied Sunbird (*Cinnyris talatala*), Kurrichane Thrush (*Turdus libonyanus*), White-throated Robin-chat (*Cossypha humeralis*), Kalahari Scrub Robin (*Erythropygia paena*) and Barred Wren-Warbler (*Calamonastes fasciolatus*) (Birdlife South Africa, 2015).

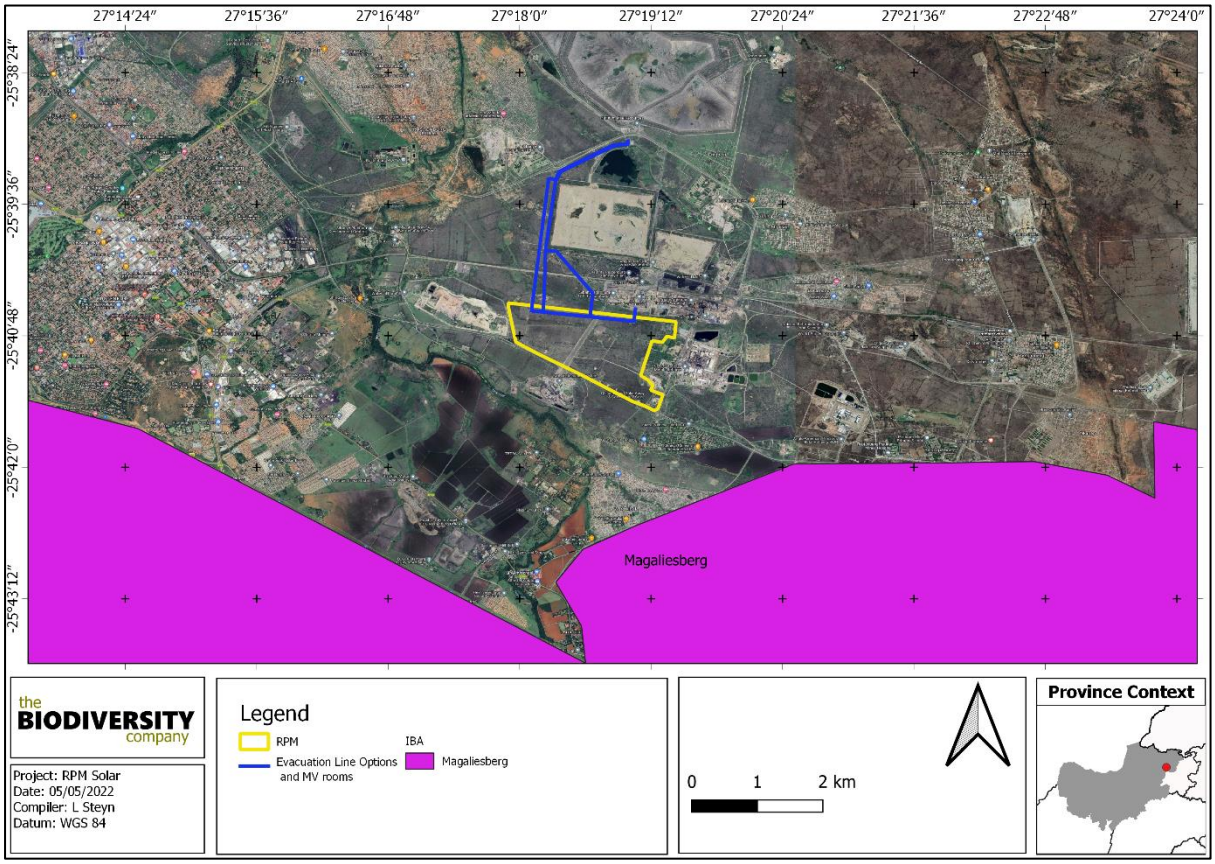


Figure 3-6 The project area in relation to the Magaliesberg IBA

3.1.1.7 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area's 500 m regulated area overlaps with a CR and LC wetland but does not overlap with any rivers (Figure 3-7).

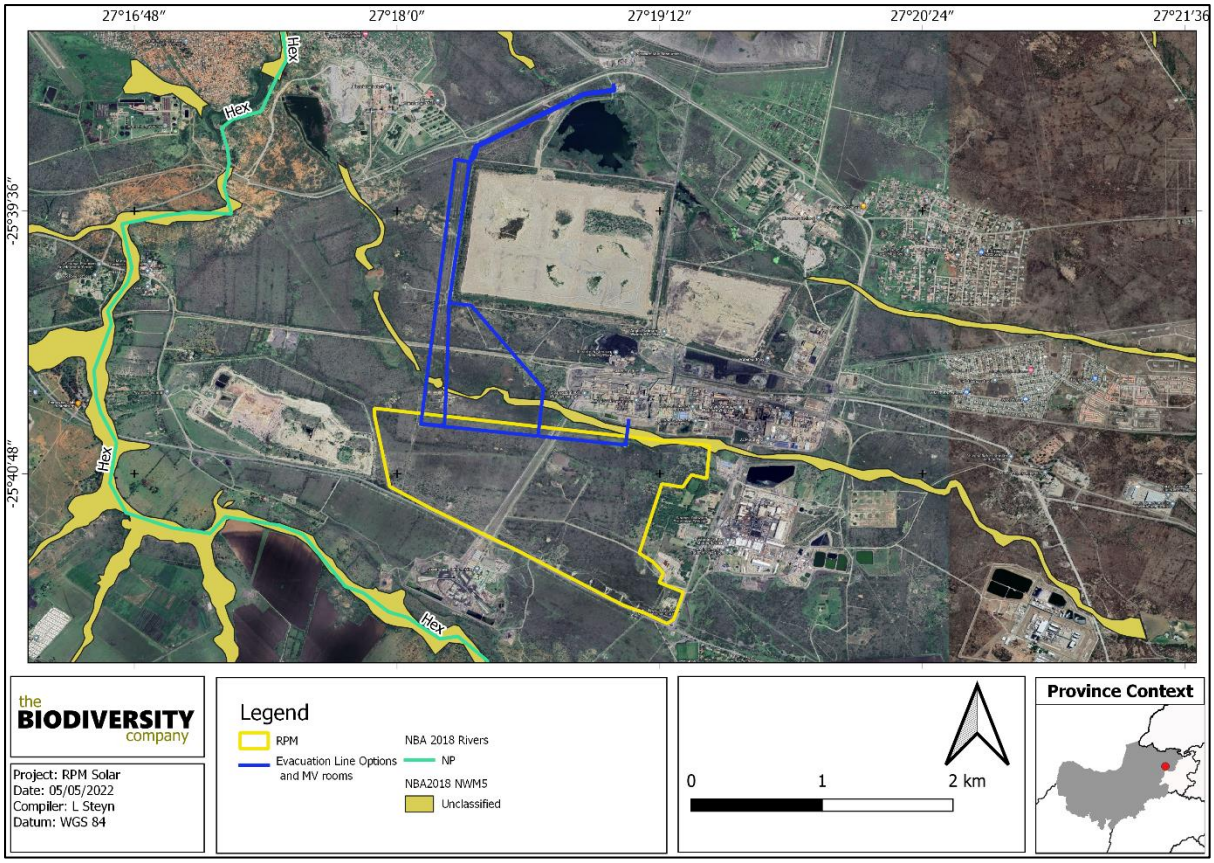


Figure 3-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

3.1.1.8 National Freshwater Ecosystem Priority Area Status

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

Figure 3-8 shows that the project area and its 500 m regulated area overlaps with twelve unclassified NFEPA wetlands.

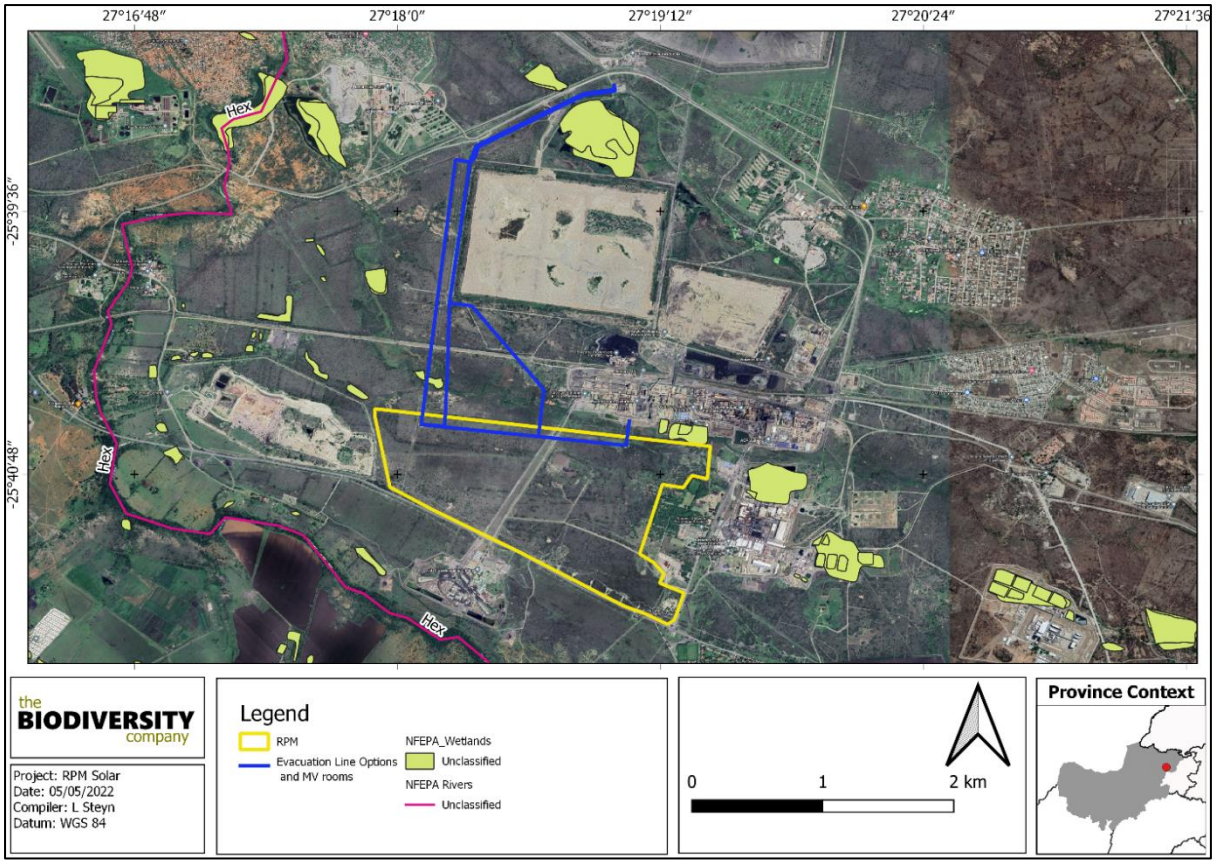


Figure 3-8 The project area in relation to the National Freshwater Ecosystem Priority Areas

3.1.2 Flora Baseline

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

3.1.2.1 Vegetation Type

The project area is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include a seasonal precipitation and a sub-tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer (Mucina & Rutherford, 2006). At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia* and *Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the project area overlaps with the Marikana Thornveld vegetation type (Figure 3-9).

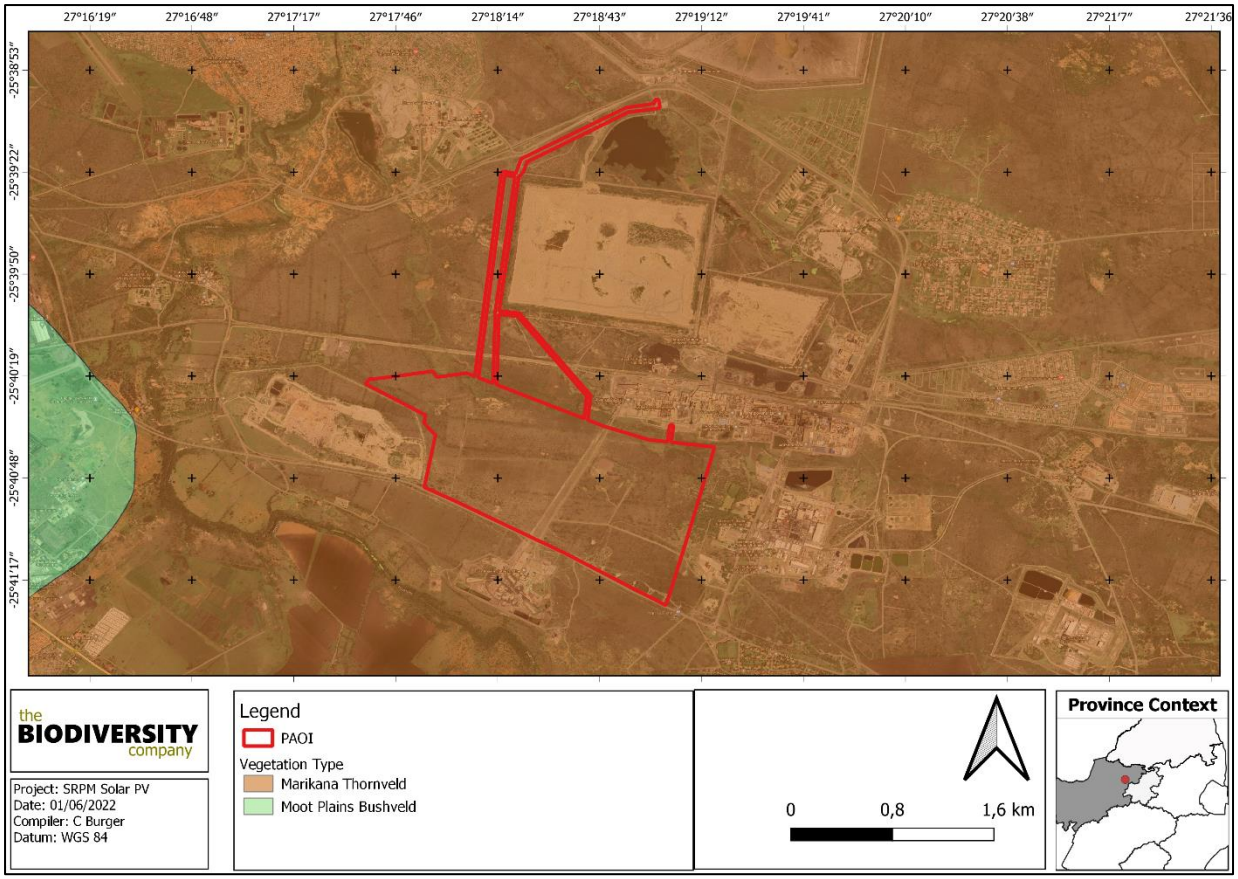


Figure 3-9 Map illustrating the vegetation type associated with the project area

3.1.2.1.1 Marikana Thornveld

Marikana Thornveld extends on the broad plains from Rustenburg in the West, through Marikana and Brits, and towards Pretoria in the East (Mucina & Rutherford, 2006). It is characterised by open *Vachellia karroo* woodland, which occurs in valleys and on undulating plains and hills (Mucina & Rutherford, 2006). Fire-protected habitats, such as drainage lines, rocky outcrops and termitaria are typically dominated by denser, shrub-dominated vegetation (Mucina & Rutherford, 2006).

Important Plant Taxa in the Marikana Thornveld

Based on Mucina and Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type. They note the following species are important taxa in the Marikana Thornveld vegetation type:

Tall Tree: *Senegalia burkei*.

Small Trees: *Senegalia caffra*, *Vachellia gerrardii*, *Vachellia karroo*, *Combretum molle*, *Searsia lancea*, *Ziziphus mucronata*, *Vachellia nilotica, Vachellia tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*.

Tall Shrubs: *Euclea crispa* subsp. *crispa*, *Olea europaea* subsp. *africana*, *Searsia pyroides* var. *pyroides*, *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*.

Low Shrubs: *Asparagus cooperi*, *Rhynchosia nitens*, *Indigofera zeyheri*, *Justicia flava*.

Woody Climbers: *Clematis brachiata*, *Helinus integrifolius*.

Herbaceous Climbers: *Pentarrhinum insipidum*, *Cyphostemma cirrhosum*.

Graminoids: *Elionurus muticus*, *Eragrostis lehmanniana*, *Setaria sphacelata*, *Themeda triandra*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*.

Herbs: *Hermannia depressa*, *Ipomoea obscura*, *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*.

Geophytic Herbs: *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

Conservation Status

According to Mucina and Rutherford (2006), this vegetation type is classified as Endangered, with its national conservation target being 19%. Over 48% has already been transformed by urban expansion and cultivation, and alien invasive plants occur in high densities, especially along drainage lines (Mucina & Rutherford, 2006). Erosion is very low to moderate (Mucina & Rutherford, 2006). Less than 1% is conserved in the Magaliesberg Nature Area, De Onderstepoort Nature Reserve and other reserves. Erosion is very low to moderate (Mucina & Rutherford, 2006).

3.1.2.2 Expected Flora Species

The POSA database indicates that 347 species of indigenous plants are expected to occur within the project area. Eighteen flora SCCs, based on their conservation status, could be expected to occur within the project area and are provided in Table 3-2 below.

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

Family	Taxon	Author	IUCN	Ecology
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*	C.A.Sm.	NT	Indigenous; Endemic
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis litoralis*	L.	NE	Indigenous
Crassulaceae	*Crassula setulosa var. jenkinsii*	Harv. Schonland	NE	Indigenous; Endemic
Crassulaceae	*Crassula setulosa var. setulosa setulosa*	Harv.	NE	Indigenous
Asteraceae	*Curio talinoides*	(DC.) P.V.Heath	DD	Indigenous; Endemic
Asteraceae	*Geigeria burkei subsp. burkei burkei*	Harv.	NE	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei zeyheri*	Harv. (Harv.) Merxm.	NE	Indigenous
Asteraceae	*Helichrysum mixtum var. mixtum*	(Kuntze) Moeser	NE	Indigenous
Amaranthaceae	*Hermbstaedtia odorata var. odorata*	(Burch.) T.Cooke	NE	Indigenous
Limeaceae	*Limeum viscosum subsp. viscosum viscosum*	(J.Gay) Fenzl	NE	Indigenous
Lamiaceae	*Ocimum gratissimum subsp. gratissimum gratissimum*	L.	NE	Indigenous
Lamiaceae	*Ocimum obovatum subsp. obovatum obovatum*	E.Mey. ex Benth.	NE	Indigenous
Marattiaceae	*Ptisana fraxinea var. salicifolia*	(Sm.) Murdock (Schrad.) Murdock	NE	Indigenous
Fabaceae	*Tephrosia villosa subsp. ehrenbergiana ehrenbergiana*	(L.) Pers. (Schweinf.) Brummitt	NE	Indigenous
Malvaceae	*Triumfetta annua forma piligera*	L. Sprague & Hutch.	NE	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris linearis*	(L.f.) Thunb. Bridson E.Mey. ex Bridson	NE	Indigenous
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*	C.A.Sm.	NT	Indigenous; Endemic
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis litoralis*	L.	NE	Indigenous

3.1.3 Faunal baseline

Herpetofauna (amphibians and reptiles) and mammal species fall under this section. A separate avifaunal report was compiled for this project.

3.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and FrogMap, 42 amphibian species are expected to occur within the area. One species is regarded as threatened (Table 3-3).

Table 3-3 Threatened reptile 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**	**Moderate**

The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that has a moderate possibility to occur within the project area. The Giant Bull Frog is listed as near threatened on a regional scale. It is a species of drier savannahs. 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).

3.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 85 reptile species are expected to occur within the area. Two species are regarded as threatened (Table 3-4).

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

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
Homoroselaps dorsalis	Striped Harlequin Snake	NT	LC	Moderate

Homoroselaps dorsalis (Striped Harlequin Snake) is partially fossorial and known to inhabit old termitaria in grassland habitat (IUCN, 2017). Most of its range is at moderately high altitudes, reaching 1,800 m in Mpumalanga and Swaziland, but it is also found at elevations as low as about 100 m in KwaZulu-Natal. The likelihood of occurrence was rated as moderate.

3.1.3.3 Mammals

The IUCN Red List Spatial Data lists 103 mammal species that could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Fourteen of these expected species are regarded as threatened (Table 3-5). Of these 14 SCCs, eleven have a low likelihood of occurrence based on the lack of suitable habitat in the project area.

Table 3-5 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	Moderate
Atelerix frontalis	South Africa Hedgehog	NT	LC	Low
Cloeotis percivali	Short-eared Trident Bat	EN	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Moderate

Leptailurus serval	Serval	NT	LC	Low
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Ourebia ourebi	Oribi	EN	LC	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the presence of a nearby wetland area and seasonal stream, the likelihood of occurrence of this species occurring in the project area is considered to be 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. Given that 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 sub-optimal for the species and the likelihood of occurrence is rated as moderate.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat may be available in across the project area and therefore the likelihood of occurrence is moderate.

3.2 Field Assessment

The following sections provide the results from the field survey for the proposed development that was undertaken from the 10th of May 2022.

3.2.1 Flora Assessment

This section is divided into two sections:

- Indigenous flora; and
- Invasive Alien Plants (IAPs).

3.2.1.1 Indigenous flora

The vegetation assessment was conducted throughout the extent of the project area. A total of 88 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 3-6). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text. Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text. Some of the plant species recorded can be seen in Figure 3-10. The list of plant species recorded to is by no means comprehensive, and repeated surveys during different phenological periods not covered, may likely yield up to 20-30% additional flora species for the project area. However, floristic analysis conducted to date is however regarded as a sound representation of the local flora for the project area.

Table 3-6 Trees, shrub and herbaceous plant species recorded in the project area.

Family	*Scientific Name*	Threat Status (SANBI, 2021)	SA Endemic	Alien Category
Amaranthaceae	*Alternanthera pungens*			Not indigenous; Naturalised
Amaranthaceae	*Gomphrena celosioides*			Not indigenous; Naturalised
Anacardiaceae	*Searsia lancea*	LC	Not Endemic	
Anacardiaceae	*Searsia zeyheri*	LC	Endemic	
Apocynaceae	*Gomphocarpus fruticosus*	LC	Not Endemic	
Asparagaceae	*Asparagus cooperi*	LC	Not Endemic	
Asparagaceae	*Agave americana*			Not indigenous; Naturalised
Asphodelaceae	*Aloe greatheadii*	LC	Not Endemic	
Asteraceae	*Bidens pilosa*			Not indigenous; Naturalised
Asteraceae	*Conyza bonariensis*			Not indigenous; Naturalised
Asteraceae	*Flaveria bidentis*			NEMBA Category 1b.
Asteraceae	*Helichrysum rugulosum*	LC	Not Endemic	
Asteraceae	*Nidorella anomala*	LC	Not Endemic	
Asteraceae	*Schkuhria pinnata*			Not indigenous; Naturalised
Asteraceae	*Tagetes minuta*			Not indigenous; Naturalised
Asteraceae	*Tithonia rotundifolia*			NEMBA Category 1b.
Asteraceae	*Zinnia peruviana*			Not indigenous; Naturalised
Bignoniaceae	*Tecoma stans*			NEMBA Category 1b.
Boraginaceae	*Ehretia rigida*	LC	Endemic	
Cactaceae	*Epiphyllum oxypetalum*			Not indigenous; Naturalised
Cactaceae	*Opuntia ficus-indica*			NEMBA Category 1b.
Convolvulaceae	*Ipomoea purpurea*			NEMBA Category 1b.

Fabaceae	*Dichrostachys cinerea*	LC	Not Endemic	
Fabaceae	*Peltophorum africanum*	LC	Not Endemic	
Fabaceae	*Vachellia karoo*	LC	Not Endemic	
Fabaceae	*Vachellia nilotica*	LC	Not Endemic	
Fabaceae	*Vachellia tortilis*	LC	Not Endemic	
Fabaceae	*Vachellia xanthophloea*	LC	Not Endemic	
Fabaceae	*Acacia mearnsii*			NEMBA Category 2
Fabaceae	*Tipuana tipu*			NEMBA Category 3
Hyacinthaceae	*Ledebouria revoluta*	LC	Not Endemic	
Lamiaceae	*Leonotis dysophylla*	LC	Not Endemic	
Meliaceae	*Melia azedarach*			NEMBA Category 1b.
Poaceae	*Aristida bipartita*	LC	Not Endemic	
Poaceae	*Aristida congesta subsp. barbicollis*	LC	Not Endemic	
Poaceae	*Arundo donax*			NEMBA Category 1b.
Poaceae	*Bothriochloa insculpta*	LC	Not Endemic	
Poaceae	*Brachiaria xantholeuca*	LC	Not Endemic	
Poaceae	*Cymbopogon caesius*	LC	Not Endemic	
Poaceae	*Cynodon dactylon*	LC	Not Endemic	
Poaceae	*Digitaria eriantha*	LC	Not Endemic	
Poaceae	*Eragrostis chloromelas*	LC	Not Endemic	
Poaceae	*Eragrostis curvula*	LC	Not Endemic	
Poaceae	*Eragrostis racemosa*	LC	Not Endemic	
Poaceae	*Eragrostis rigidior*	LC	Not Endemic	
Poaceae	*Heteropogon contortus*	LC	Not Endemic	
Poaceae	*Hyparrhenia hirta*	LC	Not Endemic	
Poaceae	*Melinis repens*	LC	Not Endemic	
Poaceae	*Panicum maximum*	LC	Not Endemic	
Poaceae	*Pennisetum clandestinum*			NEMBA Category 1b in protected areas and wetlands.
Poaceae	*Pennisetum setaceum*			NEMBA Category 1b.
Poaceae	*Pogonarthria squarrosa*	LC	Not Endemic	
Poaceae	*Sporobolus africanus*	LC	Not Endemic	
Poaceae	*Themeda triandra*	LC	Not Endemic	
Poaceae	*Phragmites australis*	LC	Not Endemic	
Pteridaceae	*Pellaea calomelanos var. calomelanos*	LC	Not Endemic	
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	LC	Not Endemic	
Ruscaceae	*Sansevieria aethiopica*	LC	Not Endemic	
Solanaceae	*Solanum mauritianum*			NEMBA Category 1b.
Vitaceae	*Rhoicissus tridentata*	LC	Not Endemic	

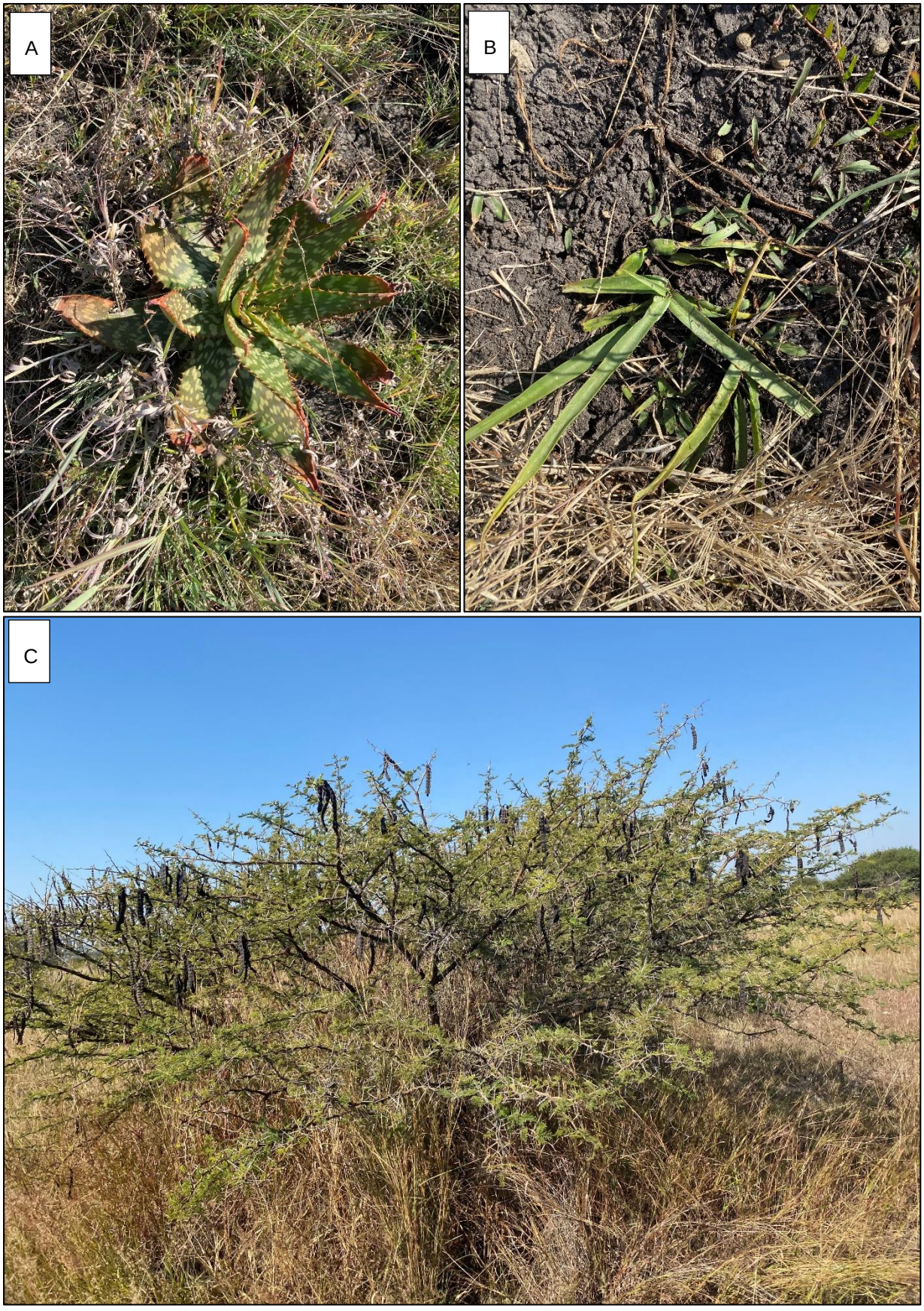


Figure 3-10 Photographs illustrating some of the flora recorded within the assessment area. A) Aloe greatheadii, B) Ledebouria revoluta, and C) Vachellia nilotica.

3.2.1.2 Invasive Alien Plants

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

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 43726, 18 September 2020. 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.

Twenty-One (21) IAP species were recorded within the project area. Ten (10) of these species are listed under the Alien and Invasive Species List 2020, Government Gazette No. GN1003 as Category 1b. These IAP species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

3.2.2 Faunal Assessment

Herpetofauna and mammal observations and recordings fall under this section. A separate avifaunal report was compiled for this project.

3.2.2.1 Amphibians and Reptiles

No species of reptile or amphibians were recorded within the project area during the survey period. However, there is the possibility of at least several species being present, as certain reptile and amphibian species are secretive and longer-term surveys are required in order to ensure adequate sampling.

3.2.2.2 Mammals

One (1) mammal species was observed in total based on either direct observation or the presence of visual tracks and signs (Table 3-7) (Figure 3-11). No SCC were observed.

Table 3-7 Summary of mammal species recorded within the project area.

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2022)
Lepus saxatilis	Scrub Hare	LC	LC

Figure 3-11 Photographs illustrating evidence of the mammal species recorded within the project area during the survey period. A) Lepus saxatilis

3.3 Wetland Assessment

3.3.1 Background

The wetland areas associated with the project area has previously been delineated and assessed by Wetland Consulting Services. This report will utilise and illustrate the wetlands identified by Wetland Consulting Services.

3.3.2 Terrain

The terrain of the regulation 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).

3.3.2.1 Slope

The slope percentage of the project area has been calculated and is illustrated in Figure 3-12. Most of the regulated area is characterised by a slope percentage between 0 and 10%. This illustration indicates a uniform topography with gentle slopes being present within the project area.

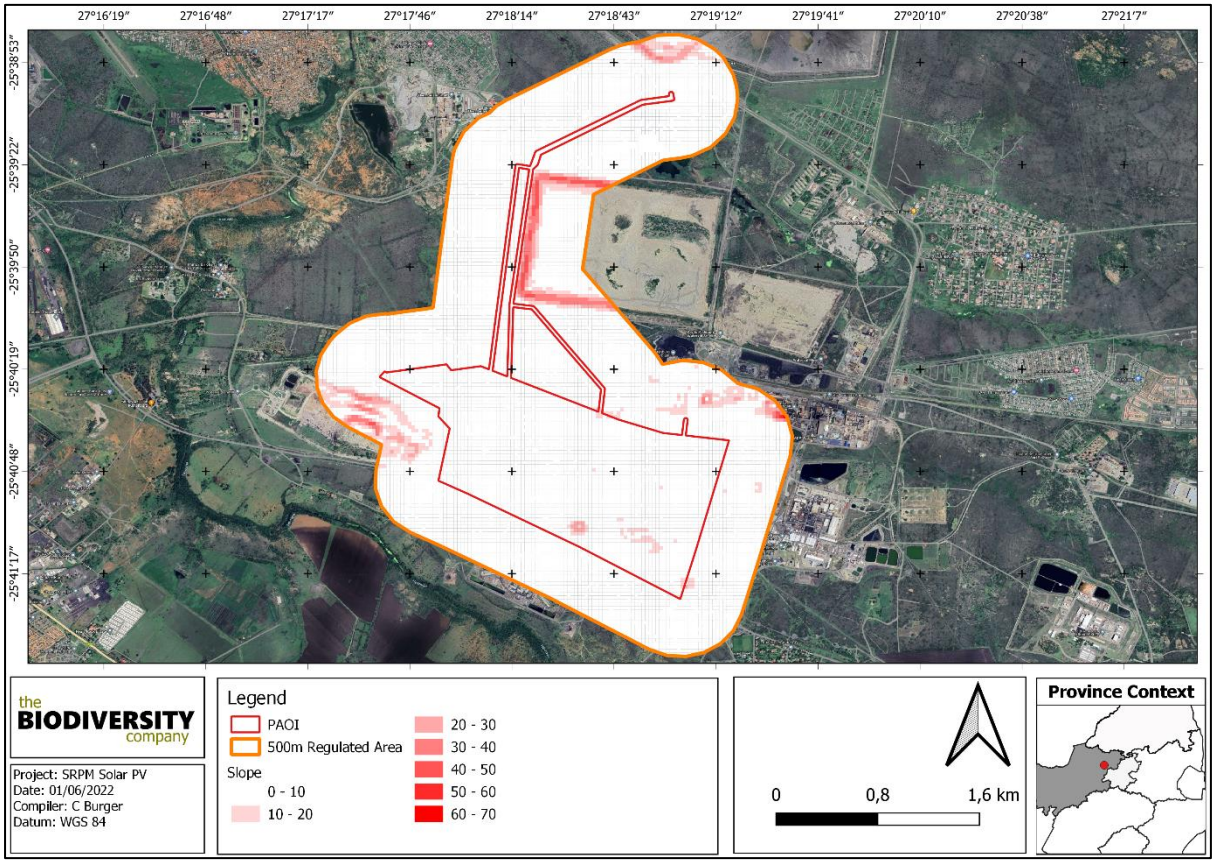


Figure 3-12 Slope percentage map for the regulated area

3.3.2.2 Digital Elevation Model

The Digital Elevation Model (DEM) of the project area (Figure 3-13) indicates an elevation of 1 113 to 1 172 Metres Above Sea Level (MASL). The lower laying areas (generally represented in dark blue) represent the areas that will have the highest potential to be characterised as wetlands.

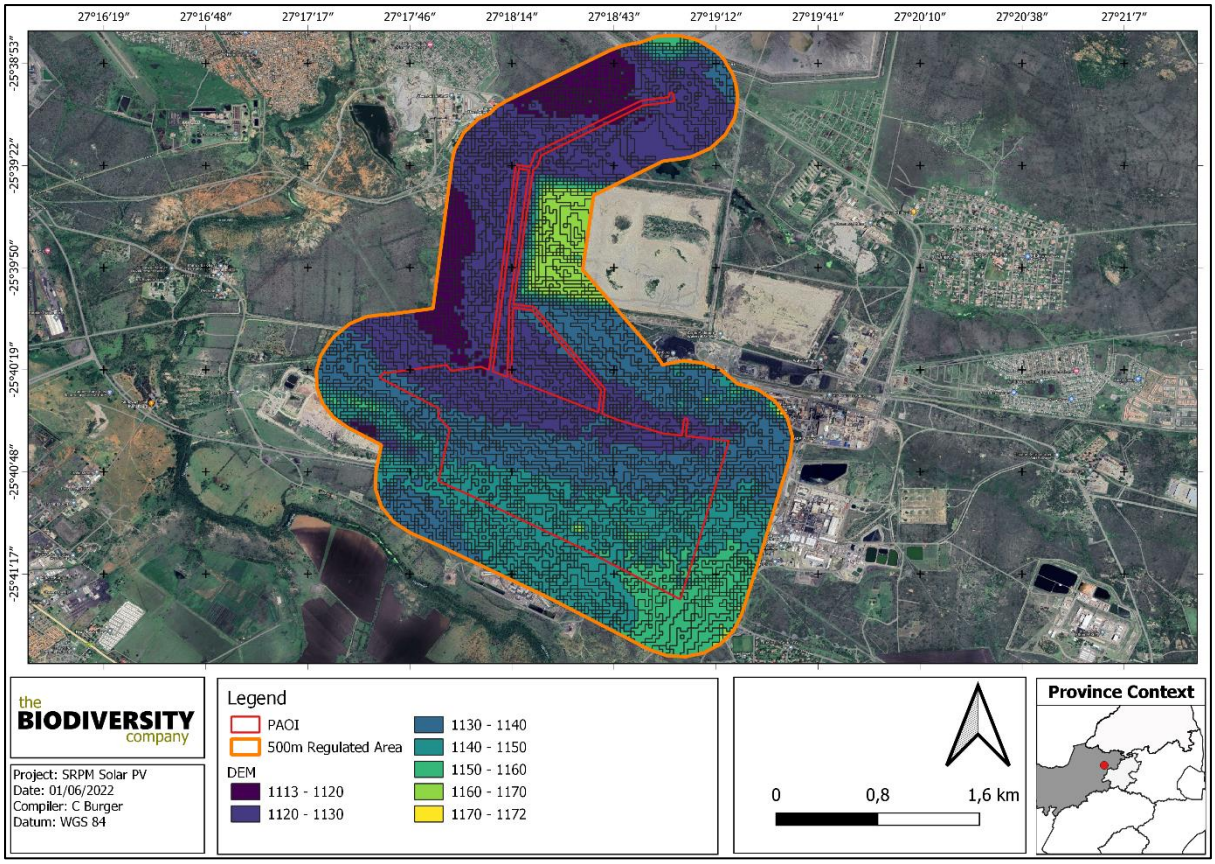


Figure 3-13 Digital Elevation Model of the regulated area

3.3.3 Delineation

Wetland systems were identified and delineated for the project by Wetland Consulting Services (Figure 3-18). These comprised both natural and artificial systems, with the artificial systems consisting of a dam and discharge wetlands. The dam is located directly northeast of the project area while the two discharge wetlands are located to the north and to the west of the project area respectively. The three hydrogeomorphic (HGM) types identified for the project include a unchanneled and channelled valley bottom wetland which traverses the northern boundary of the project area, while three depression wetlands are located in the southwestern corner of the project area. Photographs of the identified resources are presented in Figure 3-14.

Figure 3-14 Photographs of the delineated resources. A & B) Channelled valley bottom, C) Unchanneled valley bottom

The level 1-4 classification for these HGM units, as per the national wetland classification system (Ollis et al., 2013), is presented in (Table 3-8). A map showing the extent of these wetlands is shown in Figure 3-18.

Table 3-8 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	Bushveld	Central Bushveld Group 2	Valley Floor	Unchanneled valley bottom	N/A	N/A
HGM 2	Inland	Bushveld	Central Bushveld Group 2	Valley Floor	Channelled valley bottom	N/A	N/A
HGM 3	Inland	Bushveld	Central Bushveld Group 2	Slope	Depression	Dammed	Without channelled inflow

3.3.4 Wetland Types

Unchanneled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows. Figure 3-15 presents a diagram of the relevant HGM unit, showing the dominant movement of water into, through and out of the system.

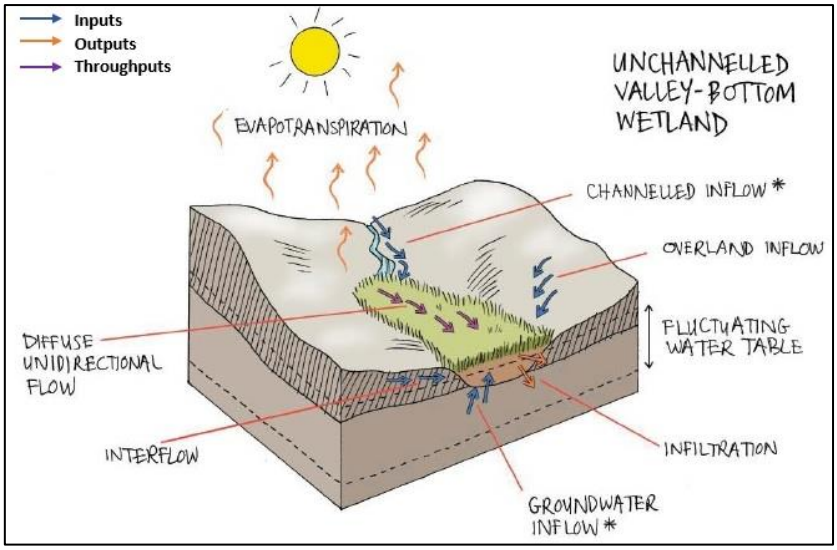


Figure 3-15 Amalgamated diagram of a typical unchanneled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

Depression wetlands are located on the "slope" 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 3-16 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

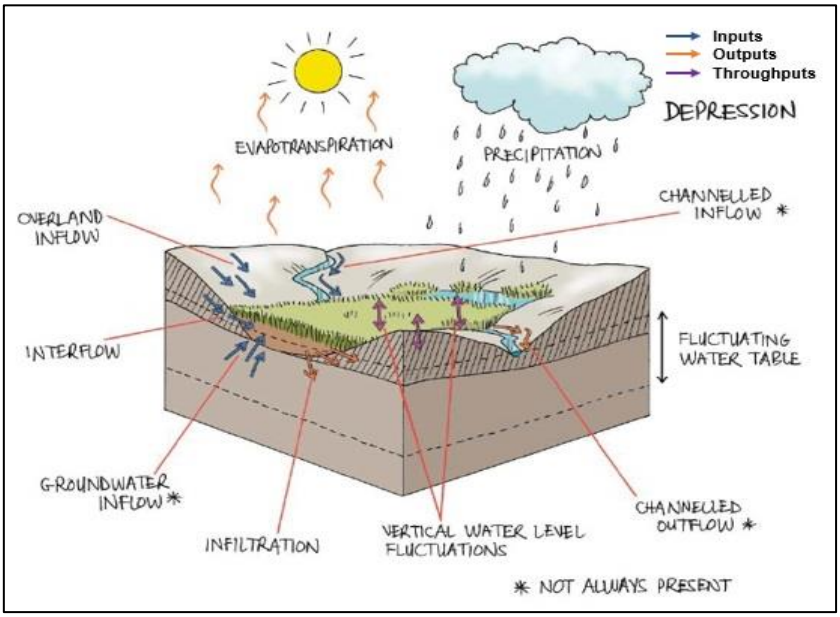


Figure 3-16 Amalgamated diagram of atypical depression wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

Channelled valley-bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland. Dominant water inputs to these wetlands are from the river channel flowing through the wetland, either as surface flow resulting from flooding or as sub surface flow, and/or from adjacent valley-side slopes. Figure 3-16Figure 3-17 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

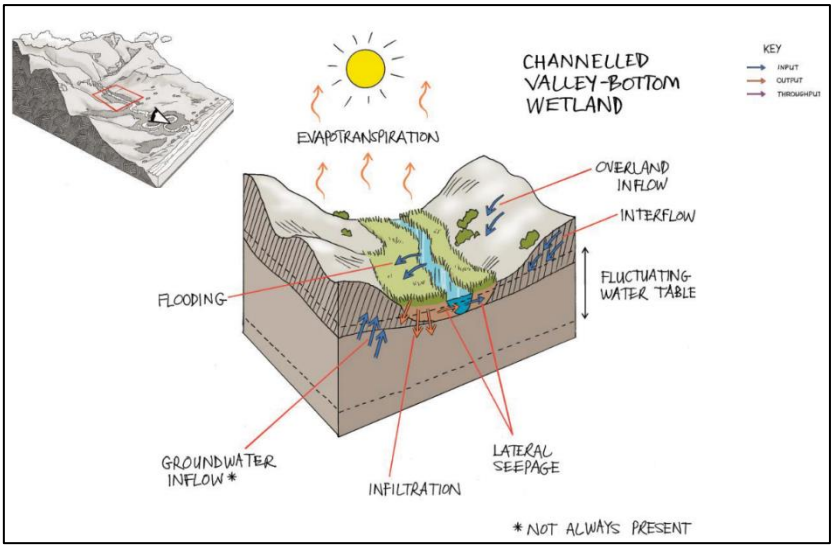


Figure 3-17 Amalgamated diagram of a typical channelled valley bottom wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

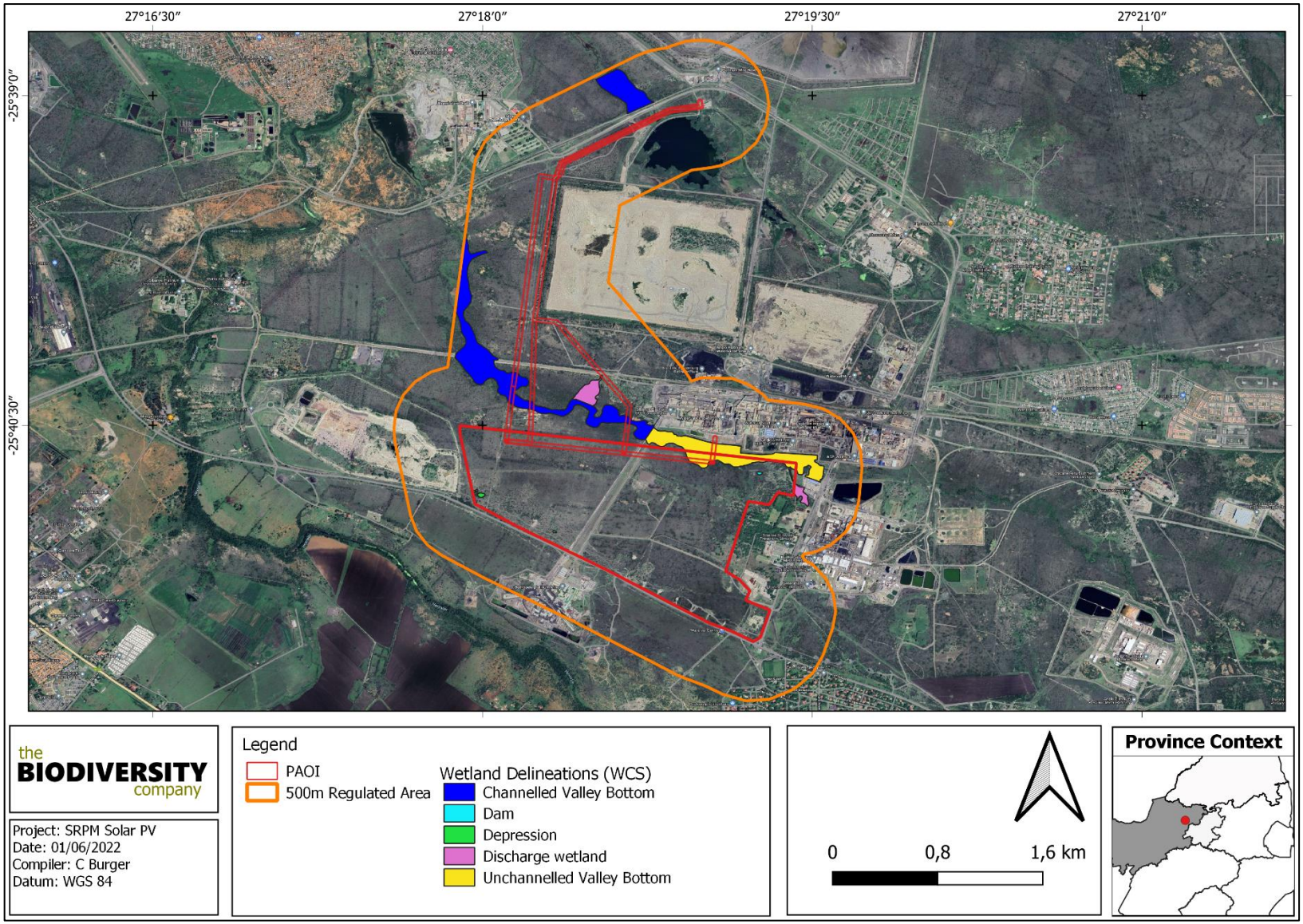


Figure 3-18 The delineated wetland systems

3.4 General Functional Description

Eco-Services

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 (Kotze et al., 2009). 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 be explained the precipitation as well as continues precipitation and dissolving of minerals and other contaminants during dry and wet seasons respectively, (Kotze et al., 2009).

Unchanneled valley-bottom wetlands are characterised by a gentle gradient with streamflow generally being spread diffusely across the wetland, ultimately ensuring prolonged saturation levels and high levels of organic matter. The assimilation of toxicants, nitrates and phosphates are usually high for unchanneled valley-bottom wetlands, especially in cases where the valley is fed by sub-surface interflow from slopes. The shallow depths of surface water within this system adds to the degradation of toxic contaminants by means of sunlight penetration (Kotze *et al.,* 2009).

Channelled valley bottom wetlands resemble floodplains. However, they are characterized by the less active deposition of sediment and an absence of oxbow lakes and other floodplain features such as natural levees and meander scrolls. They tend to be narrower and have somewhat steeper gradients and the contribution from lateral groundwater input relative to the mainstream channel is generally greater. From a functional point of view, they tend to contribute less towards flood attenuation and sediment trapping but would supply these benefits to a certain extent. Some nitrate and toxicant removal potential would be expected, particularly from the water being delivered from the adjacent hillslopes (Kotze et al., 2009).

It is however important to note that the descriptions of the above-mentioned functions are merely typical expectations.

Present Ecological State (PES)

Overall, the channelled valley bottom wetland and the depression wetlands associated with the project area were determined to be in a moderately modified (Class C) condition, while the unchanneled valley bottom wetland and the channelled valley bottom wetland in the northern portion of the 500m regulated area were determined to be in a largely modified (Class D) condition (Figure 3-19). The site in general, as well as the local catchment, has been transformed due to the local mining activities and the development of the catchment area. Photographs of some impact sources are presented in Figure 3-20. Aspects identified that have contributed to the impacted state of the systems include the following:

- The disruption in hydrological connectivity due to activities taking place within the wetlands;
- The changes to the hydrological regimes caused by instream infrastructure and road crossing within flow paths and the diversion of flows;
- The placement of infrastructure within the wetlands, and the expanse of development into the periphery of wetland areas;
- Adjacent mining operations which contribute to impaired water quality;
- Dumping of waste in the area; and
- The infestation of alien vegetation in the catchment area.

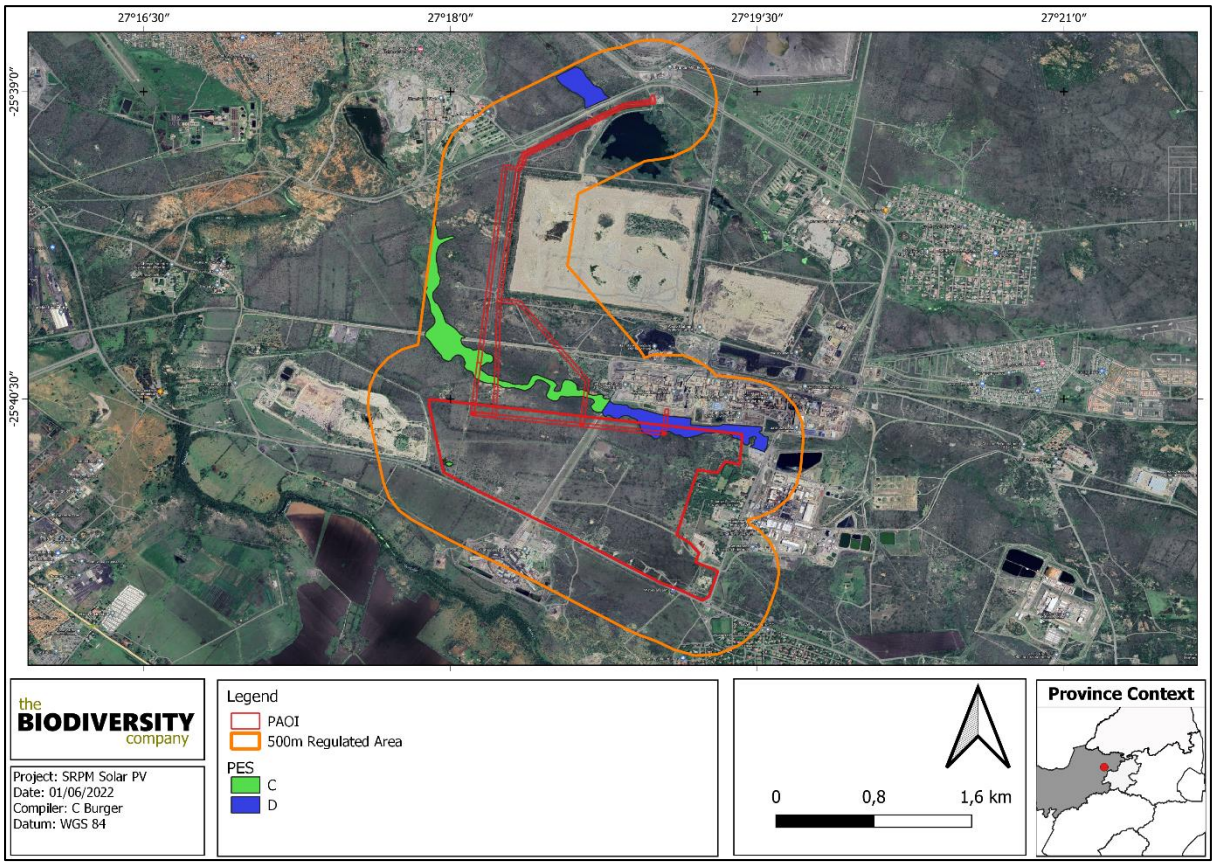


Figure 3-19 Present Ecological State of Delineated Wetlands

Figure 3-20 Photographs of impact sources. A & B) Road crossings and instream infrastructure, C) Mining activities, D) Dumping of waste.

Ecological Importance and Sensitivity (IS)

At a regional scale, the NFEPA Wetveg database recognises channelled valley bottom wetlands within the Central Bushveld Group 2 as Critically Endangered and Not Protected, unchanneled valley bottom wetlands as Vulnerable and Moderately Protected and depression wetland types as Least Threatened and Poorly Protected (Nel and Driver, 2012). None of the wetlands within the area are recognised as priority NFEPA wetlands. The overall ecological importance and sensitivity of the channelled and unchanneled valley bottom systems were determined to be moderate, while the depression wetland systems were determined to be low/marginal (Figure 3-21). The following was also considered for the EIS description. The project area:

- Is not located in a Strategic Water Source Area;
- Does not overlap any CBAs or ESAs; and
- Is located in a Vulnerable vegetation type.

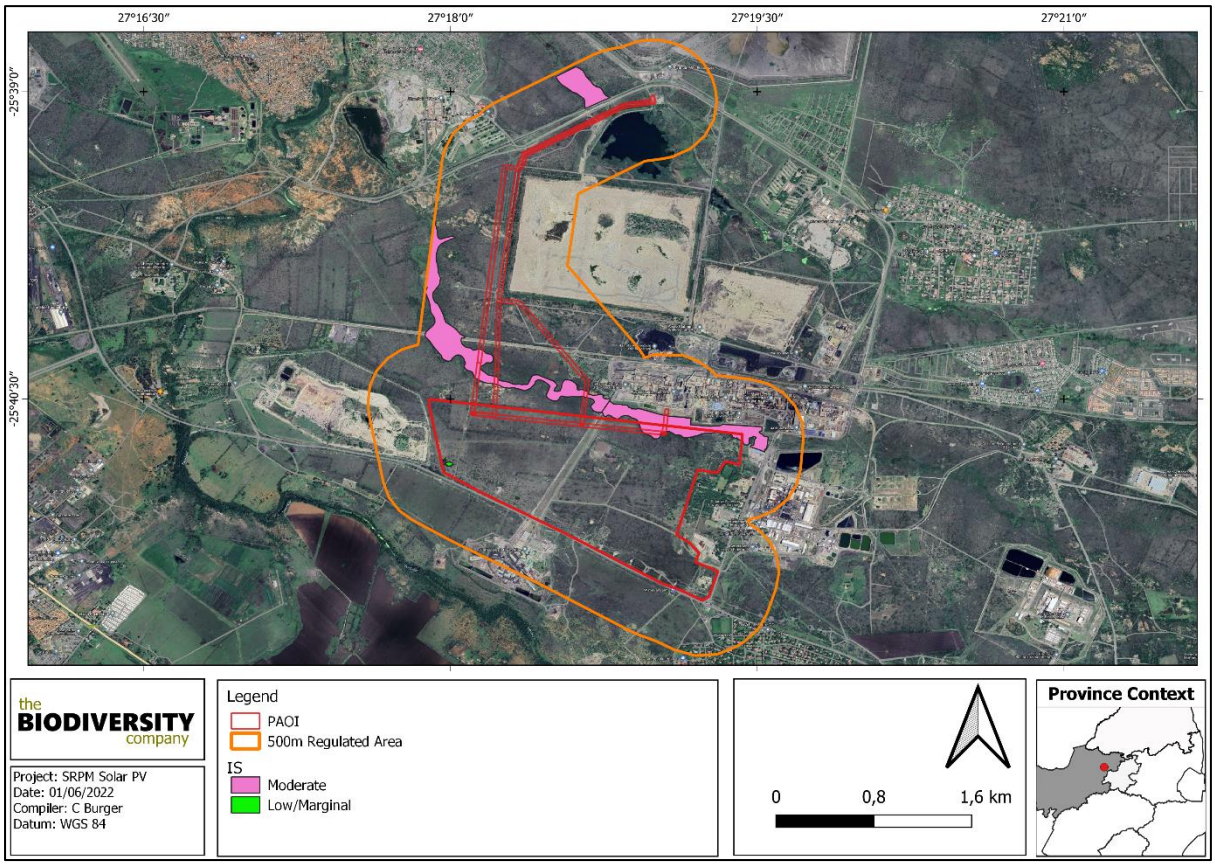


Figure 3-21 Map showing the IS of Delineated Wetlands

3.4.1 Buffer Analysis

Buffer zones have been used in land-use planning to protect natural resources and limit the impact of one land-use on another. A buffer zone has been prescribed for this project to serve as a "barrier" between the proposed development and the wetland systems.

The scientific buffer calculation (Macfarlane *et al.*, 2014) was used to determine the size of the buffer zones relevant to the proposed development of the PV as well as for the proposed powerlines. The buffer size for both the development and the powerlines were determined to be 15 m post mitigation (see Table 3-9 and Figure 3-22).

Table 3-9 Pre- and post-mitigation buffer requirements

Aspect	Pre-Mitigation Buffer Size (m)	Post Mitigation Buffer Size (m)
PV and Substation	36	15
Powerlines	30	15

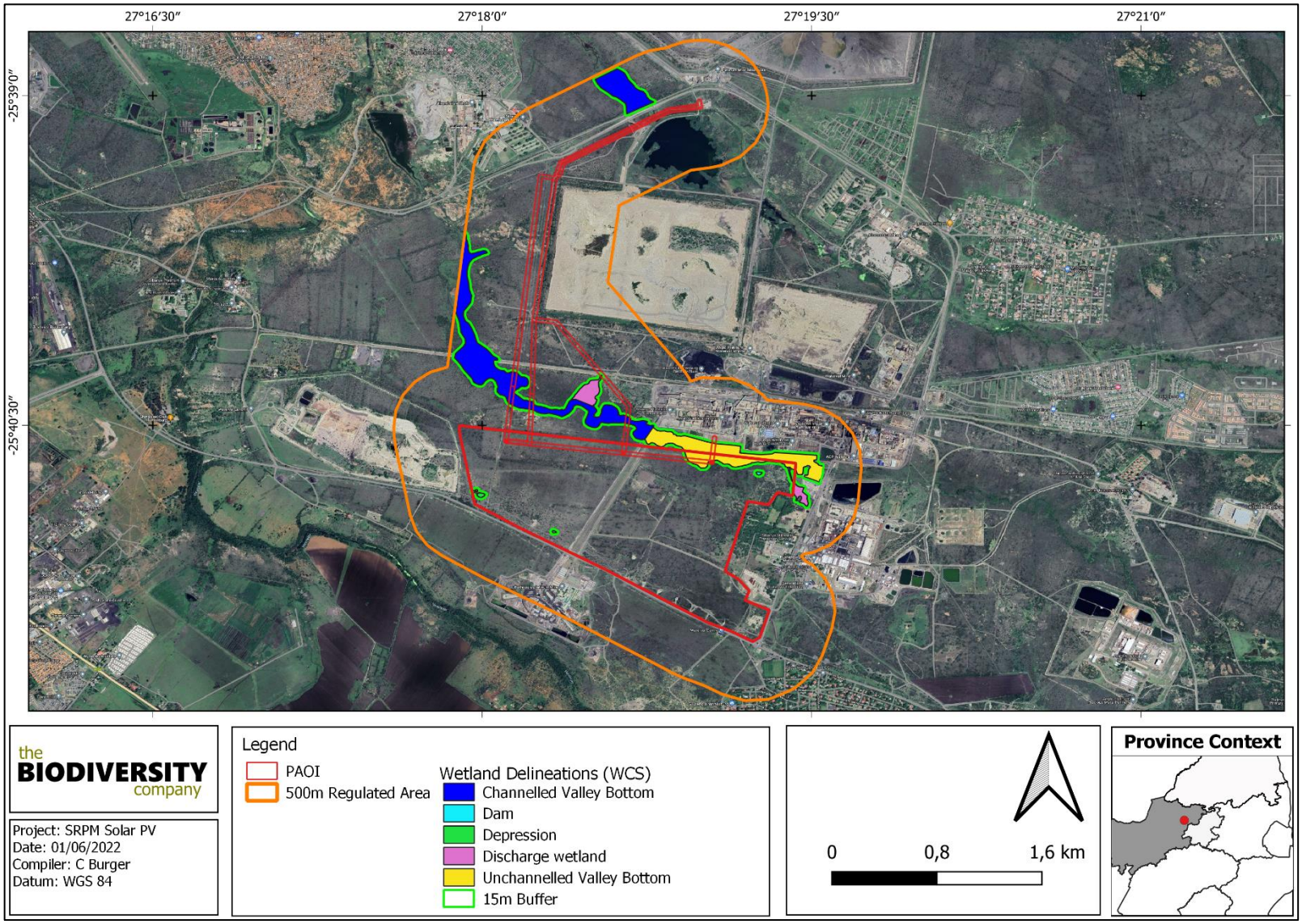


Figure 3-22 Recommended 15 m buffer zone for the delineated wetlands

4 Habitat Assessment and Site Ecological Importance

4.1 Habitat Assessment

The main habitat types identified across the project area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey; the delineated habitats can be seen in Figure 4-1. Emphasis was placed on limiting timed meander searches within the natural habitats and therefore habitats with a higher potential of hosting SCC. Four habitats were identified in the project area, each of the habitats identified are discussed in the sub-sections below.

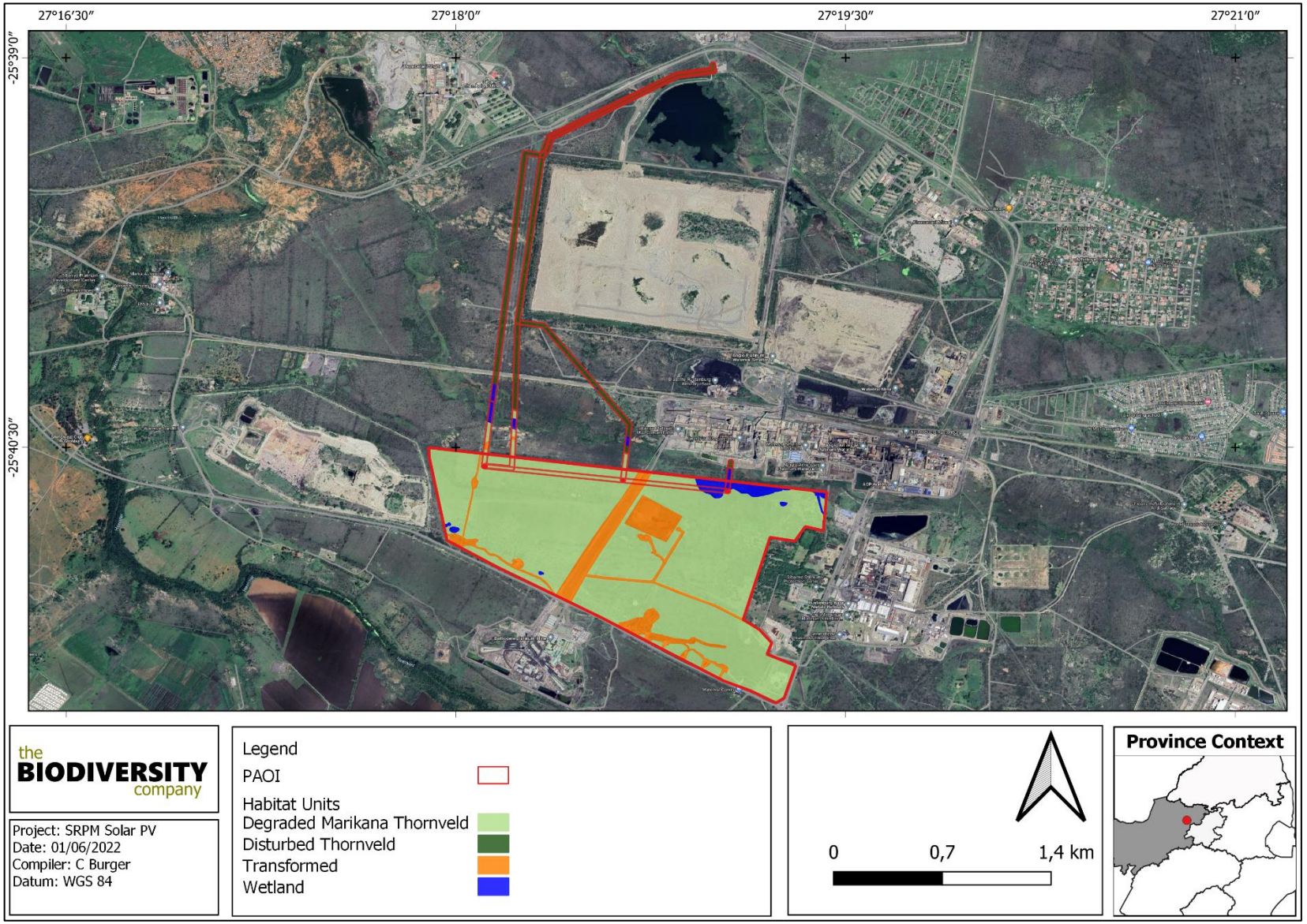


Figure 4-1 Habitats identified in the project area.

Degraded Thornveld

This habitat type is regarded as semi-natural thornveld, but slightly disturbed due to the presence of roads, mismanagement (overgrazing) and also human infringement as it is located directly adjacent to active mining operations. (Figure 4-2 and Figure 4-3). This habitat represents open woodland dominated by thorny trees and bushes such as *Vachellia karroo* and *Vachellia tortilis*, with rocky boulders in certain areas. The current ecological condition of this habitat regarding the main driving forces has been altered to some extent, which is evident in the low diversity of flora and fauna species recorded across the habitat unit. Current human infringement still occurs throughout, especially in areas close to roads. The difference between this habitat and the disturbed thornveld is the extent of the disturbance in the disturbed thornveld being more severe.

Based on the current ecological condition of this habitat regarding the driving forces, are inconsistent due to the current land uses. The condition difference within this habitat depends on the extent of the disturbance in some areas being more severe, usually related to one being more overgrazed and exposed to current anthropogenic activities than the other. As a result of the ongoing and historic disturbances the plant community is no longer considered as being fully representative of the reference vegetation.

Figure 4-2 A typical example of degraded Thornveld habitat from the project area.

Figure 4-3 A typical example of degraded Thornveld habitat from the project area.

Disturbed Thornveld

This habitat is regarded as areas that have been impacted on more by historic land clearing, mismanagement and land use (Figure 4-4). Historical vegetation clearing to make way for the construction of Overhead Powerlines has led to alterations of the natural thornveld habitat and current utilisation of the area for grazing as well as ongoing human infringement, especially in areas close to roads, are still impacting on this habitat unit. These habitats aren't entirely transformed but in a constant disturbed state, as they can't recover to a more natural state due to ongoing disturbances and impacts as a result of grazing and anthropogenic related activities. These areas are considered to have a low sensitivity, as they may be used as a movement corridor.

Figure 4-4 A typical example of disturbed Thornveld habitat from the project area.

Transformed

This habitat unit represents all areas of roads as well as mining areas associated with the project area (Figure 4-5 and Figure 4-6). The transformed areas have little to no remaining natural vegetation due to land transformation by various mining activities and roads. These habitats exist in a constant disturbed state as it cannot recover to a more natural state unless through human intervention.

Figure 4-5 Illustration of transformed habitat from the project area.

Figure 4-6 Illustration of transformed habitat from the project area.

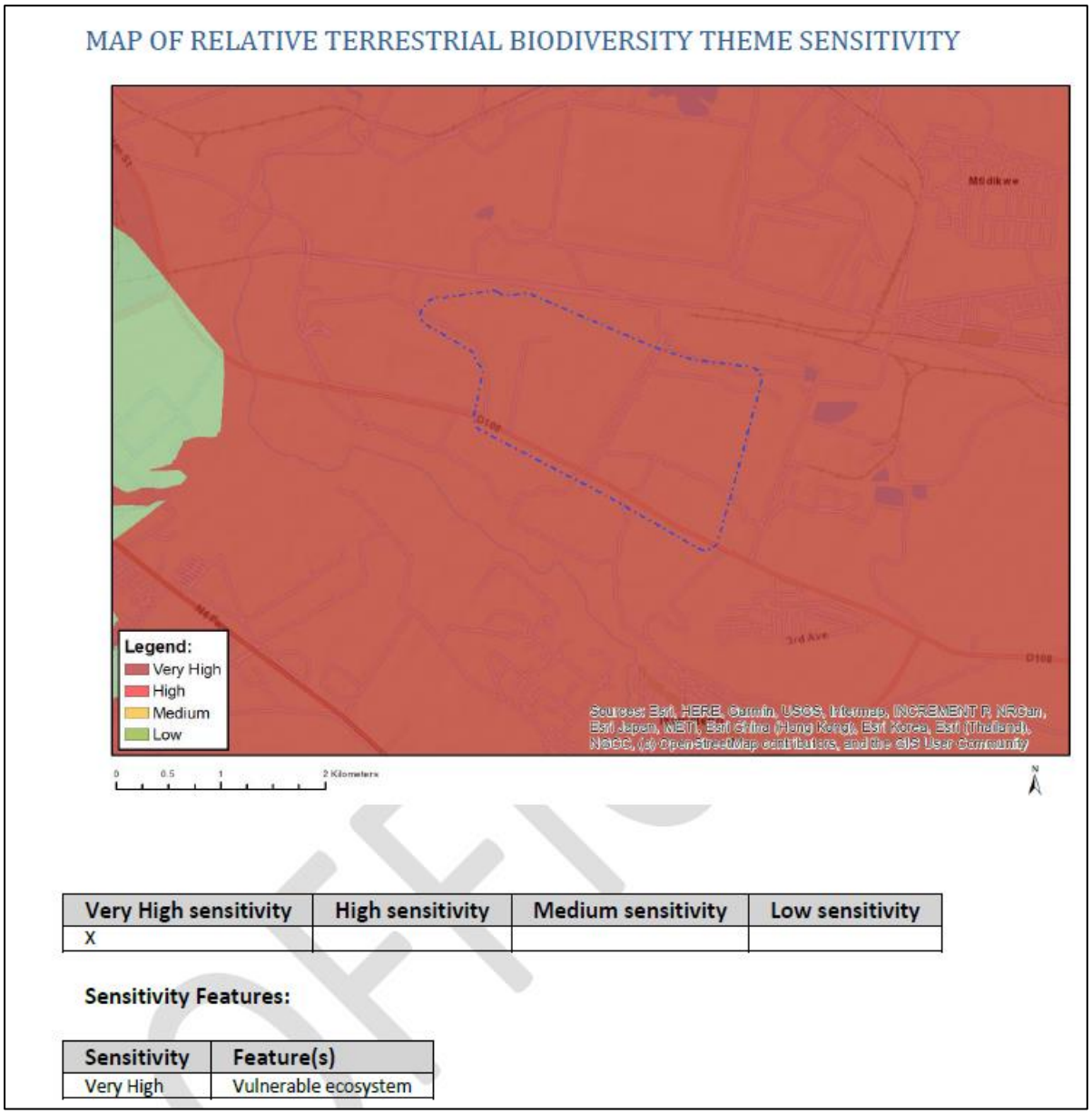
Wetlands

This habitat unit represents the wetland areas. These habitats are represented in the wetland section. Even though somewhat disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora (Figure 4-7).

Figure 4-7 Illustration of wetland habitat from the project area

4.2 Site Ecological Importance (SEI)

The terrestrial biodiversity theme sensitivity, as indicated in the DFFE screening report, was derived to be Very High, mainly due to the project area being with an Vulnerable Ecosystem (Figure 4-8), while the animal species theme is classified to be High sensitivity and the plant species theme is classified as Low sensitivity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Vulnerable ecosystem

Figure 4-8 Terrestrial Biodiversity Theme Sensitivity, TBC Screening Report

The completion of the terrestrial biodiversity assessment found that the Degraded Thornveld habitat that overlaps with the screening report is of medium sensitivity and thus do not corroborate the screening report in that regard.

As per the terms of reference for the project, GIS sensitivity maps are required in order to identify sensitive features in terms of the relevant specialist discipline/s within the project area. The sensitivity scores identified during the field survey for each terrestrial habitat are mapped.

Three (3) different terrestrial habitat types were delineated within the project area, and one set of wetland habitats as a whole. Based on the criteria provided in Section 2.2 of this report, all habitats within the assessment area of the proposed project were allocated a sensitivity category Table 4-1. The sensitivities of the habitat types delineated are illustrated in Figure 4-9.

Table 4-1 Summary of habitat types delineated within the project area

Habitat (Area)	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Degraded Thornveld	Medium	High	Medium	Medium	Medium

Wetlands	Medium	Medium	Medium	Low	Medium
Disturbed Thornveld	Medium	Low	Low	Medium	Low
Transformed	Very Low	Very Low	Very Low	Low	Very Low

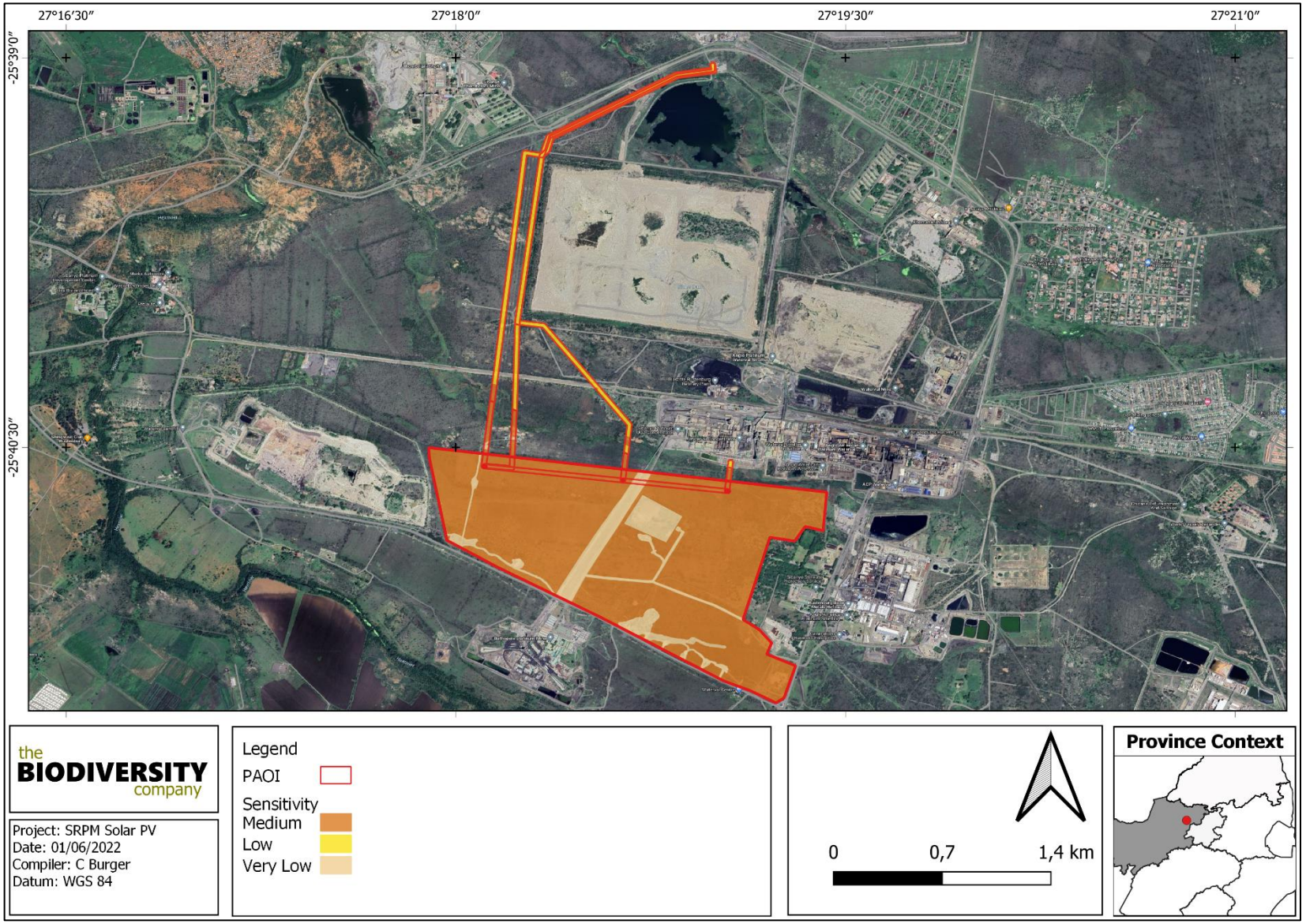


Figure 4-9 Sensitivity of the project area

5 Impact Risk Assessment

5.1 Biodiversity: Risk Assessment Method

The assessment of the significance of direct, indirect and cumulative impacts was undertaken using the method as developed by Savannah. The assessment of the impacts considers the following, the:

- Nature of the impact, which shall include a description of what causes the effect, what will be affected, and how it will be affected;
- Extent of the impact, indicating whether the impact will be local or regional;
- Duration of the impact, very short-term duration (0-1 year), short-term duration (2-5 years), medium-term (5-15 years), long-term (> 15 years) or permanent;
- Probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable, probable, highly probable or definite;
- Severity/beneficial scale, indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit); severe/beneficial (long-term impact that could be mitigated/long-term benefit); moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit); slight; or have no effect;
- Significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high;
- Status, which will be described as either positive, negative or neutral;
- Degree to which the impact can be reversed;
- Degree to which the impact may cause irreplaceable loss of resources; and
- Degree to which the impact can be mitigated.

5.1.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the project area. These include:

- Mining activities;
- Present energy distribution infrastructure, including powerlines;
- Historical land clearing and land-use;
- Invasive species;
- Roads and associated vehicle traffic and road kills; and
- Fences.

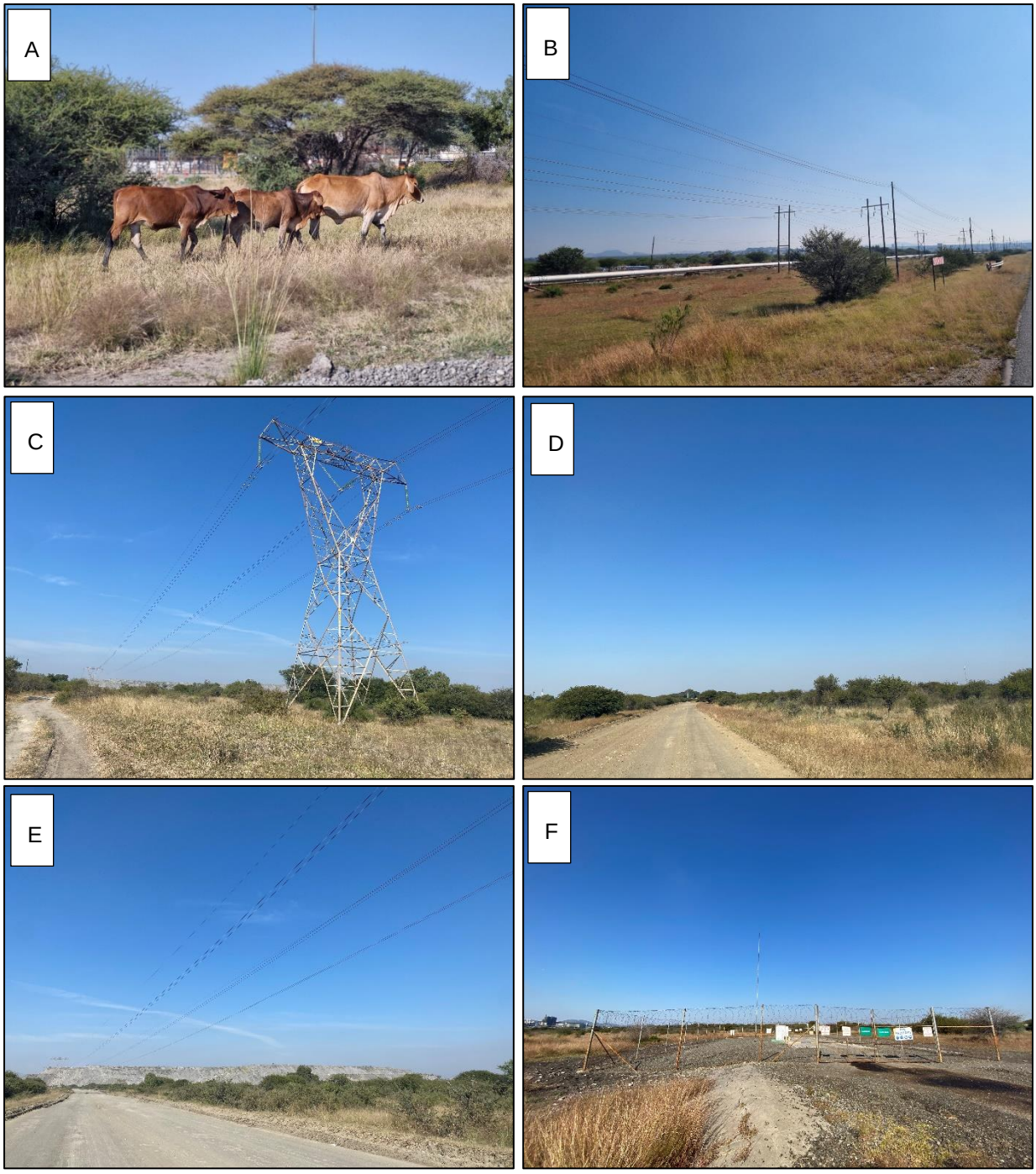


Figure 5-1 Photographs illustrating impacts to biodiversity A) Grazing), B & C) Overhead Lines, D) Road servitude and E & F) Mining Areas

5.1.2 Identification of Additional Potential Impacts

The potential impacts during the construction and operation phases of the project are presented in Table 5-1. The decommissioning of the project is not anticipated and therefore the decommissioning phase has not been assessed.

Table 5-1 Potential impacts to biodiversity associated with the proposed activity

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
	Access roads and servitudes	Increased potential for soil erosion
	Soil dust precipitation	Habitat fragmentation
	Dumping of waste products	Increased potential for establishment of alien & invasive vegetation
	Random events such as fire (cooking fires or cigarettes)	Erosion
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	Habitat loss for native flora & fauna
	Vehicles potentially spreading seed	Spreading of potentially dangerous diseases due to invasive and pest species
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	Alteration of fauna assemblages due to habitat modification
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation	Loss of habitat
		Loss of ecosystem services
	Roadkill due to vehicle collision	
	Pollution of water resources due to dust effects, chemical spills, etc.	Increase in rodent populations and associated disease risk
	Intentional killing of fauna for food (hunting)	
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor	Reduced dispersal/migration of fauna
		Loss of ecosystem services
	Compacted roads	Reduced plant seed dispersal
	Removal of vegetation	
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills	Pollution in watercourses and the surrounding environment
	Erosion	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)	Disruption/alteration of ecological life cycles due to noise
		Loss of ecosystem services
	Project activities that can cause disruption/alteration of ecological life cycles due to dust	Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
	Vehicles	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

5.1.3 Assessment of Impact Significance

The assessment of impact significance was undertaken in accordance with the method developed by Savannah. The various identified impacts are assessed below for the different phases of the development. The impacts assessed may be re-assessed if an exact infrastructure layout has been provided

5.1.3.1 Construction Phase

The following potential main impacts on the biodiversity (based on the framework above) were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed features are constructed; and is considered to have the largest direct impact on biodiversity. The actual footprint of the pole/pylon infrastructure has a small localised, impact. It is the clearance for the PV areas as well as creation off access and service roads that is a more important aspect to consider and will be considered in relation to the powerlines. The following potential impacts to terrestrial biodiversity were considered:

- Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community (Table 5-2),
- Introduction of alien species, especially plants (Table 5-3); and
- Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and poaching) (Table 5-4).

Table 5-2 Construction phase impacts: Loss of vegetation within development footprint

Impact Nature: Loss of vegetation within development footprint		
Destruction, further loss and fragmentation of habitats, ecosystems and vegetation community		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Permanent (5)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (68)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the loss of vegetation/habitat is unavoidable.	
Mitigation:		
• Limiting the impact area and construction activities to the proposed footprint area and the associated infrastructure servitude only. • Existing roads/servitudes should be considered first option over the construction of new roads/servitudes and must only be made where necessary. • Minimise the extent of vegetation clearing for the infrastructure. Areas to be cleared must be clearly/visibly demarcated to avoid unnecessary clearing. • Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities. • Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other areas in need of stabilisation and vegetation cover.		
Residual Impacts:		
The loss of vegetation is an unavoidable consequence of the project and cannot be entirely mitigated.		

Table 5-3 Construction phase impacts: Introduction of alien species, especially plants

Impact Nature: Introduction of alien species, especially plants		
Degradation and loss of surrounding natural vegetation		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (56)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also prescribe a monitoring plan and be updated as/when new data is collated; • Remove organic waste from site weekly to prevent pest species from becoming a problem. A waste management plan must be compiled and implemented from the onset of the construction phase. The plan must designate collection areas, define the separation of waste and also prescribe removal measures and frequencies from the areas. This plan must be also prescribing a monitoring plan and be updated as/when new data is collated.		
Residual Impacts:		
Long-term broad scale IAP infestation if not mitigated.		

Table 5-4 Construction phase impacts: Displacement of faunal community due to habitat loss, direct mortalities and disturbance

Impact Nature: Displacement of faunal community due to habitat loss, direct mortalities and disturbance		
Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution. Disturbance due to dust and noise pollution and vibration may disrupt behaviour.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Moderate term (3)	Very Short term (1)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to some extent. Noise and disturbance cannot be well mitigated, impacts on fauna due to human presence, such as vehicle collisions, poaching, and persecution can be mitigated.	
Mitigation:		
• Signs must be put up stating that should any person be found poaching any species they will be fined. • Construction must take place in the winter months as much is feasible. • The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, access to these areas must be controlled.		

• Signs must be put up to enforce this. • Speed limits must be implemented on all roads. • Areas should be cleared and disturbed on a needs basis only, as opposed to clearing and disturbing a number of sites simultaneously. • Any holes/deep excavations must done in a progressive manner on a needs basis only. No holes/excavations may be left open overnight. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas. • Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the project progresses. This will give the smaller mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories. • 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 SCC, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr; • Prior to vegetation clearing activities, the area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance. • The timing between clearing of an area and subsequent development must be minimized to avoid fauna from re-entering the site to be disturbed.
Residual Impacts:
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

5.1.3.2 Operation Phase

The operational phase impacts of daily activities is anticipated to result in the further spreading of the IAP, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts. Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld. Moving maintenance vehicles don't only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions.

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems (Table 5-5);
- Spread of alien and/or invasive species (Table 5-6);
- Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, noise, light and dust,) (Table 5-7).

Table 5-5 Operational phase impacts: Continued fragmentation and degradation of habitats and ecosystems

Impact Nature: Continued fragmentation and degradation of habitats and ecosystems		
Disturbance created during the construction phase will leave the project area vulnerable to erosion and IAP encroachment.		
	Without Mitigation	With Mitigation
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Permanent (5)	Short term (2)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**High (64)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		

Impact Nature: Continued fragmentation and degradation of habitats and ecosystems
• 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. • Implementation of an alien vegetation management plan. • The area must be demarcated and no disturbance is to be allowed outside the direct development footprint.
Residual Impacts
There is still some potential for erosion and IAP encroachment even with the implementation of control measures but would have a low impact.

Table 5-6 Operational phase impacts: Spread of alien and/or invasive species

Impact Nature: Spread of alien and/or invasive species		
Degradation and loss of surrounding natural vegetation		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (52)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Implementation of an alien vegetation management plan. • Implementation of a waste management plan. Waste management must be a priority and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis (as a minimum) to prevent rodents and pests entering the site. No waste is to be burned on site. • Refuse bins must be emptied and secured. • Temporary storage of domestic waste must be in covered waste skips. • Maximum domestic waste storage period will be 7 days. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used.		
Residual Impacts:		
Long term broad scale IAP infestation if not mitigated.		

Table 5-7 Operational phase impacts: Ongoing displacement and direct mortalities of faunal community due to disturbance

Impact Nature: Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)		
The operation and maintenance of the proposed development may lead to disturbance or persecution of fauna in the vicinity of the development.		
	Without Mitigation	**With Mitigation**
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Short term (2)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (16)**

Impact Nature: Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)		
The operation and maintenance of the proposed development may lead to disturbance or persecution of fauna in the vicinity of the development.		
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Lighting should be kept to a minimum to avoid disturbing crepuscular and nocturnal species. Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward, to minimize light pollution which could attract night migrating species. • Lighting should be directed towards to footprint area and avoid unnecessary illumination of the adjacent undeveloped areas. • Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas • Avoid using any road during the night; • Fences must have 30 x 30 cm holes in at the bottom at every 250m to allow for free movement of fauna.		
Residual Impacts		
Disturbance from maintenance activities will occur albeit at a low and infrequent level.		

5.1.3.3 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

Table 5-8 Cumulative impacts associated with the proposed development

Impact Nature: Cumulative habitat loss within the region		
The development of the proposed infrastructure will contribute to cumulative habitat loss and thereby impact the ecological processes in the region.		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local area (3)	Regional (4)
Duration	Moderate term (3)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	To some degree, but most of the impact results from the presence of the various facilities which cannot be well mitigated.	
Mitigation:		
Ensure that a rehabilitation plan and IAP management plan be compiled for each development and are effectively implemented.		

5.1.4 Biodiversity Management Outcomes

The purpose of the management outcomes is to allow for the mitigation measures associated with the impact assessment to be incorporated into the EMPr. These are provided in Table 5-9.

Table 5-9 Mitigation measures including requirements for timeframes, roles and responsibilities for this report

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 than that proposed for the project. Clearing of vegetation should be minimized and avoided where possible.	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 very low/ 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 under powerline and in SS 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 may occur 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
Storm Water run-off & Discharge Water Quality monitoring	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

Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site	Life of operation	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
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
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
Any excavations or holes must be conducted in a progressive manner. • Should the holes/excavations stay open 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
A qualified environmental control officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species.	During phase
Once the development layout has been confirmed, the open areas must be fenced off appropriately pre-construction in order to allow animals to move or be moved into these areas before breaking ground activities occur. Construction activities must take place systemically.	Planning/Construction Phase	Environmental Officer & Design Engineer	Areas not to be developed and construction direction	Ongoing
Management outcome: Alien Vegetation and Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

Compilation of and implementation of an alien vegetation management plan.	Life of operation	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Twice a year
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	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used.	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation
Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and 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 adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins will be emptied and secured; • Temporary storage of domestic waste shall be in covered waste skips; and • Maximum domestic waste storage period will be 10 days.	Construction Phase	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
Toilets at the recommended Health and Safety standards must be provided. These should be emptied twice a day, to prevent staff from using the surrounding vegetation.	Construction Phase	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. Under no circumstances may domestic waste be burned on site.	Construction Phase	Environmental Officer & Health and Safety Officer	Availability of bins and the collection 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.	Construction Phase	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing

Suitable temporary solid waste facilities are to be incorporated into the design to prevent unsanitary conditions. These are to be cleared weekly and waste collected by the local waste management department. The residents must be encouraged to recycle.	Operational Phase	Project manager	Management of bins and collection of waste	Ongoing
Management outcome: Environmental Awareness Training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the biology, habitat requirements and management requirements in the EA and EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the "no-go" to be avoided.	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 earthmoving machinery, through wetting the soil surface; putting up signs to enforce speed limit; and 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

5.2 Wetland Risk Assessment

5.2.1 Potential Impacts

The impact assessment considered both direct and indirect impacts, if any, to the wetland systems. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the study (Figure 5-2). 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.

The risks posed by the proposed development to wetlands within the project area are provided in Table 5-10 for scenarios with and without mitigation. Three levels of risk have been identified and considered for the overall risk assessment, these include high, medium and low risks. The high risks refer to the wetlands directly impacted by die PV solar panels themselves these risks can be avoided by placing the PVs outside the wetland buffer. Medium risk refers to wetland areas that are either directly affected or on the periphery of the infrastructure and at an indirect risk. These risks are associated with powerlines crossing over wetlands. Low risks are wetland systems beyond the project area that would be avoided, or wetland areas that could be avoided if feasible. The medium risks were the priority for the risk assessment, focussing on the expected potential for these indirect risks. The significance of all post-mitigation risks was determined to be low.

For this project we will focus on using the first step in the hierarchy which is the avoidance of the impacts on the wetland. Due to the fact that direct and indirect impacts will degrade delineated wetland systems, a risk assessment has been compiled to determine the potential risk towards sensitive receptors.

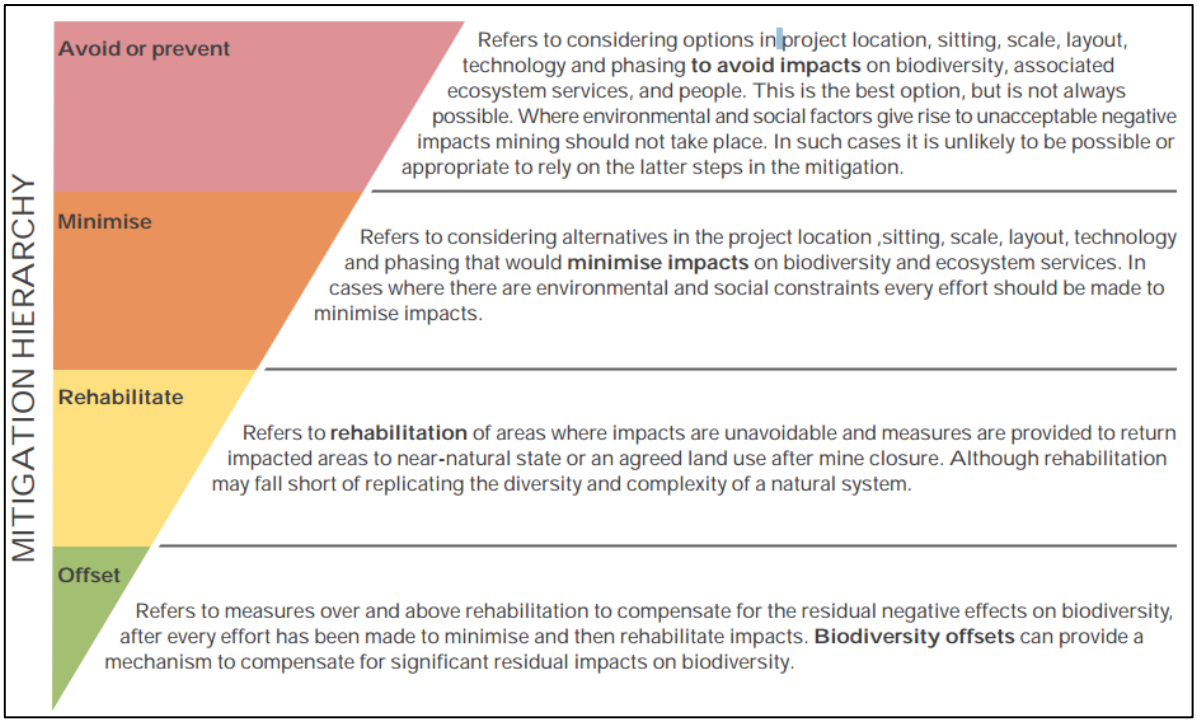


Figure 5-2 The mitigation hierarchy as described by the DEA (2013)

Table 5-10 DWS Risk Impact Matrix for the proposed project (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	3	2	3	2	2.5	2	3	7.5	3	4	1	1	9	68	**M**	• Demarcate and avoid all wetlands and the associated 15 m buffer area. • Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure 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 15 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 15 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). • All alien vegetation along the transmission servitude should be managed in terms of Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. • Landscape and re-vegetate all denuded areas as soon as possible.
			With	2	1	2	1	1.5	2	3	6.5	3	3	1	1	8	52	**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	3	3	2	2	2.5	2	3	7.5	3	3	1	2	9	68	M	• Limit construction activities near (< 50m) the wetlands to winter where possible when rain is least likely to wash concrete and sand into the wetland. Activities in hydromorphic 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	2	2	1	1	1.5	2	2	5.5	3	2	1	1	7	39	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	3	2	2	2	1	2	5	3	3	1	2	9	45	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. • 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.
			With	1	1	1	1	1	1	2	4	1	2	1	2	6	24	L	
Operation																			
Operation of the solar facility.	Hardened surfaces.	Potential for increased stormwater runoff leading to	Without	2	2	2	2	2	3	2	7	3	3	1	2	9	63	M	• 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	2	3	2	2	2.3	3	2	7.3	3	3	1	2	9	65	M	• 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	3	2	2.3	2	3	7.3	3	3	1	1	8	58	M	• 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	

5.3 Wetland Impact Assessment

5.3.1 Assessment of Impact Significance

The assessment of impact significance was undertaken in accordance with the method developed by Savannah. The various identified impacts are assessed below for the different phases of the project. The impacts assessed may be re-assessed if an exact infrastructure layout has been provided.

5.3.1.1 Construction Phase

The following potential main impacts on the wetlands were considered for the construction phase of the proposed project. This phase refers to the period during construction when the proposed features are constructed. The following potential impacts during site clearing and preparation were considered:

- Wetland disturbance / loss.
    - Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility. (Table 5-11); and
- Water runoff from construction site;
    - Increased erosion and sedimentation. (Table 5-12).

Table 5-11 Impacts to wetlands associated with the proposed construction phase.

Impact Nature: Wetland disturbance / loss		
Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Long term (4)	Moderate term (3)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, avoidance of wetlands is possible.	
Mitigation:		
• Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. • When clearing vegetation, allow for some vegetation cover as opposed to bare areas. • Transmission lines should span over the length of the wetland and not be constructed within the wetlands. • Minimize the disturbance footprint and 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 15 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 and the overall master plan. • All activities (including driving) must adhere to the 15 m buffer area. • Promptly remove / control all AIPs 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 CARA and IAP regulations. • Landscape and re-vegetate all denuded areas as soon as possible.		
Residual Impacts:		
The loss of wetlands directly is unexpected, as wetlands can be avoided, and transmission lines can be spanned over the wetlands where required. The residual impact would be low.		

Table 5-12 Impacts to wetlands associated with the proposed construction phase.

Impact Nature: Water runoff from construction site		
Increased erosion and sedimentation		
	Without mitigation	**With mitigation**
Extent	High (4)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (56)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Limit construction activities to winter (as much as possible) when rain is least likely to wash concrete and sand into the wetland. • 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.		
Residual Impacts:		
Long term broad scale erosion and sedimentation		

5.3.1.2 Operation Phase

The operational phase refers to the phase when the construction has been completed and the infrastructure is functional. It is anticipated to increase stormwater runoff due to the hardened surfaces or potentially contaminate any wetland systems.

The following potential impacts were considered:

- Hardened surfaces;
    - Potential for increased stormwater runoff, leading to increased erosion and sedimentation (Table 5-13); and
- Contamination;
    - Potential for increased contaminants entering the wetland systems (Table 5-14).

Table 5-13 Impacts to wetlands associated with the proposed operational phase

Impact Nature: Hardened surfaces		
Potential for increased stormwater runoff leading to increased erosion and sedimentation		
	Without Mitigation	With Mitigation
Extent	Moderate (3)	Low (2)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (64)**	**Low (14)**

Impact Nature: Hardened surfaces		
Potential for increased stormwater runoff leading to increased erosion and sedimentation		
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
• Design and Implement an effective stormwater management plan. • Promote water infiltration into the ground beneath the solar panels. • Release only clean water into the environment. • Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). • Re-vegetate denuded areas as soon as possible. • Regularly clear drains. • Minimise the extent of concreted / paved / gravel areas. • A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible, then gravel is preferable over concrete or paving. • Avoid excessively compacting the ground beneath the solar panels.		
Residual Impacts		
Long-term broad scale erosion and sedimentation		

Table 5-14 Impacts to wetlands associated with the proposed operational phase.

Impact Nature: Contamination		
Potential for increased contaminants entering the wetland systems		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (52)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Where possible, minimise the use of 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.		
Residual Impacts:		
Wetland deterioration over time		

5.4 Conclusion

5.5 Terrestrial Biodiversity

The project area has been historically altered. The present land use has had a direct impact on both the fauna and the flora in the area, which is evident in the disturbed and transformed habitats. Historically, land clearing and adjacent mining activities has led to the deterioration of most of the area, resulting in a disturbed habitat that has not recovered since.

No significant impacts from a terrestrial ecology perspective are expected, subject to the implementation of the recommended mitigation measures, since the majority of the areas have been found to be modified. No faunal component of significance was observed, which further reduced the impact significance of the development on terrestrial biodiversity.

However, the Degraded Thornveld Habitat and the Wetland Habitat in the project area is regarded as having a Medium ecological theme sensitivity as these areas still provide functional habitat to flora and fauna species associated with the vegetation type.

The ecological integrity, importance and functioning of these terrestrial biodiversity areas do provide ecological services considered to be beneficial, with one key service being the maintenance of biodiversity. The preservation of these systems must remain an important aspect to consider for the proposed project.

The alternatives considered for the proposed evacuation lines all follow the same route through the same sensitivity areas and as such there is no preferred option of the alternative routes provided and no preference is given to any of the designs.

5.6 Wetland Ecology

Natural and artificial wetland systems were identified and delineated for the project, with the artificial systems consisting of a dam and two discharge wetlands. The three natural hydrogeomorphic (HGM) types identified for the project include a unchanneled and channelled valley bottom wetland which traverses the northern boundary of the project area, and three depression wetlands which are located in the southwestern corner of the project area.

Overall, the channelled valley bottom wetland and the depression wetlands associated with the project area were determined to be in a moderately modified (Class C) condition, while the unchanneled valley bottom wetland and the channelled valley bottom wetland in the northern portion of the 500m regulated area were determined to be in a largely modified (Class D) condition. The overall ecological importance and sensitivity of the channelled and unchanneled valley bottom systems were determined to be moderate, while the depression wetland systems were determined to be low/marginal. A 15 m post mitigation buffer was assigned to the wetland systems.

5.7 Impact Statement

There is no preferred option of the alternative routes provided, all the routes traverse the delineated wetland and are associated with similar habitat sensitivities.

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

- Habitat loss and fragmentation;
- Degradation of surrounding habitat;
- Indirect loss of wetlands;
- Disturbance and displacement caused during the construction and maintenance phases; and
- Direct mortality during the construction phase.

Mitigation measures as described in this report must be implemented to reduce the significance of the risk. Considering that areas have been identified as being of medium importance for biodiversity maintenance and ecological processes, development may proceed but with caution and only with the implementation of mitigation measures.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project may be favourably considered on condition that all prescribed mitigation measures and supporting recommendations are implemented. Due to the low residual impacts to the wetlands, a General Authorisation is required for the authorisation.

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7 Appendix Items

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

Family	Taxon	Author	IUCN	Ecology
Acanthaceae	*Crabbea hirsuta*	Harv.	LC	Indigenous
Acanthaceae	*Ruellia cordata*	Thunb.	LC	Indigenous
Acanthaceae	*Thunbergia atriplicifolia*	E.Mey. ex Nees	LC	Indigenous; Endemic
Acanthaceae	*Isoglossa woodii*	C.B.Clarke	LC	Indigenous; Endemic
Acanthaceae	*Crabbea angustifolia*	Nees	LC	Indigenous; Endemic
Acanthaceae	*Hypoestes forskaolii*	(Vahl) R.Br.	LC	Indigenous
Acanthaceae	*Justicia anagalloides*	(Nees) T.Anderson	LC	Indigenous
Acanthaceae	*Barleria pretoriensis*	C.B.Clarke	LC	Indigenous; Endemic
Aizoaceae	*Khadia acutipetala*	(N.E.Br.) N.E.Br.	LC	Indigenous; Endemic
Aizoaceae	*Frithia pulchra*	N.E.Br.	LC	Indigenous; Endemic
Aizoaceae	*Delosperma sp.*			
Amaranthaceae	*Hermbstaedtia odorata var. odorata*	(Burch.) T.Cooke	NE	Indigenous
Amaranthaceae	*Aerva sp.*			
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus breviflorus*	Harv.	LC	Indigenous
Anacardiaceae	*Searsia chirindensis*	(Baker f.) Moffett	LC	Indigenous
Anacardiaceae	*Ozoroa paniculosa var. paniculosa*	(Sond.) R.Fern. & A.Fern.	LC	Indigenous
Anacardiaceae	*Searsia lancea*	(L.f.) F.A.Barkley	LC	Indigenous
Anacardiaceae	*Searsia magalismontana subsp. magalismontana*	(Sond.) Moffett	LC	Indigenous
Anacardiaceae	*Ozoroa paniculosa var. salicina*	(Sond.) R.Fern. & A.Fern. (Sond.) R.Fern. & A.Fern.	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Apiaceae	*Deverra burchellii*	(DC.) Eckl. & Zeyh.	LC	Indigenous
Apocynaceae	*Asclepias densiflora*	N.E.Br.	LC	Indigenous
Apocynaceae	*Acokanthera oppositifolia*	(Lam.) Codd	LC	Indigenous
Apocynaceae	*Raphionacme velutina*	Schltr.	LC	Indigenous
Apocynaceae	*Carissa bispinosa*	(L.) Desf. ex Brenan	LC	Indigenous
Apocynaceae	*Ceropegia gracilior*	Bruyns		Indigenous
Apocynaceae	*Cynanchum viminale subsp. viminale*	(L.) L.		Indigenous
Apocynaceae	*Gomphocarpus glaucophyllus*	Schltr.	LC	Indigenous
Apocynaceae	*Raphionacme galpinii*	Schltr.	LC	Indigenous; Endemic

Apocynaceae	*Asclepias aurea*	(Schltr.) Schltr.	LC	Indigenous
Apocynaceae	*Huernia transvaalensis*	Stent	LC	Indigenous; Endemic
Apocynaceae	*Aspidoglossum glabrescens*	(Schltr.) Kupicha	LC	Indigenous; Endemic
Araliaceae	*Cussonia spicata*	Thunb.	LC	Indigenous
Asparagaceae	*Asparagus virgatus*	Baker	LC	Indigenous
Asphodelaceae	*Bulbine angustifolia*	Poelln.	LC	Indigenous; Endemic
Asphodelaceae	*Kniphofia ensifolia subsp. ensifolia*	Baker	LC	Indigenous
Asteraceae	*Senecio sp.*			
Asteraceae	*Helichrysum argyrosphaerum*	DC.	LC	Indigenous
Asteraceae	*Senecio venosus*	Harv.	LC	Indigenous; Endemic
Asteraceae	*Helichrysum nudifolium var. nudifolium*	(L.) Less.	LC	Indigenous
Asteraceae	*Curio talinoides*	(DC.) P.V.Heath	DD	Indigenous; Endemic
Asteraceae	*Helichrysum paronychioides*	DC.	LC	Indigenous; Endemic
Asteraceae	*Geigeria burkei subsp. burkei burkei*	Harv.	NE	Indigenous
Asteraceae	*Helichrysum cerastioides var. cerastioides*	DC.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei zeyheri*	Harv. (Harv.) Merxm.	NE	Indigenous
Asteraceae	*Polydora angustifolia*	(Steetz) H.Rob.	LC	Indigenous
Asteraceae	*Adenostemma caffrum*	DC.	LC	Indigenous
Asteraceae	*Dicoma macrocephala*	DC.	LC	Indigenous
Asteraceae	*Seriphium plumosum*	L.		Indigenous
Asteraceae	*Schistostephium crataegifolium*	(DC.) Fenzl ex Harv.	LC	Indigenous
Asteraceae	*Sonchus dregeanus*	DC.	LC	Indigenous
Asteraceae	*Ursinia sp.*			
Asteraceae	*Conyza podocephala*	DC.		Indigenous; Endemic
Asteraceae	*Helichrysum mixtum var. mixtum*	(Kuntze) Moeser	NE	Indigenous
Asteraceae	*Psiadia punctulata*	(DC.) Vatke	LC	Indigenous
Asteraceae	*Nidorella hottentotica*	DC.	LC	Indigenous; Endemic
Asteraceae	*Athrixia elata*	Sond.	LC	Indigenous; Endemic
Asteraceae	*Doellia cafra*	(DC.) Anderb.	LC	Indigenous
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank. & J.C.Manning		Indigenous
Asteraceae	*Oocephala staehelinoides*	(Harv.) H.Rob. & Skvarla		Indigenous; Endemic
Asteraceae	*Ursinia nana subsp. leptophylla*	DC. Prassler	LC	Indigenous; Endemic
Asteraceae	*Helichrysum sp.*			
Asteraceae	*Helichrysum harveyanum*	Wild	LC	Indigenous
Asteraceae	*Lopholaena coriifolia*	(Sond.) E.Phillips & C.A.Sm.	LC	Indigenous
Asteraceae	*Tagetes minuta*	L.		Not indigenous; Naturalised; Invasive
Asteraceae	*Sonchus friesii var. friesii*	Boulos	LC	Indigenous

Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond. (Harv. ex F.C.Wilson) S.Ortiz & Rodr.Oubina	LC	Indigenous
Asteraceae	*Nidorella sp.*			
Asteraceae	*Senecio lydenburgensis*	Hutch. & Burtt Davy	LC	Indigenous; Endemic
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Indigenous; Endemic
Asteraceae	*Helichrysum kraussii*	Sch.Bip.	LC	Indigenous
Aytoniaceae	*Asterella muscicola*	(Steph.) S.W.Arnell		Indigenous
Aytoniaceae	*Plagiochasma rupestre var. rupestre*	(J.R.Forst. & G.Forst.) Steph.		Indigenous
Aytoniaceae	*Asterella bachmannii*	(Steph.) S.W.Arnell		Indigenous
Aytoniaceae	*Plagiochasma rupestre var. volkii*	(J.R.Forst. & G.Forst.) Steph. Bischl.		Indigenous
Bartramiaceae	*Philonotis africana*	(Mull.Hal.) Rehmann ex Paris		Indigenous
Blechnaceae	*Blechnum australe subsp. australe*	L.	LC	Indigenous
Bryaceae	*Bryum pycnophyllum*	(Dixon) Mohamed		Indigenous
Burmanniaceae	*Burmannia madagascariensis*	Mart.	LC	Indigenous
Campanulaceae	*Wahlenbergia magaliesbergensis*	Lammers	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia lycopodioides*	Schltr. & Brehmer	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia sp.*			
Capparaceae	*Cadaba aphylla*	(Thunb.) Wild	LC	Indigenous
Capparaceae	*Boscia albitrunca*	(Burch.) Gilg & Gilg-Ben.	LC	Indigenous
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis litoralis*	L.	NE	Indigenous
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Celastraceae	*Gymnosporia tenuispina*	(Sond.) Szyszyl.	LC	Indigenous; Endemic
Celastraceae	*Maytenus sp.*			
Celastraceae	*Maytenus undata*	(Thunb.) Blakelock	LC	Indigenous
Celastraceae	*Pterocelastrus echinatus*	N.E.Br.	LC	Indigenous
Colchicaceae	*Colchicum melanthioides subsp. melanthioides*	(Willd.) J.C.Manning & Vinn.	LC	Indigenous; Endemic
Combretaceae	*Combretum molle*	R.Br. ex G.Don	LC	Indigenous
Combretaceae	*Combretum zeyheri*	Sond.	LC	Indigenous
Commelinaceae	*Commelina africana var. krebsiana*	L. (Kunth) C.B.Clarke	LC	Indigenous
Commelinaceae	*Floscopa glomerata*	(Willd. ex Schult. & Schult.f.) Hassk.	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B.Clarke	LC	Indigenous
Convolvulaceae	*Ipomoea obscura var. obscura*	(L.) Ker Gawl.	LC	Indigenous
Convolvulaceae	*Ipomoea bolusiana*	Schinz	LC	Indigenous
Convolvulaceae	*Xenostegia tridentata subsp. angustifolia*	(L.) D.F.Austin & Staples (Jacq.) Lejoly & Lisowski	LC	Indigenous
Convolvulaceae	*Evolvulus alsinoides*	(L.) L.	LC	Indigenous

Convolvulaceae	*Convolvulus sagittatus*	Thunb.	LC	Indigenous
Convolvulaceae	*Ipomoea coscinosperma*	Hochst. ex Choisy	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E.Mey. ex Choisy	LC	Indigenous
Corbichoniaceae	*Corbichonia decumbens*	(Forssk.) Exell	LC	Indigenous
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*	C.A.Sm.	NT	Indigenous; Endemic
Crassulaceae	*Crassula setulosa var. jenkinsii*	Harv. Schonland	NE	Indigenous; Endemic
Crassulaceae	*Crassula setulosa var. setulosa setulosa*	Harv.	NE	Indigenous
Cucurbitaceae	*Peponium caledonicum*	(Sond.) Engl.	LC	Indigenous; Endemic
Cucurbitaceae	*Momordica balsamina*	L.	LC	Indigenous
Cyperaceae	*Kyllinga alba*	Nees	LC	Indigenous
Cyperaceae	*Schoenoplectus muricinux*	(C.B.Clarke) J.Raynal	LC	Indigenous
Cyperaceae	*Ascolepis capensis*	(Kunth) Ridl.	LC	Indigenous
Cyperaceae	*Cyperus esculentus var. esculentus*	L.	LC	Indigenous
Cyperaceae	*Cyperus congestus*	Vahl	LC	Indigenous
Cyperaceae	*Schoenoplectus brachyceras*	(Hochst. ex A.Rich.) Lye	LC	Indigenous
Cyperaceae	*Cyperus leptocladus*	Kunth	LC	Indigenous; Endemic
Cyperaceae	*Isolepis fluitans var. fluitans*	(L.) R.Br.	LC	Indigenous
Cyperaceae	*Carex spicatopaniculata*	Boeckeler ex C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Dioscoreaceae	*Dioscorea retusa*	Mast.	LC	Indigenous; Endemic
Dipsacaceae	*Scabiosa columbaria*	L.	LC	Indigenous
Droseraceae	*Drosera collinsiae*	N.E.Br.	LC	Indigenous; Endemic
Ebenaceae	*Diospyros lycioides subsp. lycioides*	Desf.	LC	Indigenous
Equisetaceae	*Equisetum ramosissimum subsp. ramosissimum*	Desf.	LC	Indigenous
Ericaceae	*Erica woodii var. woodii*	Bolus	LC	Indigenous
Euphorbiaceae	*Euphorbia heterophylla*	L.	NE	Not indigenous; Naturalised
Euphorbiaceae	*Croton gratissimus var. subgratissimus*	Burch. (Prain) Burtt Davy	LC	Indigenous
Euphorbiaceae	*Euphorbia davyi*	N.E.Br.	LC	Indigenous
Euphorbiaceae	*Acalypha villicaulis*	Hochst. ex A.Rich.	LC	Indigenous
Euphorbiaceae	*Acalypha indica var. indica*	L.	LC	Indigenous
Euphorbiaceae	*Acalypha angustata*	Sond.	LC	Indigenous; Endemic
Fabaceae	*Senegalia burkei*	(Benth.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Vachellia robusta subsp. robusta*	(Burch.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Senegalia caffra*	(Thunb.) P.J.H.Hurter & Mabb.	LC	Indigenous
Fabaceae	*Indigofera hilaris var. hilaris*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Senna septemtrionalis*	(Viv.) H.S.Irwin & Barneby	NE	Not indigenous; Naturalised; Invasive

Fabaceae	*Eriosema burkei var. burkei*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Rhynchosia caribaea*	(Jacq.) DC.	LC	Indigenous
Fabaceae	*Crotalaria distans subsp. distans*	Benth.	LC	Indigenous
Fabaceae	*Tephrosia multijuga*	R.G.N.Young	LC	Indigenous
Fabaceae	*Mundulea sericea subsp. sericea*	(Willd.) A.Chev.	LC	Indigenous
Fabaceae	*Rhynchosia albissima*	Gand.	LC	Indigenous
Fabaceae	*Pearsonia sessilifolia subsp. sessilifolia*	(Harv.) Dummer	LC	Indigenous
Fabaceae	*Erythrina lysistemon*	Hutch.	LC	Indigenous
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Fabaceae	*Sphenostylis angustifolia*	Sond.	LC	Indigenous; Endemic
Fabaceae	*Alysicarpus zeyheri*	Harv.	LC	Indigenous
Fabaceae	*Eriosema cordatum*	E.Mey.	LC	Indigenous
Fabaceae	*Indigofera heterotricha*	DC.	LC	Indigenous
Fabaceae	*Pearsonia uniflora*	(Kensit) Polhill	LC	Indigenous
Fabaceae	*Zornia linearis*	E.Mey.	LC	Indigenous; Endemic
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Fabaceae	*Indigofera melanadenia*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Tephrosia sp.*			
Fabaceae	*Abrus laevigatus*	E.Mey.	LC	Indigenous
Fabaceae	*Rhynchosia crassifolia*	Benth. ex Harv.	LC	Indigenous; Endemic
Fabaceae	*Rhynchosia totta var. venulosa*	(Thunb.) DC. (Hiern) Verdc.		Indigenous
Fabaceae	*Rhynchosia totta var. rigidula*	(Thunb.) DC. (DC.) Moteetee & M.M.le Roux		Indigenous
Fabaceae	*Tephrosia villosa subsp. ehrenbergiana ehrenbergiana*	(L.) Pers. (Schweinf.) Brummitt	NE	Indigenous
Fabaceae	*Tylosema esculentum*	(Burch.) A.Schreib.	LC	Indigenous
Fabaceae	*Eriosema pauciflorum var. pauciflorum*	Klotzsch	LC	Indigenous
Fabaceae	*Chamaecrista biensis*	(Steyaert) Lock	LC	Indigenous
Fabaceae	*Senegalia erubescens*	(Welw. ex Oliv.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Tephrosia capensis var. capensis*	(Jacq.) Pers.	LC	Indigenous
Fabaceae	*Ophrestia oblongifolia var. oblongifolia*	(E.Mey.) H.M.L.Forbes	LC	Indigenous; Endemic
Fabaceae	*Leobordea divaricata*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Indigofera oxytropis*	Benth. ex Harv.	LC	Indigenous; Endemic
Fabaceae	*Burkea africana*	Hook.	LC	Indigenous
Fabaceae	*Stylosanthes fruticosa*	(Retz.) Alston	LC	Indigenous
Family	*Genus Sp1 Rank1 Sp2 Sp3*		iuc n	ecology
Fissidentaceae	*Fissidens sciophyllus*	Mitt.		Indigenous
Fissidentaceae	*Fissidens ovatus*	Brid.		Indigenous
Gentianaceae	*Exochaenium grande*	(E.Mey.) Griseb.	LC	Indigenous
Gentianaceae	*Sebaea junodii*	Schinz	LC	Indigenous

Gentianaceae	*Chironia purpurascens subsp. humilis*	(E.Mey.) Benth. & Hook.f. (Gilg) I.Verd.	LC	Indigenous
Gleicheniaceae	*Gleichenia polypodioides*	(L.) Sm.	LC	Indigenous
Hyacinthaceae	*Dipcadi marlothii*	Engl.	LC	Indigenous
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Hyacinthaceae	*Dipcadi papillatum*	Oberm.	LC	Indigenous
Hyacinthaceae	*Schizocarphus nervosus*	(Burch.) Van der Merwe	LC	Indigenous
Hyacinthaceae	*Ledebouria ovatifolia*	(Baker) Jessop		Indigenous; Endemic
Hyacinthaceae	*Ledebouria atrobrunnea*	S.Venter	LC	Indigenous; Endemic
Hyacinthaceae	*Ledebouria cooperi*	(Hook.f.) Jessop	LC	Indigenous
Hypericaceae	*Hypericum lalandii*	Choisy	LC	Indigenous
Icacinaceae	*Apodytes dimidiata subsp. dimidiata*	E.Mey. ex Arn.	LC	Indigenous
Iridaceae	*Aristea angolensis subsp. angolensis*	Baker	LC	Indigenous
Iridaceae	*Babiana bainesii*	Baker	LC	Indigenous
Iridaceae	*Afrosolen sandersonii subsp. sandersonii*	(Baker) Goldblatt & J.C.Manning		Indigenous; Endemic
Iridaceae	*Tritonia nelsonii*	Baker	LC	Indigenous; Endemic
Iridaceae	*Gladiolus permeabilis subsp. edulis*	D.Delaroche (Burch. ex Ker Gawl.) Oberm.	LC	Indigenous
Iridaceae	*Dierama mossii*	(N.E.Br.) Hilliard	LC	Indigenous; Endemic
Lamiaceae	*Leonotis sp.*			
Lamiaceae	*Aeollanthus buchnerianus*	Briq.	LC	Indigenous
Lamiaceae	*Tetradenia brevispicata*	(N.E.Br.) Codd	LC	Indigenous
Lamiaceae	*Orthosiphon suffrutescens*	(Thonn.) J.K.Morton	LC	Indigenous
Lamiaceae	*Plectranthus aliciae*	(Codd) Van Jaarsv. & T.J.Edwards	LC	Indigenous; Endemic
Lamiaceae	*Ocimum gratissimum subsp. gratissimum gratissimum*	L.	NE	Indigenous
Lamiaceae	*Ocimum obovatum subsp. obovatum obovatum*	E.Mey. ex Benth.	NE	Indigenous
Lamiaceae	*Acrotome hispida*	Benth.	LC	Indigenous; Endemic
Lamiaceae	*Pycnostachys reticulata*	(E.Mey.) Benth.	LC	Indigenous
Lamiaceae	*Vitex zeyheri*	Sond.	LC	Indigenous; Endemic
Leucobryaceae	*Campylopus pilifer var. pilifer*	Brid.		Indigenous
Limeaceae	*Limeum viscosum subsp. viscosum viscosum*	(J.Gay) Fenzl	NE	Indigenous
Lobeliaceae	*Monopsis decipiens*	(Sond.) Thulin	LC	Indigenous
Lobeliaceae	*Cyphia persicifolia*	C.Presl	LC	Indigenous; Endemic
Loganiaceae	*Strychnos pungens*	Soler.	LC	Indigenous
Loranthaceae	*Agelanthus natalitius subsp. zeyheri*	(Meisn.) Polhill & Wiens (Harv.) Polhill & Wiens	LC	Indigenous
Lycopodiaceae	*Palhinhaea cernua*	(L.) Vasc. & Franco		Indigenous
Malpighiaceae	*Sphedamnocarpus pruriens subsp. pruriens*	(A.Juss.) Szyszyl.	LC	Indigenous
Malpighiaceae	*Sphedamnocarpus pruriens subsp. galphimiifolius*	(A.Juss.) Szyszyl. (A.Juss.) P.D.de Villiers & D.J.Botha	LC	Indigenous

Malvaceae	*Abutilon angulatum var. angulatum*	(Guill. & Perr.) Mast.	NE	Indigenous
Malvaceae	*Hibiscus pusillus*	Thunb.	LC	Indigenous
Malvaceae	*Hermannia sp.*			
Malvaceae	*Hermannia quartiniana*	A.Rich.	LC	Indigenous
Malvaceae	*Hibiscus subreniformis*	Burtt Davy	LC	Indigenous
Malvaceae	*Triumfetta pilosa*	Roth	LC	Indigenous
Malvaceae	*Sida chrysantha*	Ulbr.	LC	Indigenous
Malvaceae	*Grewia occidentalis var. occidentalis*	L.	LC	Indigenous
Malvaceae	*Waltheria indica*	L.	LC	Indigenous
Malvaceae	*Hibiscus marlothianus*	K.Schum.	LC	Indigenous; Endemic
Malvaceae	*Hibiscus sidiformis*	Baill.	LC	Indigenous
Malvaceae	*Hermannia grisea*	Schinz	LC	Indigenous; Endemic
Malvaceae	*Grewia monticola*	Sond.	LC	Indigenous
Malvaceae	*Hibiscus lunariifolius*	Willd.	LC	Indigenous
Malvaceae	*Grewia flava*	DC.	LC	Indigenous
Malvaceae	*Hibiscus engleri*	K.Schum.	LC	Indigenous
Malvaceae	*Hermannia burkei*	Burtt Davy	LC	Indigenous; Endemic
Malvaceae	*Grewia subspathulata*	N.E.Br.	LC	Indigenous
Malvaceae	*Hermannia floribunda*	Harv.	LC	Indigenous
Malvaceae	*Hibiscus sp.*			
Malvaceae	*Triumfetta sp.*			
Malvaceae	*Triumfetta annua forma piligera*	L. Sprague & Hutch.	NE	Indigenous
Marattiaceae	*Ptisana fraxinea var. salicifolia*	(Sm.) Murdock (Schrad.) Murdock	NE	Indigenous
Meliaceae	*Turraea obtusifolia*	Hochst.	LC	Indigenous
Molluginaceae	*Paramollugo nudicaulis*	(Lam.) Thulin		Indigenous
Moraceae	*Ficus thonningii*	Blume		Indigenous
Moraceae	*Ficus salicifolia*	Vahl	LC	Indigenous
Moraceae	*Ficus ingens var. ingens*	(Miq.) Miq.		Indigenous
Myricaceae	*Morella serrata*	(Lam.) Killick	LC	Indigenous
Ochnaceae	*Ochna pulchra*	Hook.f.	LC	Indigenous
Olacaceae	*Ximenia caffra var. caffra*	Sond.	LC	Indigenous
Oleaceae	*Olea capensis subsp. enervis*	L. (Harv. ex C.H.Wright) I.Verd.	LC	Indigenous
Oleaceae	*Menodora africana*	Hook.	LC	Indigenous; Endemic
Orchidaceae	*Bonatea saundersioides*	(Kraenzl. & Schltr.) Cortesi	LC	Indigenous
Orchidaceae	*Satyrium hallackii subsp. ocellatum*	Bolus (Bolus) A.V.Hall	LC	Indigenous
Orobanchaceae	*Striga gesnerioides*	(Willd.) Vatke	LC	Indigenous
Orobanchaceae	*Harveya pumila*	Schltr.	LC	Indigenous; Endemic
Orobanchaceae	*Striga sp.*			

Orobanchaceae	*Striga forbesii*	Benth.	LC	Indigenous
Osmundaceae	*Osmunda regalis*	L.	LC	Indigenous
Pedaliaceae	*Dicerocaryum sp.*			
Peraceae	*Clutia sp.*			
Peraceae	*Clutia pulchella var. pulchella*	L.	LC	Indigenous
Phyllanthaceae	*Flueggea virosa subsp. virosa*	(Roxb. ex Willd.) Royle	LC	Indigenous
Phyllanthaceae	*Phyllanthus incurvus*	Thunb.	LC	Indigenous
Phyllanthaceae	*Phyllanthus sp.*			
Pittosporaceae	*Pittosporum viridiflorum*	Sims	LC	Indigenous
Plumbaginaceae	*Plumbago zeylanica*	L.		Indigenous
Poaceae	*Stiburus alopecuroides*	(Hack.) Stapf	LC	Indigenous
Poaceae	*Setaria incrassata*	(Hochst.) Hack.	LC	Indigenous
Poaceae	*Urochloa panicoides*	P.Beauv.	LC	Indigenous
Poaceae	*Aristida adscensionis*	L.	LC	Indigenous
Poaceae	*Eragrostis sclerantha subsp. sclerantha*	Nees	LC	Indigenous; Endemic
Poaceae	*Eragrostis cilianensis*	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	*Eragrostis hierniana*	Rendle	LC	Indigenous
Poaceae	*Aristida bipartita*	(Nees) Trin. & Rupr.	LC	Indigenous
Poaceae	*Sorghum versicolor*	Andersson	LC	Indigenous
Poaceae	*Ischaemum afrum*	(J.F.Gmel.) Dandy	LC	Indigenous
Poaceae	*Sporobolus stapfianus*	Gand.	LC	Indigenous
Poaceae	*Enneapogon cenchroides*	(Licht. ex Roem. & Schult.) C.E.Hubb.	LC	Indigenous
Poaceae	*Arundinella nepalensis*	Trin.	LC	Indigenous
Poaceae	*Bothriochloa insculpta*	(Hochst. ex A.Rich.) A.Camus	LC	Indigenous
Poaceae	*Brachiaria deflexa*	(Schumach.) C.E.Hubb. ex Robyns	LC	Indigenous
Poaceae	*Melinis repens subsp. repens*	(Willd.) Zizka	LC	Indigenous
Poaceae	*Aristida aequiglumis*	Hack.	LC	Indigenous
Poaceae	*Hyparrhenia dregeana*	(Nees) Stapf ex Stent	LC	Indigenous
Poaceae	*Sehima galpinii*	Stent	LC	Indigenous; Endemic
Poaceae	*Eragrostis heteromera*	Stapf	LC	Indigenous
Poaceae	*Eragrostis capensis*	(Thunb.) Trin.	LC	Indigenous
Poaceae	*Aristida junciformis subsp. junciformis*	Trin. & Rupr.	LC	Indigenous; Endemic
Poaceae	*Imperata cylindrica*	(L.) P.Beauv.		Indigenous
Poaceae	*Monocymbium ceresiiforme*	(Nees) Stapf	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Paspalum urvillei*	Steud.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Loudetia simplex*	(Nees) C.E.Hubb.	LC	Indigenous
Poaceae	*Dichanthium annulatum var. papillosum*	(Forssk.) Stapf (A.Rich.) de Wet & Harlan	LC	Indigenous

Poaceae	*Chrysopogon serrulatus*	Trin.	LC	Indigenous
Poaceae	*Tragus berteronianus*	Schult.	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Poaceae	*Panicum natalense*	Hochst.	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous
Poaceae	*Fingerhuthia africana*	Lehm.	LC	Indigenous; Endemic
Poaceae	*Sporobolus festivus*	Hochst. ex A.Rich.	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Polygalaceae	*Polygala sp.*			
Polygonaceae	*Persicaria decipiens*	(R.Br.) K.L.Wilson	LC	Indigenous
Portulacaceae	*Portulaca pilosa*	L.	LC	Not indigenous; Naturalised; Invasive
Portulacaceae	*Portulaca oleracea*	L.		Not indigenous; Naturalised
Proteaceae	*Protea caffra subsp. caffra*	Meisn.	LC	Indigenous
Proteaceae	*Faurea saligna*	Harv.	LC	Indigenous
Proteaceae	*Protea gaguedi*	J.F.Gmel.	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. viridis*	(Forssk.) Sw.	LC	Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Ranunculaceae	*Clematis brachiata*	Thunb.	LC	Indigenous
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Rhamnaceae	*Helinus integrifolius*	(Lam.) Kuntze	LC	Indigenous
Rhamnaceae	*Phyllogeiton zeyheri*	(Sond.) Suess.		Indigenous
Ricciaceae	*Riccia volkii*	S.W.Arnell		Indigenous
Rosaceae	*Rubus cuneifolius*	Pursh		Not indigenous; Naturalised; Invasive
Rubiaceae	*Anthospermum hispidulum*	E.Mey. ex Sond.	LC	Indigenous; Endemic
Rubiaceae	*Pentanisia angustifolia*	(Hochst.) Hochst.	LC	Indigenous
Rubiaceae	*Otiophora calycophylla subsp. calycophylla*	(Sond.) Schltr. & K.Schum.	LC	Indigenous; Endemic
Rubiaceae	*Vangueria infausta subsp. infausta*	Burch.	LC	Indigenous
Rubiaceae	*Pygmaeothamnus zeyheri var. zeyheri*	(Sond.) Robyns	LC	Indigenous
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	Schnizl. (Sond.) D.Mantell	LC	Indigenous
Rubiaceae	*Pavetta gardeniifolia var. subtomentosa*	A.Rich. K.Schum.	LC	Indigenous
Rubiaceae	*Afrocanthium mundianum*	(Cham. & Schltdl.) Lantz	LC	Indigenous
Rubiaceae	*Canthium suberosum*	Codd	LC	Indigenous; Endemic
Rubiaceae	*Oldenlandia tenella*	(Hochst.) Kuntze	LC	Indigenous; Endemic
Rubiaceae	*Vangueria parvifolia*	Sond.	LC	Indigenous; Endemic
Rubiaceae	*Fadogia homblei*	De Wild.	LC	Indigenous
Rutaceae	*Zanthoxylum capense*	(Thunb.) Harv.	LC	Indigenous

Santalaceae	*Thesium sp.*			
Santalaceae	*Thesium magalismontanum*	Sond.	LC	Indigenous; Endemic
Sapindaceae	*Erythrophysa transvaalensis*	I.Verd.	LC	Indigenous
Scrophulariaceae	*Buddleja salviifolia*	(L.) Lam.	LC	Indigenous
Scrophulariaceae	*Selago sp.*			
Scrophulariaceae	*Aptosimum sp.*			
Scrophulariaceae	*Zaluzianskya elongata*	Hilliard & B.L.Burtt	LC	Indigenous; Endemic
Scrophulariaceae	*Chaenostoma leve*	(Hiern) Kornhall	LC	Indigenous; Endemic
Scrophulariaceae	*Buddleja saligna*	Willd.	LC	Indigenous
Solanaceae	*Solanum campylacanthum*	Hochst. ex A.Rich.		Indigenous
Sphagnaceae	*Sphagnum truncatum*	Hornsch.		Indigenous
Thymelaeaceae	*Lasiosiphon capitatus*	(L.f.) Burtt Davy	LC	Indigenous; Endemic
Thymelaeaceae	*Lasiosiphon sericocephalus*	(Meisn.) J.C.Manning & Boatwr.	LC	Indigenous; Endemic
Urticaceae	*Pouzolzia sp.*			
Urticaceae	*Pouzolzia mixta var. mixta*	Solms	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris linearis*	(L.f.) Thunb. Bridson E.Mey. ex Bridson	NE	Indigenous
Verbenaceae	*Lantana rugosa*	Thunb.	LC	Indigenous
Verbenaceae	*Duranta erecta*	L.		Not indigenous; Naturalised; Invasive
Verbenaceae	*Chascanum hederaceum var. hederaceum*	(Sond.) Moldenke	LC	Indigenous; Endemic
Vitaceae	*Cyphostemma lanigerum*	(Harv.) Desc. ex Wild & R.B.Drumm.	LC	Indigenous
Vitaceae	*Cyphostemma puberulum*	(C.A.Sm.) Wild & R.B.Drumm.	LC	Indigenous
Vitaceae	*Cyphostemma sulcatum*	(C.A.Sm.) J.J.M.van der Merwe	LC	Indigenous; Endemic
Xyridaceae	*Xyris congensis*	Buettner	LC	Indigenous

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2022)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Amietia poyntoni	Poynton's River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC	LC
Hemisus marmoratus	Mottled Shovel-nosed Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Poyntonophrynus fenoulheti	Northern Pygmy Toad	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Ptychadena mossambica	Mozambique Ridged Frog	LC	LC
Ptychadena mossambica	Broadbanded Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Pyxicephalus edulis	African Bullfrog	LC	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
Sclerophrys sp.		LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna krugerensis	Knocking 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

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2022)
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Acontias occidentalis	Western Legless Skink	LC	Unlisted
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Distant's Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Amblyodipsas polylepis polylepis	Common Purple-glossed Snake	Unlisted	Unlisted
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chondrodactylus turneri	Turner's Gecko	LC	Unlisted
Cordylus jonesii	Jones' Girdled Lizard	LC	Unlisted
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dendroaspis polylepis	Black Mamba	LC	LC
Dispholidus typus viridis	Northern Boomslang	LC	Unlisted
Duberria lutrix lutrix	South African Slug-eater	LC	LC
Elapsoidea sundevallii media	Highveld Garter Snake	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Gonionotophis capensis	Common File Snake	LC	LC
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Homoroselaps dorsalis	Striped Harlequin Snake	NT	LC
Ichnotropis capensis	Ornate Rough-scaled Lizard	LC	Unlisted
Kinixys lobatsiana	Lobatse Hinged Tortoise	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops distanti	Distant's Thread Snake	LC	LC
Leptotyphlops incognitus	Incognito Thread Snake	LC	Unlisted
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Leptotyphlops sp.		LC	Unlisted
Limaformosa capensis	Common File 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
Lygodactylus ocellatus	Spotted Dwarf Gecko	LC	LC
Meroles squamulosus	Common Rough-scaled Lizard	LC	Unlisted
Mochlus sundevallii	Sundevall's Writhing Skink	LC	LC
Naja annulifera	Snouted Cobra	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Nucras intertexta	Spotted Sandveld Lizard	LC	Unlisted
Nucras lalandii	Delalande's Sandveld Lizard	LC	LC
Nucras ornata	Ornate Sandveld Lizard	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Pachydactylus sp.		LC	Unlisted
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Pelusios sinuatus	Serrated Hinged Terrapin	LC	Unlisted
Philothamnus hoplogaster	South Eastern Green Snake	LC	Unlisted
Philothamnus occidentalis	Western Natal Green Snake	Unlisted	Unlisted
Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna bivittata	Two-striped Shovel-snout	LC	Unlisted
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis angolensis	Dwarf Sand Snake	LC	Unlisted
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC
Psammophis subtaeniatus	Western Yellow-bellied Sand Snake	LC	LC
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus melanotus melanotus	Common Crag Lizard	LC	LC
Python natalensis	Southern African Python	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Thelotornis capensis capensis	Southern Twig Snake	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted

Trachylepis damarana	Damara Variable Skink	Unlisted	LC
Trachylepis laevigata	Striped Variable Skink	DD	DD
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis sp. (Transvaal varia)	Skink sp. 1	LC	Unlisted
Trachylepis varia sensu lato	Common Variable Skink Complex	LC	LC
Trachylepis varia sensu stricto	Common Variable Skink	LC	LC
Varanus albigularis albigularis	Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2022)
Aepyceros melampus	Impala	LC	LC
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Antidorcas marsupialis	Springbok	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
Ceratotherium simum	White Rhinoceros	NT	NT
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Civettictis civetta	African Civet	LC	LC
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC
Crocidura hirta	Lesser Red Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Crocidura silacea	Lesser Grey-brown Musk Shrew	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus lunatus	Tsessebe	VU	LC
Damaliscus pygargus	Blesbok	LC	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Galago moholi	Southern Lesser Galago	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC

Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Giraffa camelopardalis	Giraffe	LC	VU
Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hipposideros caffer	Sundevall's Leaf-nosed Bat	LC	LC
Hippotragus niger	Sable Antelope	VU	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
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Lemniscomys rosalia	Single-striped Mouse	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	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
Myotis tricolor	Temminck's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Oreotragus oreotragus	Klipspringer	LC	LC
Orycteropus afer	Aardvark	LC	LC
Oryx gazella	Gemsbok	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	EN	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Paraxerus cepapi	Tree Squirrel	LC	LC
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
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
Redunca arundinum	Southern Reedbuck	LC	LC
Redunca fulvorufula	Mountain Reedbuck	EN	EN
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Rhinolophus hildebrandtii	Ruppell's Horseshoe Bat	LC	LC
Rhinolophus simulator	Bushveld 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
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus lixus	Greater Dwarf Shrew	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thallomys paedulcus	Tree Rat	LC	LC
Tragelaphus oryx	Eland	LC	LC
Tragelaphus scriptus	Cape Bushbuck	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

7.5 Appendix E Specialist Declarations

DECLARATION

I, Carami Burger, 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.

Carami Burger

Ecologist

The Biodiversity Company

May 2022

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;
- 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

May 2022

Appendix F Specialists CVs

Carami Burger

B.Sc. Honours – Ecological Interactions and Ecosystem Resilience (Cum Laude)

(*Cand Sci Nat*)

Cell: +27 83 630 9077

Email: Carami@thebiodiversitycompany.com

Identity Number: 9606250185084

Date of birth: 25 June 1996

Profile Summary

Working experience in South Africa and Mozambique.

Specialist experience with infrastructure development, road development, renewable energy, mining and prospecting.

Specialist expertise include terrestrial ecology, wetland resources, rehabilitation and management plans, environmental compliance and monitoring.

Areas of Interest

Renewable Energy & Bulk Services Infrastructure Development, Mining, Farming, Sustainability and Conservation.

Key Experience

- Environmental Impact Assessments (EIA)
- Basic Assessments
- Terrestrial Ecological Assessments
- Wetland Delineation and Ecological Assessments
- Environmental Management Programmes (EMPr)
- Rehabilitation Plans
- Invasive Species Plans
- Search and Rescue Plans
- Environmental Compliance Audits
- Water Use License Applications
- Dust Fallout Monitoring
- Water Quality Monitoring

Countries worked in

South Africa

Mozambique

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- BSc Hons Ecological Interactions and Ecosystem Resilience.
- BSc Botany and Zoology.
- Cand Sci Nat (121757)

SELECTED PROJECT EXPERIENCE

Project Name: The Central Térmica de Temane (CTT) Project - Management Plans

Client: TSK

Personal position / role on project: Author

Location: Inhambane Province, Mozambique

Main project features: Compile a Plant Search and Rescue Plan, Site Clearance Plan, Invasive Alien Species Plan and a Rehabilitation Plan for the Central Térmica de Temane (CTT) project

Project Name: The Central Térmica de Temane (CTT) Project - Flora and Fauna Survey and Report

Client: TSK

Personal position / role on project: Terrestrial Specialist

Location: Inhambane Province, Mozambique

Main project features: Conduct a Flora and Fauna survey and report during the dry and wet season for the Central Térmica de Temane (CTT) project, located in the vicinity of the town of Inhassoro, Inhambane Province, Mozambique

Project Name: Sikhwetha Lodge - Ridge and Terrestrial Ecological Assessment

Client: Neels Bezuidenhout Architects

Personal position / role on project: Terrestrial Specialist

Location: Roodeplaat, Gauteng

Main project features: Conduct a Ridge And Terrestrial Ecological Assessment as part of the Environmental Authorisation process for the proposed Sikhwetha Lodge located on Portion 2 of the Farm Doornfontein 291 JR.

Project Name: Rama City Bulk Service Infrastructure Development - Watercourse Delineation and Assessment

Client: RCDC

Personal position / role on project: Wetland Ecologist

Location: Ga-Rankuwa Gauteng

Main project features: Conduct a Watercourse Delineation and Assessment for the Rama City Bulk Service Infrastructure Development.

Project Name: Katoloso Minerals Prospecting Right – Terrestrial and Wetland Ecological Opinion

Client: Katoloso Minerals

Personal position / role on project: Terrestrial/ Wetland Ecologist

Location: Ventersdorp North West

Main project features: To conduct a terrestrial and wetland ecological opinion for the proposed Prospecting Right.

Project Name: Wetland Assessment as part of the Environmental Authorisation process for the proposed construction of residential units on Portion 9 of the farm Olievenhoutbosch 389-JR, Gauteng Province.

Personal position / role on project: Avifaunal specialist

Location: Olievenhoutbosch, Gauteng Province.

Main project features: To conduct a wetland assessment for the proposed construction of residential units.

Project Name: Copperton Wind Farm Project - Rehabilitation Method Statement

Personal position / role on project: Terrestrial Ecologist

Location: Copperton Northern Cape Province.

Main project features: To compile a rehabilitation method statement for the Copperton Wind Farm Project located on the farm Nelspoortjie (Farm No. 103 Portion 4 (a portion of portion 2) and 7 (a portion of portion 5) near Copperton in the Northern Cape Province.

Project Name: Wonderfontein Road Diversion - Terrestrial Ecological Scan

Personal position / role on project: Terrestrial Ecologist.

Location: Belfast, Mpumalanga Province

Main project features: To conduct a terrestrial ecological scan as part of the Environmental Authorisation Process for the Proposed Wonderfontein Road Diversion Near Wonderfontein Colliery.

Project Name: Terrestrial Ecological Report for the proposed construction of a crematorium on a portion of the remaining extent of the Farm Vulcania 279 IR, Gauteng Province

Personal position / role on project: Terrestrial Ecologist

Location: Springs, Gauteng

Main project features: Conduct a detailed terrestrial ecology basic assessment for the proposed construction of a crematorium.

Project Name: Wetland study as part of the Environmental Authorisation process for the proposed construction of a crematorium on a portion of the remaining extent of the Farm Vulcania 279 IR, Gauteng Province.

Personal position / role on project: Wetland Ecologist

Location: Springs, Gauteng

Main project features: To conduct a wetland delineation and ecological assessment for the proposed construction of a crematorium.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Terrestrial Ecological Assessments.
- Faunal surveys which include mammals, birds, amphibians and reptiles.
- Wetland Ecological Assessment.
- Management plan compilation (Plant Search and Rescue, Rehabilitation, Site Clearance, Alien Invasive Species Plans).
- Compliance audits.
- Water Use Licenses.
- Water Quality and Dust Fall Monitoring.

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (May 2022 - Present)

Terrestrial Ecological Assessments, Wetland Ecological Assessment and management Plans.

EMPLOYMENT: EP3 Environmental - Senior Consultant and Ecologist (June 2019 - April 2022)

Responsibilities:

- Specialist studies
- Environmental Procedures
- Basic Assessment Reports
- Environmental Impact Assessment Reports
- Water Use License Applications
- Environmental Management Programmes
- Environmental Control Officer Audits and Reports
- Surface Water Quality Monitoring Reports
- Groundwater Quality Monitoring Reports
- Dust Fallout Monitoring Reports

EMPLOYMENT: Scientific Aquatic Services (SAS)- Internship (November 2018 - June 2019)

Responsibilities:

- Specialist studies
- Background Information, Mapping (ArcGIS) and Desktop Studies

ACADEMIC QUALIFICATIONS

North-West University of Potchefstroom (2017): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Botany and Zoology.

North-West University of Potchefstroom (2013): BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Ecological Interactions and Ecosystem Resilience (Cum Laude)

Title: Mini-Dissertation on ecological information in Environmental Impact Assessments (EIA) at Mooi River Mall.

Andrew Husted

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

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979

Profile Summary

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

Specialist experience with on-shore drilling, mining, engineering, hydropower and renewable energy.

Experience with project management of national and international multi-disciplinary projects. Including managing and compiling ESHIAs and EMPs

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

Specialist expertise include Instream Flow and Ecological Water Requirements, aquatic ecology and wetlands resources.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Sustainability and Conservation.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Terrestrial Ecological Assessments
- Aquatic Ecological Assessments
- Rehabilitation Plans and Monitoring
- Aquaculture

Country Experience

Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mozambique

Nigeria, Republic of Armenia, Senegal

Sierra Leone, South Africa

Swaziland, Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

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

SELECTED PROJECT EXPERIENCE

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed Nondvo Dam

Client: WSP

Personal position / role on project: Project Manager.

Location: Swaziland

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: The environmental flow assessment for the Mara River system

Client: IHE Delft Institute for Water Education

Personal position / role on project: Project Manager / Freshwater Ecologist

Location: Tanzania

Main project features: To conduct a dual season campaign to the Lower Mara River Basin in Tanzania to collect hydrological and ecological information as part of an environmental flow assessment on the Tanzanian side of the Mara River in collaboration with GIZ and NBI-NELSAP.

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed solar photovoltaic facility and transmission in Cuamba

Client: WSP

Personal position / role on project: Project Manager.

Location: Mozambique

Main project features: To conduct a single season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline assessment for the proposed Siguiri Gold Mine Project, in Kankan Province, Guinea.

Client: SRK Consulting.

Personal position / role on project: Project Manager.

Location: Siguiri, Guinea, West-Africa (2018).

Main project features: To conduct a dual season ecological baseline assessment for the expected impact footprint area. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline and impact assessment for the proposed Lesotho Bulk Water Supply Scheme, Lesotho.

Client: WSP.

Personal position / role on project: Wetland & Aquatic Ecologist, PROBFLO and Project Manager.

Location: Mohale's Hoek, Lesotho (2018).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the pipeline route and proposed weir. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements using PROBFLO for the system.

Project Name: A biodiversity baseline and impact assessment for the proposed Pavua Hydropower Project, in Sofala Province, Central Mozambique.

Client: Mott MacDonald.

Personal position / role on project: Project Manager.

Location: Sofala Province, Mozambique (2017).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the expected impact footprint area, including Gorongosa National. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements for the system.

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (January 2015 – Present)

I founded The Biodiversity Company in 2015, now consisting of experienced ecologists who provide technical expertise and policy advice to numerous sectors, such as mining, agriculture, construction and natural resources. The team at The Biodiversity Company have conducted stand-alone specialist studies, and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

EMPLOYMENT: Digby Wells Environmental (October 2013 – December 2014)

Digby Wells assigned me to the role of Country Manager for the united Kingdom. This was a new endeavour for the company as the company's global footprint continues to increase. The primary responsibilities for the role included the following:

- **Client liaison** to be able to interact more efficiently and personally with current mining clients, mining industry service providers, legal firms and banking institutions in order to introduce Digby Wells as a services provider with the aim of securing work.
- **Project management** for international projects which may require a presence in the united Kingdom, this was dependent on the location and needs of the client. These projects would mostly be based on the Equator Principles (EP) and International Finance Corporation (IFC) Performance Standards.
- **Technical input** to provide specialist technical expertise for projects, this included fauna, aquatic ecology, wetlands and rehabilitation. Continued with the design and implementation of Biodiversity and Land Management Plans to assist clients with managing the natural resources. Responsibilities also included the mentorship and management (including reviewing and guiding) other expertise such as flora, fauna and pedology.

EMPLOYMENT: Digby Wells Environmental (March 2012 – September 2013)

Manager of a multi-disciplinary department of scientists providing specialist services in support of national and international requirements as well as best practice guidelines, primarily focussing on the mining sector. In addition to managing the department, I was also expected to contribute specialist services, most notably focusing on water resources. Further responsibilities also included the management of numerous projects on a national or international scale. A general overview of the required responsibilities are as follows:

- **Project management** for single as well as multi-disciplinary studies on a national and international scale. This included legislation and commitments for the respective country being operated in, as well as included the World Bank (WB), EP and IFC requirements.
- **Individual and/or team management** in order to provide mentoring and supportive structures for development and growth in support of the company's strategic objectives.
- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.
- **Report reviewing** in order to ensure compliance and consideration of relevant legislation and guidelines

and also quality control.

- **Specialist management** to facilitate the collaboration and integration of specialist skills for the respective projects. This also included the development of Biodiversity and Land Management Plan for clients.
- **Client Resource Manager** for numerous clients in order to establish as well as maintain working relationships.

An overview of the tenure working with the company is provided below**:**

- **October 2013 – December 2014: London Operations Manager** – Deployed to establish a presence for the company (remote office) in the united Kingdom by means of generating project work to support the employment of staff and operation of a business structure.
- **March 2012 – September 2013: Biophysical Department Manager** – Responsible for the development and growth of the department to consist of four specialist units. This included the development of a new specialist unit, namely Rehabilitation.
- **January 2011 - February 2012: Ecological unit Manager** – In addition to implementing aquatic and wetland specialist services, the role required the overall management of additional specialist services which included fauna & flora.
- **June 2010 - December 2010: Aquatic Services Manager** – This required the marketing and implementation of specialist programmes for the client base such as biomonitoring and wetland off-set strategies. In addition to this, this also included expanding on the existing skill set to include services such as toxicity, bioaccumulation and ecological flow assessments.
- **August 2008: Aquatic ecologist** – Employed as a specialist to establish the aquatic services within the company. In addition to this, wetland specialist services were added to the existing portfolio.

PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)

- June 2007 – July 2008: Junior aquatic ecologist
  - Researcher
  - Technical assistant for fieldwork
  - Reporting writing
  - Project management

ADDITIONAL EXPERIENCE

Compliance audits	Conducting site investigations in order to determine the level of compliance attained, ensuring that the client maintains an appropriate measure of compliance with environmental regulations by means of a legislative approach
Control officer	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
Screening studies	Project investigations in order to determine the level of complexity for the environmental and social studies required for a project. This is a form of risk assessment to guide the advancement of the project.
Public consultation	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
Water use licenses	Consultation with the relevant authorities in order to establish the project requirements, as well as provide specialist (aquatics/wetland) input for the application in order to achieve authorisation.

Closure	Primarily the review of closure projects, with emphasis on the closure cost calculations. Support was also provided by assisting with the measurements of structures during fieldwork.
Visual	The review of visual studies as well as the collation of field data to be considered for the visual interpretation for the project.

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

PUBLICATIONS

Mahomed D, Husted A, Fry C, Downsa CT and O'Brien GC. 2019. Spatial shifts and habitat partitioning of ichthyofauna within the middle-lower region of the Pungwe Basin, Mozambique, Journal of Freshwater Ecology, 34:1, 685-702, DOI: 10.1080/02705060.2019.1673221

Tate RB and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate RB and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Iviore. African Journal of Aquatic Science.

O'Brien GC, Bulfin JB, Husted A. and Smit NJ. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi, H, Husted, A, O'Brien, GC, Cloete, Y, Van Dyk C, Pieterse GM, Wepener V, Nel A and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).