TERRESTRIAL BIODIVERSITY ASSESSMENT

June 2023

biosphere
Enviro Solutions

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT (INCLUDING PLANT AND ANIMAL SPECIES ASSESSMENT) FOR PHADIMA SOLAR PV, NEAR FOCHVILLE, GAUTENG PROVINCE, SOUTH AFRICA

On various portions of the farm Elandsfontein 144 and the Remaining Extent of the farm Elandsfontein 140

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DECLARATION OF INDEPENDENCE

I, Mari van der Westhuizen, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

Mari van der Westhuizen (*Pri. Sci. Nat.)*

- MSc. Environmental Sciences
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List of abbreviations

CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
DFFE	Department of Forestry, Fisheries and the Environment
DWAF	Department of Water Affairs and Forestry
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ENPAT	Environmental Potential Atlas, South Africa
ESA	Ecological Support Areas
ESO	Environmental Site Officer
IBA	Important Bird Areas
LC	Least Concern
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NFEPA	National Freshwater Ecosystem Protected Areas
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
NWM5	National Wetland Map 5
PA	Protected Areas
PV	Photovoltaic
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SWSA	Strategic Water Source Areas
VU	Vulnerable

1 INTRODUCTION

Phadima Solar PV (RF) (Pty) Ltd (applicant) proposes to construct a Photovoltaic (PV) facility and associated infrastructure (inclusive of a 1 km gridline) near Fochville in Gauteng. The proposed PV Facility will consist of a 240 Megawatt (MW) Photovoltaic (PV) facility on various portions of the farm Elandsfontein 144 and the Remaining Extent of the farm Elandsfontein 140 which is located approximately 3km south-west of the town of Fochville. In addition, it is proposed to construct a 132kV power line to an existing substation east of the site. Savannah Environmental (Pty) Ltd has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of WKN. This terrestrial biodiversity assessment is intended to inform the environmental authorisation process for the project.

1.1 TERMS OF REFERENCE

1. Conduct a field study to determine the state of the vegetation on site:
    a. After studying the aerial photograph determine the previous state of the vegetation compared to the current state of the vegetation on site.
    b. Conduct a site visit and list the plant species (trees, shrubs, grasses, succulents and other herbaceous species of special interest) present for plant communities still present after construction.
    c. Identify potential red data plant species, possible encroacher species and exotic plant species.
2. Determine the ecological impact the development will have on the fauna and flora of the site and conduct an impact rating assessment.
3. Fauna scoping
    a. List the potential fauna (mammal species, red data birds, reptiles, amphibians, invertebrates) present linked to the specific potential habitats that occur as identified in the vegetation survey.
    b. Analyse the data and identify potential red data fauna species, as well as other endemic or protected species of importance.
    c. Indicate species mitigation measures and management measures to be implemented to prevent any negative impacts on the fauna of the area.
4. General

1. Identify and describe ecologically sensitive areas. Create a sensitivity map to indicate specific sensitive areas based on various environmental parameters such as natural vegetation in a good condition, rockiness, slopes, flood lines etc.
2. Make recommendations, impact ratings and risk assessments for each specific impact.

1.2 Legal Framework

1. The National Environmental Management Act (107 of 1998).
2. National Environmental Management: Biodiversity Act (10 of 2004).
3. National Environmental Management: Biodiversity Act (10 of 2004): Draft lists of threatened and protected species, 2005.
4. National Environmental Management: Biodiversity Act (10 of 2004). Alien and invasive species lists, 2020.
5. The National Forest Act: Protected tree species.
6. Environmental Impact Assessment (EIA) regulations.
7. Terrestrial Biodiversity, Plant and Animal Species protocols, gazetted 30 October 2020 (Government Notice number 1150).
8. Transvaal Nature Conservation Ordinance (12 of 1983).
9. Gauteng Nature Conservation Bill (2014).
10. GDARD Requirements for Biodiversity Assessments Version 3 (2014)

The National Environmental Management Act (NEMA, Act 107 of 1998) and the National Environmental Management Biodiversity Act (NEMBA, Act 10 0f 2004) ensure the protection of ecological processes, natural systems and the preservation of biotic diversity within the natural environment. They also ensure the protection of the environment against disturbance, deterioration, defacement or destruction as a result of man-made structures, installations, processes, products or activities.

1.3 Assumptions and Limitations

- In order to obtain a comprehensive understanding of the dynamics of the vegetation of the study area, surveys should ideally be replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are

not feasible. This survey was conducted during the end of the wet season in 20-22 March 2023. Since environmental studies deal with dynamic natural systems, additional information may come to light at a later stage.

- Furthermore, even though it might be assumed that survey findings are representative of the ecosystem of the project area, it should be stated that the possibility exists that individual plants species might have been missed due to the size of the terrain.
- Some plant species are only identifiable when in flower, but not all species were in flower during the site visit.
- The fauna assessment is mainly 'n desktop survey, combined with a field survey of available habitat types. An in-depth survey of animal species including trapping etc. was not conducted.
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the current survey, and as such there is a high confidence in the information provided.

1.4 INFORMATION SOURCES

The following information sources were obtained:

1. Relevant maps through GIS mapping, and information on the natural environment of the area concerned.
2. Legislation pertaining to the fauna and flora study as relevant.
3. The vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006).
4. Red data species list from the South African National Biodiversity Institute (SANBI).
5. The Biodiversity and Development Institute – The Virtual Museum.
6. Relevant plant and animal field guides (see Reference list).

2 BACKGROUND TO THE STUDY AREA

2.1 LOCATION

The study area comprises of portions 7, 8, 16, 28, 32, 33, 35 and 37 of the farm Elandsfontein 144 and the Remaining Extent of the farm Elandsfontein 140 which is located approximately 3km south-west of the town of Fochville, Gauteng Province.

2.2 CLIMATE

Fochville's climate is mild, and generally warm and temperate. According to Köppen and Geiger, this climate is classified as Cwb (Climate-Data, 2023). The Mean Annual Temperature (MAT) is 17.0 °C and the Mean Annual Precipitation (MAP) is about 700 mm per year.

2.3 GEOLOGY AND SOIL TYPES

Geology is directly related to soil types and plant communities that may occur in a specific area. A Land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type unit represented within the study area is the Bc36 land type (Land Type Survey Staff, 1987) (ENPAT, 2000). The land type, geology and associated soil types is presented in Table 1 below as classified by the Environmental Potential Atlas, South Africa (ENPAT, 2000).

Table 1. Land types, geology, and dominant soil types of the proposed development site

Landtype	Soils	Geology
Bc36	Plinthic catena: eutrophic; red soils widespread, upland duplex and margalitic soils rare	Shale, slate and quartzite of the Pretoria Group; Hekpoort lava; many diabase sills; sporadic occurrence of dolomite and chert, Ventersdorp lava and Ecca shale and sandstone in the south-east. Quartzite usually forms crests and scarps.

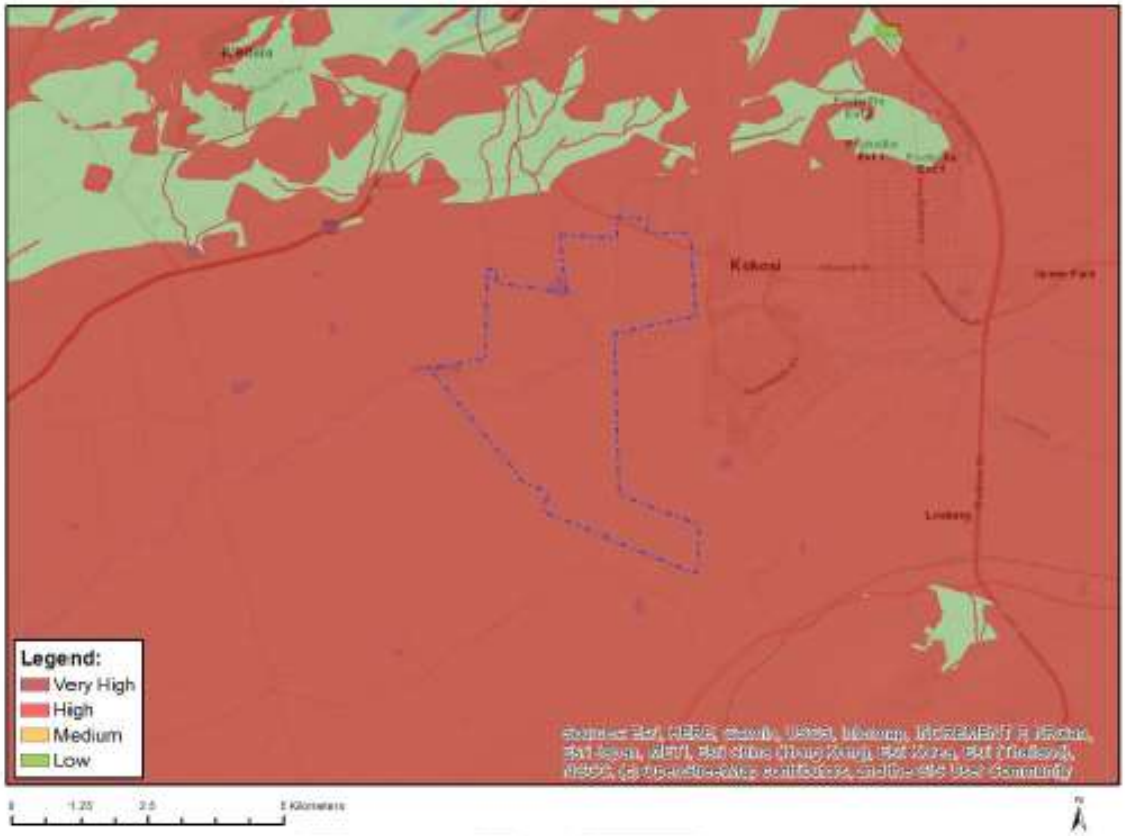
2.4 EIA SCREENING TOOL

According to the national web-based environmental screening tool in terms of National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), the site has the following sensitivities:

- Terrestrial Biodiversity: Very High Sensitivity (Figure 1).
- Animal Species Theme: Medium Sensitivity (Figure 2).

- Plant Species Theme: Medium Sensitivity (Figure 3).

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



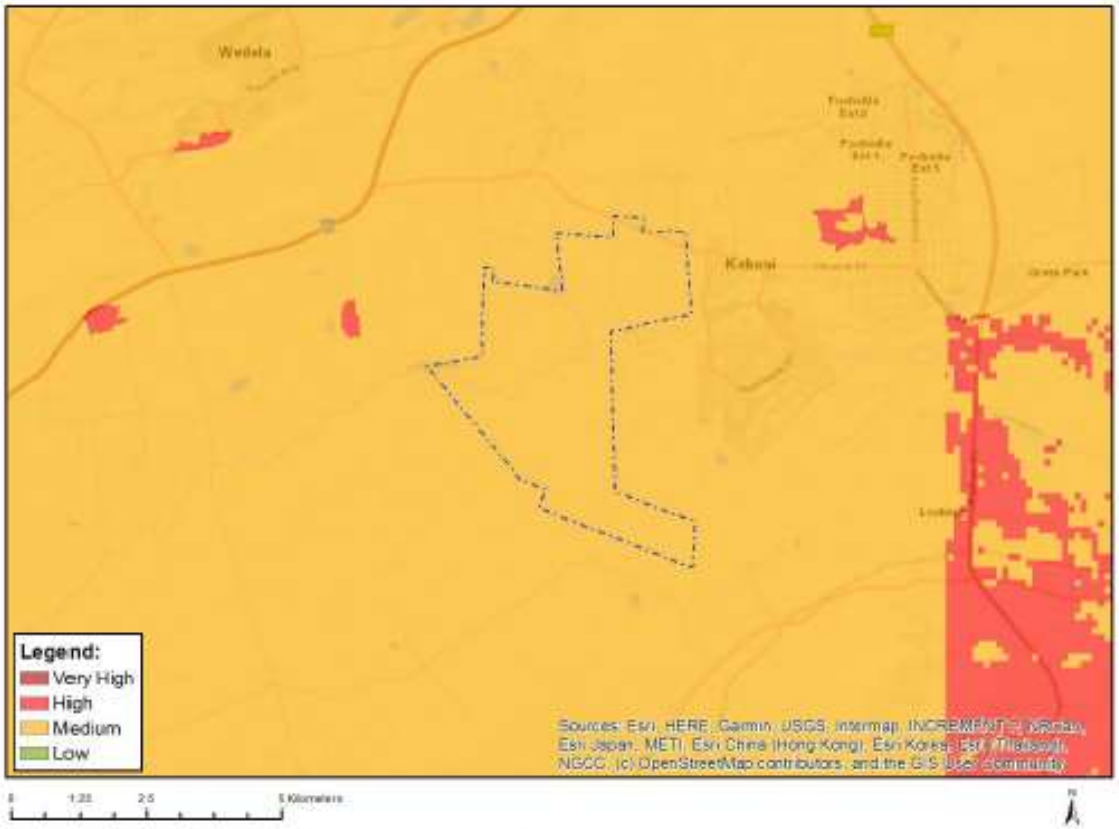
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Ecological support area
Very High	Protected Areas Expansion Strategy
Very High	Vulnerable ecosystem

Figure 1: Terrestrial biodiversity theme sensitivity according to the Screening Tool

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

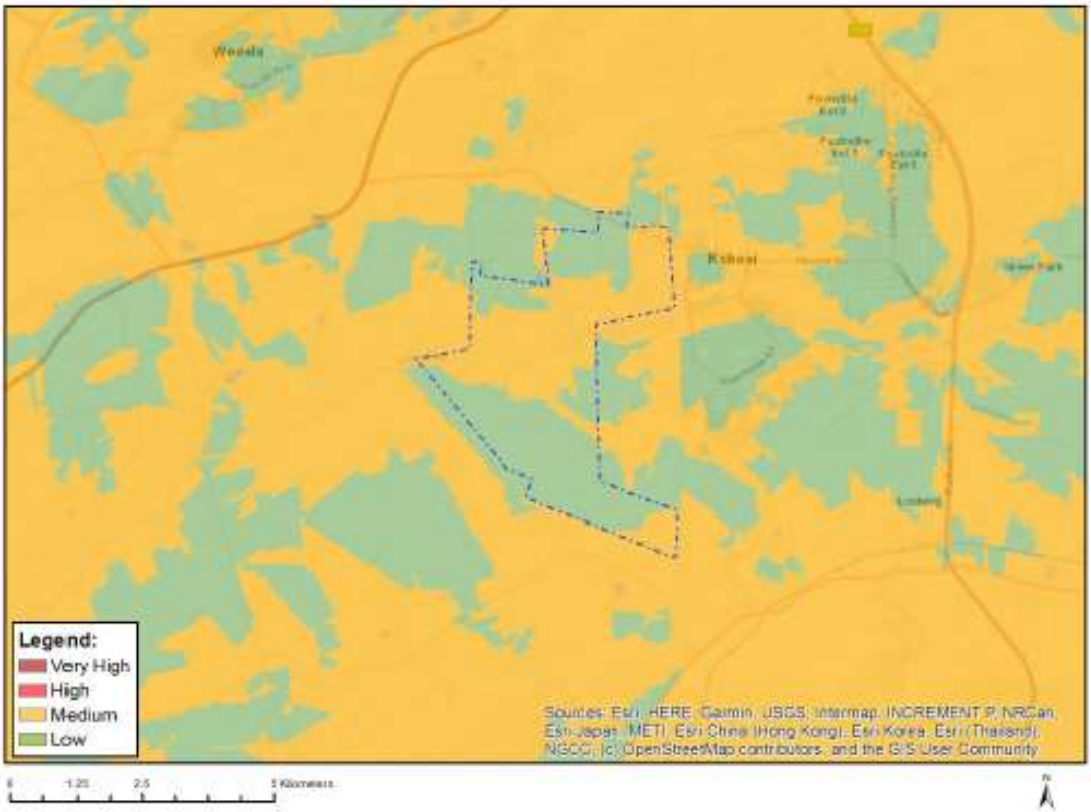
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Aves-Tyto capensis
Medium	Aves-Hydroprogne caspia
Medium	Insecta-Lepidochrysops praeterita
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Invertebrate-Clonia uvarovi

Figure 2: Animal species theme sensitivity according to the Screening Tool

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



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Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		x	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	Sensitive species 691
Medium	Sensitive species 1248

Figure 3: Plant species theme sensitivity according to the Screening Tool

A site sensitivity verification was therefore conducted to determine if the assessment was accurate and if the studies recommended should be conducted. After the site visit the following was concluded:

- The site rather has a Medium sensitivity from a terrestrial biodiversity perspective. Although the area is in the vulnerable Rand Highland Grassland vegetation unit, most of the project area is disturbed by agricultural fields or overgrazing. None of the vegetation in the proposed development area is in a pristine or near natural condition. The species diversity in the grassland is relatively high, which does not imply that the sensitivity is also high.
- The site has a Medium Sensitivity from an Animal Species Theme Perspective due to the presence of fauna habitats. The Near Threatened Cape Clawless Otter is present in the project area and other SCCs may be present, although unlikely.
- The site has a Medium-High Sensitivity from a Plant Species Theme Perspective. The species diversity in the grassland is relatively high. Two plant species of conservation concern was recorded, namely *Kniphofia typhoides*, which is Near Threatened and *Crinum bulbispermum* which is in the Declining category. Seven endemic plant species were recorded.

2.5 VEGETATION

South Africa has been recognized as having remarkable plant diversity with high levels of endemism. South Africa hosts a wide range of ecosystems, including nine biomes, namely the Fynbos, Succulent Karoo, Desert, Nama-Karoo, Grassland, Savanna, Albany Thicket, Indian Ocean Coastal Belt and Forest Biomes (Mucina & Rutherford, 2006). The project area is situated in the Grassland biome (Mucina & Rutherford, 2006), which is characterised by herbaceous vegetation of relatively short and simple structure that is dominated by graminoids, usually of the family Poaceae. Woody plants are rare (usually low to medium-sized shrubs) or absent or are confined to specific habitats, such as smaller escarpments or koppies. Core grassland areas usually have deep, fertile soils although a wide spectrum of soil types occurs. Precipitation is strongly seasonal, and the growing season lasts approximately half the year (Mucina & Rutherford, 2006).

The project area overlaps the Rand Highland Grassland vegetation units (Mucina *et al.*, 2018). The Rand Highland Grassland vegetation unit is described as a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland

on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the family Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Senegalia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* (especially *S.* magalismonata) is most prominent. The conservation status of this vegetation unit is Vulnerable. The National Biodiversity Assessment lists it as **Vulnerable** and the protection level is Poorly protected (SANBI, 2018).

2.6 SENSITIVITY ANALYSIS AND CONSERVATION ANALYSIS TOOLS

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based on much finer scale data can be used to ground truth the larger scale assessments and put it into a more localised context.

2.6.1 Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas (CBA) are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Ecological Support Areas (ESA) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

The primary purpose of a map of Critical Biodiversity Areas and Ecological Support Areas is to guide decision-making about where best to locate development. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes (SANBI Biodiversity Advisor, 2017).

Most of the project area has been disturbed by crop production and is completely disturbed. Some sections are however less disturbed and were classified as CBA or ESA (Figure 4) (GDARD, 2011).

2.6.2 Important Bird Areas (Key Biodiversity Areas)

Important Bird Areas (IBAs) are sites of global significance for bird conservation (Marnewick et al., 2015). The project area is not located in or close to an Important Bird Area.

2.6.3 Protected Areas (PA) and National Protected Area Expansion Strategy (NPAES)

Officially protected areas, either Provincially or Nationally that occur close to a project site could have consequences as far as impacts on these areas are concerned. The National Protected Area Expansion Strategy (NPAES) sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion.

The project area is not located in or close to a National Protected Area. The closest protected area is the Tweefontein Private Nature Reserve, which is approximately 20km south-east of the project area (Government of South Africa, 2010). The project area is not inside or close to a NPAES, the closest one is the Vaal Grasslands NPAES, which is approximately 10km west of the project area (Figure 5).

2.6.4 Nationally threatened ecosystems

The Biodiversity Act (Act 10 of 2004) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value.

The current (first) phase of listing deals with threatened ecosystems in the terrestrial environment. The ecosystems listed in the current phase make up 9.5% of the country, with

critically endangered and endangered ecosystems together accounting for 2.7% and vulnerable ecosystems a further 6.8%. The mapping of terrestrial ecosystems was based on the South African vegetation map, national forest types recognized by DWAF, priority areas identified in a provincial systematic biodiversity plan, or high irreplaceability forest patches or clusters systematic identified by DWAF (SANBI, 2011).

The project area overlaps the Vulnerable Rand Highveld Grassland vegetation unit, (SANBI, 2011; SANBI, 2018) (Figure 6).

2.7 Quaternary Catchments and Associated Watercourses

The study site falls within the C23J Quaternary Catchment and forms part of the Upper Vaal Water Management Area (WMA). The major rivers in the Upper Vaal WMA are the Wilge, Liebenbergsvlei and Vaal Rivers.

2.8 National Freshwater Ecosystem Priority Areas (NFEPAs) and National Wetland Map 5

South Africa's freshwater ecosystems are diverse, ranging from sub-tropical in the north-eastern part of the country, to semi-arid and arid in the interior, to the cool and temperate rivers of the fynbos. "Freshwater ecosystems" refer to all inland water bodies whether fresh or saline, including rivers, lakes, wetlands, sub-surface waters and estuaries. Consistent with global trends, high levels of threat have been reported for freshwater ecosystems. According to the National Biodiversity Assessment 2018 nearly 80% of inland wetland ecosystem types in South Africa are threatened and approximately 75% of inland wetland ecosystem types are both threatened and under-protected (SANBI, 2019). South Africa's freshwater fauna also displays high levels of threat: at least one third of freshwater fish indigenous to South Africa are reported as threatened, and a recent southern African study on the conservation status of major freshwater-dependent taxonomic groups (fishes, molluscs, dragonflies, crabs and vascular plants) reported far higher levels of threat in South Africa than in the rest of the region.

Urgent attention is needed to ensure that we conserve some representative natural examples of the different ecosystems that make up the natural heritage of this country for current and future generations. NFEPA responds to this need, providing strategic spatial priorities for

conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources (Driver *et al.*, 2011)

The National Wetland Map version 5 (NWM5) shows the distribution of inland wetland ecosystem types across South Africa and includes estuaries and the extent of some rivers (CSIR, 2018).

There are two NFEPA rivers, one NFEPA wetland and several NWM5 wetlands (Figure 7).

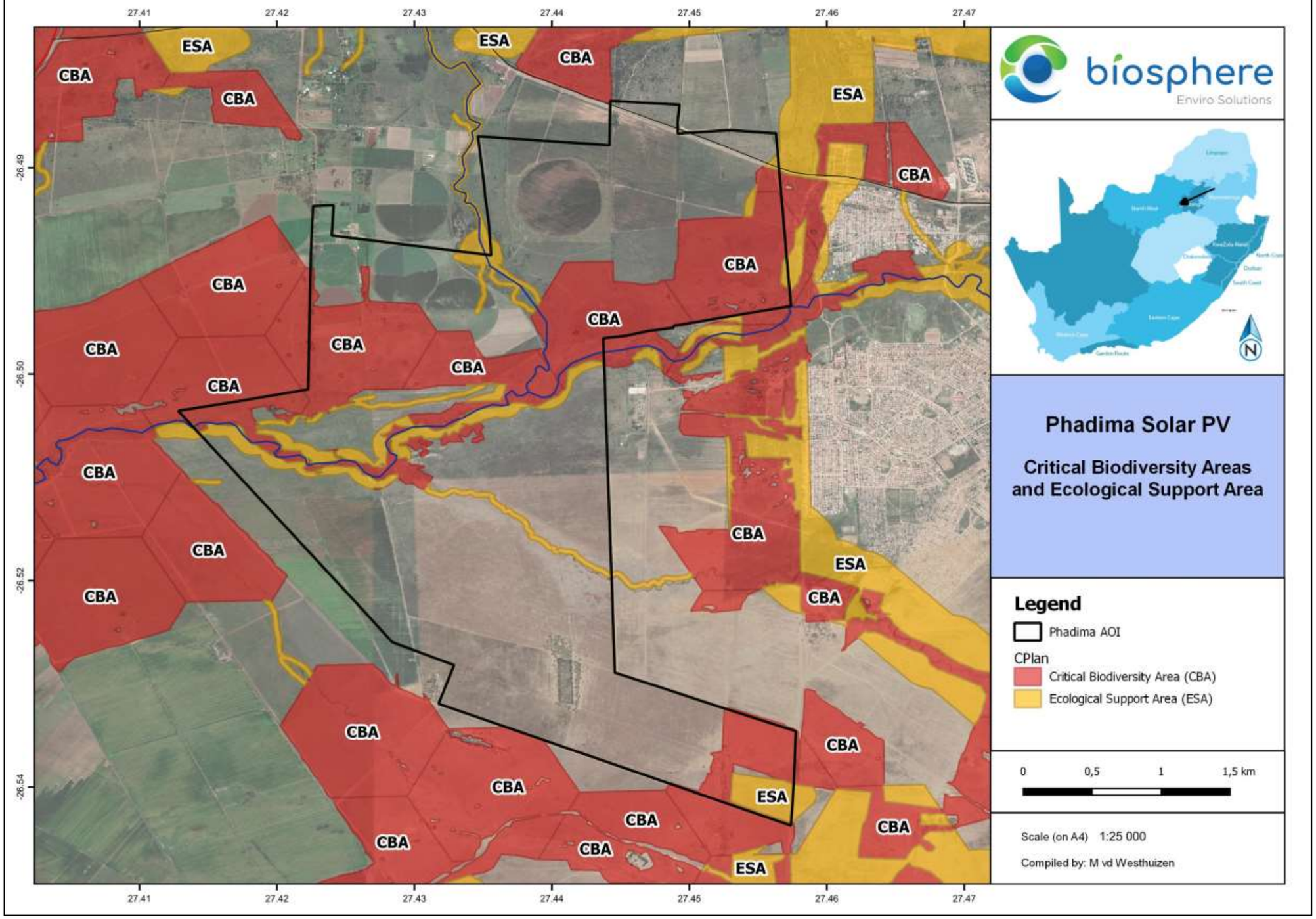

Figure 4: Critical Biodiversity Areas and Ecological Support Areas (GDARD, 2011)

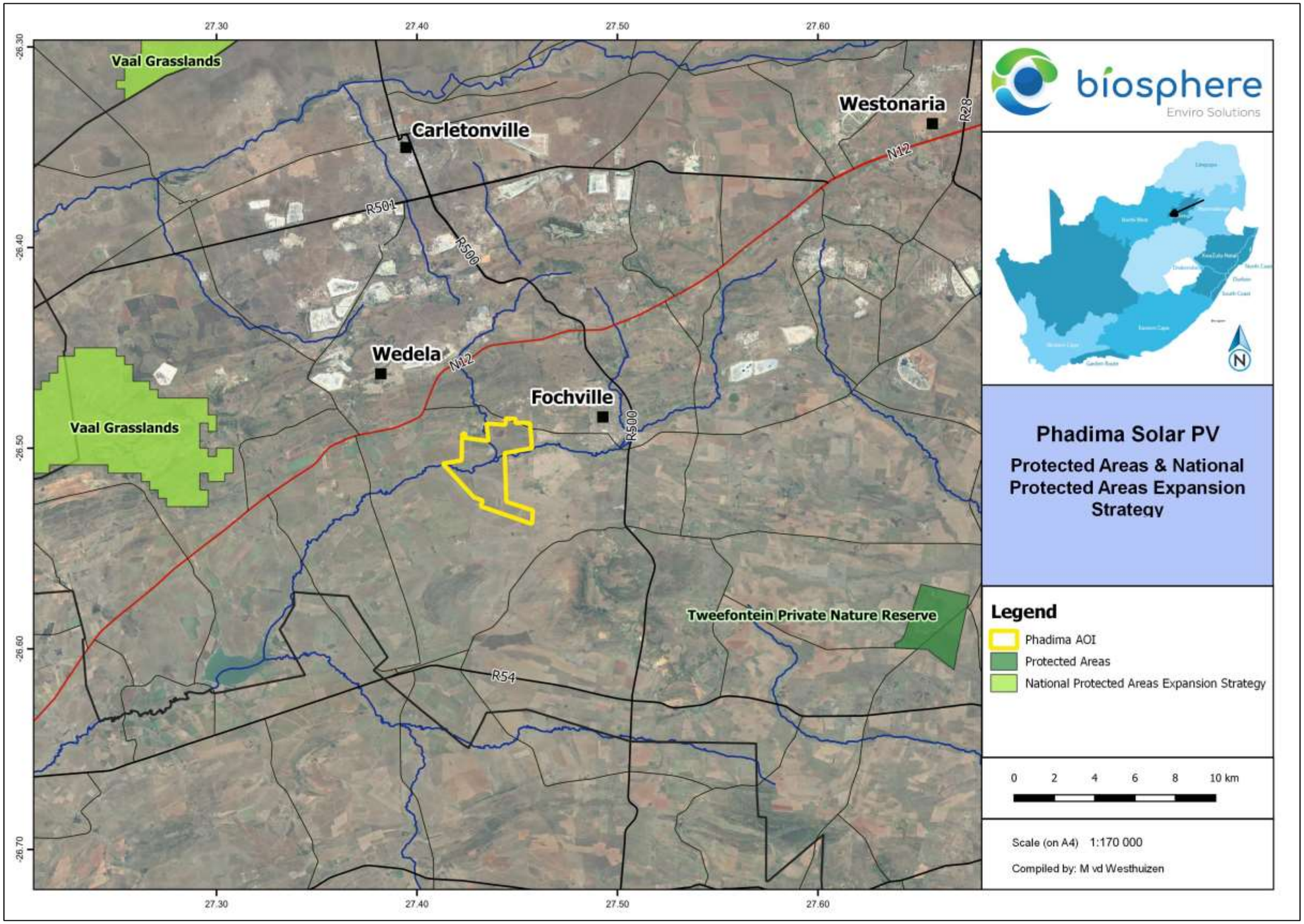

Figure 5: Protected Areas and Protected Areas Expansion Strategy areas

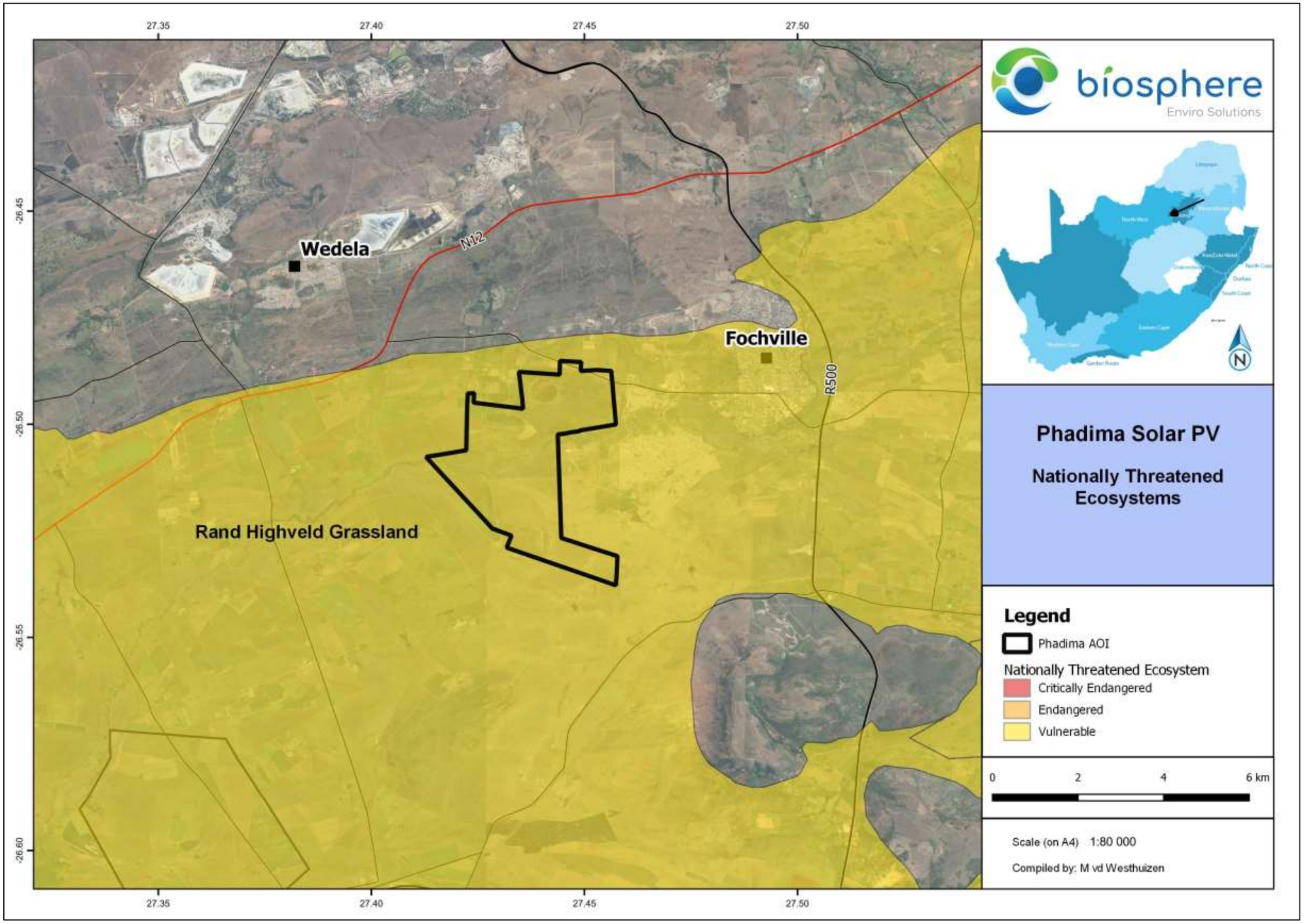

Figure 6: Nationally Threatened Ecosystems

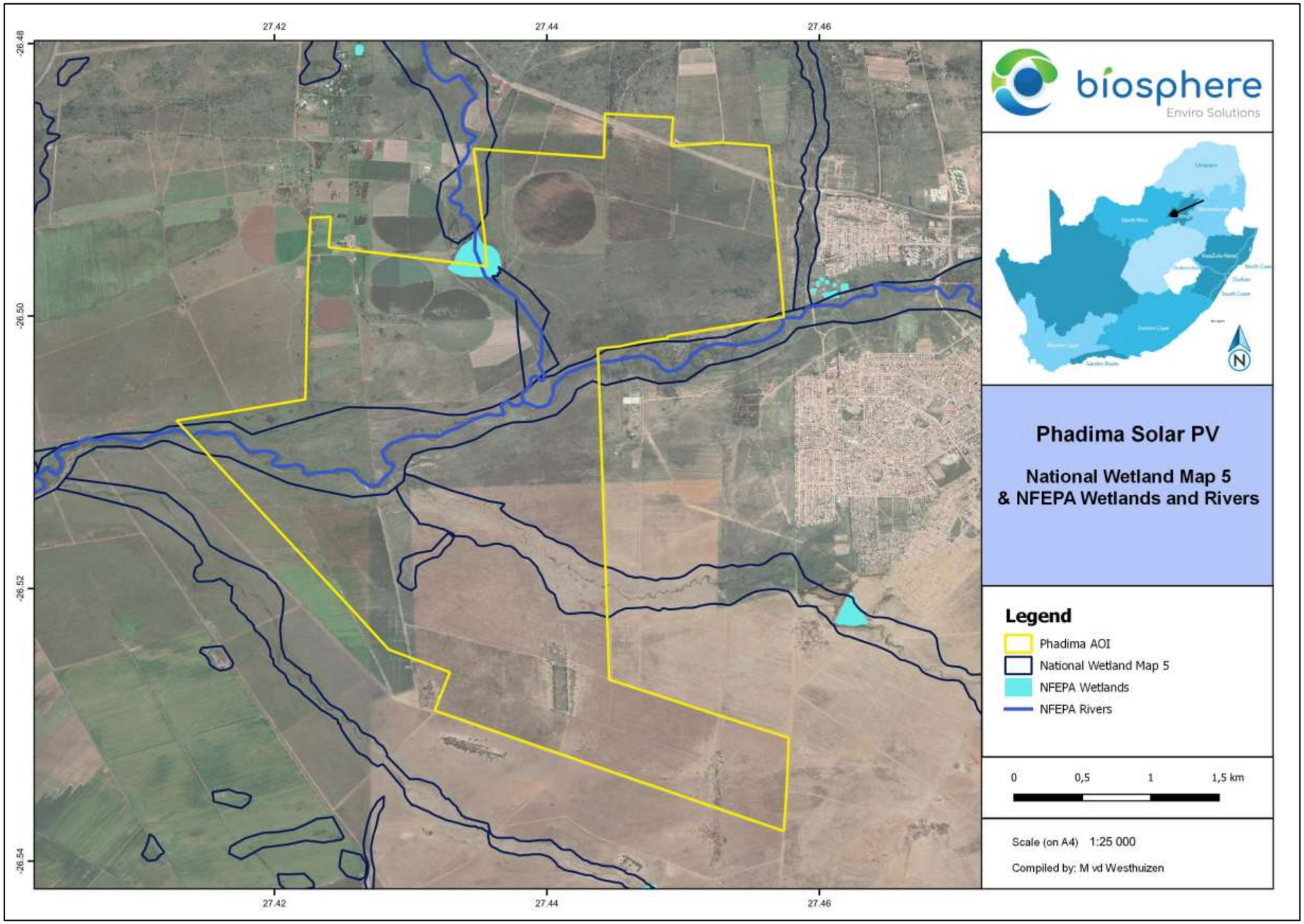

Figure 7: National Freshwater Ecosystem Priority Areas (NFEPAs) and National Wetland Map 5

3 METHODS

3.1 BASIC ENVIRONMENT SURVEY

A desktop survey was completed to determine whether the project area is located in any sensitive areas, like Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA), National Freshwater Ecosystem Priority Areas (NFEPAs), Important Bird Areas (IBA), Nationally Threatened Ecosystems etc. Climate, soil, geology and vegetation were also discussed for the project area.

3.2 FLORA SURVEY

A desktop study was completed to find out into which vegetation type, according to Mucina and Rutherford (2006), the project area falls. A field survey was completed on 20 - 22 March 2023, during which vegetation was surveyed.

A search for any Species of Conservation Concern (SCC) was also conducted as listed in the EIA screening tool.

Vegetation was described in terms of dominant and protected species and environmental factors (such as soil type and land use). A list of plant species was compiled for the project area. The red list category, endemism and invasive category are given for each species recorded.

3.3 FAUNA SURVEY

A desktop survey was completed to determine which fauna species of conservation concern may be found in the area, according to the Virtual Museum. Habitat types were identified during the field surveys and described. It could then be seen whether there is the suitable habitat type for species that might be present in the area according to their distribution.

3.4 SENSITIVITY ANALYSIS AND ZONING

The ecological sensitivity of any piece of land is based on its inherent ecosystem service and overall preservation of biodiversity. The project area's sensitivity will be determined, considering the following factors:

Ecological function

The ecological function relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one

another are perceived to be more sensitive and will be those contributing to ecosystem service (e.g. wetlands) or overall preservation of biodiversity.

Conservation importance

Conservation importance relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation.

Sensitivity scale

High – sensitive ecosystem with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems or with high species diversity and usually provide suitable habitat for a number of threatened or rare species. These areas should be protected.

Medium – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems or ecosystems with intermediate levels of species diversity but may include potential ephemeral habitat for threatened species; and

Low – Degraded and highly disturbed / transformed systems with little ecological function and are generally very poor in species diversity.

3.5 IDENTIFICATION OF IMPACTS

Potential impacts were identified and described. Gaps in knowledge were also identified.

4 RESULTS

4.1 VEGETATION UNITS

The project area can be divided into the following vegetation / land use units:

1) *Themeda triandra - Eragrostis chloromelas* grassland;
2) *Helichrysum nudifolium - Hilliardiella oligocephala* grassland;
3) *Seriphium plumosum - Pseudognaphaleum luteo-album* grassland;
4) *Eragrostis chloromelas - Ipomoea ommanneyi* rocky grassland
5) *Asparagus laricinus - Hyparrhenia tamba* shrubland
6) *Vachellia karroo – Eragrostis chloromelas* woodland;
7) *Senegalia hereroensis - Diospyros lycioides* woodland
8) Wetlands;
9) *Eucalyptus camaldulensis* plantation;
10) Cultivated crops;
11) Old cultivated land;
12) Buildings and gardens.

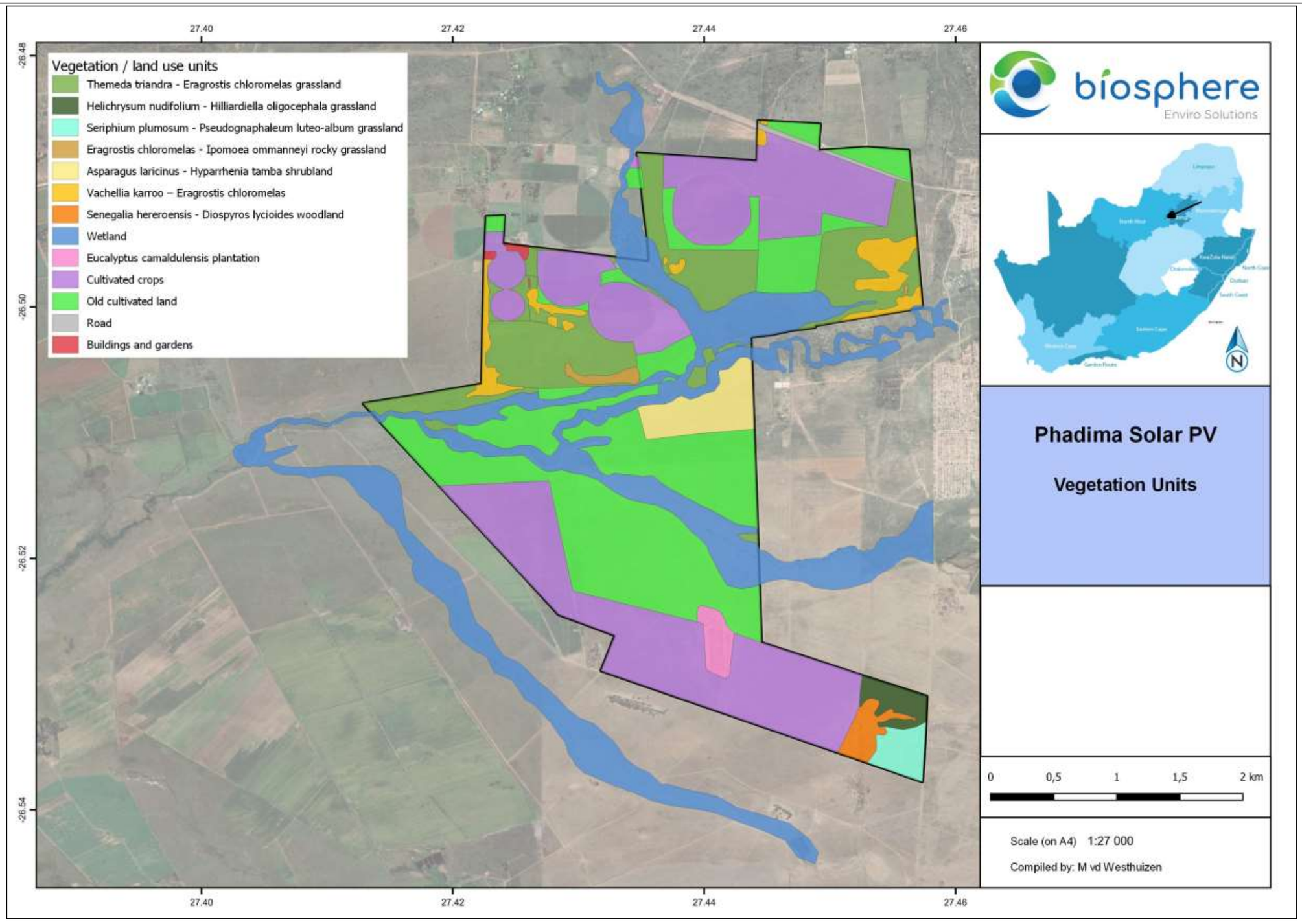

Figure 8: Vegetation units

4.1.1 *Themeda triandra - Eragrostis chloromelas* grassland

This vegetation unit occurs on sandy plains. It was used for crop production many years ago and is therefore disturbed. Currently it is used for cattle grazing. The vegetation unit consists mostly of grasses and forbs with scattered bush clumps. The plant species diversity is relatively high. Most of this vegetation unit is in a CBA2, but it is quite disturbed or transformed.

Dominant grasses include *Themeda triandra, Eragrostis chloromelas, Setaria sphacelata*, and *Brachiaria serrata*, the forbs *Hilliardiella oligocephala, Ipomoea ommanneyi, Hermannia depressa* and *Conyza bonariensis* and the shrub *Seriphium plumosa*. Bush clumps consist of *Vachellia karroo, Ziziphus mucronata, Searsia pyroides* and *Asparagus laricinus*. No protected plant species or protected tree species were recorded in this vegetation unit. Three endemic species were recorded namely *Helichrysum cymosum* subsp. *cymosum, Hermannia transvaalensis* and *Sida spinosa*. The state of the vegetation is indicated in Figure 9, while the characteristics of this vegetation unit are summarised in Table 2.

Table 2. Botanical analysis and characteristics of *Themeda triandra – Eragrostis chloromelas* grassland

State of the vegetation:	Very disturbed
Need for rehabilitation	Low
Conservation priority	Low
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 5 % (avg. height: 2,5m)
Density of herbaceous layer	Grasses: 50% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Medium
Dominant plant species	*Themeda triandra, Eragrostis chloromelas, Setaria sphacelata, Brachiaria serrata, Hilliardiella oligocephala, Ipomoea ommanneyi, Hermannia depressa, Conyza bonariensis, Seriphium plumosa, Vachellia karroo, Ziziphus mucronata, Searsia pyroides* and *Asparagus laricinus*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium sensitivity due to the fact that it has a high species diversity and three endemic species were recorded. It further represents the Vulnerable

Rand Highveld Grassland vegetation unit. It is also in a Critical Biodiversity Unit 2 (CBA), but is very disturbed with many alien invasive plant species.

Figure 9. State of the *Themeda triandra– Eragrostis chloromelas* grassland

4.1.2 *Helichrysum nudifolium - Hilliardiella oligocephala* grassland

This vegetation unit occurs on sandy plains. It has not been used for crop production in the past and is therefore in a better condition than the *Themeda triandra– Eragrostis chloromelas* grassland. It has however been disturbed to some extent by overgrazing. It is currently used for cattle grazing. The vegetation unit consists mostly of grasses and forbs. The plant species diversity is relatively high. This vegetation unit is in a CBA2, but it is moderately disturbed.

Dominant plant species include the grasses *Themeda triandra, Eragrostis chloromelas, Trachypogon spicatus*, and *Eragrostis gummiflua*, the forbs Helichrysum nudifolium, *Hilliardiella oligocephala, Monsonia angustifolia* and *Pseudognaphaleum luteo-album* and the shrub *Seriphium plumosa*. No protected plant species or protected tree species were recorded in this vegetation unit. Three endemic species were recorded namely *Helichrysum cymosum* subsp.

cymosum, Hermannia transvaalensis and *Sida spinosa*. One orchid was recorded in this unit, but the species is unknown, as it was not in flower. The state of the vegetation is indicated in Figure 10, while the characteristics of this vegetation unit are summarised in Table 3.

Table 3. Botanical analysis and characteristics of *Helichrysum nudifolium - Hilliardiella oligocephala* grassland

State of the vegetation:	Somewhat disturbed
Need for rehabilitation	Low
Conservation priority	Medium
Soils & Geology	Sandy soil
Density of herbaceous layer	Grasses: 60% (avg. height: 0,6m) Forbs: 40% (avg. height: 0,6m)
Sensitivity	Medium-High
Dominant plant species	*Themeda triandra, Eragrostis chloromelas, Trachypogon spicatus, Eragrostis gummiflua, Helichrysum nudifolium, Hilliardiella oligocephala, Monsonia angustifolia, Pseudognaphaleum luteo-album, Seriphium plumosa*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium-High sensitivity due to the fact that it has a high species diversity and three endemic species were recorded. It further represents the Vulnerable Rand Highveld Grassland vegetation unit. It is also in a CBA2.

Figure 10. State of the *Helichrysum nudifolium - Hilliardiella oligocephala* grassland

4.1.3 *Seriphium plumosum - Pseudognaphaleum luteo-album* grassland

This vegetation unit occurs in rocky soils. It is very disturbed and dominated by *Seriphium plumosum* (Bankrupt bush), which is an indication of disturbance. The current land use is cattle grazing. The vegetation unit consists mostly of grasses, forbs, and small shrubs. The plant species diversity is moderately high. Most of this vegetation unit is in an ESA.

Dominant grasses include *Themeda triandra, Andropogon schirensis*, and *Triraphis andropogonoides*, the forbs *Pseudognaphaleum luteo-album*, *Conyza bonariensis*, *Hilliardiella oligocephala, Hermannia depressa* and *Nidorella anomala* and the shrub *Seriphium plumosa*. No protected plant species or protected tree species were recorded in this vegetation unit. Two endemic species were recorded namely *Helichrysum cymosum* subsp. *cymosum* and *Hermannia transvaalensis*. The state of the vegetation is indicated in Figure 9, while the characteristics of this vegetation unit are summarised in Table 4.

Table 4. Botanical analysis and characteristics of *Seriphium plumosum - Pseudognaphaleum luteo-album* grassland

State of the vegetation:	Very disturbed
Need for rehabilitation	Low
Conservation priority	Low
Soils & Geology	Sandy soil with some rocks
Density of woody layer	Shrubs: 30 % (avg. height: 0,5m)
Density of herbaceous layer	Grasses: 35% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Low
Dominant plant species	*Themeda triandra, Andropogon schirensis,, Triraphis andropogonoides, Pseudognaphaleum luteo-album, Conyza bonariensis, Hilliardiella oligocephala, Hermannia depressa, Nidorella anomala* and *Seriphium plumosa*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Low sensitivity due to the fact that it is very disturbed and encroached with *Seriphium plumosa*. It represents the Vulnerable Rand Highveld Grassland vegetation unit and is in an Ecological Support Area (ESA).

Figure 11. State of the *Themeda triandra– Eragrostis chloromelas* grassland

4.1.4 *Eragrostis chloromelas - Ipomoea ommanneyi* rocky grassland

This vegetation unit occurs in rocky areas within the grassland. It is disturbed by overgrazing and there are many weedy species and alien invasive plant species. Currently it is used for cattle grazing. The vegetation unit consists mostly of grasses and forbs with some small shrubs. The plant species diversity is relatively high. This vegetation unit is in a Critical Biodiversity Area (CBA2), but it is quite disturbed.

Dominant grasses include *Eragrostis chloromelas, Eragrostis gummiflua*, and *Melinis repens*, the forbs *Polydora poskeana*, *Bidens pilosa*, *Hermannia transvaalensis, Ipomoea ommanneyi, Ledebouria revoluta* and *Conyza bonariensis* and the shrub *Diospyros lycioides*. No protected plant species or protected tree species were recorded in this vegetation unit. Two endemic species were recorded namely, *Hermannia transvaalensis* and *Searsia rigida* var. *rigida*. The state of the vegetation is indicated in Figure 12, while the characteristics of this vegetation unit are summarised in Table 5.

Table 5. Botanical analysis and characteristics of *Eragrostis chloromelas - Ipomoea ommanneyi* rocky grassland

State of the vegetation:	Moderately disturbed
Need for rehabilitation	Low
Conservation priority	Medium
Soils & Geology	Sandy rocky soil
Density of woody layer	Shrubs and trees: 10% (avg. height: 1,5m)
Density of herbaceous layer	Grasses: 40% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,3m)
Sensitivity	Medium-High
Dominant plant species	*Eragrostis chloromelas, Eragrostis gummiflua, Melinis repens, Polydora poskeana, Bidens pilosa, Hermannia transvaalensis, Ipomoea ommanneyi, Ledebouria revolute, Conyza bonariensis, Diospyros lycioides.*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium-High sensitivity due to the fact that it has a high species diversity with several geophyte species. It further represents the Vulnerable Rand Highveld Grassland vegetation unit. It is also in a CBA, but is moderately disturbed.

Figure 12. State of the *Eragrostis chloromelas - Ipomoea ommanneyi* rocky grassland

4.1.5 *Asparagus laricinus - Hyparrhenia tamba* shrubland

This vegetation unit occurs next to the Loopspruit. It is very disturbed and dominated by *Asparagus laricinus*. The current land use is cattle grazing. The vegetation unit consists mostly of grasses, forbs, and shrubs. The plant species diversity is low. A small section of this vegetation unit is in an ESA, while the majority of this unit is not in a CBA or ESA.

Dominant grasses include *Hyparrhenia tamba*, *Themeda triandra* and *Hypharrhenia hirta*, the forbs *Conyza podocephala*, *Chamaecrista mimosoides*, *Verbena bonariensis* and *Gomphocarpus fruticosus* and the shrub *Asparagus laricinus*. No protected plant species or protected tree species were recorded in this vegetation unit. One endemic species were recorded namely *Hermannia transvaalensis*. The state of the vegetation is indicated in Figure 13, while the characteristics of this vegetation unit are summarised in Table 6.

Table 6. Botanical analysis and characteristics of *Asparagus laricinus* - *Hyparrhenia tamba* shrubland

State of the vegetation:	Disturbed
Need for rehabilitation	Low
Conservation priority	Low
Soils & Geology	Clay soil
Density of woody layer	Shrubs: 40 % (avg. height: 1,5m)
Density of herbaceous layer	Grasses: 35% (avg. height: 0,6m) Forbs: 20% (avg. height: 0,5m)
Sensitivity	Low
Dominant plant species	*include Hyparrhenia tamba, Themeda triandra, Hypharrhenia hirta, Conyza podocephala, Chamaecrista mimosoides, Verbena bonariensis, Gomphocarpus fruticosus* and *Asparagus laricinus*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Low sensitivity due to the fact that it is very disturbed and encroached with *Asparagus laricinus*. It represents the Vulnerable Rand Highveld Grassland vegetation unit but is far from its natural state.

Figure 13: State of the *Asparagus laricinus - Hyparrhenia tamba shrubland*

4.1.6 *Vachellia karroo – Eragrostis chloromelas* woodland

This vegetation unit occurs in patches in the grassland. Currently it is used for cattle grazing. The vegetation is dominated by trees, mainly *Vachellia karroo* (Sweet thorn), but also *Searsia pyroides* and *Searsia lancea.* Dominant grasses include *Eragrostis chloromelas, Melinis repens, Urochloa mosambicensis* and *Eragrostis gummiflua.* Dominant forbs include alien weedy species such as *Pseudognaphaleum luteo-album, Conyza bonariensis, Bidens pilosa* and some indigenous forbs such as *Anthospermum rigidum, Felicia muricata* and *Hermannia depressa.*

No protected plant species or protected tree species were recorded in this vegetation unit. Two endemic species were recorded namely*, Hermannia transvaalensis* and *Sida spinosa*. The state of the vegetation is indicated in Figure 14 while the characteristics of this vegetation unit are summarised in Table 7.

Table 7: Botanical analysis and characteristics of *Vachellia karroo – Eragrostis chloromelas* woodland

State of the vegetation:	Very disturbed
Need for rehabilitation	Low
Conservation priority	Low
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 50 % (avg. height: 2,5m)
Density of herbaceous layer	Grasses: 40% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Low
Dominant plant species	*Vachellia karroo, Searsia pyroides, Searsia lancea, Eragrostis chloromelas, Melinis repens, Urochloa mosambicensis, Eragrostis gummiflua, Pseudognaphaleum luteo-album, Conyza bonariensis, Bidens pilosa, Anthospermum rigidum, Felicia muricata and Hermannia depressa.*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Low sensitivity due to the fact that it very disturbed. Two endemic species were recorded. It further represents the Vulnerable Rand Highveld Grassland vegetation unit. It is also in a Critical Biodiversity Unit (CBA2), but is very disturbed with many alien invasive plant species.

Figure 14. State of the *Vachellia karroo – Eragrostis chloromelas* woodland

4.1.7 *Senegalia hereroensis - Diospyros lycioides* woodland

This vegetation unit occurs in patches in the grassland in the southern part of the project area. It is on a hill, on rocky soil. Currently it is used for cattle grazing. The vegetation is dominated by trees, mainly *Senegalia hereroensis*, but also *Celtis africana* and the shrub *Diospyros lycioides*. Dominant grasses include *Urochloa mosambicensis, Melinis repens, Aristida congesta* and *Hypharrhenia hirta.* Dominant forbs include alien weedy species such as *Pseudognaphaleum luteo-album, Conyza bonariensis, Bidens pilosa* and some indigenous forbs such as *Nidorella anomala* and *Chamaecrista mimosoides* and the climber *Pentarrhinum insipidum.*

No protected plant species or protected tree species were recorded in this vegetation unit. The state of the vegetation is indicated in Figure 15 while the characteristics of this vegetation unit are summarised in Table 8.

Table 8: Botanical analysis and characteristics of *Senegalia hereroensis - Diospyros lycioides* woodland

State of the vegetation:	Moderately disturbed
Need for rehabilitation	Low
Conservation priority	Medium
Soils & Geology	Rocky soil
Density of woody layer	Shrubs and trees: 50 % (avg. height: 3m)
Density of herbaceous layer	Grasses: 40% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Medium
Dominant plant species	*Senegalia hereroensis, Celtis Africana, Diospyros lycioides, Urochloa mosambicensis, Melinis repens, Aristida congesta, Hypharrhenia hirta, Pseudognaphaleum luteo-album, Conyza bonariensis, Bidens pilosa, Nidorella anomala, Chamaecrista mimosoides, Pentarrhinum insipidum.*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium sensitivity due to the fact that it is an important habitat type with a high biodiversity. It represents the Vulnerable Rand Highveld Grassland vegetation unit. It is also in a Critical Biodiversity Unit (CBA2), but is quite disturbed.

Figure 15. State of the *Senegalia hereroensis - Diospyros lycioides* woodland

4.1.8 Wetlands

The wetlands in the project area are mostly found on valley bottoms. Most of the wetlands in the project area are channelled valley bottom wetlands. Some smaller sections are classified as unchannelled valley bottom wetlands and one is a depression wetland (artificial dam). The soil is clayey and the current land use is cattle grazing.

The vegetation associated with these wetlands is dominated by grasses and reeds. *Phragmites australis* and *Typha capensis* are the dominant reed species present and grass species include *Cynodon dactylon, Paspalum dilatatum, Panicum schinzii* and *Setaria sphacelata* var*. sericea*. Sedges include *Cyperus congestus, Cyperus esculenthus* and *Schoenoplectus brachyceras*. Forbs include *Persicaria decipiens, Berula erecta, Lobelia thermalis, Ranunculus multifidus* and *Oenothera rosea*.

Two plant species of conservation concern were recorded in the wetlands, namely *Kniphofia typhoides* (Near Threatened) and *Crinum bulbispermum* (Declining). *Kniphofia typhoides* is also endemic to South Africa. No other endemic species were recorded in the wetlands. No protected

trees were recorded. The state of the vegetation is indicated in Figure 16 while the characteristics of the variations of this vegetation unit are summarised in Table 9.

Table 9. Botanical analysis and characteristics the wetlands

State of the vegetation:	Moderately disturbed
Conservation priority	High
Soils & Geology	Clayey soil
Density of woody layer	Trees and Shrubs: 10 % (avg. height: 2m)
Density of herbaceous layer	Grasses and sedges: 45% (avg. height: 1m) Forbs: 20% (avg. height: 0,3m)
Sensitivity	High
Dominant plant species	*Phragmites australis, Typha capensis, Cynodon dactylon, Paspalum dilatatum, Panicum schinzii, Setaria sphacelata* var. *sericea, Cyperus congestus, Cyperus esculenthus, Schoenoplectus brachyceras, Persicaria decipiens, Berula erecta, Lobelia thermalis, Ranunculus multifidus* and *Oenothera rosea.*
Red data species	*Kniphofia typhoides* (Near Threatened) and *Crinum bulbispermum* (Declining)
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a High sensitivity due to its high connectivity, ecosystem services and important habitat types that it creates. It is moderately disturbed. It represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. Two plant species of conservation concern were recorded but no protected trees were recorded.

Figure 16. State of the wetlands

4.1.9 *Eucalyptus camaldulensis* plantation

Between the agricultural fields in the southern section of the project area there is a Eucalyptus camaldulensis (Red gum) plantation. *Eucalyptus camaldulensis* is a category 1b declared invader in the grassland biome. The plant species diversity is not very high in this vegetation unit. Other than *Eucalyptus camaldulensis*, dominant species include the grass *Themeda triandra* and the forbs *Bidens pilosa* and *Chamaecrista mimosoides* and the geophyte *Hypoxis hemerocallidea*. No protected plant species or protected tree species were recorded in this vegetation unit. The state of the vegetation is indicated in Figure 17 while the characteristics of this vegetation unit are summarised in Table 10.

Table 10: Botanical analysis and characteristics of the Eucalyptus camaldulensis woodland

State of the vegetation:	Very disturbed
Conservation priority	Low
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 50 % (avg. height: 8m)
Density of herbaceous layer	Grasses: 40% (avg. height: 0,8m) Forbs: 30% (avg. height: 0,5m)
Sensitivity	Low
Dominant plant species	*Eucalyptus camaldulensis, Cynodon dactylon, Eragrostis gummiflua, Aristida congesta, Asparagus laricinus, Bidens bipinnata and Polydora poskeana*
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Low sensitivity due to the fact that it is completely disturbed with a low species diversity.

Figure 17. State of the *Eucalyptus camaldulensis* plantation

4.1.10 Agricultural crops

There are several agricultural fields in the project area, planted with maize and *Digitaria eriantha*. There is very little indigenous vegetation left in these fields. The species diversity is very low and the sensitivity is also low.

4.1.11 Old agricultural field

Many sections of the project area were cultivated in the past. The natural vegetation has recovered to some extent in these areas, the species diversity is however still low, and the sensitivity is also low. Dominant species include the grasses *Hypharrhenia hirta, Sporobolus africanus* and *Urochloa mosambicensis,* and the forbs *Verbena bonariensis, Chamaecrista mimosoides, Cosmos bipinnatus* and the shrub *Seriphium plumosum*. See Figure 18

Figure 18. State of the Old cultivated lands

4.1.12 Buildings and gardens

This area has little indigenous vegetation and therefore the sensitivity is low.

4.2 PLANT SPECIES LEVEL ASSESSMENT

South Africa has been recognized as having remarkable plant diversity with high levels of endemism. The major threats to plants in the study area are urban expansion, non-sustainable harvesting, collecting, overgrazing/browsing, mining and agriculture. The objective of this section was to compile a list of all plant species, but also specifically for plant species of conservation concern. This included threatened, rare, declining, protected, and endemic species.

4.2.1 Species list

Find the species list for the project site below.

Table 11: Trees and shrubs

Trees and shrubs			
Scientific name	Common name	Exotic	Status
Agave americana	American Agave	Yes	Not evaluated
Asparagus laricinus	Wild asparagus	No	Least concern
Asparagus setaceus	Asparagus fern	No	Least concern
Celtis africana	White stinkwood	No	Least concern
Clematis brachiata	Traveller's joy	No	Least concern
Diospyros lycioides	Bluebush	No	Least concern
Elephantorrhiza elephantina	Elephant's Root	No	Least concern
Eucalyptus camaldulensis	Red gum	Yes	Declared invader 2
Melia azedarach	Syringa	Yes	Declared invader 1b
Opuntia ficus-indica	Prickly Pear	Yes	Declared invader 1b
Morus alba	White mulberry	Yes	Declared invader 3
Physalis angulata	Wild Gooseberry	Yes	Not evaluated
Prosopis glandulosa	Honey mesquite	Yes	Not evaluated
Salix babylonica	Weeping Willow	Yes	Not evaluated
Searsia lancea	Karree	No	Least concern
Searsia pyroides	Common wild currant	No	Least concern
Searsia rigida var. *rigida*	Witwatersrand Rock Currant	No	Least concern, SA Endemic
Senegalia hereroensis	Arid Hook-thorn	No	Least concern
Seriphium plumosum	Bankrupt bush, Slangbos	No	Least concern

Trees and shrubs			
Scientific name	Common name	Exotic	Status
Vachellia hebeclada subsp. *hebeclada*	Candle thorn	No	Least concern
Vachellia karroo	Sweet thorn	No	Least concern
Xysmalobium undulatum	Bitterhout	No	Least concern
Ziziphus zeyheriana	Dwarf buffalo-thorn	No	Least concern

Table 12: Grasses and sedges

Grasses and sedges			
Scientific name	Common name	Exotic	Status
Abildgaardia ovata		No	Least concern
Andropogon schirensis	Stab Grass	No	Least concern
Aristida congesta	Tassel three-awn	No	Least concern
Aristida diffusa	Iron grass	No	Least concern
Agrostis lachnantha var. *lachnantha*	Bent Grass	No	Least concern
Bulbostylis burchellii	Joang-ba-nokana (ss)	No	Least concern
Brachiaria eruciformis	Sweet signal grass	No	Least concern
Brachiaria serrata	Velvet signal grass	No	Least concern
Chloris virgata	Feather-top chloris	No	Least concern
Cymbopogon caesius	Broad-leaved turpentine grass	No	Least concern
Cynodon dactylon	Couch Grass	No	Least concern
Cyperus congestus		No	Least concern
Cyperus eragrostis		Yes	Not evaluated
Cyperus esculenthus	Yellow nutsedge	Yes	Not evaluated
Cyperus rotundus	Purple Nutsedge	No	Least concern
Dactyloctenium aegyptium	Common crowfoot	No	Least concern
Digitaria eriantha	Common finger grass	No	Least concern
Digitaria ternata	Black-seed Finger Grass	No	Least concern
Eleusine coracana	Goose grass	No	Least concern
Eragrostis biflora	Shade eragrostis	No	Least concern
Eragrostis chloromelas	Narrow curly leaf	No	Least concern
Eragrostis curvula	Weeping love grass	No	Least concern
Eragrostis gummiflua	Gum grass	No	Least concern
Eragrostis plana	Tough love grass	No	Least concern
Eragrostis racemosa	Narrow heart love grass	No	Least concern

Grasses and sedges			
Scientific name	Common name	Exotic	Status
Hypharrhenia hirta	Common thatching grass	No	Least concern
Hyparrhenia tamba	Blue thatching grass	No	Least concern
Imperata cylindrica	Cotton-wool Grass	No	Least concern
Leersia hexandra	Rice Grass	No	Least concern
Melinis repens	Natal red top	No	Least concern
Panicum schinzii	Vlei Panicum	No	Least concern
Paspalum dilatatum	Dallis grass	Yes	Not evaluated
Paspalum notatum	Bahai grass	Yes	Not evaluated
Phragmites australis	Common reed	No	Least concern
Pogonarthria squarrosa	Herringbone grass	No	Least concern
Schoenoplectus brachyceras		No	Least concern
Setaria sphacelata var. *sericea*	Golden bristle grass	No	Least concern
Setaria sphacelata var. *sphacelata*	Common bristle grass	No	Least concern
Setaria sphacelata var. *torta*	Creeping bristle grass	No	Least concern
Setaria verticillata	Bur bristle grass	No	Least concern
Sporobolus africanus	Ratstail dropseed	No	Least concern
Themeda triandra	Red grass	No	Least concern
Trachypogon spicatus	Giant spear grass	No	Least concern
Tragus berteronianus	Spiked Carrot-seed Grass	No	Least concern
Triraphis andropogonoides	Broom needle grass	No	Least concern
Typha capensis	Bulrush	No	Least concern
Urochloa mosambicensis	Bushveld signal grass	No	Least concern

Table 13: Forbs

Forbs			
Scientific name	Common name	Exotic	Status
Acalypha angustata	Copper leaf	No	Least concern
Achyranthes aspera	Chaff flower	Yes	Not evaluated
Ajuga ophrydis	Bugle Plant	No	Least concern
Alectra sessiliflora	Verfblommetjie	No	Least concern
Aloe greatheadii	Spotted aloe	No	Least concern
Alternanthera sessilis	Sessile Joyweed	Yes	Not evaluated
Amaranthus viridis	Slender amaranth	Yes	Not evaluated
Anthospermum rigidum	Umlomomnandomncane (z)	No	Least concern
Araujia sericifera	Moth catcher	Yes	Declared invader 1b

Forbs			
Scientific name	Common name	Exotic	Status
Barleria macrostegia		No	Least concern
Berkheya radula	Boesmansrietjie	No	Least concern
Berula erecta	Toothache Root	No	Least concern
Bidens pilosa	Common blackjack	Yes	Not evaluated
Blepharis maderaspatensis	Surprise Packet, Skietpitjie	No	Least concern
Brunsvigea sp.	Candelabra Flower		
Bulbine narcissifolia	Strap-leaved Bulbine	No	Least concern
Cestrum laevigatum	Inkberry	Yes	Declared invader 1b
Chamaecrista comosa		No	Least concern
Chamaecrista mimosoides	Fishbone dwarf cassia	No	Least concern
Chironia palustris subsp. transvaalensis	Transvaal Chironia	No	Least concern
Chlorophytum fasciculatum		No	Least concern
Chlorophytum trichophlebium		No	Least concern, SA endemic
Ciclospermum leptophyllum	Wild celery	Yes	Not evaluated
Cirsium vulgare	Scotch Thistle	Yes	Declared invader 1b
Commelina africana	Yellow wandering Jew	No	Least concern
Convolvulus sagittatus	Wild bindweed	No	Least concern
Conyza bonariensis	Flax-leaf fleabane	Yes	Not evaluated
Conyza podocephala	Bakbossie	No	Least concern
Corchorus asplenifolius	Gusha	No	Least concern
Cosmos bipinnatus	Cosmos	Yes	Not evaluated
Crabbea acaulis		No	Least concern
Crinum bulbispermum	Orange river lily	No	Declining
Crinum graminicola	Grass Crinum	No	Least concern
Cucumis zeyheri	Wild cucumber	No	Least concern
Cuscuta campestris	Dodder	Yes	Declared invader 1b
Datura ferox	Large thorn-apple	Yes	Declared invader 1b
Datura stramonium	Thorn apple	Yes	Declared invader 1b
Dianthus mooiensis	Frilly Carnation	No	Least concern
Dicoma anomala	Maagbitterwortel	No	Least concern
Dicoma macrocephala		No	Least concern
Euphorbia inaequilatera	Smooth creeping milkweed	No	Least concern
Exochaenium grande	Mipa (ss)	No	Least concern
Falkia oblonga		No	Least concern

Forbs			
Scientific name	Common name	Exotic	Status
Felicia muricata	Wild aster	No	Least concern
Flaveria bidentis	Smelter's bush	Yes	Declared invader 1b
Chironia palustris	Bitterwortel	No	Least concern
Gladiolus crassifolius	Thick-leaved Gladiolus	No	Least concern
Gomphocarpus fruticosus	Milkweed	No	Least concern
Gomphrena celocioides	Prostrate globe amaranth	Yes	Not evaluated
Haplocarpha scaposa	Common Haplocarpha	No	Least concern
Helichrysum caespititium	Speelwonderboom	No	Least concern
Helichrysum cymosum subsp. cymosum	Impepho (z)	No	Least concern, SA endemic
Helichrysum nudifolium	Hottentot's tea	No	Least concern
Helichrysum rugulosum	Marotole (ss)	No	Least concern
Hermannia coccocarpa	Moederkappie	No	Least concern
Hermannia depressa	Rooi-opslag	No	Least concern
Hermannia transvaalensis		No	Least concern, SA endemic
Hibiscus aethiopicus	Common Dwarf Wild Hibiscus	No	Least concern
Hibiscus microcarpus		No	Least concern
Hibiscus pusillus	Bladderweed	No	Least concern
Hibiscus trionum	Bladder weed	Yes	Not evaluated
Hilliardiella oligocephala	Bicoloured-leaved vernonia	No	Least concern
Hypoxis hemerocallidea	Star-flower, gifbol	No	Least concern
Indigofera daleoides		No	Least concern
Ipomoea crassipes	Wildepatata	No	Least concern
Ipomoea obscura	Wild Petunia	No	Least concern
Ipomoea ommanneyi	Ox Potato	No	Least concern
Ipomoea purpurea	Morning glory	Yes	Declared invader 1b
Jamesbrittenia aurantiaca	Cape saffron	No	Least concern
Kalanchoe rotundifolia	Nentabos, Plakkie	No	Least concern
Kniphofia typhoides	Bulrush Poker	No	Near Threatened, SA Endemic
Lactuca inermis	Iklabeklabe	No	Least concern
Lasiosiphon capitatus	Gifbossie / Kerriebossie	No	Least concern
Lasiosiphon sericocephalus		No	Least concern
Ledebouria ovatifolia subsp. ovatifolia	Icubudwana (z)	No	Least concern, SA Endemic

Forbs			
Scientific name	Common name	Exotic	Status
Ledebouria revoluta	Icubudwana (z)	No	Least concern
Leucas martinescens	Bobbin weed	No	Least concern
Lobelia thermalis		No	Least concern
Lotonotis calycina	Namele (ss)	No	Least concern
Marsilea sp.	Water Clover		
Merremia palmata		No	Least concern
Mimulus gracilis	Sehlapetsu (ss)	No	Least concern
Monsonia angustifolia	Crane's Bill	No	Least concern
Nidorella anomala	Mokoteli	No	Least concern
Oenothera rosea	Rose eveing primrose	Yes	Not evaluated
Osteospermum muricatum	Boegoebos	No	Least concern
Pavonia senegalensis		No	Least concern
Pellaea calomelanos	Hard Fern	No	Least concern
Pentarrhinum insipidum	African Heartvine	No	Least concern
Persicaria decipiens	Knotweed	No	Least concern
Plantago lanceolata	Buckhorn plantain	Yes	Not evaluated
Plectrantus madagascariensis	Ibozane (z)	No	Least concern
Polydora poskeana		No	Least concern
Polygala amatymbica	Dwarf Polygala	No	Least concern
Polygala hottentotta	Small purple broom	No	Least concern
Pseudognaphaleum luteo-album	Cud weed	Yes	Not evaluated
Ranunculus dregei	Bog Buttercup	No	Least concern
Ranunculus multifidus	Common Buttercup	No	Least concern
Raphionacme hirsuta	Khadi-root	No	Least concern
Rhynchosia minima		No	Least concern
Rhynchosia totta		No	Least concern
Rumex crispus	Curly Dock	Yes	Not evaluated
Scabiosa columbaria	Wild scabious	No	Least concern
Schkuria pinnata	Dwarf Mexican Marigold	Yes	Not evaluated
Selago densiflora		No	Least concern
Senecio consanguineus	Ragworth	No	Least concern
Senecio coronatus	Woolly Grassland Senecio	No	Least concern
Sida dregei	Spider-leg	No	Least concern
Sida spinosa	Spiny sida	No	Least concern, SA Endemic
Solanum mauritianum	Bugweed	Yes	Declared invader 1b

Forbs			
Scientific name	Common name	Exotic	Status
Solanum nigrum	Black nightshade	Yes	Not evaluated
Solanum panduriforme	Poison apple	No	Least concern
Striga asiatica	Mealie-witchweed	No	Least concern
Tagetes minuta	Tall khaki weed	Yes	Not evaluated
Taraxacum officinale	Dandelion	Yes	Not evaluated
Tephrosia lupinifolia	Plat-ertjie	No	Least concern
Teucrium trifidum	Akkedispoot	No	Least concern
Vahlia capensis subsp. vulgaris var. linearis		No	Least concern
Verbena bonariensis	Purple top	Yes	Declared invader 1b
Verbena officionalis	Verbain	Yes	Not evaluated
Vigna vexillata	Wild cowpea	No	Least concern
Wahlenbergia undulata	African Bluebell	No	Least concern
Xanthium strumarium	Large cocklebur	Yes	Declared invader 1b
Xysmalobium undulatum	Bitterhout	No	Least concern
Zinnia peruviana	Wild Zinnia	Yes	Not evaluated

4.3 PROTECTED PLANTS

Two nationally protected plants were recorded (NEMBA listed species, 2005). Both were recorded in the wetlands.

Table 14: Protected plants

Scientific name	Common name	Category
Crinum bulbispermum	Orange river lily	Declining
Kniphofia typhoides	Bulrush Poker	Near Threatened

A permit should be obtained from authorities should any of these plants be removed during the construction process. Development in the wetlands is not supported. Therefore, these species should not be affected.

Kniphofia typhiodes is an A3 Red data plant in Gauteng, which must have a buffer of 400m around the boundary of the population (GDARD, 2017).

Seven endemic species were recorded.

Table 15: Endemic species

Scientific name	Common name
Chlorophytum trichophlebium	
Helichrysum cymosum subsp. *cymosum*	Impepho (z)
Hermannia transvaalensis	
Kniphofia typhoides	Bulrush Poker
Ledebouria ovatifolia subsp. *ovatifolia*	Icubudwana (z)
Searsia rigida var. *rigida*	Witwatersrand Rock Currant
Sida spinosa	Spiny sida

Some of the geophytes (and other forbs) on site were not in flower during the site visit, complicating identification. Additional protected species may be present. One *Brunsvigia* sp., for example, was recorded. It may be protected, depending on the species, but the species cannot be determined as it was not in flower. It was however recorded in the rocky area, which should not be developed.

4.4 PROTECTED TREES

No protected tree species were recorded.

4.5 EIA SCREENING TOOL LISTED SPECIES (SCC)

The screening tool listed three plant Species of Conservation Concern (SCC) that may be present in the project area. All three are vulnerable. None of these species were recorded, but there is suitable habitat for two of them. It may be present in the *Vachellia karroo* and *Senegalia hereroensis* woodland, although unlikely.

4.6 DECLARED INVADERS

The following declared invaders were recorded in the project area and must be controlled:

Table 16: Alien Invasive Plant Species (NEMBA: Alien and invasive species lists, 2020)

Scientific name	Common name	Invader category
Araujia sericifera	Moth catcher	1b
Cestrum laevigatum	Inkberry	1b
Cirsium vulgare	Spear thistle, Scotch thistle	1b
Cuscuta campestris	Dodder	1b
Datura ferox	Large thorn apple	1b
Datura stramonium	Thorn apple	1b
Eucalyptus camaldulensis	Red gum	2
Flaveria bidentis	Smelter's bush	1b
Ipomoea purpurea	Morning glory	1b
Melia azedarach	Syringa	1b
Morus alba	White mulberry	3
Opuntia ficus-indica	Prickly Pear	1b
Solanum mauritianum	Bugweed	1b
Verbena bonariensis	Purple top	1b
Xanthium strumarium	Large cocklebur	1b

Category 1 plants are prohibited plants which must be controlled or eradicated. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment.

- Category 1a: Plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned
- Category 1b: Plants are widespread invasive species controlled by a management program.

Category 2 plants are invaders with certain useful qualities, such as commercial use or for woodlots, animal fodder, soil stabilisation, etc. These plants are allowed in demarcated areas under controlled conditions and in biocontrol reserves.

Category 3 plants are alien plants that are currently growing in, or have escaped from areas such as gardens, but that are proven invaders. No further planting is allowed (except with special permission), nor trade in propagative material. Existing plant may remain but must be prevented from spreading. Plants within the flood line and watercourses must be removed (Bromilow, 2010).

4.7 FAUNA IN AND AROUND THE PROJECT AREA

4.7.1 Fauna habitat types

The number of mammal species supported by a plant community depends on several factors like the primary production, seasonal availability of resources, floral heterogeneity, diversity of plant structure, nature of the substratum and previous history (Delany, 1982). Each mammal species has a particular niche, which can be regarded as the sum of all ecological requirements of a species namely food, space, shelter and physical conditions. Mills & Hes (1997) stated that the distribution and abundance of animal species does not rigorously follow that of plant communities or biomes. Instead, mammal species seem to have certain preferences for a specific habitat type (Skinner & Smithers, 1990).

A survey was conducted during March 2022 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid.

The following habitat types were identified:

- Indigenous disturbed grassland
- Woodland
- Wetlands
- Planted pastures *(Digitaria eriantha*)
- Agricultural field
- Old agricultural land

4.7.2 Fauna species of Conservation Concern

Species of conservation concern (SCC) are listed if they have been recorded in the relevant quarter degree grid on the Virtual Museum of Biodiversity and Development Institute (Virtual Museum, 2022) and also if they were flagged by the EIA Screening Tool Report for the project area. Species flagged by the EIA screening are highlighted in orange. An indication is given whether suitable habitat is present at the project area and the likelihood of it occurring there according to Child *et al.* (2016) and Taylor *et al.* (2015). Only species of conservation concern is included in this part (Table 17 to Table

20). For a complete list of species recorded in the quarter degree grid, see Appendix A.

Red list categories are as follows:

CR: Critically Endangered, indicating that the species is facing an extremely high risk of extinction.

EN: Endangered, indicating that the species is facing a very high risk of extinction.

VU: Vulnerable, indicating that the species is facing a high risk of extinction.

NT: Near Threatened, is likely to become at risk of extinction in the near future.

Declining: A species is Declining when there are threatening processes causing a continuing decline of the species.

LC: Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

Table 17: Mammals of conservation concern that may be present (Screening tool & Virtual Museum)

Species flagged by the EIA screening are highlighted in orange.

Family	Scientific name	Common name	Red list category	TOPS
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern (2008)	Protected
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern (2016)	Protected
Bovidae	*Connochaetes taurinus taurinus*		Least Concern (2016)	Protected
Bovidae	*Damaliscus lunatus lunatus*	(Southern African) Tsessebe	Vulnerable (2016)	Protected
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (2016)	Protected
Bovidae	*Damaliscus pygargus pygargus*	Bontebok	Vulnerable (2016)	Protected
Bovidae	*Hippotragus niger niger*	Sable antelope	Vulnerable (2016)	Vulnerable
Bovidae	*Neotragus moschatus*	Suni	Endangered	Protected
Bovidae	*Ourebia ourebi*	Oribi	Endangered	Endangered
Bovidae	*Pelea capreolus*	Vaal Rhebok	Near Threatened (2016)	
Bovidae	*Raphicerus melanotis*	Cape Grysbok	Least Concern (2016)	Protected
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern (2016)	Protected

Family	Scientific name	Common name	Red list category	TOPS
Canidae	*Vulpes chama*	Cape Fox	Least Concern (2016)	Protected
Equidae	*Equus quagga*	Plains Zebra	Near Threatened (IUCN, 2016)	
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)	Protected
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	Protected
Hyaenidae	*Hyaena brunnea*	Brown Hyena	Near Threatened (2015)	Protected
Muridae	*Otomys auratus*	Southern African Vlei Rat (Grassland type)	Near Threatened (2016)	
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened (2016)	
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Near Threatened (2016)	
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened (2016)	
Nesomyidae	*Mystromys albicaudatus*	African White-tailed Rat	Vulnerable (2016)	
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (2016)	Protected
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)	
Vespertilionidae	*Miniopterus schreibersii*	Schreibers's Long-fingered Bat	Near Threatened	

Table 18: Likeliness of mammal SCC to be present in project area

Scientific name	Common name	Likelihood of being present
Alcelaphus buselaphus caama	Red Hartebeest	Not present
Connochaetes gnou	Black Wildebeest	Not present
Connochaetes taurinus taurinus	Blue Wildebeest	Not present
Damaliscus lunatus lunatus	(Southern African) Tsessebe	Not present
Damaliscus pygargus phillipsi	Blesbok	Not present
Damaliscus pygargus pygargus	Bontebok	Not present
Hippotragus niger niger	Sable antelope	Not present
Neotragus moschatus	Suni	Very low

Scientific name	Common name	Likelihood of being present
Ourebia ourebi	Oribi	Low
Pelea capreolus	Vaal Rhebok	Low
Raphicerus melanotis	Cape Grysbok	Low
Otocyon megalotis	Bat-eared Fox	Medium
Vulpes chama	Cape Fox	Low
Equus quagga	Plains Zebra	Not present
Felis nigripes	Black-footed Cat	Low
Leptailurus serval	Serval	Present on adjacent farm portion, not in project area
Hyaena brunnea	Brown Hyena	Low
Otomys auratus	Southern African Vlei Rat (Grassland type)	Suitable habitat - medium
Aonyx capensis	Cape Clawless Otter	Confirmed by landowner to be present
Hydrictis maculicollis	Spotted-necked Otter	Suitable habitat - medium
Poecilogale albinucha	African Striped Weasel	Low
Mystromys albicaudatus	African White-tailed Rat	Low
Orycteropus afer	Aardvark	Present
Crocidura mariquensis	Swamp Musk Shrew	Suitable habitat - medium
Miniopterus schreibersii	Schreibers's Long-fingered Bat	No suitable habitat - low

The landowner (pers.comm.) confirmed that he has seen the Cape Clawless Otter which is Near Threatened at the dam in the Elandsfonteinspruit. He also confirmed that he has seen servals (also Near Threatened) in the past in the hills north of the project area, but not in the project area itself.

Table 19: Birds of conservation concern that may be present (Screening Tool & Virtual Museum)

Family	Scientific name	Common name	Red list category	TOPS
Accipitridae	*Circus ranivorus*	African Marsh-Harrier	Global: LC; BLSA: EN	
Accipitridae	*Gyps africanus*	White-backed Vulture	Global: CR; BLSA: CR	Endangered
Accipitridae	*Gyps coprotheres*	Cape Vulture (Griffon)	Global: EN; BLSA: EN	Endangered
Ciconiidae	*Ciconia abdimii*	Abdim's Stork	Global: LC; BLSA: NT	
Ciconiidae	*Mycteria ibis*	Yellow-billed Stork	Global: LC; BLSA: EN	

Coraciidae	*Coracias garrulus*	European Roller	Global: LC; BLSA: NT	
Glareolidae	*Glareola nordmanni*	Black-winged Pratincole	Global: NT; BLSA: NT	
Laridae	*Sterna caspia*	Caspian Tern	Global: LC; BLSA: VU	
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	Global: LC; BLSA: NT	
Tytonidae	*Tyto capensis*	African Grass Owl	Global: LC; BLSA: VU	

Table 20: Likeliness of bird SCC to be present in project area

Scientific name	Common name	Likelihood of being present
Circus ranivorus	African Marsh-Harrier	Suitable habitat - Low to medium
Gyps africanus	White-backed Vulture	Suitable habitat for breeding (tall trees) - No nests recorded
Gyps coprotheres	Cape Vulture (Griffon)	No suitable habitat for breeding (cliffs)
Ciconia abdimii	Abdim's Stork	Suitable habitat, medium
Mycteria ibis	Yellow-billed Stork	Suitable habitat, medium
Coracias garrulus	European Roller	Suitable habitat, low
Glareola nordmanni	Black-winged Pratincole	Suitable habitat, medium
Sterna caspia	Caspian Tern	No suitable habitat for breeding, low
Phoenicopterus roseus	Greater Flamingo	Suitable habitat, low
Tyto capensis	African Grass Owl	Suitable habitat, low

See the avifauna specialist report for more detail on the birds and the confirmed species present.

One reptile SCC was previously recorded in the quarter degree grid, namely the Cape Sand Snake (*Psammophis leightoni*). It is not expected to be in the area according to its distribution. It is therefore not expected to be present at the project area.

One amphibian species of conservation concern's distribution overlaps with the project area namely the Giant Bull Frog (*Pyxicephalus adspersus*). There is suitable habitat for it on-site, and the likeliness of them occurring there is medium. The landowner has not seen Giant Bull Frogs in the project area. If they are however present, they will inhabit the wetlands, which is not to be developed.

Insects and invertebrates flagged by the EIA Screening Tool

One insect SCC was flagged by the EIA Screening Tool as potentially being present at the project area, namely the endangered *Lepidochrysops praeterita* (Highveld blue), which is a butterfly of the family Lycaenidae. This taxon is confined to grassy, rocky, typically south-facing slopes, where its host plant (*Ocimum obovatum*) and, presumably, its host ant occur. Most localities are within an altitudinal band between 1,500m and 1,750m. Males frequently fly around solitary trees or other features in the general vicinity of the colony. *Lepidochrysops praeterita* is highly localized and appears to have a very specific habitat niche (SANBI, 2022a). The host plant was not recorded in the project area, neither was the Highveld blue spotted. Due to disturbance of the site and absence of its' host plant, this species has a low likelihood of being present at the project area.

One invertebrate SCC was flagged by the EIA Screening Tool as potentially being present at the project area, namely *Clonia uvarovi* (Uvarov's Clonia), which is Vulnerable. This species occurs in tall, woodland savannah in areas which are under intensive grazing pressure by livestock and wildlife, cultivation with non-timber crops, urban development, and invasion by alien plant species such as *Lantana* spp., bugweed and other non-native weed species. Furthermore, climate change is already causing increasingly frequent extreme weather events in these regions, which is liable to drastically effect the distribution of grasses, the katydid's food plant (SANBI, 2022b). There is not suitable habitat for this species and it therefore has a low likelihood of being present at the project area is

4.8 Sensitivity Analysis for the project area

The project area is disturbed to a great extent. Most of the area was used for crop production at some stage. The areas that were not cultivated were mostly overgrazed. These sections have a low sensitivity as there is little natural vegetation left. The wetlands have a high sensitivity due to its high connectivity, ecosystem services and important habitat types that it creates. The buffer zones also have a high sensitivity. The *Kniphofia typhiodes* populations also has a high sensitivity, as it is an A3 Red data plant in Gauteng, which must have a buffer of 400m around it (Red list and orange list plant species recorded from Gauteng). Other areas vary from low to medium-high

sensitivity depending on how disturbed it is and the species diversity. See sensitivity map (Figure 19).

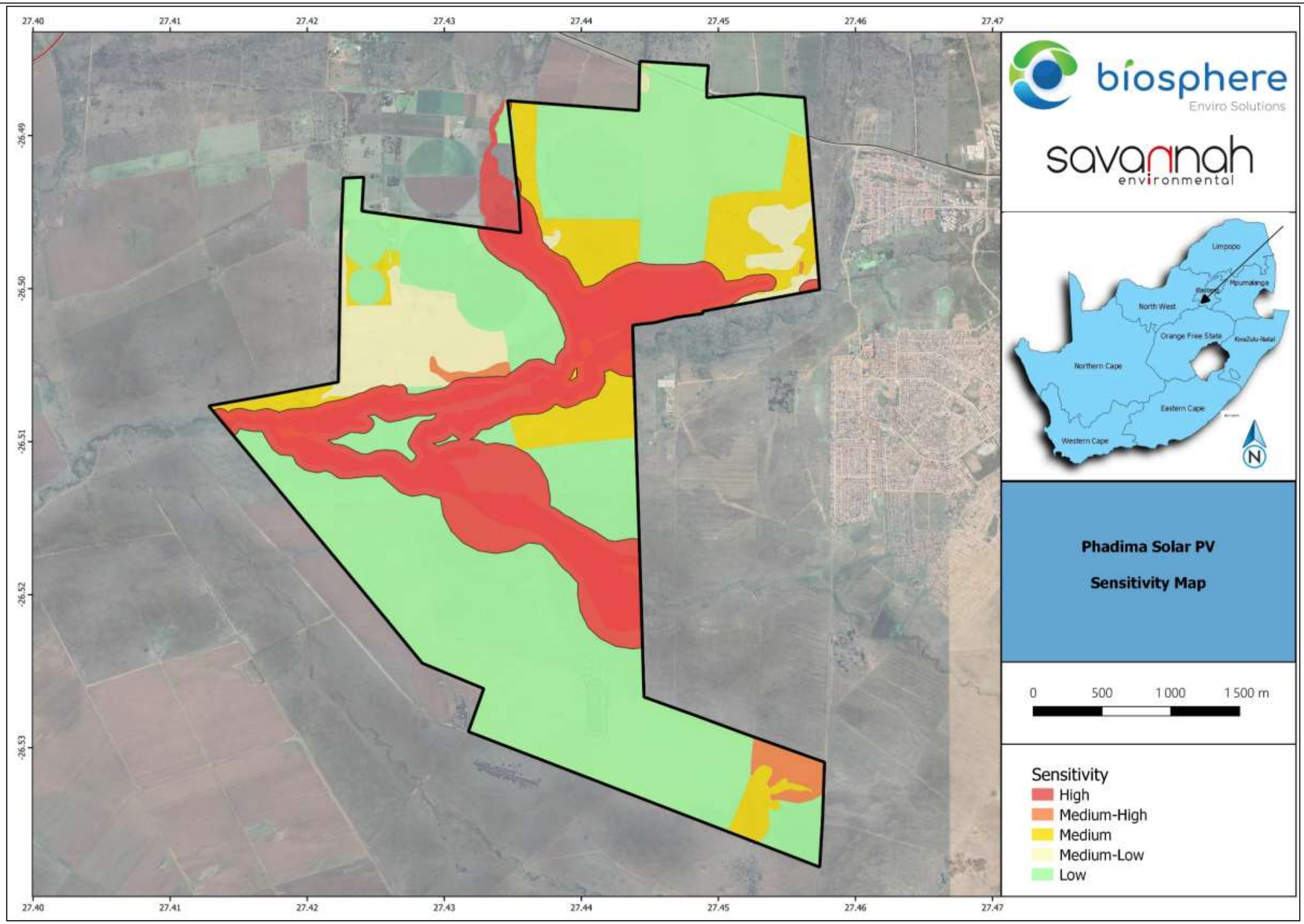

Figure 19: Sensitivity map

5 Potential impacts of the proposed development on the FAUNA AND FLORA

An environmental impact is defined as a change in the environment, be it the physical/chemical, biological, cultural and or socio-economic environment. Any impact can be related to certain aspects of human activities in this environment and this impact can be either positive or negative. It could also affect the environment directly or indirectly and the effect of it can be cumulative. There are three major categories of impacts on biodiversity namely:

- Impacts on habitat resulting in loss, degradation and / or fragmentation.
- Direct impacts on fauna and flora and species, for example plants and animals that are endemic / threatened / specially adapted to a habitat, will not be able to survive if that habitat is destroyed or altered by the development.
- Impact on natural environmental processes and ecosystem functioning. This can lead to an accumulated effect on both habitat and species.

This biodiversity assessment focused on the description of ecosystem- and species-related biodiversity. It can be expected that if ecosystem diversity is managed effectively, species and genetic diversity should also be protected. Emphasis was therefore placed on the ecosystem diversity (landscape/habitat types) within the proposed development area, with reference to biota observed and expected to utilise these landscapes or habitat types.

Impacts are discussed in the tables below.

Table 21: Scoping Assessment: Direct habitat destruction/loss of habitat

Impact
Most habitat destruction will be caused during the construction phase. Vegetation communities are likely to be impacted on a small spatial scale in comparison to the extent of the vegetation communities' total area in the region. The impact of the habitat destruction will be on the flora and fauna of the study area in the following ways: • The construction will lead to the loss of individual plants such as grasses, forbs, trees, and shrubs that will be cleared on the footprint area. This will mostly occur during the construction phase. The impact will be smaller in the grid connection corridor, as vegetation will not be completely removed. It will just be disturbed, especially where pylons are erected, but the impact will be much lower than where the solar panels will be erected. The disturbance will continue to a lesser extent during the operational phase as the infrastructure has to be operated and maintained.

- Due to habitat loss and construction activities, animals will migrate from the construction area and animal numbers will decrease.
- Loss of species of conservation concern: The anticipated loss of the natural grassland will result in the local displacement of some fauna species. In some cases, isolated populations of threatened fauna might be removed from the area. Species of conservation concern were recorded in the wetlands, which is not to be cleared off vegetation.

Changes in the community structure: It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will dominate the study area. Attempts to rehabilitate will attract taxa with unspecialised and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Potential loss of plant and animal species	Direct impacts: » Loss of vegetation communities, habitat, plant and animal species Indirect impacts: » Minimal edge effects leading to loss of habitat outside development site, thus loss of faunal species	Local	Wetlands and their 50m buffer.
Potential loss of Species of Conservation Concern	Direct impacts: » Loss of Species of Conservation Concern. Indirect impacts: » None	Local	Wetlands and their 50m buffer

Description of expected significance of impact

The habitat of plants and animals will be lost and therefore also some plant and animal communities. Animal and plant SCCs were recorded in the wetlands. If the wetlands are disturbed some of these individuals may be lost. If the wetlands and their buffer zones are however not used to place solar panels, impacts on SSCs should be minimal.

Gaps in knowledge & recommendations for further study

» None

Recommendations with regards to general field surveys

» None. Field surveys have been completed. Collected data is sufficient.

Table 22: Impact on species of conservation concern

Impact			
The construction of the solar development and associated infrastructure will impact in the *Kniphofia typhoides* population if development occur where they are located. If development does not occur where they are located or in the 400m buffer, they will not be impacted.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance of habitat	Direct impacts: » Impact on SCC population Indirect impacts: » Decrease in population size	Local	Location of *Kniphofia typhiodes* and 400m buffer
Description of expected significance of impact			
Significant as this plant is Near threatened			
Gaps in knowledge & recommendations for further study			
» Exact location of population			
Recommendations with regards to general field surveys			
» Do a field survey in February – March to determine exact extent of the population.			

Table 23: Impact Assessment: Habitat Fragmentation

Impact			
The construction of the solar development and associated infrastructure will result in natural movement patterns being disrupted for a limited period and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations, although the impact will be minimal as the area is already fragmented, by fences, roads and crop fields in and around it.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Fragmentation of natural populations	Direct impacts: » Restricted movement of animal species Indirect impacts: » Loss of fauna	Local	Wetlands and their 50m buffer
Description of expected significance of impact			
Plant and animal populations may be fragmented and the natural movement patterns be disrupted.			
Gaps in knowledge & recommendations for further study			

» None

Recommendations with regards to general field surveys

» None. Field surveys have been completed. Collected data is sufficient.

Table 24: Impact Assessment: Increased Soil Erosion and Sedimentation

Impact

The construction and decommissioning phases may result in widespread soil disturbance and is usually associated with accelerated soil erosion. Soil erosion promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition, loss of habitat for indigenous flora and sedimentation of watercourses, wetlands and dams.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Increased Soil Erosion and Sedimentation	Direct impacts: » Soil erosion Indirect impacts: » Sedimentation » Establishment of Alien Invasive Plant species	Local	Wetlands and their 50m buffer

Description of expected significance of impact

Loss of valuable top-soil. Sedimentation of wetlands and rivers.

Gaps in knowledge & recommendations for further study

» None

Recommendations with regards to general field surveys

» None. Field surveys have been completed. Collected data is sufficient.

Table 25: Impact Assessment: Soil and water pollution

Impact

Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or groundwater, leading to potential medium/long-term impacts on fauna and flora. During the construction phase, heavy machinery and vehicles would be the main contributors to potential pollution problems. Littering by construction workers.

Dumping of building materials or other waste. Photovoltaic panels may contain hazardous materials, and although they are sealed under normal operating conditions, there is the potential for environmental contamination if they were damaged or improperly disposed upon decommissioning.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Soil and Water Pollution	Direct impacts: » Soil pollution » Water pollution Indirect impacts: » Loss of plant and animal species	Local	Wetlands and their 50m buffer
Description of expected significance of impact If soil and water is polluted it will have a negative impact on plants and animals.			
Gaps in knowledge & recommendations for further study » None **Recommendations with regards to general field surveys** » None. Field surveys have been completed. Collected data is sufficient.			

Table 26: Impact Assessment: Spread and establishment of alien invasive species

Impact Continued movement of vehicles on and off the site during the construction and decommissioning phases will result in a risk of importation of alien species. Vehicles often transport many seeds, and some may be of invader species, which may become established along the access road, especially where the area is disturbed. The construction carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites. Fifteen alien invasive plant species were recorded in the project area. If not managed properly they will increase and spread. The decommissioning phase will also cause disturbance, which creates the ideal circumstances for declared invaders to flourish.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Spread and establishment of alien invasive species	Direct impacts: » Spread of alien invasive species » Establishment of alien invasive	Local	Wetlands and their 50m buffer

	species Indirect impacts: » Displacement of plant and animal species » Loss of biodiversity		
Description of expected significance of impact Movement between sites and disturbance of vegetation promotes the spread and establishment of Alien Invasive species, which in turn threaten and outcompete indigenous species.			
Gaps in knowledge & recommendations for further study » None **Recommendations with regards to general field surveys** » None. Field surveys have been completed. Collected data is sufficient.			

Table 27: Impact Assessment: Negative effect of human activities on fauna and road mortalities

Impact

An increase in human activity on the site and surrounding areas is anticipated for all phases. The risk of snaring, killing, and hunting of certain faunal species is increased. If staff compounds are erected for construction workers, the risk of pollution because of litter and inadequate sanitation and the introduction of invasive fauna and flora are increased. The presence of many construction workers or regular workers during the construction phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires arising from cooking fires, improperly disposed cigarettes etc.

Large numbers of fauna are also killed daily on roads. They are either being crushed under the tyres of vehicles in the case of crawling species, or by colliding with the vehicle itself in the case of avifauna or flying invertebrates. The impact is intensified at night, especially for flying insects, as result of their attraction to the lights of vehicles.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Fauna mortalities	Direct impacts: » Fauna mortalities Indirect impacts: » None	Local	Wetlands and their 50m buffer
Description of expected significance of impact Increased human activity in the area may lead to fauna mortalities.			

Gaps in knowledge & recommendations for further study

- An in-depth fauna survey was not completed.

Recommendations with regards to general field surveys

- None. Field surveys have been completed. Collected data is sufficient.

6 DISCUSSION & CONCLUSION

Phadima Solar PV (RF) (Pty) Ltd (applicant) proposes to construct a Photovoltaic (PV) facility and associated infrastructure (inclusive of a 1 km gridline) near Fochville in Gauteng. The proposed PV Facility will consist of a 240 Megawatt (MW) Photovoltaic (PV) facility on various portions of the farm Elandsfontein 144 and the Remaining Extent of the farm Elandsfontein 140 which is located approximately 3km south-west of the town of Fochville. In addition, it is proposed to construct a 132kV line to an existing substation east of the site. Savannah Environmental (Pty) Ltd has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended. This terrestrial biodiversity assessment is intended to inform the environmental authorisation process for the project.

According to the national web-based environmental screening tool in terms of National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), the site has the following sensitivities:

- Terrestrial Biodiversity: Very High Sensitivity.
- Animal Species Theme: Medium Sensitivity.
- Plant Species Theme: Medium Sensitivity.

A site sensitivity verification was therefore conducted to determine if the assessment was accurate and if the studies recommended must be conducted. After the site visit the following was concluded:

- The site has a Medium sensitivity from a terrestrial biodiversity perspective. Although the area is in the vulnerable Rand Highland Grassland vegetation unit, most of the project area is disturbed by agricultural fields or overgrazing. None of the vegetation in the proposed development area is in a pristine condition. The species diversity in the grassland is relatively high, which does not imply that the sensitivity is also high.
- The site has a Medium Sensitivity from an Animal Species Theme Perspective due to the presence of fauna habitats. The Near Threatened Cape Clawless Otter is present in the project area and other SCCs may be present, although unlikely.
- The site has a Medium-High Sensitivity from a Plant Species Theme Perspective. The species diversity in the grassland is relatively high. Two plant species of conservation concern was recorded, namely *Kniphofia typhoides*, which is Near Threatened and

Crinum bulbispermum which is in the Declining category. Seven endemic plant species were recorded. *Kniphofia typhiodes* is an A3 Red data plant in Gauteng, which must have a buffer of 400m around the boundary of the population (GDARD, 2017).

The desktop survey indicates that:

- Some sections of the project area fall into CBA2 and ESA of which the majority is already disturbed by past land use practices.
- There are some NFEPA and National Wetland Map 5 wetlands in the project area.
- The project area is not located in or close to an Important Bird Area.
- The project area overlaps one nationally threatened ecosystems, namely the Vulnerable Rand Highland Grassland vegetation unit.
- It is also not located in or close to a Protected Area or National Protected Area Expansion Strategy Area.

The project area can be divided into the following vegetation / land use units:

1. *Themeda triandra - Eragrostis chloromelas* grassland;
2. *Helichrysum nudifolium - Hilliardiella oligocephala* grassland;
3. *Seriphium plumosum - Pseudognaphaleum luteo-album* grassland;
4. *Eragrostis chloromelas - Ipomoea ommanneyi* rocky grassland
5. *Asparagus laricinus - Hyparrhenia tamba* shrubland
6. *Vachellia karroo – Eragrostis chloromelas* woodland;
7. *Senegalia hereroensis - Diospyros lycioides* woodland
8. Wetlands;
9. *Eucalyptus camaldulensis* plantation;
10. Cultivated crops;
11. Old cultivated land;
12. Buildings and gardens.

Fifteen declared invader plant species were recorded. They must be eradicated.

A desktop survey was completed to determine which fauna species may occur in the project area according to its distribution and habitat requirements. The national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended, lists two mammal species of conservation concern (SCC), namely *Hydrictis maculicolis* (Spotted-necked otter)

and *Crocidura maquassiensis* (Maquassie Musk Shrew) that may be present, two bird species: *Tyto capensis* (Grass owl) and *Hydroprogne caspia* (Caspian Tern). It also lists one insect SCC (*Lepidochrysops praeterita*) and one invertebrate SCC (*Clonia uvarovi*). None of these species were recorded. The two mammal species have a medium likeliness of being present at site and the other four species have a low likeliness of being present in the project area. For more information on fauna SCCs that may be present in the project area see Section 4.7.2.

The sensitivity analysis indicated that sensitivity of most of the site is low to medium. The wetlands and their buffers have a high sensitivity due to its high connectivity, ecosystem services and important habitat types that it creates. The *Kniphofia typhoides* population and its buffer also has a high sensitivity. The percentage of the area with a high sensitivity is 24%. Some species of conservation concern were recorded in them. Solar panels must not be placed in the wetlands and their buffer zones or in the *Kniphofia typhoides* population and its buffer. Power lines may traverse the wetlands as long is disturbance is kept to a minimum.

Potential impacts were described. Impacts include habitat destruction and fragmentation, soil erosion and sedimentation, soil and water pollution, the spread of declared invader plant species and impacts on fauna.

Disturbance must still be limited as far as possible, especially in the wetlands and their buffer zones as well as the *Kniphofia typhiodes* population and its 400m buffer zone. If mitigation measures, as discussed in Section 5, are implemented the development can be supported from a biodiversity point of view.

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Appendix A: Fauna species list for quarter degree grid (2627AD, 2627CB)

Table 28: Mammals

Species highlighted in blue is known to be present at site.

Family	Scientific name	Common name	Red list category	TOPS
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern (2016)	
Bovidae	*Aepyceros melampus*	Impala	Least Concern	
Bovidae	*Alcelaphus buselaphus*	Hartebeest	Least Concern	
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern (2008)	Protected
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (2016)	
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern (2016)	Protected
Bovidae	*Connochaetes taurinus taurinus*	Blue Wildebeest	Least Concern (2016)	Protected
Bovidae	*Damaliscus lunatus lunatus*	(Southern African) Tsessebe	Vulnerable (2016)	Protected
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (2016)	Protected
Bovidae	*Damaliscus pygargus pygargus*	Bontebok	Vulnerable (2016)	Protected
Bovidae	*Hippotragus niger niger*	Sable antelope	Vulnerable (2016)	Vulnerable
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*		Least Concern (2016)	
Bovidae	*Neotragus moschatus*	Suni	Endangered	Protected
Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern (2016)	
Bovidae	*Oryx gazella*	Gemsbok	Least Concern (2016)	
Bovidae	*Ourebia ourebi*	Oribi	Endangered	Endangered
Bovidae	*Pelea capreolus*	Vaal Rhebok	Near Threatened (2016)	
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (2016)	
Bovidae	*Raphicerus melanotis*	Cape Grysbok	Least Concern (2016)	Protected
Bovidae	*Redunca arundinum*	Southern Reedbuck	Least Concern (2016)	
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	Least Concern	
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)	
Bovidae	*Syncerus caffer*	African Buffalo	Least Concern (2008)	
Bovidae	*Taurotragus oryx*	Common Eland	Least Concern (2016)	

Family	Scientific name	Common name	Red list category	TOPS
Bovidae	*Tragelaphus angasii*	Nyala	Least Concern (2016)	
Bovidae	*Tragelaphus scriptus*	Bushbuck	Least Concern	
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern (2016)	
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)	
Canidae	*Hybrid Canis mesomelas x C. lupus familiaris*	Hybrid Black-backed Jackal x Domestic dog		
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern (2016)	Protected
Canidae	*Vulpes chama*	Cape Fox	Least Concern (2016)	Protected
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern (2016)	
Cercopithecidae	*Chlorocebus pygerythrus pygerythrus*	Vervet Monkey (subspecies pygerythrus)	Least Concern (2008)	
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC (IUCN, 2016)	
Cervidae	*Dama dama*	Fallow Deer	Introduced	
Chrysochloridae	*Amblysomus hottentotus*	Hottentot Golden Mole	Least Concern (2016)	
Equidae	*Equus quagga*	Plains Zebra	Near Threatened (IUCN, 2016)	
Felidae	*Caracal caracal*	Caracal	Least Concern (2016)	
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)	Protected
Felidae	*Felis silvestris*	Wildcat	Least Concern (2016)	
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	Protected
Giraffidae	*Giraffa giraffa giraffa*	South African Giraffe	Least Concern (2016)	
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)	
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern (2016)	
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (2016)	
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern (2016)	
Hyaenidae	*Hyaena brunnea*	Brown Hyena	Near Threatened (2015)	Protected
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern (2016)	
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	
Leporidae	*Lepus capensis*	Cape Hare	Least Concern	
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern	
Leporidae	*Lepus sp.*	Hares		
Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	Least Concern (2016)	

Family	Scientific name	Common name	Red list category	TOPS
Molossidae	*Chaerephon pumilus*	Little Free-tailed Bat	Least Concern (2016)	
Molossidae	*Sauromys petrophilus*	Roberts's Flat-headed Bat	Least Concern (2016)	
Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern (2016)	
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	Least Concern	
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern (2016)	
Muridae	*Gerbilliscus leucogaster*	Bushveld Gerbil	Least Concern (2016)	
Muridae	*Mastomys coucha*	Southern African Mastomys	Least Concern (2016)	
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)	
Muridae	*Mastomys sp.*	Multimammate Mice		
Muridae	*Mus (Nannomys) indutus*	Desert Pygmy Mouse	Least Concern	
Muridae	*Mus (Nannomys) minutoides*	Southern African Pygmy Mouse	Least Concern	
Muridae	*Otomys auratus*	Southern African Vlei Rat (Grassland type)	Near Threatened (2016)	
Muridae	*Rattus rattus*	Roof Rat	Least Concern	
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)	
Muridae	*Tatera sp.*			
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)	
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable (2016)	
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern (2016)	
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern (2016)	
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened (2016)	
Nesomyidae	*Dendromus mystacalis*	Chestnut African Climbing Mouse	Least Concern (2016)	
Nesomyidae	*Dendromus sp.*	African Climbing Mice		
Nesomyidae	*Malacothrix typica*	Large-eared African Desert Mouse	Least Concern (2016)	
Nesomyidae	*Mystromys albicaudatus*	African White-tailed Rat	Vulnerable (2016)	
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (2016)	Protected
Pedetidae	*Pedetes capensis*	South African Spring Hare	Least Concern (2016)	

Family	Scientific name	Common name	Red list category	TOPS
Procaviidae	*Procavia capensis capensis*	Cape Rock Hyrax	LC (IUCN 2015, global sp. level)	
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern (2016)	
Rhinolophidae	*Rhinolophus sp.*	Horseshoe Bats		
Sciuridae	*Xerus inauris*	South African Ground Squirrel	Least Concern	
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)	
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	Least Concern (2016)	
Suidae	*Phacochoerus africanus*	Common Warthog	Least Concern (2016)	
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat	Least Concern (2016)	
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern (2016)	
Vespertilionidae	*Miniopterus schreibersii*	Schreibers's Long-fingered Bat	Near Threatened	
Vespertilionidae	*Myotis tricolor*	Temminck's Myotis	Least Concern (2016)	
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (2016)	
Viveridae	*Genetta maculata*	Common Large-spotted Genet	Least Concern (2016)	
Viverridae	*Genetta genetta*	Common Genet	Least Concern (2016)	
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	Least Concern (2016)	

Table 29: Birds

Family	Scientific name	Common name	Red list category	TOPS
Accipitridae	*Accipiter melanoleucus*	Black Sparrowhawk (Goshawk)	LC	
Accipitridae	*Aquila wahlbergi*	Wahlberg's Eagle	LC	
Accipitridae	*Buteo [augur] rufofuscus*	Jackal Buzzard	LC	
Accipitridae	*Buteo buteo*	Steppe (Common) Buzzard	LC	
Accipitridae	*Circus ranivorus*	African Marsh-Harrier	Global: LC; BLSA: EN	
Accipitridae	*Elanus caeruleus*	Black-shouldered (Winged) Kite	LC	

Family	Scientific name	Common name	Red list category	TOPS
Accipitridae	*Gyps africanus*	White-backed Vulture	Global: CR; BLSA: CR	Endangered
Accipitridae	*Gyps coprotheres*	Cape Vulture (Griffon)	Global: EN; BLSA: EN	Endangered
Accipitridae	*Haliaeetus vocifer*	African Fish-Eagle	LC	
Accipitridae	*Lophaetus occipitalis*	Long-crested Eagle	LC	
Accipitridae	*Melierax canorus*	Southern Pale Chanting Goshawk	LC	
Accipitridae	*Pandion haliaetus*	Osprey	LC	
Accipitridae	*Polyboroides typus*	African Harrier-Hawk (Gymnogene)	LC	
Alaudidae	*Calandrella [brachydactyla] cinerea*	Red-capped Lark	LC	
Alaudidae	*Chersomanes albofasciata*	Spike-heeled Lark	LC	
Alaudidae	*Eremopterix leucotis*	Chestnut-backed Sparrowlark (Finchlark)	LC	
Alaudidae	*Mirafra africana*	Rufous-naped Lark	LC	
Alcedinidae	*Alcedo cristata*	Malachite Kingfisher	LC	
Anatidae	*Alopochen aegyptiaca*	Egyptian Goose	LC	
Anatidae	*Anas capensis*	Cape Teal	LC	
Anatidae	*Anas erythrorhyncha*	Red-billed Teal (Duck)	LC	
Anatidae	*Anas hottentota*	Blue-bill Teal (Hottentot Teal)	LC	
Anatidae	*Anas smithii*	Cape Shoveler	LC	
Anatidae	*Anas sparsa*	African Black Duck	LC	
Anatidae	*Anas undulata*	Yellow-billed Duck	LC	
Anatidae	*Hybrid Anas platyrhynchos subsp. domestica*	Mallard Hybrid	LC	
Anatidae	*Netta erythrophthalma*	Southern Pochard	LC	
Anatidae	*Plectropterus gambensis*	Spur-winged Goose	LC	
Anatidae	*Tadorna cana*	South African Shelduck	LC	
Anhingidae	*Anhinga rufa*	African Darter	LC	
Apodidae	*Apus caffer*	White-rumped Swift	LC	
Apodidae	*Apus horus*	Horus Swift	LC	
Ardeidae	*Ardea cinerea*	Grey Heron	LC	

Family	Scientific name	Common name	Red list category	TOPS
Ardeidae	*Ardea goliath*	Goliath Heron	LC	
Ardeidae	*Ardea melanocephala*	Black-headed Heron	LC	
Ardeidae	*Ardea purpurea*	Purple Heron	LC	
Ardeidae	*Ardeola ralloides*	Squacco Heron	LC	
Ardeidae	*Bubulcus ibis*	Cattle Egret	LC	
Ardeidae	*Egretta alba*	Great Egret	LC	
Ardeidae	*Egretta ardesiaca*	Black Heron	LC	
Ardeidae	*Egretta garzetta*	Little Egret	LC	
Ardeidae	*Ixobrychus minutus*	Little Bittern	LC	
Bucerotidae	*Tockus rufirostris*	Southern Red-billed Hornbill (split)	LC	
Burhinidae	*Burhinus capensis*	Spotted Thick-knee (Dikkop)	LC	
Burhinidae	*Burhinus vermiculatus*	Water Thick-knee (Dikkop)	LC	
Cerylidae	*Ceryle rudis*	Pied Kingfisher	LC	
Charadriidae	*Charadrius pecuarius*	Kittlitz's Plover	LC	
Charadriidae	*Charadrius tricollaris*	Three-banded Plover	LC	
Charadriidae	*Vanellus armatus*	Blacksmith Lapwing (Plover)	LC	
Charadriidae	*Vanellus coronatus*	Crowned Lapwing (Plover)	LC	
Charadriidae	*Vanellus senegallus*	African Wattled Lapwing (Plover)	LC	
Ciconiidae	*Ciconia abdimii*	Abdim's Stork	Global: LC; BLSA: NT	
Ciconiidae	*Mycteria ibis*	Yellow-billed Stork	Global: LC; BLSA: EN	
Cisticolidae	*Apalis thoracica*	Bar-throated Apalis	LC	
Cisticolidae	*Camaroptera brevicaudata*	Grey-backed Camaroptera (split)	LC	
Cisticolidae	*Cisticola aberrans*	Lazy Cisticola	LC	
Cisticolidae	*Cisticola aridulus*	Desert Cisticola	LC	
Cisticolidae	*Cisticola chiniana*	Rattling Cisticola	LC	
Cisticolidae	*Cisticola fulvicapillus*	Neddicky (Piping	LC	

Family	Scientific name	Common name	Red list category	TOPS
	[fulvicapilla]	Cisticola)		
Cisticolidae	*Cisticola juncidis*	Zitting (Fan-tailed) Cisticola	LC	
Cisticolidae	*Cisticola tinniens*	Levaillant's (Tinkling) Cisticola	LC	
Cisticolidae	*Prinia flavicans*	Black-chested Prinia	LC	
Cisticolidae	*Prinia subflava*	Tawny-flanked Prinia	LC	
Coliidae	*Colius striatus*	Speckled Mousebird	LC	
Coliidae	*Urocolius indicus*	Red-faced Mousebird	LC	
Columbidae	*Columba arquatrix*	African Olive- (Rameron) Pigeon	LC	
Columbidae	*Columba guinea*	Speckled (Rock) Pigeon	LC	
Columbidae	*Columba livia*	Rock (Feral) Dove (Pigeon)	LC	
Columbidae	*Oena capensis*	Namaqua Dove	LC	
Columbidae	*Streptopelia capicola*	Cape Turtle (Ring-necked) Dove	LC	
Columbidae	*Streptopelia semitorquata*	Red-eyed Dove	LC	
Columbidae	*Streptopelia senegalensis*	Laughing (Palm) Dove	LC	
Coraciidae	*Coracias garrulus*	European Roller	Global: LC; BLSA: NT	
Corvidae	*Corvus albus*	Pied Crow	LC	
Cuculidae	*Chrysococcyx caprius*	Dideric (Diederik) Cuckoo	LC	
Dacelonidae	*Halcyon albiventris*	Brown-hooded Kingfisher	LC	
Dacelonidae	*Megaceryle maxima (H. maximus)*	Giant Kingfisher	LC	
Dendrocygnidae	*Dendrocygna viduata*	White-faced (Whistling-) Duck	LC	
Estrildidae	*Amadina erythrocephala*	Red-headed Finch	LC	
Estrildidae	*Amandava subflava*	Orange-breasted (Zebra) Waxbill	LC	
Estrildidae	*Estrilda astrild*	Common Waxbill	LC	
Estrildidae	*Estrilda erythronotos*	Black-faced Waxbill	LC	
Estrildidae	*Lagonosticta rhodopareia*	Jameson's Firefinch	LC	
Estrildidae	*Lagonosticta senegala*	Red-billed Firefinch	LC	

Family	Scientific name	Common name	Red list category	TOPS
Estrildidae	*Ortygospiza atricollis*	Quailfinch	LC	
Estrildidae	*Pytilia melba*	Green-winged (Melba) Pytilia (Finch)	LC	
Estrildidae	*Uraeginthus [Granatina] granatina*	Violet-eared Waxbill	LC	
Estrildidae	*Uraeginthus angolensis*	Blue Waxbill	LC	
Falconidae	*Falco amurensis*	Amur (Eastern Red-footed) Falcon (Kestrel)	LC	
Falconidae	*Falco naumanni*	Lesser Kestrel	LC	
Falconidae	*Falco rupicoloides*	Greater Kestrel	LC	
Fringillidae	*Emberiza capensis*	Cape Bunting	LC	
Fringillidae	*Emberiza flaviventris*	Golden-breasted Bunting	LC	
Fringillidae	*Emberiza tahapisi*	Cinnamon-breasted (Rock) Bunting	LC	
Fringillidae	*Serinus atrogularis*	Black-throated Canary	LC	
Fringillidae	*Serinus flaviventris*	Yellow Canary	LC	
Fringillidae	*Serinus gularis*	Streaky-headed Seedeater (Canary)	LC	
Fringillidae	*Serinus mozambicus*	Yellow-fronted (eyed) Canary	LC	
Glareolidae	*Glareola nordmanni*	Black-winged Pratincole	Global: NT; BLSA: NT	
Glareolidae	*Rhinoptilus africanus*	Double-banded Courser	LC	
Hirundinidae	*Hirundo abyssinica*	Lesser Striped-Swallow	LC	
Hirundinidae	*Hirundo albigularis*	White-throated Swallow	LC	
Hirundinidae	*Hirundo cucullata*	Greater Striped-Swallow	LC	
Hirundinidae	*Hirundo rustica*	Barn (European) Swallow	LC	
Hirundinidae	*Riparia cincta*	Banded Martin	LC	
Hirundinidae	*Riparia paludicola*	Brown-throated (Plain) Martin	LC	
Indicatoridae	*Indicator indicator*	Greater Honeyguide	LC	
Indicatoridae	*Indicator minor*	Lesser Honeyguide	LC	
Jacanidae	*Actophilornis africanus*	African Jacana	LC	
Laniidae	*Lanius collaris*	Southern Fiscal	LC	
Laniidae	*Lanius collurio*	Red-backed Shrike	LC	

Family	Scientific name	Common name	Red list category	TOPS
Laniidae	*Lanius minor*	Lesser Grey Shrike	LC	
Laridae	*Chlidonias hybridus*	Whiskered Tern	LC	
Laridae	*Chlidonias leucopterus*	White-winged Tern	LC	
Laridae	*Larus cirrocephalus*	Grey-headed Gull	LC	
Lybiidae	*Lybius torquatus*	Black-collared Barbet	LC	
Lybiidae	*Trachyphonus vaillantii*	Crested Barbet	LC	
Lybiidae	*Tricholaema leucomelas*	Acacia Pied Barbet	LC	
Malaconotidae	*Batis molitor*	Chinspot Batis	LC	
Malaconotidae	*Dryoscopus cubla*	Black-backed (Southern) Puffback	LC	
Malaconotidae	*Laniarius atrococcineus*	Crimson-breasted shrike	LC	
Malaconotidae	*Laniarius ferrugineus*	Southern Boubou	LC	
Malaconotidae	*Nilaus afer*	Brubru	LC	
Malaconotidae	*Tchagra australis*	Brown-crowned (headed) Tchagra	LC	
Malaconotidae	*Tchagra senegala*	Black-crowned Tchagra	LC	
Malaconotidae	*Telophorus zeylonus*	Bokmakierie	LC	
Meropidae	*Merops apiaster*	European Bee-eater	LC	
Meropidae	*Merops bullockoides*	White-fronted Bee-eater	LC	
Meropidae	*Merops pusillus*	Little Bee-eater	LC	
Monarchidae	*Terpsiphone viridis*	African Paradise-Flycatcher	LC	
Motacillidae	*Anthus cinnamomeus*	African (Grassveld/Grassland) Pipit	LC	
Motacillidae	*Macronyx capensis*	Cape (Orange-throated) Longclaw	LC	
Motacillidae	*Motacilla aguimp*	African Pied Wagtail	LC	
Motacillidae	*Motacilla capensis*	Cape Wagtail	LC	
Muscicapidae	*Cercomela familiaris*	Familiar Chat	LC	
Muscicapidae	*Cercotrichas (Erythropygia) paena*	Kalahari Scrub-Robin	LC	
Muscicapidae	*Cossypha caffra*	Cape Robin-chat	LC	
Muscicapidae	*Muscicapa striata*	Spotted Flycatcher	LC	
Muscicapidae	*Myrmecocichla formicivora*	Ant-eating Chat	LC	

Family	Scientific name	Common name	Red list category	TOPS
Muscicapidae	*Oenanthe monticola*	Mountain Chat (Wheatear)	LC	
Muscicapidae	*Oenanthe pileata*	Capped Wheatear	LC	
Muscicapidae	*Psophocichla litsipsirupa*	Groundscraper Thrush	LC	
Muscicapidae	*Saxicola torquata*	African (Common) Stonechat	LC	
Muscicapidae	*Sigelus silens*	Fiscal Flycatcher	LC	
Muscicapidae	*Thamnolaea cinnamomeiventris*	Mocking Cliff-Chat	LC	
Nectariniidae	*Nectarinia [Chalcomitra] amethystina*	Amethyst (Black) Sunbird	LC	
Nectariniidae	*Nectarinia [Cinnyris] famosa*	Malachite Sunbird	LC	
Nectariniidae	*Nectarinia [Cinnyris] talatala*	White-bellied (breasted) Sunbird	LC	
Numididae	*Numida meleagris*	Helmeted Guineafowl	LC	
Passeridae	*Gymnoris superciliaris*	Yellow-throated Bush Sparrow (Yellow-throated Petronia)	LC	
Passeridae	*Passer diffusus*	Southern Greyheaded Sparrow (split)	LC	
Passeridae	*Passer domesticus*	House Sparrow	LC	
Passeridae	*Passer melanurus*	Cape Sparrow	LC	
Phalacrocoracidae	*Phalacrocorax africanus*	Reed (Long-tailed) Cormorant	LC	
Phalacrocoracidae	*Phalacrocorax lucidus*	White-breasted (Great) Cormorant	LC	
Phasianidae	*Pternistis swainsonii*	Swainson's Spurfowl (Francolin)	LC	
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	Global: LC; BLSA: NT	
Phoeniculidae	*Phoeniculus purpureus*	Green (Red-billed) Wood-hoopoe	LC	
Picidae	*Dendropicos fuscescens*	Cardinal Woodpecker	LC	
Picidae	*Dendropicos namaquus*	Bearded Woodpecker	LC	
Picidae	*Jynx ruficollis*	Red-throated Wryneck	LC	

Family	Scientific name	Common name	Red list category	TOPS
Ploceidae	*Amblyospiza albifrons*	Thick-billed (Grosbeak) Weaver	LC	
Ploceidae	*Bubalornis niger*	Red-billed Buffalo-Weaver	LC	
Ploceidae	*Euplectes afer*	Yellow-crowned (Golden) Bishop	LC	
Ploceidae	*Euplectes albonotatus*	White-winged Widowbird	LC	
Ploceidae	*Euplectes ardens*	Red-collared Widowbird	LC	
Ploceidae	*Euplectes axillaris*	Fan-tailed (Red-shouldered) Widowbird	LC	
Ploceidae	*Euplectes orix*	Southern Red (Red) Bishop	LC	
Ploceidae	*Euplectes progne*	Long-tailed Widowbird	LC	
Ploceidae	*Plocepasser mahali*	White-browed Sparrow-Weaver	LC	
Ploceidae	*Ploceus capensis*	Cape Weaver	LC	
Ploceidae	*Ploceus velatus*	Southern Masked-Weaver	LC	
Ploceidae	*Quelea quelea*	Red-billed Quelea	LC	
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	LC	
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe (Dabchick)	LC	
Pycnonotidae	*Hybrid Pycnonotus nigricans x tricolor*	Hybrid Red eyed Bulbul x Dark capped bulbul	LC	
Pycnonotidae	*Pycnonotus nigricans*	African Red-eyed Bulbul	LC	
Pycnonotidae	*Pycnonotus tricolor*	Dark-capped (Black-eyed) Bulbul	LC	
Rallidae	*Amaurornis flavirostris*	Black Crake	LC	
Rallidae	*Fulica cristata*	Red-knobbed Coot	LC	
Rallidae	*Gallinula angulata*	Lesser Moorhen	LC	
Rallidae	*Gallinula chloropus*	Common Moorhen	LC	
Rallidae	*Porphyrio madagascariensis*	African Purple (Purple) Swamphen (Gallinule)	LC	
Rallidae	*Rallus caerulescens*	African Rail	LC	
Rallidae	*Sarothrura rufa*	Red-chested Flufftail	LC	

Family	Scientific name	Common name	Red list category	TOPS
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	LC	
Recurvirostridae	*Recurvirostra avosetta*	Pied (Avocet) Avocet	LC	
Rhinopomastidae	*Rhinopomastus cyanomelas*	Common Scimitarbill	LC	
Scolopacidae	*Gallinago nigripennis*	African (Ethiopian) Snipe	LC	
Scolopacidae	*Philomachus pugnax*	Ruff	LC	
Scolopacidae	*Tringa glareola*	Wood Sandpiper	LC	
Scolopacidae	*Tringa nebularia*	Common Greenshank	LC	
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	LC	
Strigidae	*Bubo africanus*	Spotted Eagle-Owl	LC	
Sturnidae	*Acridotheres tristis*	Common Myna	LC	
Sturnidae	*Cinnyricinclus leucogaster*	Violet-backed (Plum-coloured, Amethyst) Starling	LC	
Sturnidae	*Creatophora cinerea*	Wattled Starling	LC	
Sturnidae	*Lamprotornis nitens*	Cape Glossy (Glossy) Starling	LC	
Sturnidae	*Spreo bicolor*	Pied (African Pied) Starling	LC	
Sylviidae	*Acrocephalus scirpaceus*	Common Reed Warbler	LC	
Sylviidae	*Parisoma (Sylvia) subcaeruleum*	Chestnut-vented Tit-Babbler	LC	
Sylviidae	*Stenostira scita*	Fairy Flycatcher (Warbler)	LC	
Threskiornithidae	*Bostrychia hagedash*	Hadeda Ibis	LC	
Threskiornithidae	*Platalea alba*	African Spoonbill	LC	
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	LC	
Threskiornithidae	*Threskiornis aethiopicus*	African Sacred (Sacred) Ibis	LC	
Turdidae	*Turdus libonyanus*	Kurrichane Thrush	LC	
Turdidae	*Turdus smithi*	Karoo Thrush (split)	LC	
Upupidae	*Upupa africana*	African Hoopoe	LC	
Viduidae	*Vidua chalybeata*	Village Indigobird	LC	
Viduidae	*Vidua funerea*	Dusky Indigobird	LC	

Family	Scientific name	Common name	Red list category	TOPS
Viduidae	*Vidua macroura*	Pin-tailed Whydah	LC	
Viduidae	*Vidua paradisaea*	Long-tailed (Paradise) Paradise-Whydah	LC	
Viduidae	*Vidua purpurascens*	Purple Indigobird	LC	
Zosteropidae	*Zosterops pallidus (split)*	Orange River White-eye (split)	LC	
Zosteropidae	*Zosterops virens*	Cape White-eye (split)	LC	

See the avifauna specialist report for more detail on the birds.

Table 30: Amphibians

Family	Scientific name	Common name	Red list category
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern
Bufonidae	*Sclerophrys garmani*	Olive Toad	Least Concern (IUCN, 2016)
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern (IUCN 2020)
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	Near Threatened
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern

Table 31: Reptiles

Family	Scientific name	Common name	Red list category	TOPS
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (IUCN 2022)	
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern (SARCA	

Family	Scientific name	Common name	Red list category	TOPS
			2014)	
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern (SARCA 2014)	
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern (IUCN 2021)	
Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern (SARCA 2014)	
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern (SARCA 2014)	
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern (SARCA 2014)	
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)	
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)	
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)	
Colubridae	*Dispholidus typus viridis*	Northern Boomslang	Not evaluated	
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)	
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)	
Gekkonidae	*Hemidactylus mabouia*	Common Tropical House Gecko	Least Concern (SARCA 2014)	
Leptotyphlopidae	*Leptotyphlops scutifrons scutifrons*	Peters' Thread Snake	Least Concern (SARCA 2014)	
Lamprophiidae	*Lycodonomorphus laevissimus*	Dusky-bellied Water Snake	Least Concern (SARCA 2014)	
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)	
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)	
Gekkonidae	*Lygodactylus capensis*	Common Dwarf Gecko	Least Concern (SARCA 2014)	
Lacertidae	*Nucras holubi*	Holub's Sandveld Lizard	Least Concern (SARCA 2014)	
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern (SARCA	

Family	Scientific name	Common name	Red list category	TOPS
			2014)	
Scincidae	*Panaspis wahlbergii*	Wahlberg's Snake-eyed Skink	Least Concern (IUCN 2021)	
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Not evaluated	
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern (SARCA 2014)	
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern (SARCA 2014)	
Lamprophiidae	*Psammophis leightoni*	Cape Sand Snake	Vulnerable (SARCA 2014)	
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)	
Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern (SARCA 2014)	
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern (SARCA 2014)	
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern (SARCA 2014)	
Scincidae	*Trachylepis damarana*	Damara Variable Skink	Least Concern	
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)	
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)	
Varanidae	*Varanus niloticus*	Water Monitor	Least Concern (SARCA 2014)	