



Terrestrial Biodiversity Impact Assessment

2022/ 08 / 03 ECO

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT (INCLUDING PLANT AND ANIMAL SPECIES ASSESSMENT) FOR THE PROPOSED NAOS SOLAR PV PROJECT TWO ON PORTION 2 OF THE FARM WATERFORD NO. 573, NEAR VILJOENSKROON IN THE FREE STATE PROVINCE.

January 2023

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Compiled by: M Van der Westhuizen**

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Conducted for:

SOLA Group

Compiled by:

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I, Mari van der Westhuizen, hereby confirm my independence as a specialist and declare that I do not have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which I was appointed as ecologist in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the terrestrial biodiversity impact assessment (including plant and animal species assessment) for the proposed Naos Solar PV Project Two on Portion 2 of the Farm Waterford No. 573, near Viljoenskroon in the Free State Province.



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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
WM	With Mitigation
WOM	Without Mitigation

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1 BACKGROUND

1.1 Assignment

Mari van der Westhuizen was requested by SOLA Group to complete a terrestrial biodiversity impact assessment (including plant and animal species assessment) for the proposed Naos Solar PV Project Two on Portion 2 of the Farm Waterford No. 573, near Viljoenskroon in the Free State Province as part of the Impact Assessment process undertaken by the EAP Environamics. The site sensitivity verification also includes the proposed grid connection corridors to Mercury Substation.

The proposed solar PV project will produce 240 MW of energy and have a footprint of up to 300 Ha. The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current).

The infrastructure will consist of multiple PV panels, a Battery Energy Storage System (BESS), Inverters and other supporting infrastructure. The power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 400kV Mercury Main Transmission Substation.

The Species Environmental Impact Assessments Guideline has been developed in support of the Terrestrial Biodiversity, Plant and Animal Species protocols that were gazetted 30th October 2020 (Government Notice number 1150). This guideline provides details for implementing relevant species protocols and is available for use to plant and animal specialists, environmental assessment practitioners and Competent Authorities. This report was compiled according to these guidelines.

1.2 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).

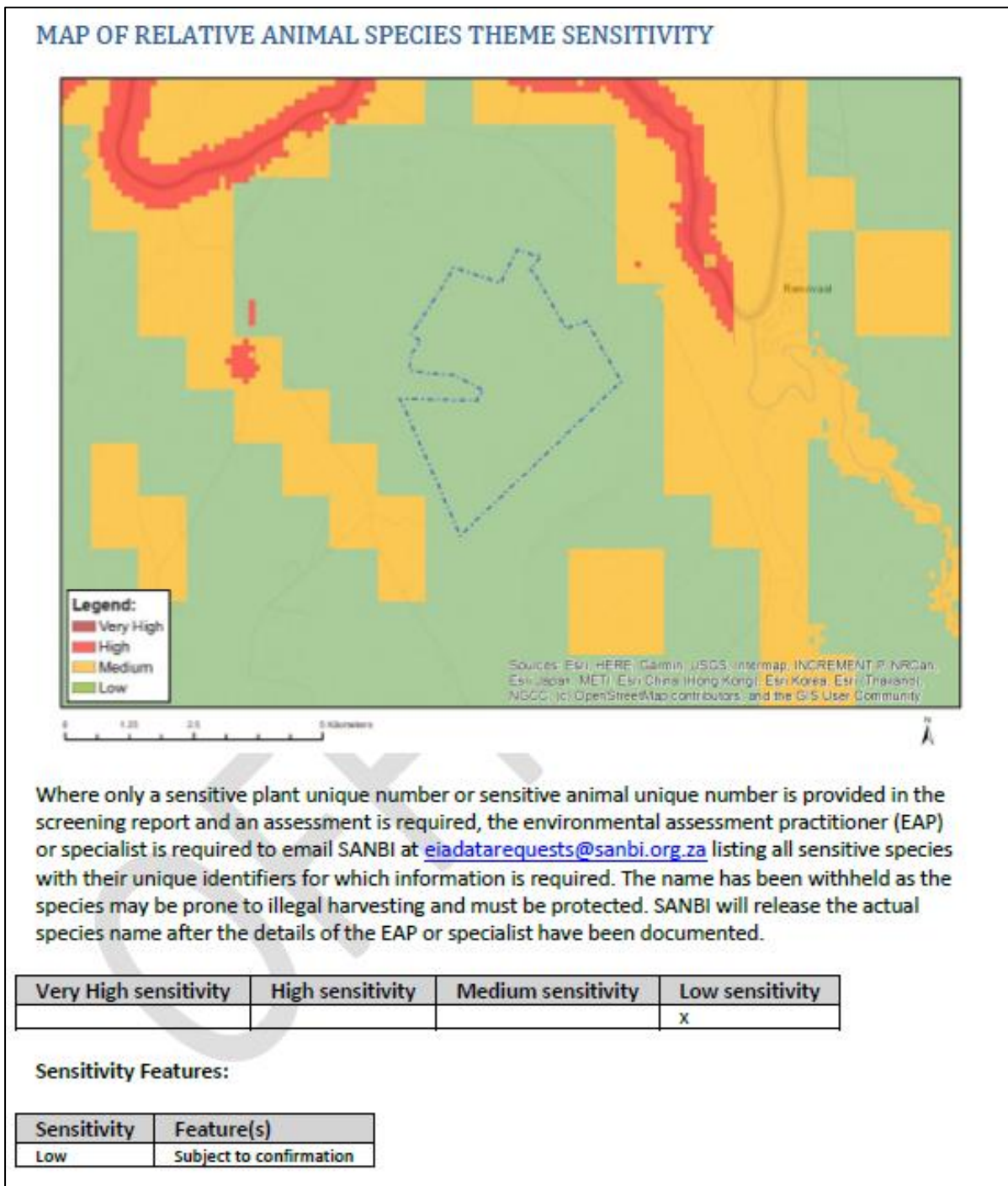


Figure 2: Animal species theme sensitivity according to the Screening Tool

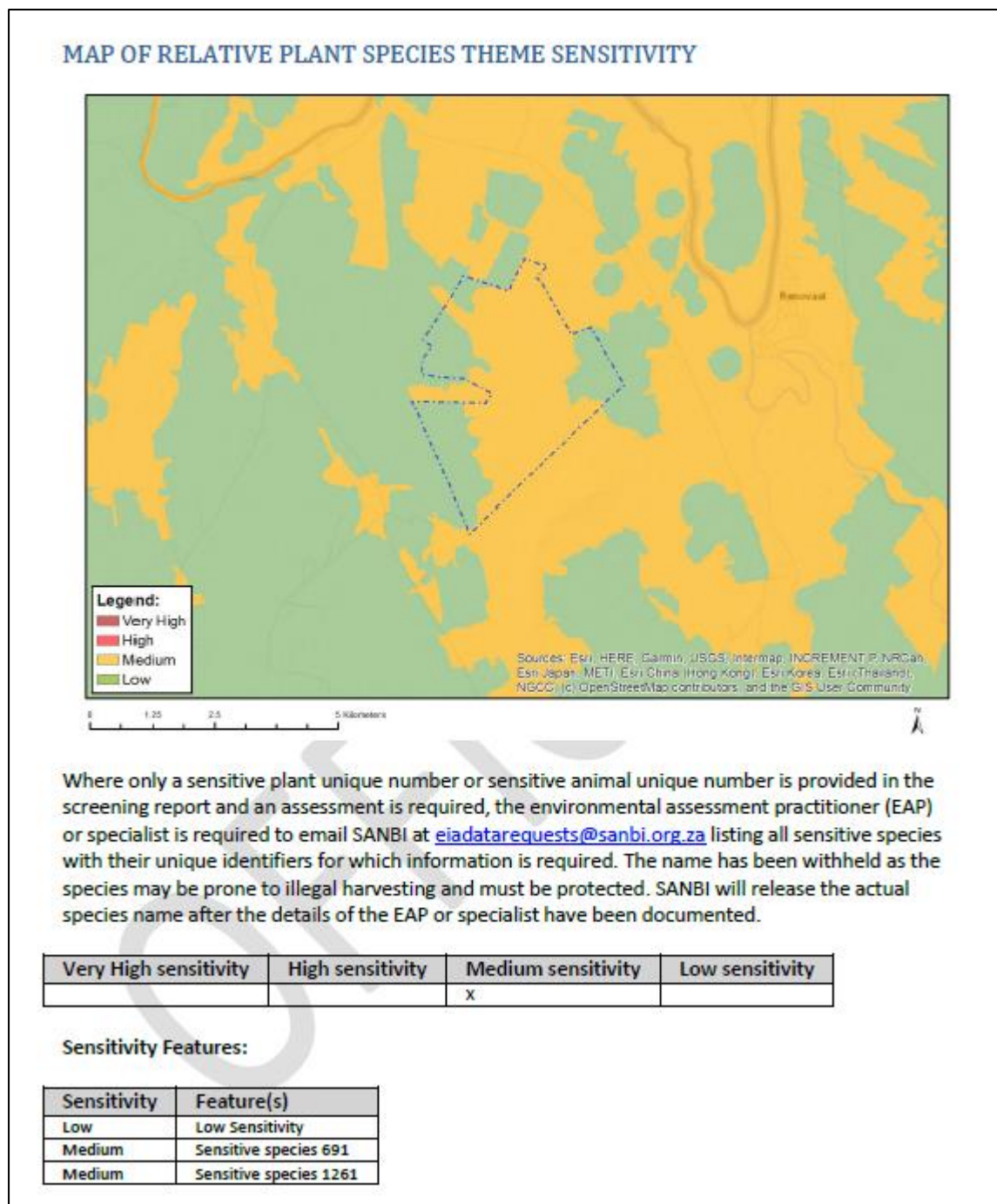


Figure 3: Plant species theme sensitivity according to the Screening Tool

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 has a Medium sensitivity from a terrestrial biodiversity perspective. Although the area is in an endangered vegetation unit – the Vaal-Vet sandy grassland vegetation unit and the vulnerable Rand Highland Grassland vegetation unit, most of the project area is completely disturbed by agricultural

fields or planted pastures and some sections are somewhat disturbed. The species diversity in the remaining natural veld is high.

- The site has a Medium Sensitivity from an Animal Species Theme Perspective due to the presence of fauna habitats. No species of conservation concern was recorded or are expected to occur there.
- The site has a Medium Sensitivity from a Plant Species Theme Perspective. The species diversity in the remaining natural veld is high. One plant species of conservation concern was recorded, namely *Crinum bulbispermum* which is in the Declining category. Ten provincially protected plant species were recorded.

1.3 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).

1.4 Regulations governing this report

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. Free State Province Nature Conservation Ordinance (8 of 1969).

1.5 Limitations and assumptions

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, and this survey was conducted over two seasons (late summer and winter), which is considered to be sufficient.

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.

The project area was surveyed on 15 to 17 March 2022 and the 2nd of June 2022. The proposed grid connection corridor alternatives were surveyed 14 to 15 July 2022. March is a good time of the year for a biodiversity survey, because most species are identifiable. July is not the best time of the year for a biodiversity survey, because the vegetation dies back as it is damaged by frost. The area is however disturbed and sensitive plant species are not expected.

2 BACKGROUND TO THE PROJECT AREA

2.1 Location

The project area is on Portion 2 of the Farm Waterford No. 573, near Viljoenskroon in the Free State Province. The proposed grid connection corridors traverse the following farms:

Power Line Alternatives 1A, 1B and 1C (1B is the technically preferred alternative)

- Portion 1 of the Farm Waterford No. 573
- Portion 1 La Reys Kraal Zuid No. 165
- Portion 2 of the Farm Kleinfontein No. 369
- Remaining Extent of the Farm Kleinfontein No. 369
- Portion 2 of the Farm Zaaiplaats No. 190
- Portion 3 of the Farm Zaaiplaats No. 190
- Portion 2 of the Farm Biesiefontein No. 173
- Farm Doornplaats 599

Power Line Alternative 2

- Portion 1 of the Farm Waterford No. 573
- Portion 1 La Reys Kraal Zuid No. 165
- Portion 2 of the Farm Kleinfontein No. 369
- Remaining Extent of the Farm Kleinfontein No. 369
- Portion 2 of the Farm Zaaiplaats No. 190
- Portion 3 of the Farm Zaaiplaats No. 190
- Portion 2 of the Farm Biesiefontein No. 173

Power Line Alternative 3

- Portion 1 of the Farm Waterford No. 573
- Portion 1 La Reys Kraal Zuid No. 165
- Portion 1 of the Farm Kleinfontein No. 369
- Portion 2 of the Farm Kleinfontein No. 369
- Remaining Extent of the Farm Kleinfontein No. 369
- Portion 3 of the Farm Zaaiplaats No. 190
- Portion 2 of the Farm Biesiefontein No. 173

Power Line Alternative 4

- Portion 1 of the Farm Waterford No. 573
- Portion 2 of the Farm Waterford No. 573
- Portion 2 of the Farm Biesiefontein No. 173
- Portion 4 of the Farm Biesiefontein No. 173
- Remaining Extent of the Farm Biesiefontein No. 173
- Portion 1 of the Farm Kleinfontein No. 369
- Portion 3 of the Farm Zaaiplaats No. 190

2.2 Climate

The climate for Klerksdorp is given, as it is the closest town with weather data available. Klerksdorp is 1308m above sea level. Klerksdorp's climate is a local steppe climate. The climate here is classified as BSh by the Köppen-Geiger system. The average annual temperature for the region is 18.1 °C. The annual rainfall is around 610 mm (Climate-data.org, 2022).

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 mostly the Bd 13 land type, with a small section falling into the Bc25 land type (Figure 5) (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
Bc25	Plinthic catena: eutrophic; red soils widespread, upland duplex and marginalitic soils rare	Diabase and Hekpoort lava predominantly. Shale, slate and quartzite of the Pretoria Group. Eccca shale and sandstone in the south. Quartzite usually forms crests and scarps. Footslopes usually on diabase, lava, shale and slate.
Bd13	Plinthic catena: eutrophic; red soils not widespread, upland duplex and marginalitic soils rare	Mainly Eccca sandstone; Eccca shale and mudstone may occur in places. Sporadic occurrence of dolerite and diabase. Pretoria Group quartzite and shale in the north-east. Aeolian sand overlies most rocks. Pans occupy 2% of land type.

2.4 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 **Vaal-Vet Sandy Grassland and Rand Highland Grassland** vegetation units (Mucina *et al.*, 2018). The Vaal-Vet Sandy Grassland vegetation unit is described as plains-dominated landscape with some scattered slightly irregular undulating plains and hills. Mainly low tussock grasslands with an abundant karroid element. *Themeda triandra* is dominant in this vegetation unit. The conservation status of this vegetation unit is **Endangered**. The National Biodiversity Assessment lists it as Endangered, and the protection level is **Not protected** (SANBI, 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. 9ucronate9d*, *Senegalia caffra* and *Celtis 9ucronat*, accompanied by a rich suite of shrubs among which the genus *Searsia* (especially *S. magalisonata*) 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).

2.5 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.

2.5.1 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).

Much of the project area falls into the categories degraded and other, some sections however fall into CBA1, CBA2, ESA1 and ESA2 (see Figure 7) (Collins, 2015; Collins, 2016).

2.5.2 National Freshwater Ecosystem Protected Areas (NFEPAs)

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)

There are no NFEPA wetlands or rivers inside the project area, there is a NFEPA wetland and river (the Vaal River) north of the project area (Figure 8) (Nel *et al.*, 2011).

2.5.3 National Wetland Map 5

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 no NWM5 wetlands in the project area where the solar panels are proposed to be developed, the proposed grid connection corridor alternatives 1, 2 and 3 however traverse a NWM5 wetland (Figure 8).

2.5.4 Strategic Water Source Areas

Water source areas are those areas that supply a disproportionate amount of mean annual runoff to a geographical region of interest. Strategic water source areas (SWSA) are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy (Nel *et al.*, 2013).

The study area is not located in a strategic water source area.

2.5.5 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.

2.5.6 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 a National Protected, but it is located 3,1 km south-west of Bushybend Private Nature Reserve and the proposed grid connection corridor is 640 m east of Mispah Game Farm (Government of South Africa, 2010). Approximately half of the Mispah Game Farm is used by Harmony Mine as tailings dams, therefore it is far from a pristine condition. A small section of the project area overlaps with a NPAES Negotiated Focus Areas 2018 (Figure 9).

2.5.7 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 12th (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 two threatened ecosystem: the **Endangered Vaal-Vet Sandy Grassland** and the **Vulnerable Rand Highland Grassland** vegetation unit, (SANBI, 2011; SANBI, 2018)) (Figure 10).

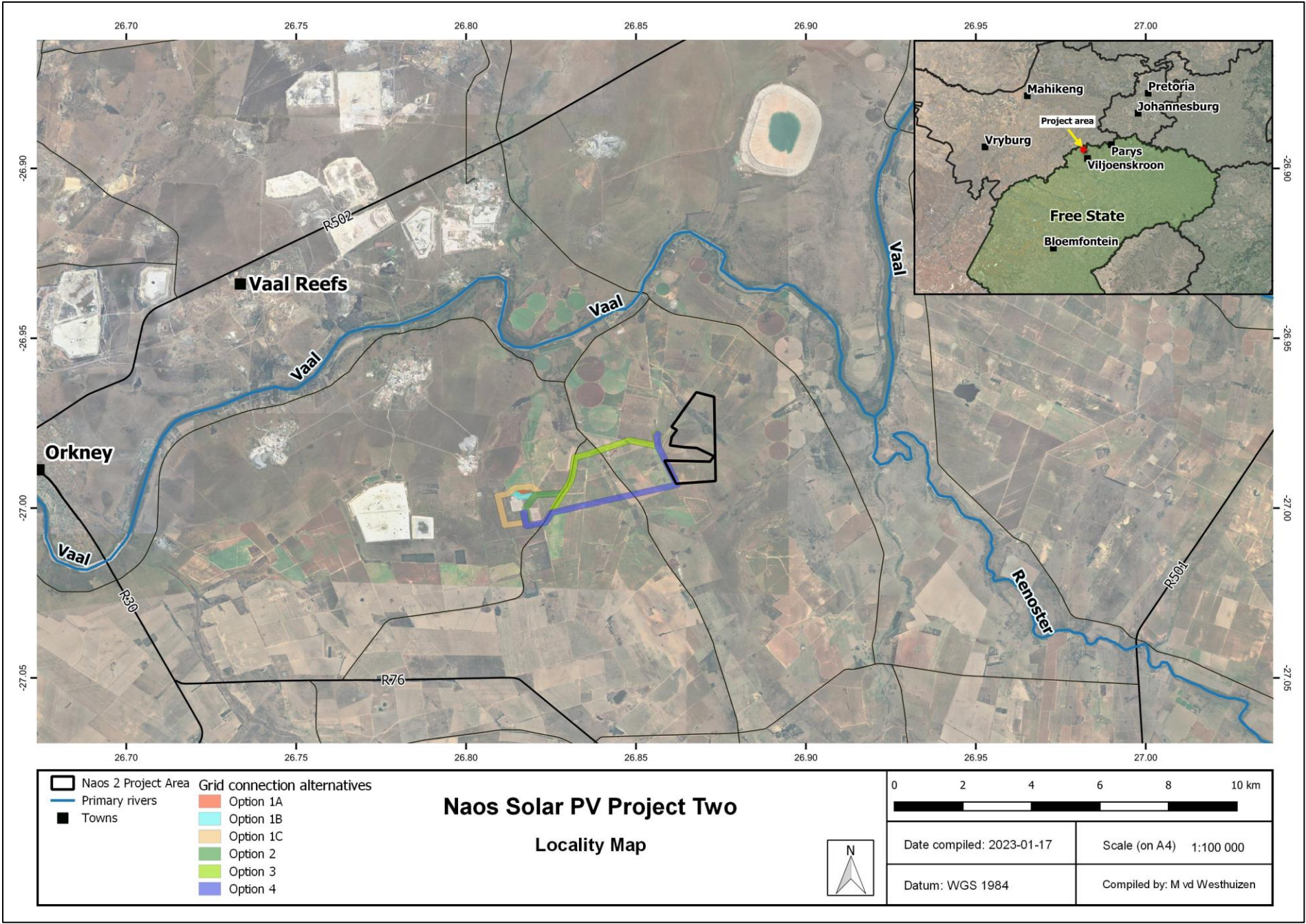
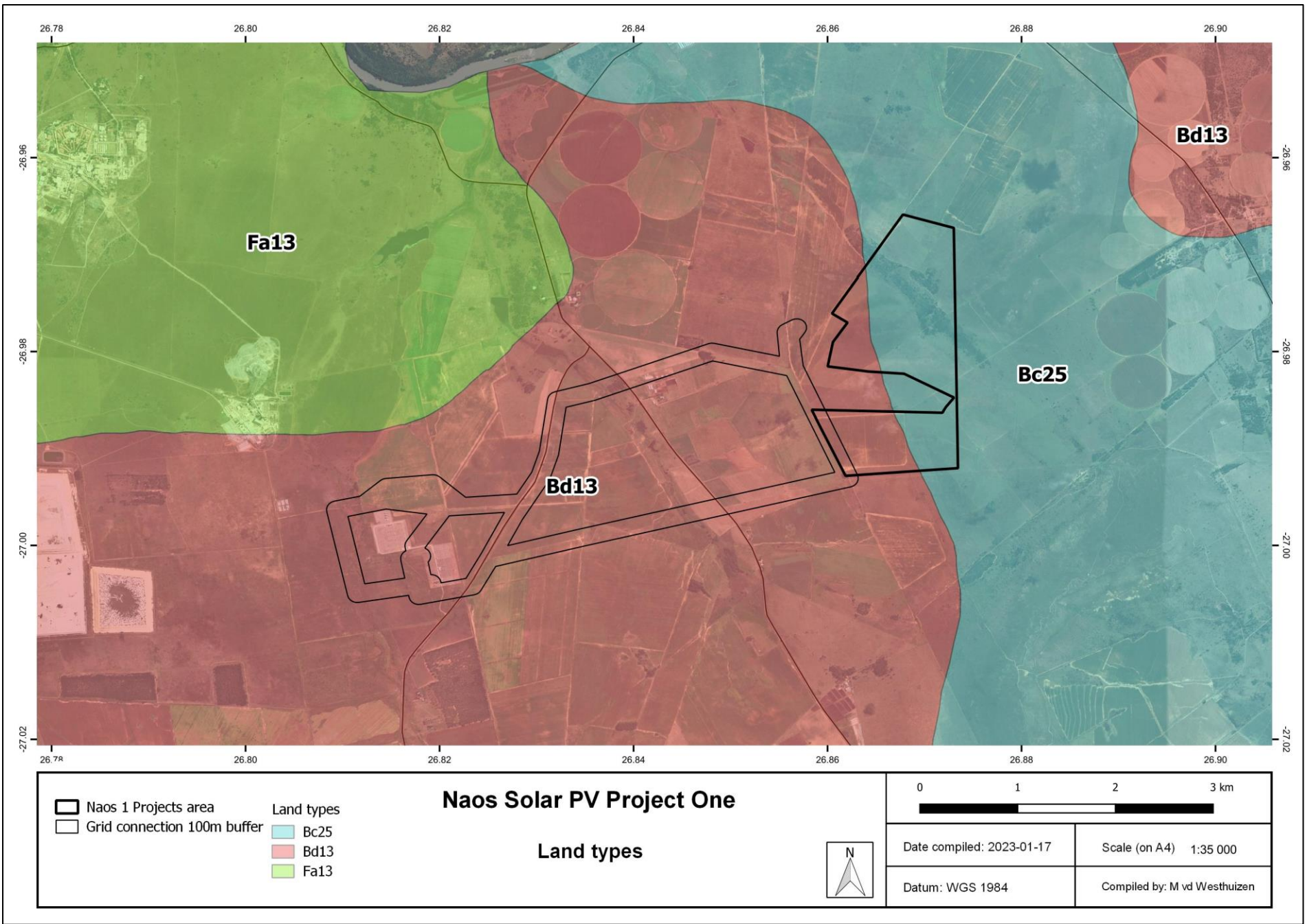


Figure 4: Locality Map



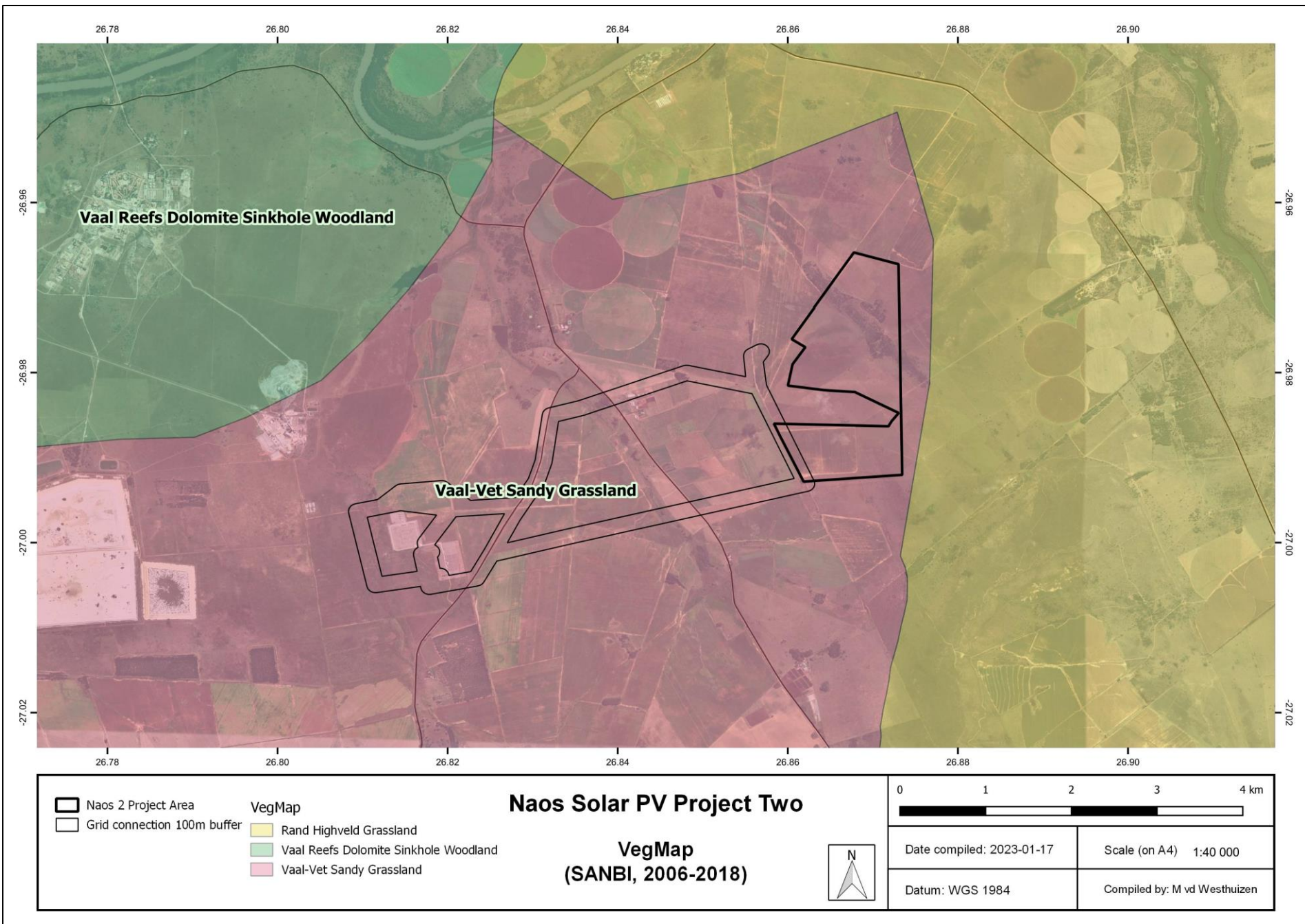


Figure 6: Vegetation units (SANBI, 2006-2018)

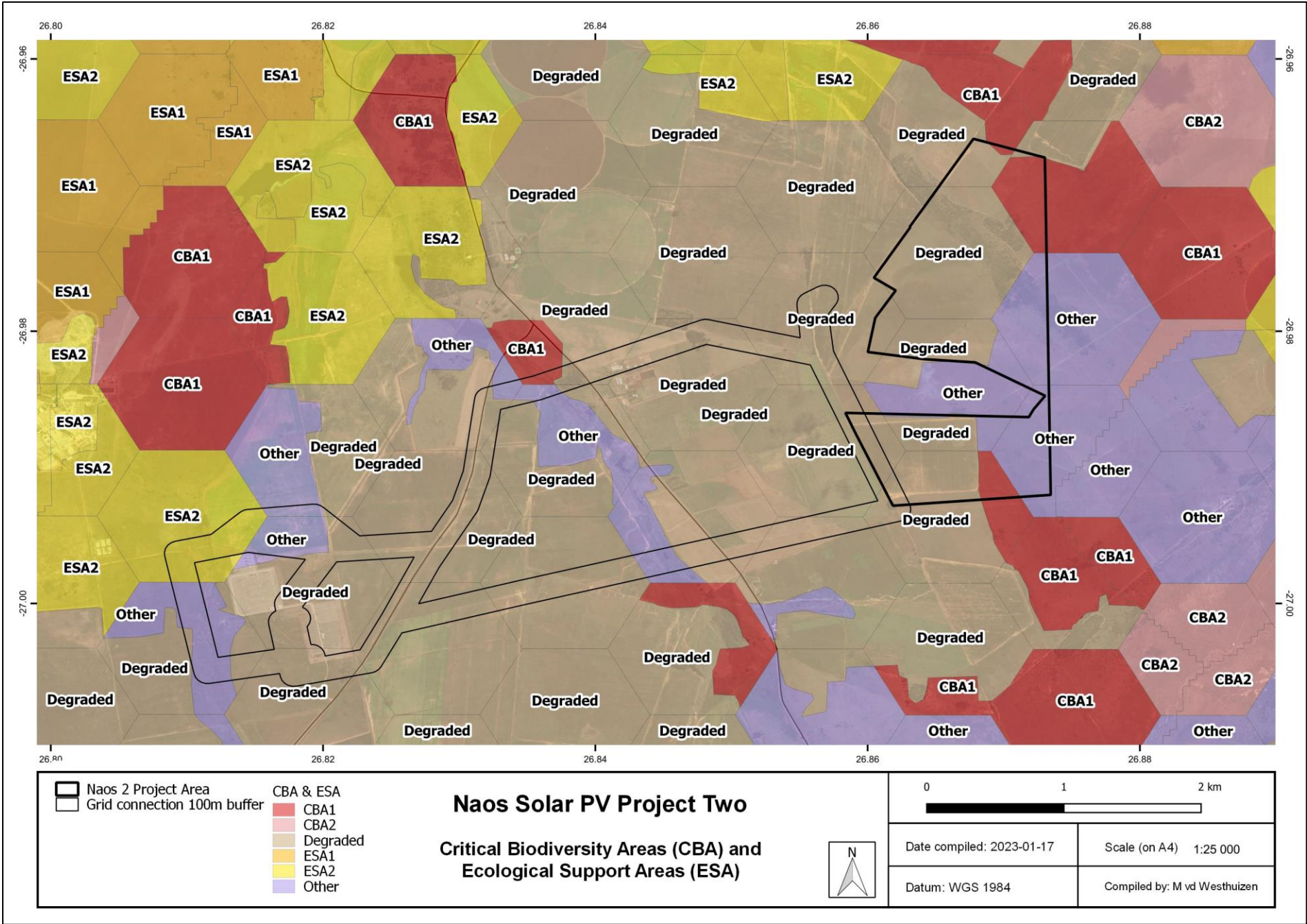


Figure 7: Critical Biodiversity Areas and Ecological Support Areas (Collins, 2015)

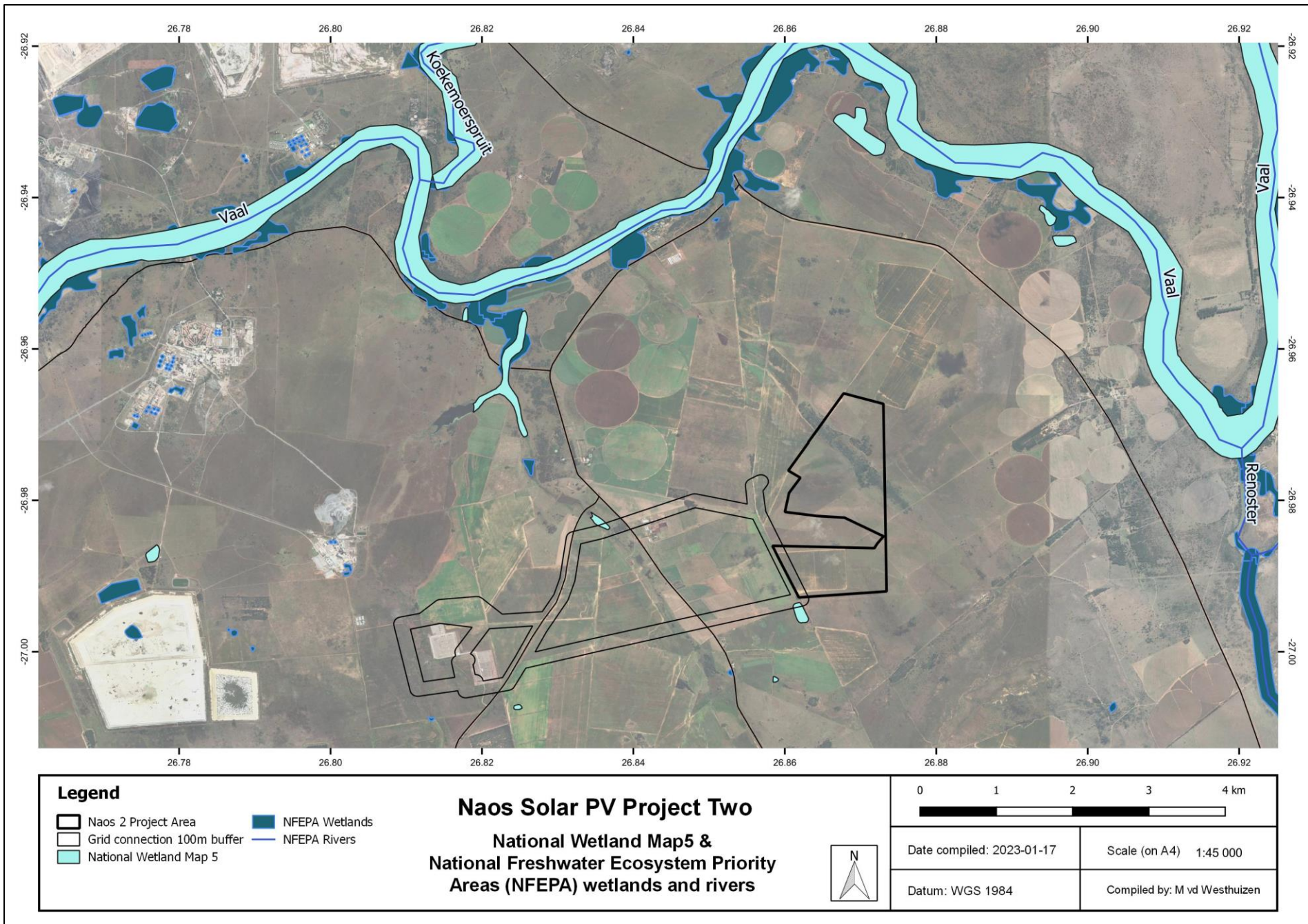


Figure 8: National Freshwater Ecosystem Priority Areas (NFEPA) rivers and wetlands (Nel *et al.*, 2011)

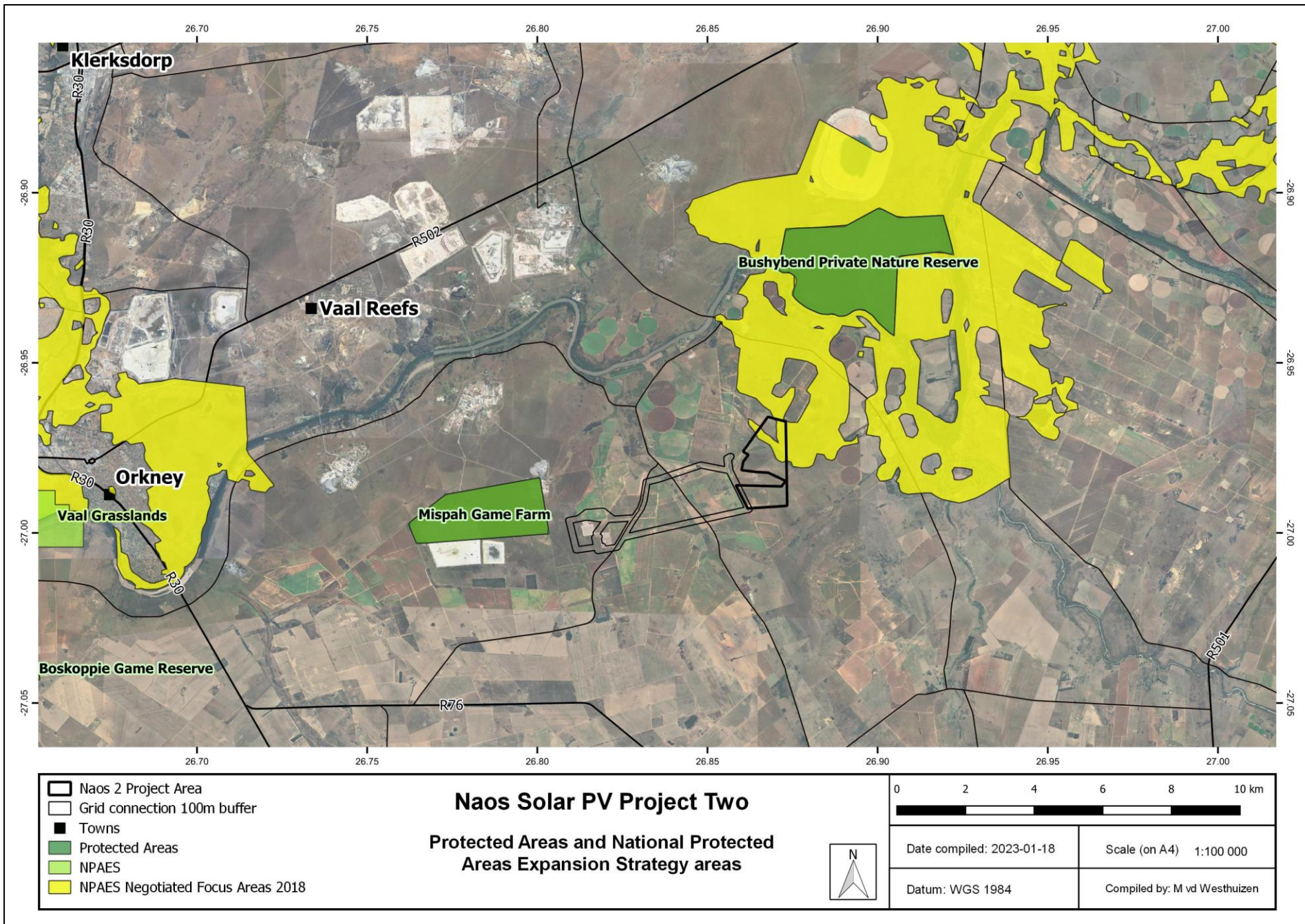


Figure 9: Protected Areas and National Protected Areas Expansion Strategy

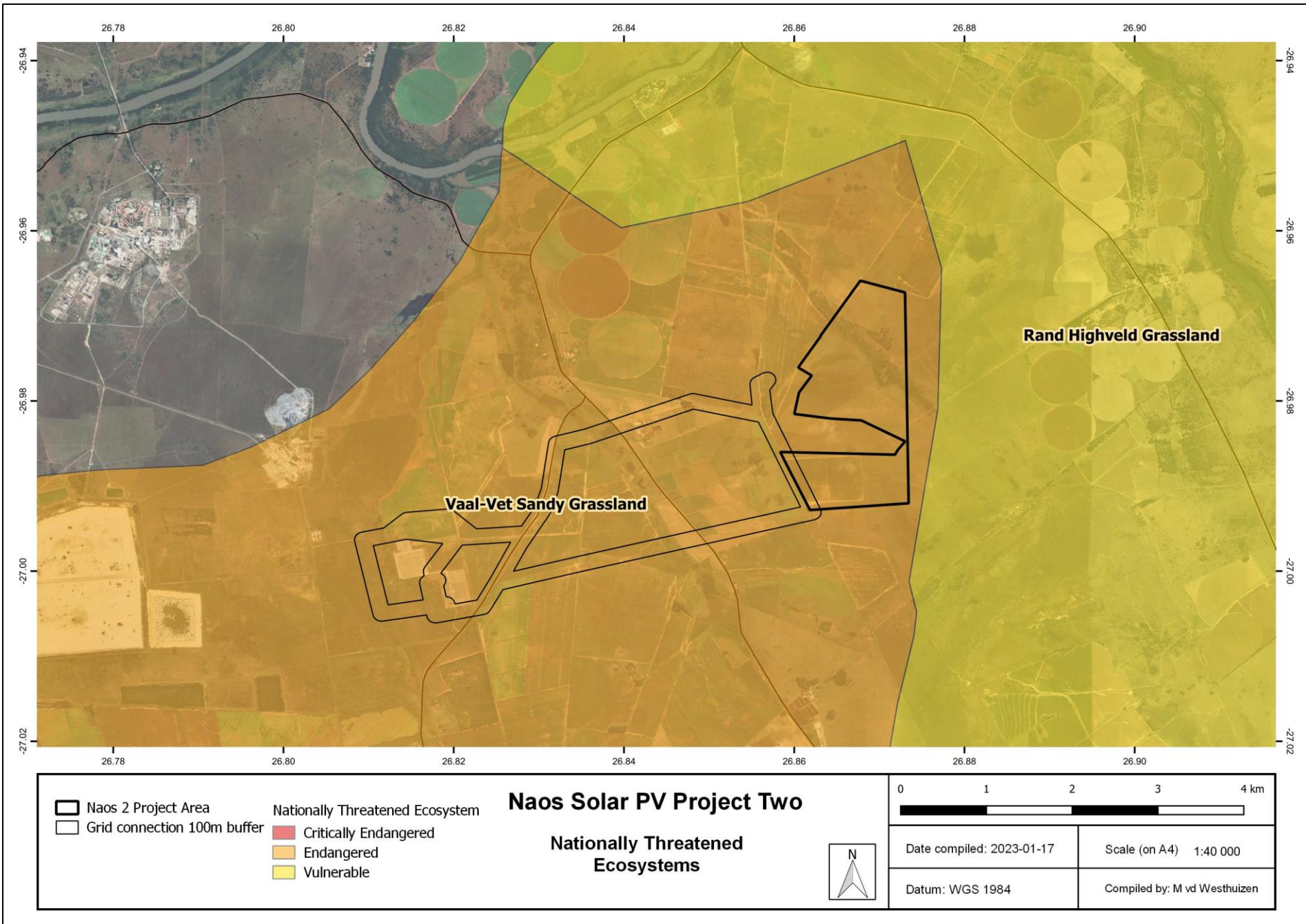


Figure 10: Nationally Threatened Ecosystems

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 units 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 15 – 17 March 2022, 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. The virtual museum was used to access fauna species list for the quarter degree grid.

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.

A search for any Species of Conservation Concern (SCC) was also conducted as listed in the EIA screening tool or other databases for the Quarter Degree Grid that lists potential species.

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.

4 RESULTS

4.1 Vegetation units

The project area can be divided into the following vegetation / land use units (Figure 11):

- 1) *Themeda triandra* – *Schizachyrium sanguineum* sandy grassland;
- 2) *Schizachyrium sanguineum* – *Dichapetalum cymosum* rocky grassland
- 3) *Seriphium plumosum* – *Eragrostis gummiflua* sandy grassland;
- 4) *Melinis repens* – *Tagetes minuta* hill grassland
- 5) *Eleusine coracana* grassland;
- 6) *Cynodon dactylon* – *Panicum schinzii* grassland
- 7) Wetlands
- 8) *Vachellia karroo* – *Asparagus laricinus* woodland;
- 9) *Digitaria eriantha* planted pastures
- 10) *Eucalyptus camaldulensis* woodland;
- 11) Remains of *Eucalyptus camaldulensis* woodland
- 12) *Digitaria eriantha* planted pastures;
- 13) Agricultural field;
- 14) Old agricultural field;
- 15) Buildings.

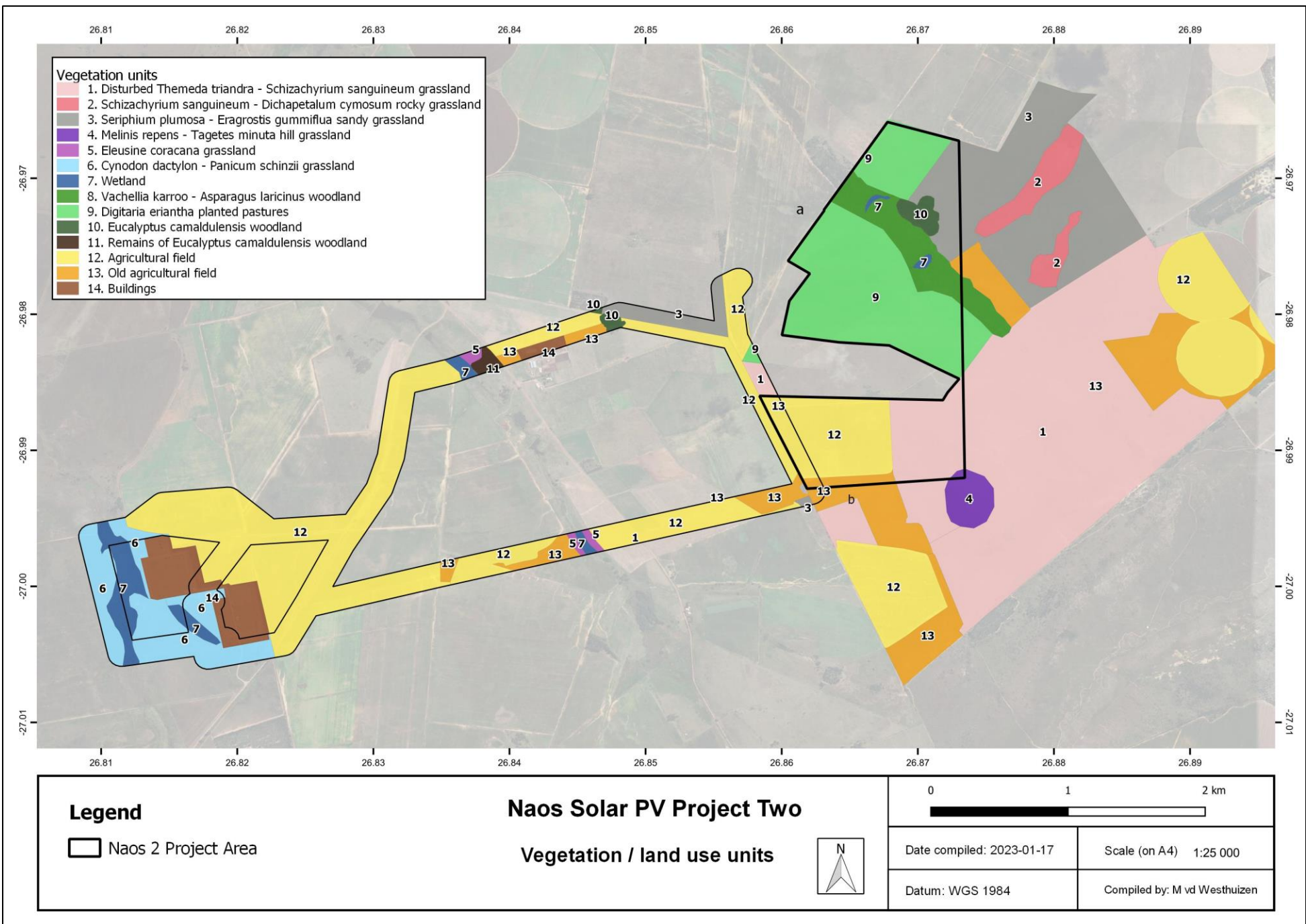


Figure 11: Vegetation units

4.1.1 *Themeda triandra* – *Schizachyrium sanguineum* sandy grassland

This vegetation unit occurs on sandy plains. It is currently used for cattle grazing. The vegetation unit consists mostly of grasses and forbs with scattered bush clumps. It is moderately disturbed, as can be seen by the presence of *Seriphium plumosa* (Bankrotbos). The species diversity is high.

Dominant grasses include *Themeda triandra*, *Digitaria eriantha*, *Schizachyrium sanguineum* and *Eragrostis gummiflua*, the forbs *Pollichia campestris*, *Crabbea acaulis* and *Gladiolus permeabilis* and the shrub *Seriphium plumosa*. Bush clumps consist of *Vachellia karroo*, *Ziziphus 25ucronate*, *Searsia pyroides* and *Asparagus larycinus*. Some provincially protected plant species are present in this vegetation unit, namely *Crinum macowanii*, *Helichrysum nudifolium*, *H. rugulosum*, *H. kraussii*, *Gladiolus permeabilis* subsp. *Edulis* and *Boophone disticha*. No protected tree species were recorded. The state of the vegetation is indicated in Figure 12, while the characteristics of the variations of this vegetation unit are summarised in Table 2.

Table 2. Botanical analysis and characteristics of *Themeda triandra*– *Schizachyrium sanguineum* sandy grassland

State of the vegetation:	Moderately disturbed
Need for rehabilitation	Medium
Conservation priority	Medium
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 10 % (avg. height: 1,2m)
Density of herbaceous layer	Grasses: 50% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Medium-High
Dominant plant species	<i>Themeda triandra</i> , <i>Digitaria eriantha</i> , <i>Schizachyrium sanguineum</i> , <i>Eragrostis gummiflua</i> , <i>Pollichia campestris</i> , <i>Crabbea acaulis</i> , <i>Gladiolus permeabilis</i> , <i>Seriphium plumosa</i> , <i>Vachellia karroo</i> , <i>Ziziphus 25ucronate</i> , <i>Searsia pyroides</i> and <i>Asparagus larycinus</i>
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium sensitivity. Although it has a high species diversity, and six provincially protected species were recorded in it, it is moderately disturbed. It further represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. No protected tree species were recorded.



Figure 12. State of the *Themeda triandra*– *Schizachyrium sanguineum* sandy grassland

4.1.2 *Schizachyrium sanguineum* – *Dichapetalum cymosum* rocky grassland

This vegetation unit occurs in very rocky areas. It is currently used for cattle grazing. Soil is sandy and rocky. The vegetation unit consists mostly of grasses and forbs. It is disturbed to some extent, as can be seen by the presence of *Seriphium plumosa* (Bankrotbos) and *Eragrostis gummiflua*, which both favours disturbed areas. It is however less disturbed than the rest of the project area.

Dominant grasses include *Schizachyrium sanguineum*, *Eragrostis chloromelas*, *Eragrostis gummiflua* and *Loudetia simplex*, the forbs *Dichapetalum cymosum*, *Lapeirousia sandersonii*, *Hypoxis rigidula* var. *rigidula* and *Triumfetta sonderi* and the shrubs *Seriphium plumosa*, *Searsia magalimontana* and *Elephantorrhiza elephantina*. Some provincially protected plant species are present in this vegetation unit, namely *Crinum macowanii*, *Helichrysum nudifolium* and *Pellaea calomelanos*. No protected trees were recorded. The state of the vegetation is indicated in Figure 13, while the characteristics of the variations of this vegetation unit are summarized in Table 3.

Table 3. Botanical analysis and characteristics of *Schizachyrium sanguineum*– *Dichapetalum cymosum* rocky grassland

State of the vegetation:	Somewhat disturbed, high species diversity
Need for rehabilitation	Medium
Conservation priority	Medium
Soils & Geology	Sandy, rocky soil
Density of woody layer	Shrubs and trees: 10 % (avg. height: 0,8m)
Density of herbaceous layer	Grasses: 50% (avg. height: 0,6m) Forbs: 25% (avg. height: 0,5m)
Sensitivity	Medium-High
Dominant plant species	<i>Schizachyrium sanguineum</i> , <i>Eragrostis chloromelas</i> , <i>Eragrostis gummiflua</i> , <i>Loudetia simplex</i> , <i>Dichapetalum cymosum</i> , <i>Lapeirousia sandersonii</i> , <i>Hypoxis rigidula</i> var. <i>rigidula</i> , <i>Triumfetta sonderi</i> , <i>Seriphium plumosa</i> and <i>Elephantorrhiza elephantina</i>
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 provincially protected species were recorded in it. It further represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. No protected trees were recorded.



Figure 13. State of the *Schizachyrium sanguineum*– *Dichapetalum cymosum* rocky grassland



Figure 14: *Lapeirousia sandersonii* (Autumn painted petals)

4.1.3 *Seriphium plumosum* – *Eragrostis gummiflua* sandy grassland

This vegetation unit occurs on sandy plains. It is currently used for cattle grazing. The vegetation unit consists mostly of grasses and forbs with almost no trees. It is very disturbed, as can be seen by the presence of *Seriphium plumosum* (Bankrotbos) which proliferates in disturbed or overgrazed areas (Badenhorst, 2004). The species diversity is low.

Dominant grasses include *Aristida congesta*, *Cynodon dactylon*, *Digitaria eriantha*, *Eragrostis chloromelas* and *Eragrostis gummiflua*, the forbs *Crotalaria sphaerocarpa* subsp. *Sphaerocarpa*, *Polydora poskeana*, *Conyza bonariensis* and *Tagetes minuta* and the shrub *Seriphium plumosum*. These species are typically found in disturbed areas. The state of the vegetation is indicated in Figure 15, while the characteristics of the variations of this vegetation unit are summarised in Table 4.

Table 4. Botanical analysis and characteristics of *Seriphium plumosum* – *Eragrostis gummiflua* sandy grassland

State of the vegetation:	Very disturbed, low diversity
Conservation priority	Medium-Low
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 1 % (avg. height: 2m)
Density of herbaceous layer	Grasses: 50% (avg. height: 0,8m) Forbs: 40% (avg. height: 1m)
Sensitivity	Low
Dominant plant species	<i>Seriphium plumosum</i> , <i>Eragrostis gummiflua</i> , <i>Aristida congesta</i> , <i>Cynodon dactylon</i> , <i>Digitaria eriantha</i> , <i>Eragrostis chloromelas</i> , <i>Crotalaria sphaerocarpa</i> subsp. <i>Sphaerocarpa</i> , <i>Polydora poskeana</i> , <i>Conyza bonariensis</i> , <i>Tagetes minuta</i>
Red data species (NEMBA)	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium-Low sensitivity since it is very disturbed, due to poor land management practices in the past. It represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. No protected tree species or species of conservation concern was recorded. Four provincially protected plant species were recorded, namely *Aloe greatheadii*, *Boophone disticha*, *Helichrysum kraussii* and *Helichrysum nudifolium*.



Figure 15: State of the *Seriphium plumosum* – *Eragrostis gummiflua* sandy grassland

4.1.4 *Melinis repens* – *Tagetes minuta* hill grassland

This vegetation unit occurs on the only small hill in the project area. It is currently used for cattle grazing. Two power lines cross this hill and there is a cement farm dam on top of it, therefore it is very disturbed, with exotics such as *Tagetes minuta* and *Pseudognaphaleum luteo-album* dominating. Soil is sandy and rocky. The vegetation unit consists mostly of grasses and forbs with some trees surrounding the farm dam.

Dominant grasses include *Melinis repens*, *Eragrostis chloromelas* and *Cymbopogon 30ucronate*, the forbs *Tagetes minuta*, *Pseudognaphaleum luteo-album* and *Hermannia depressa* and the trees / shrubs *Seriphium plumosa*, *Vachellia karroo* and *Searsia pyroides*. Some provincially protected plant species are present in this vegetation unit, namely *Aloe greatheadii*, *Boophone disticha* and *Helichrysum nudifolium*. 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 summarized in Table 5.

Table 5. Botanical analysis and characteristics of *Melinis repens* – *Tagetes minuta* hill grassland

State of the vegetation:	Disturbed grassland infested with exotic species
Need for rehabilitation	Low
Conservation priority	Medium-low
Soils & Geology	Sandy, rocky soil
Density of woody layer	Shrubs and trees: 20 % (avg. height: 0,8m)
Density of herbaceous layer	Grasses: 50% (avg. height: 0,6m) Forbs: 35% (avg. height: 0,5m)
Sensitivity	Medium-Low
Dominant plant species	<i>Melinis repens</i> , <i>Eragrostis chloromelas</i> , <i>Cymbopogon 31ucronate</i> , <i>Tagetes minuta</i> , <i>Pseudognaphaleum luteo-album</i> , <i>Hermannia depressa</i> , <i>Seriphium plumosa</i> , <i>Vachellia karroo</i> and <i>Searsia pyroides</i> .
Red data species	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium-Low sensitivity due to the fact that it is very disturbed. It does however represent the Endangered Vaal-Vet Sandy Grassland vegetation unit, and some provincially protected plant species are present. No protected trees were recorded.

Figure 16. State of the *Melinis repens* – *Tagetes minuta* hill grassland



Figure 17: Cement farm dam on hill



Figure 18: *Aloe greatheadii*

4.1.5 *Eleusine coracana* grassland

This vegetation unit occurs next to a valley bottom wetland (Figure 19). It is dominated by the grass *Eleusine coracana* and other grasses. There are no trees or shrubs. It is disturbed and has a low species diversity. Sensitivity is low.



Figure 19: *Eleusine coracana* grassland

4.1.6 *Cynodon dactylon* – *Panicum schinzii* grassland

This vegetation unit is located east and south of Mercury Substation. It is adjacent to a wetland feature. Some gravel roads and power lines traverse the grassland. No grazing occurs and the grass and forb layer is dense and tall. The development and operation of the substation have disturbed it to some extent. Soil is sandy to clayey.

Dominant grasses include *Cynodon dactylon*, *Panicum schinzii*, *Cymbopogon caesius* and *Pogonarthria squarrosa*, the forbs *Berkheya radula*, *Verbena bonariensis* and *Polydora poskeana* and the shrubs *Asparagus laricinus* and *Seriphium plumosum*. Some provincially protected plant species are present in this vegetation unit, namely *Helichrysum nudifolium*, and *Helichrysum rugulosum*. No protected trees were recorded. The state of the vegetation is indicated in Figure 20, while the characteristics of the variations of this vegetation unit are summarised in Table 6.

Table 6. Botanical analysis and characteristics of *Cynodon dactylon* – *Panicum schinzii* grassland

State of the vegetation:	Moderately disturbed
Conservation priority	Medium
Soils & Geology	Sandy to clayey soil
Density of woody layer	Shrubs: 5 % (avg. height: 0,8m)
Density of herbaceous layer	Grasses: 80% (avg. height: 1,2m) Forbs: 30% (avg. height: 0,8m)
Sensitivity	Medium
Dominant plant species	<i>Cynodon dactylon</i> , <i>Panicum schinzii</i> , <i>Cymbopogon caesius</i> , <i>Pogonarthria squarrosa</i> , <i>Berkheya radula</i> , <i>Verbena bonariensis</i> , <i>Polydora poskeana</i> , <i>Asparagus larycinus</i> and <i>Seriphium plumosum</i>
Red data species	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium sensitivity. It is moderately disturbed. It represents the Endangered Vaal-Vet Sandy Grassland vegetation unit, and some provincially protected plant species are present. No protected trees were recorded.

**Figure 20. State of the *Cynodon dactylon* – *Panicum schinzii* grassland**

4.1.7 Wetlands

There are two exorheic depression wetlands (artificial dams) in the project area and two Unchannelled Valley Bottom wetlands in the grid connection corridor (See the wetland assessment report for more details on the wetlands). The dams have been built in the early 1980's. It is the opinion of the author that it would not have had wetland characteristics if it were not for the dams. The soil is sandy and the under natural conditions the soil would not have been saturated for long enough periods to create characteristic wetland soils and vegetation. The current land use is cattle grazing. The exorheic depression wetlands are characterised by hydrophytes, such as *Persicaria decipiens*, sedges, *Cynodon dactylon*, and *Eragrostis chloromelas*.

One Unchannelled Valley Bottom wetland is located east and south of Mercury Substation. Some gravel roads and power lines traverse the wetland. No grazing occurs and the grass and forb layer is dense and tall. The Mercury substation was built partially inside the wetland. Channels were constructed to drain water into the undisturbed part of the wetland. Soil is sandy to clayey. The other Unchannelled Valley Bottom wetland is located around the middle of the grid connection corridor alternatives. 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*, *Panicum schinzii*, *Aristida junciformis*, *Cymbopogon caesius* and *Setaria 35ucronate35 var. sericea*.

No plant species of conservation concern or protected trees were recorded. The state of the vegetation is indicated in Figure 21 and Figure 22, while the characteristics of the variations of this vegetation unit are summarised in Table 7.

Table 7. Botanical analysis and characteristics of the wetlands

State of the vegetation:	Moderately disturbed
Conservation priority	High
Soils & Geology	Sandy to clayey soil
Density of woody layer	Shrubs: 0 %
Density of herbaceous layer	Grasses: 80% (avg. height: 1,2m) Forbs: 20% (avg. height: 0,8m)
Sensitivity	Medium
Dominant plant species	<i>Phragmites australis</i> , <i>Panicum schinzii</i> , <i>Aristida junciformis</i> , <i>Cyperus species</i> and <i>Berkheya radula</i>
Red data species	None observed
Protected tree species (DFFE)	None observed

The vegetation unit is classified as having a Medium sensitivity. It is moderately disturbed. It represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. No plant species of conservation concern or protected trees were recorded. Development may take place in the depression wetlands as the wetlands are artificial. Power line infrastructure may cross the valley bottom wetlands, as long as disturbance is minimised and mitigation measures implemented.



Figure 21. State of the Unchannelled Valley Bottom Wetland



Figure 22. Artificial dam surrounded by *Vachellia karroo*– *Asparagus larycinus* woodland

4.1.8 *Vachellia karroo*– *Asparagus larycinus* woodland

This vegetation unit occurs in the central part of the project area. In the rainy season water runs through this area. It surrounds the depression wetlands. This vegetation unit is somewhat disturbed.

The *Vachellia karroo*– *Asparagus larycinus* woodland is very dense, with tall grasses. Dominant tree and shrub species include *Vachellia karroo*, *Ziziphus 37ucronate* and *Asparagus larycinus*, dominant grasses include *Panicum maximum*, *Urochloa mosambicensis*, *Digitaria eriantha* and *Cynodon dactylon*. Dominant forbs include *Tagetes minuta* and *Berkheya radula*.

One plant species of conservation concern is present in this vegetation unit, namely *Crinum bulbispermum*, which is in the declining category and also provincially protected. No protected trees were recorded. The state of the vegetation is indicated in Figure 22 while the characteristics of the variations of this vegetation unit are summarized in

Table 8.

Table 8. Botanical analysis and characteristics of *Vachellia karroo*– *Asparagus laricinus* woodland

State of the vegetation:	Disturbed, very dense
Need for rehabilitation	Low
Conservation priority	Medium-high
Soils & Geology	Sandy soil
Density of woody layer	Shrubs and trees: 80 % (avg. height: 2,5)
Density of herbaceous layer	Grasses: 40% (avg. height: 1,5m) Forbs: 15% (avg. height: 0,5m)
Sensitivity	Medium-High
Dominant plant species	Woodland: <i>Vachellia karroo</i> , <i>Ziziphus 38ucronate</i> , <i>Asparagus laricinus</i> , <i>Panicum maximum</i> , <i>Urochloa mosambicensis</i> , <i>Digitaria eriantha</i> , <i>Cynodon dactylon</i> , <i>Tagetes minuta</i> and <i>Berkheya radula</i> Dams: <i>Persicaria decipiens</i> , sedges, <i>Cynodon dactylon</i> , and <i>Eragrostis chloromelas</i>
Red data species (NEMBA)	<i>Crinum bulbispermum</i> (declining)
Protected tree species (DFFE)	None observed

This vegetation unit is no longer in a natural condition as three artificial dams were constructed. This has however happened about 40 years ago, and some wetland species has settled here. It created habitat for certain specialist wetland species and also large trees for roosting. One plant species of conservation concern and no protected trees were recorded. This vegetation unit is therefore considered to have a medium-high sensitivity. This unit may be developed **on**.

4.1.9 *Digitaria eriantha* planted pastures

A large part of the project area, especially to the north, is planted pastures. The soil is sandy with few rocks. It was planted with *Digitaria eriantha* (common finger grass) which completely dominates this vegetation unit. *Digitaria eriantha* is one of the dominant indigenous grasses in the greater area. Most of these planted pastures have not been cultivated recently and therefore several other species are also found there. Species diversity is still low. Species present are mostly species which is associated with disturbance. Dominant grasses include *Digitaria eriantha*, *Eragrostis chloromelas* and *Eragrostis lehmanniana*, the forbs *Selago densiflora*, *Crotalaria sphaerocarpa* and *Pentarrhinum insipidum* and the shrubs *Seriphium plumosa* and *Asparagus laricinus*. Some provincially protected plant species are present in this vegetation unit, namely *Helichrysum*

nudifolium, and *Helichrysum rugulosum*. No protected trees were recorded. The state of the vegetation is indicated in Figure 23, while the characteristics of the variations of this vegetation unit are summarised in Table 9.

Table 9. Botanical analysis and characteristics of *Digitaria eriantha* planted pastures

State of the vegetation:	Planted pastures
Need for rehabilitation	Low
Conservation priority	Low
Soils & Geology	Sandy soil
Density of woody layer	Shrubs: 15 % (avg. height: 0,8m)
Density of herbaceous layer	Grasses: 70% (avg. height: 0,6m) Forbs: 15% (avg. height: 0,5m)
Sensitivity	Low
Dominant plant species	<i>Digitaria eriantha</i> , <i>Eragrostis chloromelas</i> , <i>Eragrostis lehmanniana</i> , <i>Selago densiflora</i> , <i>Crotalaria sphaerocarpa</i> , <i>Pentarrhinum insipidum</i> , <i>Seriphium plumosa</i> and <i>Asparagus larinus</i>
Red data species	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 planted pastures with a low species diversity. It does however represent the Endangered Vaal-Vet Sandy Grassland vegetation unit, and some provincially protected plant species are present. No protected trees were recorded.



Figure 23. State of the *Digitaria eriantha* planted pastures**4.1.10 *Eucalyptus camaldulensis* woodland**

Next to the *Vachellia karroo*– *Asparagus lariginus* woodland, there is a section covered in *Eucalyptus camaldulensis* (Red gum) trees. *Eucalyptus camaldulensis* is a category 1b declared invader in the grassland biome.

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	<i>Eucalyptus camaldulensis</i> , <i>Cynodon dactylon</i> , <i>Eragrostis gummiiflua</i> , <i>Aristida congesta</i> , <i>Asparagus lariginus</i> , <i>Bidens bipinnata</i> and <i>Polydora poskeana</i>
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.



Figure 24: State of the *Eucalyptus camaldulensis* woodland**4.1.11 Remains of *Eucalyptus camaldulensis* woodland**

This *Eucalyptus camaldulensis* patch is located in a section of the proposed grid connection corridor and has recently been felled. The species diversity and sensitivity are low.

4.1.12 Agricultural field

There are several agricultural fields in the project area, planted with maize and lucerne (Figure 25). There is very little indigenous vegetation left in these fields. The species diversity is very low and the sensitivity is also low.



Figure 25: Agricultural field: Lucerne under existing power line

4.1.13 Old agricultural field

There are some sections that 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.

4.1.14 Buildings

This area has buildings on it. There is little vegetation and therefore has low sensitivity.

4.2 Plant species level assessment

South Africa has been recognised as having remarkable plant diversity with high levels of endemism. The major threats to plants in the area are overgrazing, mining and agriculture. Details on species recorded are given below.

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
<i>Asparagus laricinus</i>	Wild asparagus	No	Least concern
<i>Asparagus setaceus</i>	Asparagus fern	No	Least concern
<i>Celtis africana</i>	White stinkwood	No	Least concern
<i>Elephantorrhiza elephantina</i>	Elephant's Root	No	Least concern
<i>Eucalyptus camaldulensis</i>	Red gum	Yes	Not evaluated
<i>Gymnosporia buxifolia</i>	Common spike-thorn	No	Least concern
<i>Opuntia ficus-indica</i>	Prickly Pear	Yes	Not evaluated
<i>Searsia lancea</i>	Karree	No	Least concern
<i>Searsia leptodictya</i>	Rock Karee	No	Least concern
<i>Searsia magalismsontana</i>		No	Least concern
<i>Searsia pyroides</i>	Common wild currant	No	Least concern
<i>Senegalia caffra</i>	Common hook-thorn	No	Least concern
<i>Senegalia erubescens</i>	Blue thorn	No	Least concern
<i>Seriphium plumosum</i>	Bankrupt bush, Slangbos	No	Least concern
<i>Vachellia hebeclada</i> subsp. <i>hebeclada</i>	Candle thorn	No	Least concern
<i>Vachellia karroo</i>	Sweet thorn	No	Least concern
<i>Vachellia robusta</i> subsp. <i>robusta</i>	Broadpod robust thorn	No	Least concern
<i>Ziziphus mucronata</i>	Buffalo-thorn	No	Least concern
<i>Ziziphus zeyheriana</i>	Dwarf buffalo-thorn	No	Least concern

Table 12: Grasses and sedges

Grasses and sedges			
Scientific name	Common name	Exotic	Status
<i>Andropogon eucomus</i>	Snowflake grass	No	Least concern
<i>Anthephora pubescens</i>	Wool grass	No	Least concern
<i>Aristida canescens</i>	Pale Three-awn	No	Least concern
<i>Aristida congesta</i>	Tassel three-awn	No	Least concern
<i>Aristida junciformis</i>	Gongoni three-awn	No	Least concern
<i>Brachiaria serrata</i>	Velvet signal grass	No	Least concern
<i>Cymbopogon caesius</i>	Broad-leaved turpentine grass	No	Least concern
<i>Cynodon dactylon</i>	Couch Grass	No	Least concern
<i>Cyperus congestus</i>		No	Least concern
<i>Cyperus eragrostis</i>		Yes	Not evaluated
<i>Cyperus kirkii</i>		No	Least concern
<i>Cyperus leptocladus</i>		No	Least concern
<i>Digitaria eriantha</i>	Common finger grass	No	Least concern
<i>Diheteropogon amplexans</i>	Broad-leaved bluestem	No	Least concern
<i>Diheteropogon filifolius</i>	Wire Bluestem	No	Least concern
<i>Eleusine coracana</i>	Goose grass	No	Least concern
<i>Elionurus muticus</i>	Wire grass	No	Least concern
<i>Eragrostis chloromelas</i>	Narrow curly leaf	No	Least concern
<i>Eragrostis curvula</i>	Weeping love grass	No	Least concern
<i>Eragrostis gummiflua</i>	Gum grass	No	Least concern
<i>Eragrostis lehmanniana</i>	Lehmann's Love Grass	No	Least concern
<i>Eragrostis plana</i>	Tough love grass	No	Least concern
<i>Eragrostis superba</i>	Saw-tooth love grass	No	Least concern
<i>Eustachys paspaloides</i>	Brown Rhodes Grass	No	Least concern
<i>Hypharrhenia hirta</i>	Common thatching grass	No	Least concern
<i>Loudetia simplex</i>	Common russet grass	No	Least concern
<i>Melinis repens</i>	Natal red top	No	Least concern
<i>Panicum maximum</i>	Guinea grass	No	Least concern
<i>Panicum schinzii</i>	Vlei Panicum	No	Least concern
<i>Paspalum dilatatum</i>	Dallis grass	Yes	Not evaluated
<i>Paspalum notatum</i>	Bahai grass	Yes	Not evaluated
<i>Perotis patens</i>	Purple Spike Catstail	No	Least concern
<i>Phragmites australis</i>	Common reed	No	Least concern
<i>Pogonarthria squarrosa</i>	Herringbone grass	No	Least concern
<i>Schoenoplectus brachyceras</i>		No	Least concern
<i>Schizachyrium sanguineum</i>	Red autumn grass	No	Least concern
<i>Setaria sphacelata</i> var. <i>sericea</i>	Golden bristle grass	No	Least concern
<i>Setaria sphacelata</i> var. <i>torta</i>	Creeping bristle grass	No	Least concern
<i>Setaria verticillata</i>	Bur bristle grass	No	Least concern
<i>Sporobolus africanus</i>	Ratstail dropseed	No	Least concern
<i>Themeda triandra</i>	Red grass	No	Least concern
<i>Trachypogon spicatus</i>	Giant spear grass	No	Least concern

Grasses and sedges			
Scientific name	Common name	Exotic	Status
<i>Trichoneura grandiglumis</i>	Small rolling grass	No	Least concern
<i>Triraphis andropogonoides</i>	Broom needle grass	No	Least concern
<i>Tristachya leucothrix</i>	Hairy Trident Grass	No	Least concern
<i>Urelytrum agropyroides</i>	Varkstertgras	No	Least concern
<i>Urochloa mosambicensis</i>	Bushveld signal grass	No	Least concern

Table 13: Forbs

Forbs			
Scientific name	Common name	Exotic	Status
<i>Acalypha angustata</i>	Copper leaf	No	Least concern
<i>Acanthosicyos naudinianus</i>	Wild Watermelon	No	Least concern
<i>Achyranthes aspera</i>	Chaff flower	Yes	Not evaluated
<i>Aerva leucura</i>	Aambeibossie	No	Least concern
<i>Aloe greatheadii</i>	Spotted aloe	No	Least concern
<i>Alternanthera pungens</i>	Khaki Burrweed	Yes	Not evaluated
<i>Amaranthus viridis</i>	Slender amaranth	Yes	Not evaluated
<i>Argemone ochroleuca</i>	White-flowered Mexican poppy	Yes	Declared invader 1b
<i>Barleria macrostegia</i>		No	Least concern
<i>Berkheya radula</i>	Boesmansrietjie	No	Least concern
<i>Bidens bipinnata</i>	Spanish blackjack	Yes	Not evaluated
<i>Bidens pilosa</i>	Common blackjack	Yes	Not evaluated
<i>Boophone disticha</i>	Poison bulb	No	Least concern
<i>Chamaecrista mimosoides</i>	Fishbone dwarf cassia	No	Least concern
<i>Chascanum hederaceum</i>		No	Least concern
<i>Chlorophytum fasciculatum</i>		No	Least concern
<i>Cirsium vulgare</i>	Scotch Thistle	Yes	Declared invader 1b
<i>Clematis brachiata</i>	Traveller's joy	No	Least concern
<i>Cleome maculata</i>	Spotted Cleome	No	Least concern
<i>Cleome rubella</i>	Pretty Lady	No	Least concern
<i>Commelina africana</i>	Yellow wandering Jew	No	Least concern
<i>Commelina benghalensis</i>	Wandering Jew	No	Least concern
<i>Commelina erecta</i>	Blouselblommetjie	No	Least concern
<i>Conyza bonariensis</i>	Flax-leaf fleabane	Yes	Not evaluated
<i>Conyza podocephala</i>	Bakbossie	No	Least concern
<i>Corchurus asplenifolius</i>	Gusha	No	Least concern
<i>Crabbea acaulis</i>		No	Least concern
<i>Crinum bulbispermum</i>	Orange river lily	No	Declining
<i>Crinum macowanii</i>	Common vlei Crinum	No	Least concern
<i>Crotalaria sphaerocarpa</i> subsp. <i>sphaerocarpa</i>	Mealie crotalaria	No	Least concern
<i>Cucumis heptadactylus</i>		No	Least concern, Endemic (SA)
<i>Cucumis zeyheri</i>	Wild cucumber	No	Least concern
<i>Datura ferox</i>	Large thorn-apple	Yes	Declared invader 1b

Forbs			
Scientific name	Common name	Exotic	Status
<i>Datura stramonium</i>	Thorn apple	Yes	Declared invader 1b
<i>Dichapetalum cymosum</i>	Poison Leaf	No	Least concern
<i>Diclis reptans</i>	Dwarf snapdragon	No	Least concern
<i>Dicoma anomala</i>	Maagbitterwortel	No	Least concern
<i>Dicoma macrocephala</i>		No	Least concern
<i>Euphorbia inaequilatera</i>	Smooth creeping milkweed	No	Least concern
<i>Exochaenium grande</i>	Mipa (ss)	No	Least concern
<i>Felicia muricata</i>	Wild aster	No	Least concern
<i>Gisekia pharnacioides</i>		No	Least concern
<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>		No	Least concern
<i>Gomphocarpus fruticosus</i>	Milkweed	No	Least concern
<i>Gomphrena celocoides</i>	Prostrate globe amaranth	Yes	Not evaluated
<i>Helichrysum kraussii</i>	Straw Everlasting	No	Least concern
<i>Helichrysum nudifolium</i>	Hottentot's tea	No	Least concern
<i>Helichrysum rugulosum</i>	Marotole (ss)	No	Least concern
<i>Hermannia cordata</i>		No	Least concern, Endemic (SA)
<i>Hermannia depressa</i>	Rooi-opslag	No	Least concern
<i>Hermannia lancifolia</i>		No	Least concern, Endemic (SA)
<i>Hibiscus aethiopicus</i>	Common Dwarf Wild Hibiscus	No	Least concern
<i>Hibiscus microcarpus</i>		No	Least concern
<i>Hibiscus pusillus</i>	Bladderweed	No	Least concern
<i>Hibiscus trionum</i>	Bladder weed	Yes	Not evaluated
<i>Hilliardiella oligocephala</i>	Bicoloured-leaved vernonia	No	Least concern
<i>Hypoxis rigidula</i> var. <i>rigidula</i>	Silver-leaved Star-flower	No	Least concern
<i>Indigofera cryptantha</i>		No	Least concern
<i>Indigofera filipes</i>		No	Least concern
<i>Ipomoea holubii</i>		No	Least concern
<i>Ipomoea oblongata</i>	Ubhoqo (z)	No	Least concern
<i>Ipomoea obscura</i>	Wild Petunia	No	Least concern
<i>Ipomoea ommanneyi</i>	Ox Potato	No	Least concern
<i>Kohautia amatymbica</i>	Tremble Tops	No	Least concern
<i>Kyllinga alba</i>	Witbiesie	No	Least concern
<i>Lapeirousia sandersonii</i>	Autumn painted petals	No	Least concern
<i>Lasiosiphon kraussianus</i> var. <i>kraussianus</i>	Lesser yellow-head	No	Least concern
<i>Ledebouria marginata</i>		No	Least concern
<i>Ledebouria revoluta</i>	Incubudwana (z)	No	Least concern
<i>Lippia rehmannii</i>	Rehmann-lippia	No	Least concern
<i>Malva parviflora</i>	Small mallow	Yes	Not evaluated
<i>Malvastrum coromandelianum</i>	Prickly Malvastrum	Yes	Declared invader 1b
<i>Medicago sativa</i>	Lucern	Yes	Not evaluated
<i>Monsonia angustifolia</i>	Crane's Bill	No	Least concern

Forbs			
Scientific name	Common name	Exotic	Status
<i>Nidorella hottentotica</i>		No	Least concern
<i>Oenothera rosea</i>	Rose eveing primrose	Yes	Not evaluated
<i>Osteospermum muricatum</i>	Boegoebos	No	Least concern
<i>Pachycarpus</i> spp.		No	Least concern
<i>Pavonia burchellii</i>	Indola Empofu (z)	No	Least concern
<i>Pellaea calomelanos</i>	Hard Fern	No	Least concern
<i>Pentarrhinum insipidum</i>	African Heartvine	No	Least concern
<i>Pentzia globosa</i>	Bitter Karoo Bush, Vaalkaroo	No	Least concern
<i>Persicaria decipiens</i>	Knotweed	No	Least concern
<i>Pollichia campestris</i>	Waxberry	No	Least concern
<i>Polydora poskeana</i>		No	Least concern
<i>Portulaca kermesina</i>	Haaskos	No	Least concern
<i>Portulaca oleracea</i>	Purslane	Yes	Not evaluated
<i>Pseudognaphaleum luteo-album</i>	Cud weed	Yes	Not evaluated
<i>Rhynchosia adenodes</i>	Ungazini (z)	No	Least concern
<i>Richardia brasiliensis</i>	Tropical richardia	Yes	Not evaluated
<i>Schizocarpus nervosus</i>	White Scilla	No	Least concern
<i>Schkuria pinnata</i>	Dwarf Mexican Marigold	Yes	Not evaluated
<i>Selago capitellata</i>		No	Least concern, Endemic (SA)
<i>Selago densiflora</i>		No	Least concern
<i>Senecio consanguineus</i>	Ragworth	No	Least concern
<i>Senecio coronatus</i>	Woolly Grassland Senecio	No	Least concern
<i>Senecio harveianus</i>	Khotalia (ss)	No	Least concern
<i>Sida alba</i>	Spiny Sida	No	Least concern
<i>Sida dregei</i>	Spider-leg	No	Least concern
<i>Solanum lichtensteinii</i>	Large yellow bitter apple	No	Least concern
<i>Solanum nigrum</i>	Black nightshade	Yes	Not evaluated
<i>Solanum panduriforme</i>	Poison apple	No	Least concern
<i>Solanum rigescens</i>	Wildelemoentjie	Yes	Not evaluated
<i>Striga asiatica</i>	Mealie-witchweed	No	Least concern
<i>Stylosanthes fruticosa</i>	Wild Lucerne	No	Least concern
<i>Tagetes minuta</i>	Tall khaki weed	Yes	Not evaluated
<i>Tephrosia lupinifolia</i>	Vingerblaartjie	No	Least concern
<i>Teucrium trifidum</i>	Akkedispoet	No	Least concern
<i>Trachyandra saltii</i>		No	Least concern, Endemic (SA)
<i>Triumfetta sonderi</i>	Maagbossie	No	Least concern
<i>Verbena bonariensis</i>	Purple top	Yes	Declared invader 1b
<i>Vigna vexillata</i>	Wild cowpea	No	Not evaluated
<i>Wahlenbergia undulata</i>	African Bluebell	No	Least concern
<i>Xanthium spinosum</i>	Spiny cocklebur	Yes	Declared invader 1b
<i>Xanthium strumarium</i>	Large cocklebur	Yes	Declared invader 1b
<i>Zinnia peruviana</i>	Wild Zinnia	Yes	Not evaluated
<i>Zornia milneana</i>	Zornia	No	Least concern

4.2.2 Protected plants

One nationally listed protected species was recorded on site, namely *Crinum bulbispermum* (Orange River Lily) which is in the Declining category (NEMBA listed species, 2005). These plants were recorded in and next to the *Vachellia karroo*– *Asparagus lariginus* woodland.

The following plants that are protected according to Free State Nature Conservation Ordinance 8 of 1969 were recorded at the project area:

Scientific name	Common name	Note
<i>Aloe greatheadii</i>	Spotted aloe	Free State Province
<i>Boophane disticha</i>	Poison bulb	Free State Province
<i>Crinum bulbispermum</i>	Orange river lily	National - Declining
<i>Crinum macowanii</i>	Common vlei Crinum	Free State Province
<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>		Free State Province
<i>Helichrysum nudifolium</i>	Hottentot's tea	Free State Province
<i>Helichrysum rugulosum</i>	Marotole (ss)	Free State Province
<i>Helichrysum kraussii</i>	Straw Everlasting	Free State Province
<i>Schizocarpus nervosus</i>	White Scilla	Free State Province

All species of the genus *Aloe*, *Crinum*, *Gladiolus*, *Helichrysum* and *Scilla* (*Schizocarpus*) are protected by the Free State Nature Conservation Ordinance 8 of 1969. A permit should be obtained from authorities should any of these species be eradicated during the construction process.

Five endemic species were recorded, namely: *Cucumis heptadactylus*, *Hermannia cordata*, *Hermannia lancifolia*, *Selago capitellata*, *Trachyandra saltii*.

As mentioned in the assumptions and limitations section of this report many of the geophytes (and other forbs) on site were not in flower during the site visit, complication identification. More provincially and nationally protected species may be present. If the natural grassland areas are to be developed 30 % of the *Boophane*, *Crinum* and *Schizocarpus* population must be relocated to areas close by that will not be developed. If other nationally protected plant species are identified at a later stage, 30% of the population should be relocated (if it is species that can be successfully relocated).

4.2.1 Protected trees

No protected tree species were recorded.

4.2.2 EIA screening tool listed species (SCC)

The screening tool listed two plant Species of Conservation Concern (SCC) in the project area. Both are vulnerable. None of these species were recorded, but there is suitable habitat for one of them. It may be present in the *Themeda triandra* – *Schizachyrium sanguineum* sandy grassland, although unlikely.

4.3 Declared invaders

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

Table 14: Declared invader plant species recorded in the project area (NEMBA: Alien and invasive species lists, 2020)

Scientific name	Common name	Invader category
<i>Cirsium vulgare</i>	Spear thistle, Scotch thisle	1b
<i>Datura ferox</i>	Large thorn apple	1b
<i>Datura stramonium</i>	Thorn apple	1b
<i>Eucalyptus camaldulensis</i>	River red gum	1b (in grassland)
<i>Malvastrum coromandelianum</i>	Prickly Malvastrum	1b
<i>Opuntia ficus-indica</i>	Sweet prickly pear, boereturksvy	1b
<i>Verbena bonariensis</i>	Purple top	1b
<i>Xanthium spinosum</i>	Spiny cocklebur	1b
<i>Xanthium strumarium</i>	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).

4.4 Fauna in and around the project area

4.4.1 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 grassland on sandy soil
- Woodland
- Artificial dams / wetlands
- Planted pastures (*Digitaria eriantha*)
- Agricultural field

4.4.2 Fauna species lists

Fauna species confirmed to be present on site is given in Table 15. Fauna species are listed if they have been recorded in the quarter degree grid on the Virtual Museum of Biodiversity and Development Institute (Virtual Museum, 2022). Only species of conservation concern is included in this part (Table 16 and Table 17). For a complete species list of species recorded in the quarter degree grid, see Appendix A. An indication is given whether suitable habitat is present at the project area for species of conservation concern according to Child *et al.* (2016).

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 15: Mammals confirmed to be present on site

Family	Scientific name	Common name	Red list
Bovidae	<i>Raphicerus campestris</i>	Steenbok	LC
Bovidae	<i>Tragelaphus strepsiceros</i>	Greater Kudu	LC
Canidae	<i>Canis mesomelas</i>	Black-backed Jackal	LC
Cercopithecidae	<i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC
Hystricidae	<i>Hystrix africae australis</i>	Cape Porcupine	LC
Mustelidae	<i>Mellivora capensis</i>	Honey Badger	LC
Orycteropodidae	<i>Orycteropus afer</i>	Aardvark	LC
Suidae	<i>Phacochoerus africanus</i>	Common Warthog	LC

Table 16: Mammals of conservation concern (Virtual Museum)

Family	Scientific name	Common name	Red list category	Suitable habitat
Mustelidae	<i>Aonyx capensis</i>	African Clawless Otter	NT	No
Bovidae	<i>Damaliscus pygargus pygargus</i>	Bontebok	VU	No

Table 17: Birds of conservation concern (Virtual Museum)

Family	Scientific name	Common name	Red list category	Suitable habitat
Accipitridae	<i>Aquila rapax</i>	Tawny Eagle	EN	Yes
Accipitridae	<i>Polemaetus bellicosus</i>	Martial Eagle	EN	Yes
Ciconiidae	<i>Mycteria ibis</i>	Yellow-billed Stork	EN	No
Coraciidae	<i>Coracias garrulus</i>	European Roller	NT	Yes
Falconidae	<i>Falco biarmicus</i>	Lanner Falcon	VU	Yes
Gruidae	<i>Anthropoides paradiseus</i>	Blue Crane	NT	Yes
Laridae	<i>Sterna caspia</i>	Caspian Tern	VU	No
Phoenicopteridae	<i>Phoenicopterus roseus</i>	Greater Flamingo	NT	No

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

No amphibian or reptile species of conservation concern distribution overlaps with the project area.

4.4.2.1 EIA screening tool species of conservation concern (SCC)

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 fauna species of conservation concern, namely *Hydrictis maculicolis* (Spotted-necked otter) and *Hydroprogne caspia* (Caspian Tern) that may potentially be present at site.

***Hydrictis maculicolis* (Spotted-necked otter)**

Spotted-necked Otters are thought to inhabit freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes (Perrin & Carugati, 2000a; d'Inzillo Carranza & Rowe-Rowe 2013). However, anecdotal observations suggest they can occur, and can be common, in relatively polluted rivers, such as the Braamfonteinspruit, Jukskei River and Blesbokspruit, Gauteng Province (Ponsonby, thesis, in prep.), and the Vaal River (Power, 2014).

Adequate riparian vegetation, in the form of long grass, reeds, or bushes, is also essential to provide cover (Perrin & d'Inzillo Carranza, 2000b), especially during periods of inactivity (Perrin & d'Inzillo Carranza 2000a) (as quoted by Child *et al.*, 2016).

It may be present at the Vaal River, which is close to the site, but there is no suitable habitat for spotted-necked otters on site.

***Hydroprogne caspia* (Caspian Tern)**

The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes,

reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (Higgins & Davis, 1996).

It may be present at the Vaal River, which is close to the site, but there is no suitable habitat for Caspian Terns on site. The wetland next to Mercury Substation is quite large, but there is no open water present.

4.5 Sensitivity Analysis for the project area

The project area is disturbed to a great extent. Some sections are completely disturbed by agricultural fields or planted pastures. These sections have a low sensitivity as there is little natural vegetation left. Some sections are indigenous grassland in a varying degree of disturbance. None of the vegetation is a pristine condition, but some are only somewhat disturbed. The vegetation unit in which the project area falls is endangered and the species diversity is high. The less disturbed areas therefore have a medium-high sensitivity and the more disturbed sections have a medium or medium-low sensitivity. The *Schizachyrium sanguineum* - *Dichapetalum cymosum* rocky grassland has a medium-high sensitivity as it is a unique habitat type with unique species adapted to it. See sensitivity map (Figure 26).

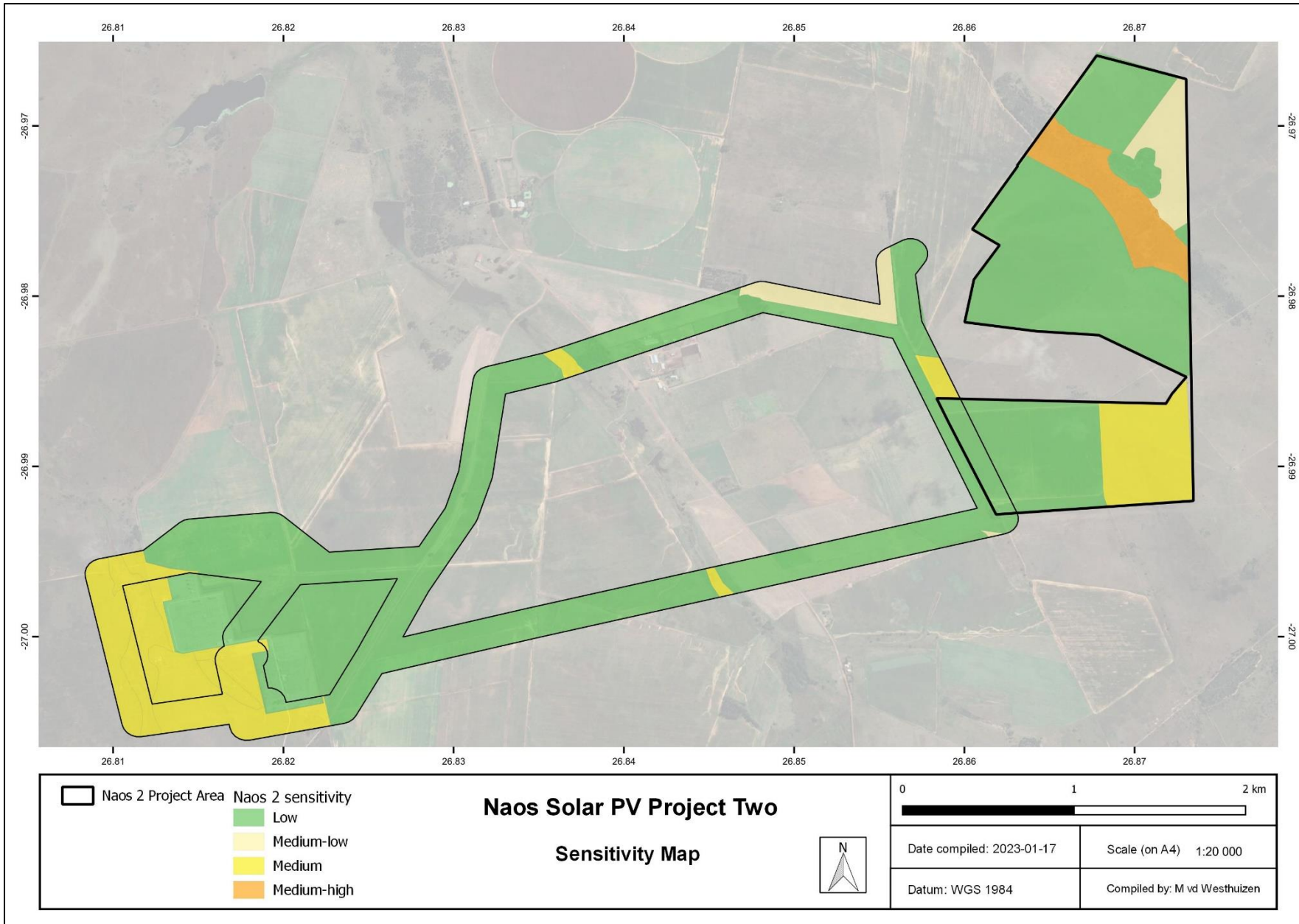


Figure 26: Sensitivity map

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. See impact rating in Table 18 to Table 24

5.1 Direct habitat destruction

5.1.1 *Description of impact:*

The construction phase of the development and associated infrastructure will result in loss of and damage to natural habitats when the vegetation is cleared for the development of the solar plant. Rehabilitation of some areas would be possible but there is likely to be long-term damage in large areas. 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, although no such populations or knowledge thereof was found in the study area.
- 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.

5.1.2 Mitigation measures:

- Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided, while the rehabilitation of the site should be prioritised after construction has been completed and again after the decommissioning phase. Indigenous grass species that are present in this area should be sown.
- During construction, sensitive habitats outside the development footprint must be avoided by construction vehicles and equipment,

wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.

- All development activities must be restricted to specific recommended areas. The Environmental Control Officer (ECO) must control these areas. Storage of equipment, fuel and other materials must be limited to demarcated areas. Layouts must be adapted to fit natural patterns rather than imposing rigid geometries. The entire development footprint must be clearly demarcated prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This would only be applicable to the construction phase of the proposed development.
- The Environmental Site Officer (ESO) must advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO must enforce any measures that he/she deem necessary. Regular environmental training must be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation.
- Where holes for poles pose a risk to animal safety, they must be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling during planting of the poles along the lines.
- Poisons for the control of problem animals must rather be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin must only be used after approval from an ecologist.
- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- Monitoring must be implemented during the construction and decommissioning phases to ensure that minimal impact is caused to the fauna and flora of the area.
- After the decommissioning phase the area must be rehabilitated.

5.2 Habitat fragmentation

5.2.1 *Description of 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. The grassland and wetlands in the project area is already fragmented, by fences, roads and crop fields in and around it.

5.2.2 *Mitigation measures:*

- Use existing facilities (e.g., impacted areas) to the extent possible to minimise the amount of new disturbance.
- Disturbance in the wetlands must be minimised.
- Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.
- After decommissioning, infrastructure must be removed and disposed of in a responsible manner and the site has to be rehabilitated with indigenous species.

5.3 Increased Soil erosion and sedimentation

5.3.1 *Description of 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 and loss of habitat for indigenous flora.

5.3.2 *Mitigation measures:*

The following mitigation measures must be implemented to prevent erosion during construction and decommissioning:

- The project must be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time.

- Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.
- Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.
- Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.
- Gravel roads to the construction sites must be well drained to limit soil erosion.
- Control the flow of runoff to move the water safely off the site without destructive gully formation.
- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.

5.4 Soil and water pollution

5.4.1 *Description of 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.

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.

5.4.2 *Mitigation measures:*

- Any excess or waste material or chemicals must be removed from the site and discarded in an environmentally friendly way. The ECO must

enforce this rule rigorously.

- Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off.
- Spill kits must be on-hand to deal with spills immediately.
- All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays that will be used to capture any spills. Drip trays must be emptied into a holding tank and returned to the supplier.
- After decommissioning all materials must be disposed of in a responsible manner.

5.5 Air pollution

5.5.1 *Description of impact:*

The environmental impacts of wind-borne dust, gases and particulates from the construction and decommissioning phases associated with the proposed development are primarily related to human health and ecosystem damage. The proposed development will typically comprise the following sources and associated air quality pollutants:

- Materials handling operations (truck loading & unloading, tipping, stockpiling).
- Vehicle entrainment on paved and unpaved roads.
- Windblown dust-fugitive emissions.

One of the primary impacts on the biophysical environment is linked to emission of dusts and fumes from the transportation system. Dust pollution will be the most severe during the construction and decommissioning phases. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure and also for the removal of infrastructure during the decommissioning phases. Diesel exhaust gasses and other hydrocarbon emissions all add to the deterioration in air quality during these phases. Vehicles travelling at high speeds on dirt roads significantly aggravate the problem.

Although the potential for severe fugitive dust impacts is greatest within 100 m of dust-generating activities, there is still the potential for dust to affect vegetation up to five kilometres or more downwind from the source. Dust deposited on the ground may cause changes in soil chemistry (chemical effects) and may over the long-term result in changes in plant chemistry, species composition and community structure. Sensitivities to dust deposition of the various plant species present in the area are not known. It is therefore difficult to predict which species may be susceptible.

Poor air quality results in deterioration of visibility and aesthetic landscape quality of the region, particularly in winter due to atmospheric inversions.

5.5.2 Mitigation measures:

- A speed limit must be enforced on dirt roads (preferably 30-40km/h).
- Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.

5.6 Spread and establishment of alien invasive species

5.6.1 Description of 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.

The decommissioning phase will also cause disturbance, which creates the ideal circumstances for declared invaders to flourish.

5.6.2 Mitigation measures:

- Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA (Conservation of Agricultural Resources Act) or in terms of Working for Water guidelines. The control of these species must begin prior to the construction phase considering that small populations of these species were observed during the field surveys, which can be coordinated between the ESO and the ECO.
- Institute strict control over materials brought onto site, which must be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Existing *Eucalyptus camaldulensis* trees must be eradicated.
- Rehabilitate disturbed areas outside the project development footprint as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.
- Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme must be implemented to ensure that the species' do not spread to surrounding natural ecosystems. The programmes are implemented during the construction and decommissioning phases and can be facilitated between the ESO and ECO.
- After decommissioning, the site has to be rehabilitated by sowing indigenous grass species, if the landowner decides to not use the property for crop production. If it is to be used as grazing, it must be rehabilitated.

The control and monitoring of declared invaders have to continue for one year after decommissioning.

5.7 Negative effect of human activities on fauna and road mortalities

5.7.1 Description of 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.

5.7.2 Mitigation measures:

- No staff must be accommodated on the site. If practical, construction workers must stay in one of the nearby towns/villages and transported daily to the site.
- The ECO must regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals.
- Maintain proper firebreaks around the entire development footprint.
- Educate construction workers regarding risks and correct disposal of cigarettes.
- More fauna is normally killed the faster vehicles travel. A speed limit must be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their

negative consequences).

- Travelling at night must be avoided or limited as much as possible.

5.8 Cumulative impacts

The development of the proposed Naos PV 2 solar power park by itself will not have a significant impact on biodiversity. One must however consider the cumulative impacts of other solar power development projects in the area / vegetation unit. Two solar power development projects have already been approved within a 30 km radius of the proposed project. In future many more may be developed in the same area and cumulatively it may have devastating consequences on the biodiversity and specifically on species of conservation concern. It is therefore essential to minimise impacts for each and every development and rather place solar panels in already disturbed areas.

Table 18: Impact rating: Habitat destruction

Habitat destruction caused by clearance of vegetation																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Site	1	Definite	4	Long term	3	Partly reversible	2	Marginal	2	Medium	3	High	3	Medium	45
	WM	Negative	Site	1	Definite	4	Long term	3	Partly reversible	2	No loss	1	Low	2	Medium	2	Low	26
Operational Phase	WOM	Negative	Site	1	Definite	4	Long term	3	Partly reversible	2	Marginal	2	Medium	3	High	3	Medium	45
	WM	Negative	Site	1	Definite	4	Long term	3	Partly reversible	2	No loss	1	Low	2	Medium	2	Low	26
Decommissioning Phase	WOM	Negative	Site	1	Definite	4	Long term	3	Partly reversible	2	Marginal	2	Medium	3	High	3	Medium	45
	WM	Negative	Site	1	Definite	4	Medium term	2	Partly reversible	2	No loss	1	Low	2	Medium	2	Low	24

Table 19: Impact rating: Habitat fragmentation

Habitat fragmentation caused by clearance of vegetation																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/ MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Local / district	2	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Site	1	Unlikely	1	Long term	3	Partly reversible	2	Marginal	2	Negligible	1	Low	1	Low	10
Operational Phase	WOM	Negative	Site	1	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Low	2	Medium	2	Low	24
	WM	Negative	Site	1	Unlikely	1	Long term	3	Partly reversible	2	Marginal	2	Negligible	1	Low	1	Low	10
Decommissioning Phase	WOM	Negative	Local / district	2	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Site	1	Unlikely	1	Medium term	2	Partly reversible	2	Marginal	2	Negligible	1	Low	1	Low	9

Table 20: Impact rating: Soil erosion and sedimentation

Increased soil erosion and sedimentation																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Local / district	2	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Medium	30
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Operational Phase	WOM	Negative	Local / district	2	Possible	2	Medium term	2	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Low	26
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Decommissioning Phase	WOM	Negative	Local / district	2	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Medium	30
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6

Table 21: Impact rating: Soil and water pollution

Soil and water pollution																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Local / district	2	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Low	28
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Operational Phase	WOM	Negative	Local / district	2	Possible	2	Medium term	2	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Low	26
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Decommissioning Phase	WOM	Negative	Local / district	2	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Low	28
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6

Table 22: Impact rating: Air pollution

Air pollution																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/ MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Local / district	2	Definite	4	Medium term	2	Completely reversible	1	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Local / district	2	Probable	3	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	9
Operational Phase	WOM	Negative	Local / district	2	Probable	3	Short term	1	Completely reversible	1	Marginal	2	Low	2	Medium	2	Low	22
	WM	Negative	Local / district	2	Possible	2	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	8
Decommissioning Phase	WOM	Negative	Local / district	2	Definite	4	Medium term	2	Completely reversible	1	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Local / district	2	Probable	3	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	9

Table 23: Impact rating: Spread and establishment of alien invasive species

Spread and establishment of alien invasive species																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Local / district	2	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Medium	30
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Operational Phase	WOM	Negative	Local / district	2	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Low	28
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6
Decommissioning Phase	WOM	Negative	Local / district	2	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Medium	3	Medium	2	Medium	30
	WM	Negative	Site	1	Unlikely	1	Short term	1	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	6

Table 24: Impact rating: Fauna mortalities

Fauna mortalities																		
Phase	Without (WOM) or With Mitigation (WM)	Nature of Impact (Negative or Positive)	GEOGRAPHICAL EXTENT		PROBABILITY		DURATION		REVERSIBILITY		IRREPLACEABLE LOSS OF RESOURCES		CUMULATIVE EFFECT		INTENSITY/MAGNITUDE		SIGNIFICANCE	
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score
Construction Phase	WOM	Negative	Site	1	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Site	1	Possible	2	Medium term	2	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	8
Operational Phase	WOM	Negative	Site	1	Possible	2	Long term	3	Partly reversible	2	Marginal	2	Low	2	Low	1	Low	12
	WM	Negative	Site	1	Unlikely	1	Medium term	2	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	7
Decommissioning Phase	WOM	Negative	Site	1	Probable	3	Long term	3	Partly reversible	2	Marginal	2	Low	2	Medium	2	Low	26
	WM	Negative	Site	1	Possible	2	Medium term	2	Completely reversible	1	No loss	1	Negligible	1	Low	1	Low	8

5.9 Cumulative impacts

The EIA Regulations (as amended in 2017) determine that cumulative impacts, “in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.” Cumulative impacts can be incremental, interactive, sequential or synergistic.

The term "Cumulative Effect" has for the purpose of this project been defined as: the summation of effects over time which can be attributed to the operation of the Project itself, and the overall effects on the ecosystem of the Project Area that can be attributed to the Project and other existing and planned future projects.

5.9.1 GEOGRAPHIC AREA OF EVALUATION

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in the cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development –Figure 27 refer to below.

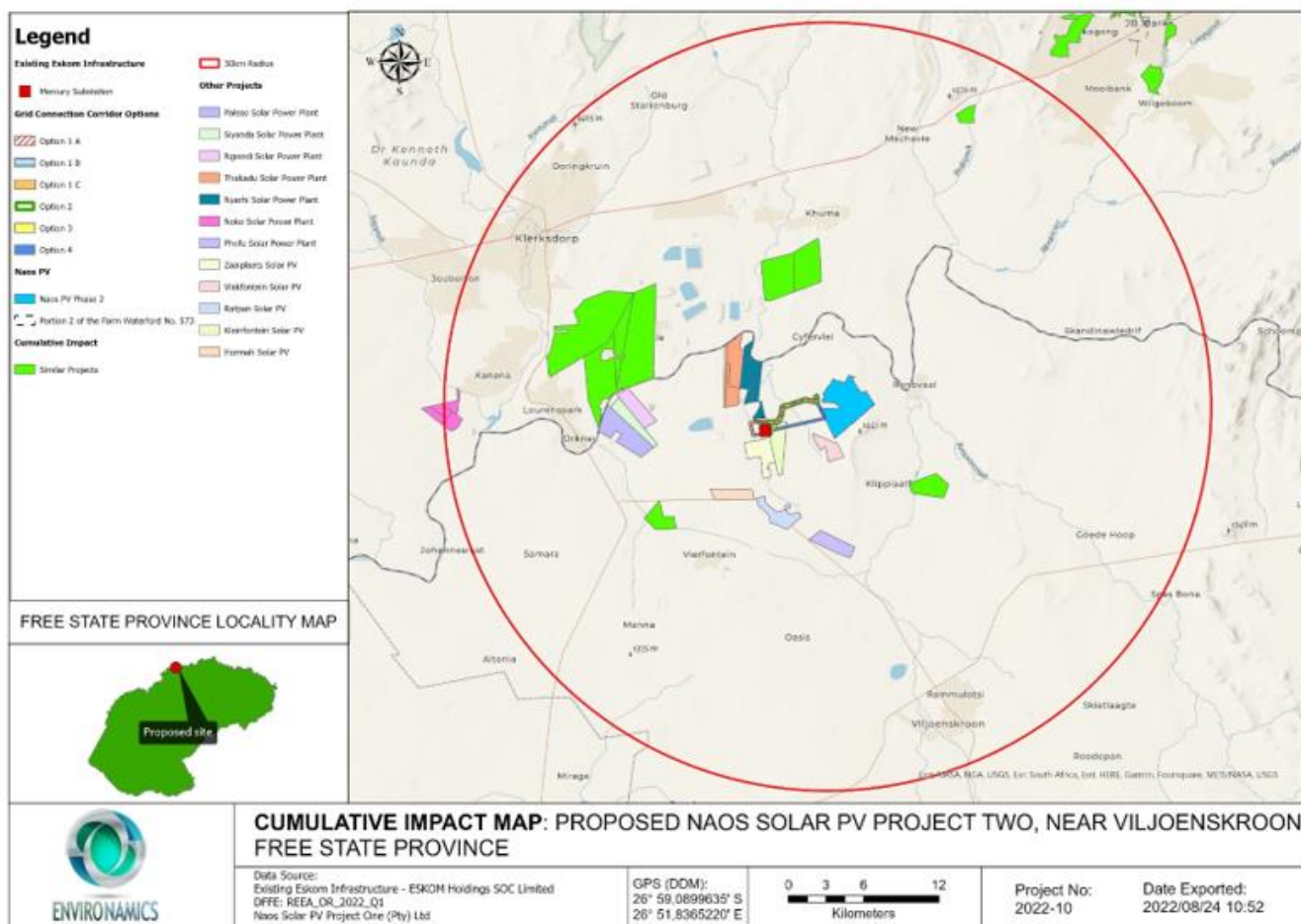


Figure 27: Cumulative impact map

The geographic spread of PV solar projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape.

5.9.2 OTHER PROJECTS IN THE AREA

The following section provides details on existing projects and project being proposed in the geographical area of evaluation.

Table 25: A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the solar energy facility.

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Paleso SPP	11km	150MW	14/12/16/3/3/1/2365	Basic Assessment	Approved
Siyanda SPP	10km	150MW	14/12/16/3/3/1/2369	Basic Assessment	Approved
Thakadu SPP	4km	150MW	14/12/16/3/3/1/2476	Basic Assessment	Approved
Ngwedi SPP	9km	150MW	14/12/16/3/3/1/2535	Basic Assessment	In process
Nyarhi SPP	3km	150MW	14/12/16/3/3/1/2533	Basic Assessment	In process
Kabi Vaalkop PV 3	13km	75 MW	12/12/20/2513/3	Scoping and EIA	Approved
Kabi Vaalkop PV 2	12km	75 MW	12/12/20/2513/2	Scoping and EIA	Approved
Kabi Vaalkop PV	11km	75 MW	12/12/20/2513/4	Scoping and EIA	Approved
Kabi Vaalkop PV 1	11km	75 MW	12/12/20/2513/1	Scoping and EIA	Approved
Buffels Solar PV 1	8km	100MW	14/12/16/3/3/2/777	Scoping and EIA	Approved
Buffels Solar PV 2	8km	100 MW	14/12/16/3/3/2/778	Amendment	Approved
Rietvlei solar	16 km	-	14/12/16/3/3/2/450	Scoping and EIA	Withdrawn/Lapsed
Genesis Orkney Solar (Pty) Ltd	24 km	100MW	14/12/16/3/3/2/954	Scoping and EIA	Approved
Afropulse 538 Pty Ltd	7 km	50MW	12/12/20/2280	BAR	Withdrawn/Lapsed
Muliilo Renewable Project Developments (Pty) Ltd (Cluster Development):	2.78	75 – 100MW	Projects only in commencement phase with no Applications for EA submitted as yet	BAR	In process (commencement Phase)

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Vlakfontein Solar PV1 (Pty) Ltd Biesfontein Solar PV1 (Pty) Ltd Kleinfontein Solar PV1 (Pty) Ltd Zaaiplaats Solar PV1 (Pty) Ltd Hormah Solar PV1 (Pty) Ltd Ratpan Solar PV1 (Pty) Ltd Ratpan Solar PV2 (Pty) Ltd					

It is unclear whether other projects not related to renewable energy is or has been constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on agriculture and mining. It is quite possible that future solar farm development may take place within the general area. The development of the proposed Naos PV 1 and 3 solar power parks is currently in the assessment phase.

5.9.3 Cumulative impact on biodiversity

The area is already impacted by agricultural and mining activities. The development of the proposed Naos PV 2 solar power park by itself will not have a significant impact on biodiversity. One must however consider the cumulative impacts of other solar power development projects in the area / vegetation unit. The cumulative impacts on biodiversity may be significant in the long term. It is therefore essential to minimise impacts for each and every development and rather place solar panels in already disturbed areas. Mitigation measures must be implemented.

6 POWER LINE CONNECTION OPTIONS

Six grid connection options are provided (Figure 28). From a biodiversity perspective, Alternatives 2, 3 and 4 would be slightly better than Alternative 1, as they will cause less disturbance to the Unchannelled Valley Bottom wetland next to Mercury

substation. All options is however supported.

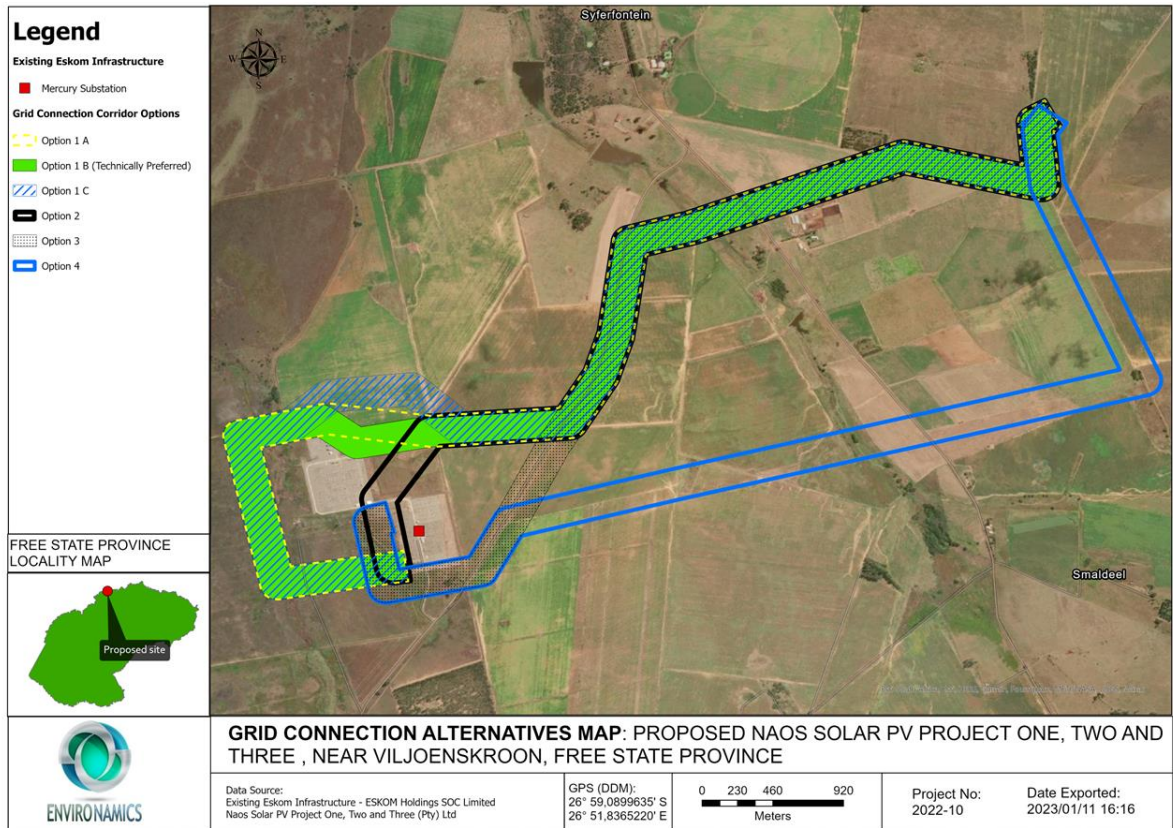


Figure 28: Six grid connection corridor alternatives proposed for the three Naos PV projects

7 CONCLUSIONS

Mari van der Westhuizen was requested by SOLA Group to complete a terrestrial biodiversity impact assessment (including plant and animal species assessment) for the proposed Naos Solar PV Project Two on Portion 2 of the Farm Waterford No. 573, near Viljoenskroon in the Free State Province. The site sensitivity verification also includes the proposed grid connection corridor alternatives to Mercury Substation.

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: Low Sensitivity (Figure 2).
- Plant Species Theme: Medium Sensitivity (Figure 3).

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 High sensitivity from a terrestrial biodiversity perspective. Although the area is in an endangered vegetation unit – the Vaal-Vet sandy grassland vegetation unit and the vulnerable Rand Highland Grassland vegetation unit, most of the project area is completely disturbed by agricultural fields or planted pastures and some sections are somewhat disturbed. The species diversity in the remaining natural veld is high.
- The site has a Medium Sensitivity from an Animal Species Theme Perspective due to the presence of fauna habitats. No species of conservation concern was recorded or are expected to occur there.
- The site has a Medium Sensitivity from a Plant Species Theme Perspective. The species diversity in the remaining natural veld is high. One plant species of conservation concern was recorded, namely *Crinum bulbispermum* which is in the Declining category. Ten provincially protected plant species were recorded. Eleven provincially protected plant species were recorded.

The desktop survey indicates that:

- Much of the project area falls into the categories degraded and other, some sections however fall into CBA1, CBA2 and ESA2 of which the majority is already disturbed by past land use practices.
- There are no NFEPA wetlands or rivers inside the project area, there is a NFEPA wetland and river north of the project area.
- The project area is not located in or close to an Important Bird Area.
- The project area overlaps two threatened ecosystems: the Endangered Vaal-Vet Sandy Grassland and the Vulnerable Rand Highland Grassland vegetation unit.

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

1. *Themeda triandra* – *Schizachyrium sanguineum* sandy grassland;
2. *Seriphium plumosum* - *Cynodon dactylon* sandy grassland;
3. *Eleusine coracana* grassland;
4. *Cynodon dactylon* - *Panicum schinzii* grassland
5. Wetlands
6. *Vachellia karroo* – *Asparagus larycinus* woodland;
7. *Eucalyptus camaldulensis* woodland;
8. Remains of *Eucalyptus camaldulensis* woodland
9. *Digitaria eriantha* planted pastures;
10. Agricultural field;
11. Old agricultural field;
12. Buildings.

Nine 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 fauna species of conservation concern, namely *Hydriectis maculicollis* (Spotted-necked otter) and *Hydroprogne caspia* (Caspian Tern). There is

no suitable habitat for either species on site. Two plant species of conservation concern were listed by the screening tool. None of these were recorded. There is also no suitable habitat for them. No protected tree species were recorded on site. One nationally protected plant species (declining) and 7 provincially protected plant species were recorded. A permit will be needed to remove any of these plants.

The sensitivity analysis indicated that sensitivity varies from low to medium-high, depending on the level of disturbance.

Potential impacts were described and rated and mitigation measures were discussed. Impacts include habitat destruction and fragmentation, soil erosion, pollution and spread of declared invader plant species. Before mitigation some impacts had a medium rating (habitat destruction, soil erosion and the spread and establishment of alien invasive species), but after mitigation all impacts were low.

Disturbance must still be limited as far as possible, especially in the wetlands and rocky grassland. Development may take place in the depression wetlands as they are artificial. The grassland with medium-high sensitivity can be developed as long as mitigation measures are implemented.

If mitigation measures, as discussed in Section 5, are implemented the development is supported from a biodiversity point of view.

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Appendix A: Fauna species list for quarter degree grid (2626DD, 2726BB)**Table 26: Mammals**

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

Family	Scientific name	Common name	Red list	Last recorded
Bathyergidae	<i>Cryptomys hottentotus</i>	Southern African Mole-rat	LC	2013/05/16
Bovidae	<i>Aepyceros melampus</i>	Impala	LC	2017/01/03
Bovidae	<i>Alcelaphus buselaphus</i>	Hartebeest	LC	2013/05/28
Bovidae	<i>Alcelaphus buselaphus caama</i>	Red Hartebeest	LC	2013/05/28
Bovidae	<i>Antidorcas marsupialis</i>	Springbok	LC	2013/06/05
Bovidae	<i>Connochaetes taurinus taurinus</i>		LC	2013/06/01
Bovidae	<i>Damaliscus pygargus phillipsi</i>	Blesbok	LC	2013/05/07
Bovidae	<i>Damaliscus pygargus pygargus</i>	Bontebok	VU	2016/05/12
Bovidae	<i>Kobus ellipsiprymnus</i>	Waterbuck	LC	2018/05/03
Bovidae	<i>Kobus ellipsiprymnus ellipsiprymnus</i>		LC	2013/05/31
Bovidae	<i>Oryx gazella</i>	Gemsbok	LC	2017/12/03
Bovidae	<i>Raphicerus campestris</i>	Steenbok	LC	2014/08/03
Bovidae	<i>Sylvicapra grimmia</i>	Bush Duiker	LC	2018/05/03
Bovidae	<i>Syncerus caffer</i>	African Buffalo	LC	2013/05/29
Bovidae	<i>Taurotragus oryx</i>	Common Eland	LC	2013/06/02
Bovidae	<i>Tragelaphus angasii</i>	Nyala	LC	2013/04/06
Bovidae	<i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	2013/06/02
Canidae	<i>Canis mesomelas</i>	Black-backed Jackal	LC	2013/06/04
Cercopithecidae	<i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	2020/02/28
Cercopithecidae	<i>Chlorocebus pygerythrus pygerythrus</i>	Vervet Monkey (subspecies pygerythrus)	LC	2013/06/04
Equidae	<i>Equus quagga</i>	Plains Zebra	LC	2016/04/23
Felidae	<i>Caracal caracal</i>	Caracal	LC	2021/02/07
Giraffidae	<i>Giraffa giraffa giraffa</i>	South African Giraffe	LC	2013/04/30
Herpestidae	<i>Atilax paludinosus</i>	Marsh Mongoose	LC	2013/08/14
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose	LC	2018/08/24
Herpestidae	<i>Herpestes sanguineus</i>	Slender Mongoose	LC	2020/07/22
Herpestidae	<i>Suricata suricatta</i>	Meerkat	LC	2013/05/14
Hyaenidae	<i>Proteles cristata</i>	Aardwolf	LC	2013/05/14
Hystricidae	<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	2013/06/05

Family	Scientific name	Common name	Red list	Last recorded
Leporidae	<i>Lepus capensis</i>	Cape Hare	LC	2013/05/30
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	LC	2013/05/30
Macroscelididae	<i>Elephantulus myurus</i>	Eastern Rock Elephant Shrew	LC	2013/04/26
Muridae	<i>Aethomys namaquensis</i>	Namaqua Rock Mouse	LC	2013/05/16
Muridae	<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	2013/05/17
Muridae	<i>Mastomys sp.</i>	Multimammate Mice		2013/05/16
Muridae	<i>Rhabdomys pumilio</i>	Xeric Four-striped Grass Rat	LC	2013/05/17
Mustelidae	<i>Aonyx capensis</i>	African Clawless Otter	NT	2018/03/18
Mustelidae	<i>Mellivora capensis</i>	Honey Badger	LC	
Orycteropodidae	<i>Orycteropus afer</i>	Aardvark	LC	
Pedetidae	<i>Pedetes capensis</i>	South African Spring Hare	LC	2013/05/14
Procaviidae	<i>Procavia capensis</i>	Cape Rock Hyrax	LC	2019/12/14
Sciuridae	<i>Xerus inauris</i>	South African Ground Squirrel	LC	2016/10/09
Suidae	<i>Phacochoerus africanus</i>	Common Warthog	LC	2013/05/14
Viveridae	<i>Genetta maculata</i>	Common Large-spotted Genet	LC	2013/05/29
Viverridae	<i>Genetta genetta</i>	Common Genet	LC	2016/02/07
Viverridae	<i>Genetta tigrina</i>	Cape Genet (Cape Large-spotted Genet)	LC	2013/08/01

Table 27: Birds

Family	Scientific name	Common name	Red list	Last recorded
Accipitridae	<i>Aquila rapax</i>	Tawny Eagle	EN	2019/09/15
Accipitridae	<i>Aquila wahlbergi</i>	Wahlberg's Eagle	LC	2021/01/10
Accipitridae	<i>Buteo buteo</i>	Steppe (Common) Buzzard	LC	2020/01/25
Accipitridae	<i>Elanus caeruleus</i>	Black-shouldered (Winged) Kite	LC	2019/06/23
Accipitridae	<i>Micronisus (Melierax) gabar</i>	Gabar Goshawk	LC	2019/06/23
Accipitridae	<i>Milvus aegyptius</i>	Yellow-billed Kite	LC	2021/02/07
Accipitridae	<i>Pernis apivorus</i>	European Honey-buzzard	LC	2016/01/24
Accipitridae	<i>Polemaetus bellicosus</i>	Martial Eagle	EN	2019/04/14
Accipitridae	<i>Polyboroides typus</i>	African Harrier-Hawk (Gymnogene)	LC	2019/09/14

Family	Scientific name	Common name	Red list	Last recorded
Alaudidae	<i>Calendulauda sabota</i>	Sabota Lark	LC	2021/01/10
Alaudidae	<i>Chersomanes albofasciata</i>	Spike-heeled Lark	LC	2019/08/17
Alaudidae	<i>Eremopterix leucotis</i>	Chestnut-backed Sparrowlark (Finchlark)	LC	2013/04/05
Alaudidae	<i>Eremopterix verticalis</i>	Grey-backed Sparrowlark (Finchlark)	LC	2019/08/17
Alaudidae	<i>Mirafra africana</i>	Rufous-naped Lark	LC	2021/02/14
Alaudidae	<i>Mirafra cheniana</i>	Melodious (Latakoo) Lark	LC	2021/01/10
Alaudidae	<i>Mirafra fasciolata</i>	Eastern Clapper Lark (split)	LC	2018/06/06
Alcedinidae	<i>Alcedo cristata</i>	Malachite Kingfisher	LC	2019/02/09
Anatidae	<i>Alopochen aegyptiacus</i>	Egyptian Goose	LC	2019/11/03
Anatidae	<i>Anas erythrorhyncha</i>	Red-billed Teal (Duck)	LC	2019/05/17
Anatidae	<i>Anas hottentota</i>	Blue-bill Teal (Hottentot Teal)	LC	2020/01/25
Anatidae	<i>Anas platyrhynchos</i>	Mallard	LC	2018/03/05
Anatidae	<i>Anas sparsa</i>	African Black Duck	LC	2020/02/28
Anatidae	<i>Anas undulata</i>	Yellow-billed Duck	LC	2020/02/28
Anatidae	<i>Anser anser subsp. domesticus</i>	Domestic Goose	LC	2018/05/03
Anatidae	<i>Plectropterus gambensis</i>	Spur-winged Goose	LC	2019/08/24
Anatidae	<i>Tadorna cana</i>	South African Shelduck	LC	2019/06/23
Anhingidae	<i>Anhinga rufa</i>	African Darter	LC	2021/05/27
Apodidae	<i>Apus affinis</i>	Little Swift	LC	2013/11/14
Apodidae	<i>Apus caffer</i>	White-rumped Swift	LC	2018/12/09
Apodidae	<i>Cypsiurus parvus</i>	African Palm-Swift	LC	2018/06/06
Ardeidae	<i>Ardea cinerea</i>	Grey Heron	LC	2020/07/22
Ardeidae	<i>Ardea goliath</i>	Goliath Heron	LC	2018/06/06
Ardeidae	<i>Ardea melanocephala</i>	Black-headed Heron	LC	2019/11/03
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	LC	2021/10/20
Ardeidae	<i>Egretta garzetta</i>	Little Egret	LC	2019/05/19
Ardeidae	<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	LC	2018/10/17
Centropodidae	<i>Centropus burchellii</i>	Burchell's Coucal (split)	LC	2019/06/23
Cerylidae	<i>Ceryle rudis</i>	Pied Kingfisher	LC	2021/07/27
Charadriidae	<i>Charadrius pecuarius</i>	Kittlitz's Plover	LC	2021/01/17
Charadriidae	<i>Charadrius tricollaris</i>	Three-banded Plover	LC	2018/11/04
Charadriidae	<i>Vanellus armatus</i>	Blacksmith Lapwing (Plover)	LC	2019/06/23
Charadriidae	<i>Vanellus senegallus</i>	African Wattled Lapwing (Plover)	LC	2018/06/06
Ciconiidae	<i>Ciconia ciconia</i>	White Stork	LC	2018/06/06
Ciconiidae	<i>Mycteria ibis</i>	Yellow-billed Stork	EN	2019/01/12
Cisticolidae	<i>Cisticola aridulus</i>	Desert Cisticola	LC	2021/02/14

Family	Scientific name	Common name	Red list	Last recorded
Cisticolidae	<i>Cisticola chiniana</i>	Rattling Cisticola	LC	2019/11/03
Cisticolidae	<i>Cisticola lais</i>	Wailing Cisticola	LC	2017/11/03
Cisticolidae	<i>Cisticola tinniens</i>	Levaillant's (Tinkling) Cisticola	LC	2019/08/18
Cisticolidae	<i>Prinia flavicans</i>	Black-chested Prinia	LC	2018/06/06
Coliidae	<i>Urocolius indicus</i>	Red-faced Mousebird	LC	2018/12/09
Columbidae	<i>Columba guinea</i>	Speckled (Rock) Pigeon	LC	2018/08/24
Columbidae	<i>Streptopelia capicola</i>	Cape Turtle (Ring-necked) Dove	LC	2019/08/24
Columbidae	<i>Streptopelia semitorquata</i>	Red-eyed Dove	LC	2019/06/23
Columbidae	<i>Streptopelia senegalensis</i>	Laughing (Palm) Dove	LC	2019/05/19
Coraciidae	<i>Coracias garrulus</i>	European Roller	NT	2017/12/04
Corvidae	<i>Corvus albus</i>	Pied Crow	LC	2019/11/03
Cuculidae	<i>Clamator glandarius</i>	Great Spotted Cuckoo	LC	2019/03/03
Cuculidae	<i>Clamator (Oxylophus) jacobinus</i>	Jacobin (Pied) Cuckoo	LC	2021/01/10
Dacelonidae	<i>Halcyon albiventris</i>	Brown-hooded Kingfisher	LC	2018/05/03
Dacelonidae	<i>Megaceryle maxima (H. maximus)</i>	Giant Kingfisher	LC	2021/05/27
Dendrocygnidae	<i>Dendrocygna bicolor</i>	Fulvous (Whistling) Duck	LC	2019/02/09
Dendrocygnidae	<i>Dendrocygna viduata</i>	White-faced (Whistling-) Duck	LC	2019/06/23
Estrildidae	<i>Amadina fasciata</i>	Cut-throat Finch	LC	2019/05/30
Estrildidae	<i>Amandava subflava</i>	Orange-breasted (Zebra) Waxbill	LC	2018/01/31
Estrildidae	<i>Estrilda astrild</i>	Common Waxbill	LC	2020/02/28
Estrildidae	<i>Estrilda erythronotos</i>	Black-faced Waxbill	LC	2021/01/10
Estrildidae	<i>Uraeginthus [Granatina] granatina</i>	Violet-eared Waxbill	LC	2019/12/14
Estrildidae	<i>Lagonosticta rhodopareia</i>	Jameson's Firefinch	LC	2019/05/09
Estrildidae	<i>Lagonosticta senegala</i>	Red-billed Firefinch	LC	2021/07/27
Estrildidae	<i>Pytilia melba</i>	Green-winged (Melba) Pytilia (Finch)	LC	2021/07/27
Estrildidae	<i>Uraeginthus angolensis</i>	Blue Waxbill	LC	2019/05/17
Falconidae	<i>Falco amurensis</i>	Amur (Eastern Red-footed) Falcon (Kestrel)	LC	2021/01/17
Falconidae	<i>Falco biarmicus</i>	Lanner Falcon	VU	2019/09/15
Falconidae	<i>Falco naumanni</i>	Lesser Kestrel	LC	2014/02/04
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	LC	2018/06/06
Falconidae	<i>Falco rupicoloides</i>	Greater Kestrel	LC	2018/09/09
Fringillidae	<i>Serinus atrogularis</i>	Black-throated Canary	LC	2019/05/09

Family	Scientific name	Common name	Red list	Last recorded
Fringillidae	<i>Serinus flaviventris</i>	Yellow Canary	LC	2018/12/09
Fringillidae	<i>Serinus gularis</i>	Streaky-headed Seedeater (Canary)	LC	2013/06/29
Fringillidae	<i>Emberiza impetuani</i>	Lark-like Bunting	LC	2019/03/31
Fringillidae	<i>Emberiza tahapisi</i>	Cinnamon-breasted (Rock) Bunting	LC	2017/12/31
Gruidae	<i>Anthropoides paradiseus</i>	Blue Crane	NT	2018/01/14
Hirundinidae	<i>Hirundo albigularis</i>	White-throated Swallow	LC	2018/02/24
Hirundinidae	<i>Hirundo rustica</i>	Barn (European) Swallow	LC	2021/01/17
Hirundinidae	<i>Hirundo spilodera</i>	South African Cliff-Swallow	LC	2021/01/17
Hirundinidae	<i>Riparia paludicola</i>	Brown-throated (Plain) Martin	LC	2021/04/20
Indicatoridae	<i>Indicator minor</i>	Lesser Honeyguide	LC	2019/08/24
Indicatoridae	<i>Prodotiscus regulus</i>	Brown-backed (Sharp-billed) Honeybird (Honeyguide)	LC	2021/01/10
Laniidae	<i>Lanius collaris</i>	Southern Fiscal	LC	2020/07/22
Laniidae	<i>Lanius collurio</i>	Red-backed Shrike	LC	2019/03/03
Laniidae	<i>Lanius minor</i>	Lesser Grey Shrike	LC	2017/12/04
Laridae	<i>Sterna caspia</i>	Caspian Tern	VU	2018/09/09
Lybiidae	<i>Lybius torquatus</i>	Black-collared Barbet	LC	2021/07/27
Lybiidae	<i>Trachyphonus vaillantii</i>	Crested Barbet	LC	2019/08/24
Lybiidae	<i>Tricholaema leucomelas</i>	Acacia Pied Barbet	LC	2013/08/11
Malaconotidae	<i>Batis molitor</i>	Chinspot Batis	LC	2019/05/17
Malaconotidae	<i>Batis pririt</i>	Pirit Batis	LC	2019/08/24
Malaconotidae	<i>Tchagra australis</i>	Brown-crowned (headed) Tchagra	LC	2018/09/16
Malaconotidae	<i>Telophorus zeylonus</i>	Bokmakierie	LC	2019/09/15
Meropidae	<i>Merops apiaster</i>	European Bee-eater	LC	2018/03/10
Meropidae	<i>Merops bullockoides</i>	White-fronted Bee-eater	LC	2021/07/27
Meropidae	<i>Merops hirundineus</i>	Swallow-tailed Bee-eater	LC	2013/06/29
Meropidae	<i>Merops pusillus</i>	Little Bee-eater	LC	2018/02/06
Monarchidae	<i>Terpsiphone viridis</i>	African Paradise-Flycatcher	LC	2020/11/15
Motacillidae	<i>Anthus cinnamomeus</i>	African (Grassveld/Grassland) Pipit	LC	2021/07/27
Motacillidae	<i>Anthus nicholsoni</i>	Nicholson's Pipit	LC	2019/12/14
Motacillidae	<i>Anthus vaalensis</i>	Buffy Pipit	LC	2021/01/10
Motacillidae	<i>Macronyx capensis</i>	Cape (Orange-throated) Longclaw	LC	2021/07/27
Motacillidae	<i>Motacilla capensis</i>	Cape Wagtail	LC	2018/08/24
Muscicapidae	<i>Cercomela familiaris</i>	Familiar Chat	LC	2019/05/09
Muscicapidae	<i>Cercotrichas (Erythropgia) paena</i>	Kalahari Scrub-Robin	LC	2019/12/14

Family	Scientific name	Common name	Red list	Last recorded
Muscicapidae	<i>Cossypha caffra</i>	Cape Robin-chat	LC	2021/07/27
Muscicapidae	<i>Muscicapa striata</i>	Spotted Flycatcher	LC	2018/01/07
Muscicapidae	<i>Oenanthe monticola</i>	Mountain Chat (Wheatear)	LC	2019/08/17
Muscicapidae	<i>Psophocichla litsipsirupa</i>	Groundscraper Thrush	LC	2021/04/20
Muscicapidae	<i>Saxicola torquata</i>	African (Common) Stonechat	LC	2019/12/14
Muscicapidae	<i>Sigelus silens</i>	Fiscal Flycatcher	LC	2019/12/14
Nectariniidae	<i>Nectarinia [Cinnyris] talatala</i>	White-bellied (breasted) Sunbird	LC	2018/01/07
Numididae	<i>Numida meleagris</i>	Helmeted Guineafowl	LC	2020/01/25
Paridae	<i>Anthoscopus minutus</i>	Cape (Southern) Penduline-Tit	LC	2019/08/17
Paridae	<i>Parus cinerascens</i>	Ashy Tit	LC	2019/08/24
Passeridae	<i>Passer diffusus</i>	Southern Greyheaded Sparrow (split)	LC	2018/09/09
Passeridae	<i>Passer domesticus</i>	House Sparrow	LC	2019/05/09
Passeridae	<i>Passer melanurus</i>	Cape Sparrow	LC	2019/05/09
Phalacrocoracidae	<i>Phalacrocorax africanus</i>	Reed (Long-tailed) Cormorant	LC	2021/05/27
Phasianidae	<i>Pternistis natalensis</i>	Natal Spurfowl (Francolin)	LC	2020/01/25
Phasianidae	<i>Scleroptila levaillantoides</i>	Orange River Francolin	LC	2020/07/22
Phoenicopteridae	<i>Phoenicopterus minor</i>	Lesser Flamingo	LC	2020/01/25
Phoenicopteridae	<i>Phoenicopterus roseus</i>	Greater Flamingo	NT	2020/01/25
Phoeniculidae	<i>Phoeniculus purpureus</i>	Green (Red-billed) Wood-hoopoe	LC	2020/07/22
Picidae	<i>Campethera abingoni</i>	Golden-tailed Woodpecker	LC	2018/01/07
Picidae	<i>Dendropicos fuscescens</i>	Cardinal Woodpecker	LC	2020/07/22
Ploceidae	<i>Amblyospiza albifrons</i>	Thick-billed (Grosbeak) Weaver	LC	2021/04/20
Ploceidae	<i>Euplectes sp.</i>	Bishops and Widowbirds (unidentified)	LC	2019/05/19
Ploceidae	<i>Euplectes afer</i>	Yellow-crowned (Golden) Bishop	LC	2021/05/27
Ploceidae	<i>Euplectes ardens</i>	Red-collared Widowbird	LC	2021/07/27
Ploceidae	<i>Euplectes orix</i>	Southern Red (Red) Bishop	LC	2018/01/31
Ploceidae	<i>Ploceus capensis</i>	Cape Weaver	LC	2021/01/17
Ploceidae	<i>Ploceus velatus</i>	Southern Masked-Weaver	LC	2020/01/25
Ploceidae	<i>Quelea quelea</i>	Red-billed Quelea	LC	2018/08/24
Ploceidae	<i>Sporopipes squamifrons</i>	Scaly-feathered Finch	LC	2019/05/19
Podicipedidae	<i>Tachybaptus ruficollis</i>	Little Grebe (Dabchick)	LC	2019/01/24
Pycnonotidae	<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC	2021/07/27
Rallidae	<i>Amaurornis flavirostris</i>	Black Crake	LC	2018/08/24
Rallidae	<i>Fulica cristata</i>	Red-knobbed Coot	LC	2021/07/27

Family	Scientific name	Common name	Red list	Last recorded
Rallidae	<i>Gallinula chloropus</i>	Common Moorhen	LC	2019/06/23
Rallidae	<i>Porphyrio madagascariensis</i>	African Purple (Purple) Swamphen (Gallinule)	LC	2021/10/20
Rhinopomastidae	<i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	LC	2018/01/31
Scolopacidae	<i>Calidris minuta</i>	Little Stint	LC	2020/01/25
Scolopacidae	<i>Gallinago nigripennis</i>	African (Ethiopian) Snipe	LC	2017/12/31
Scolopacidae	<i>Philomachus pugnax</i>	Ruff	LC	2020/01/25
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	LC	2019/02/09
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	LC	2019/02/09
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	LC	2019/02/09
Sturnidae	<i>Acridotheres tristis</i>	Common Myna	LC	2019/08/18
Sturnidae	<i>Buphagus erythrorhynchus</i>	Red-billed Oxpecker	LC	2017/11/03
Sturnidae	<i>Creatophora cinerea</i>	Wattled Starling	LC	2018/12/09
Sturnidae	<i>Lamprotornis nitens</i>	Cape Glossy (Glossy) Starling	LC	2019/08/24
Sturnidae	<i>Spreo bicolor</i>	Pied (African Pied) Starling	LC	2018/09/09
Sylviidae	<i>Acrocephalus arundinaceus</i>	Great Reed-Warbler	LC	2018/03/05
Sylviidae	<i>Acrocephalus baeticatus</i>	African (African Marsh-Warbler) Reed-Warbler	LC	2019/08/18
Sylviidae	<i>Acrocephalus gracilirostris</i>	Lesser Swamp- (Cape Reed) Warbler	LC	2018/01/31
Sylviidae	<i>Parisoma (Sylvia) subcaeruleum</i>	Chestnut-vented Tit-Babbler	LC	2019/05/09
Sylviidae	<i>Phylloscopus trochilus</i>	Willow Warbler	LC	2017/12/23
Sylviidae	<i>Sylvia communis</i>	Common (Whitethroat) Whitethroat	LC	2018/02/24
Threskiornithidae	<i>Bostrychia hagedash</i>	Hadedda Ibis	LC	2021/04/20
Threskiornithidae	<i>Platalea alba</i>	African Spoonbill	LC	2021/04/20
Threskiornithidae	<i>Threskiornis aethiopicus</i>	African Sacred (Sacred) Ibis	LC	2021/04/20
Turdidae	<i>Turdus smithi</i>	Karoo Thrush (split)	LC	2018/08/24
Upupidae	<i>Upupa africana</i>	African Hoopoe	LC	2019/05/18
Viduidae	<i>Vidua chalybeata</i>	Village Indigobird	LC	2020/02/28
Viduidae	<i>Vidua macroura</i>	Pin-tailed Whydah	LC	2019/01/12
Viduidae	<i>Vidua purpurascens</i>	Purple Indigobird	LC	2018/03/10
Viduidae	<i>Vidua regia</i>	Shaft-tailed Whydah	LC	2021/07/27

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

Table 28: Amphibians

Family	Scientific name	Common name	Red list	Last recorded
Bufonidae	<i>Sclerophrys poweri</i>	Power's Toad	LC	2018/10/17
Hyperoliidae	<i>Kassina senegalensis</i>	Bubbling Kassina	LC	2017/01/22
Pipidae	<i>Xenopus laevis</i>	Common Platanna	LC	1981/02/25
Pyxicephalidae	<i>Amietia delalandii</i>	Delalande's River Frog	LC	2016/05/12
Pyxicephalidae	<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC	2019/05/17
Pyxicephalidae	<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	LC	1981/02/25

Table 29: Reptiles

Family	Scientific name	Common name	Red list	Last recorded
Agamidae	<i>Agama aculeata distanti</i>	Distant's Ground Agama	LC	1900/06/15
Agamidae	<i>Agama atra</i>	Southern Rock Agama	LC	2016/10/23
Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC	2013/10/31
Cordylidae	<i>Cordylus vittifer</i>	Common Girdled Lizard	LC	1981/02/25
Elapidae	<i>Naja nivea</i>	Cape Cobra	LC	2012/11/19
Gekkonidae	<i>Pachydactylus capensis</i>	Cape Gecko	LC	1900/06/15
Gerrhosauridae	<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC	1981/02/25
Lamprophiidae	<i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC	1900/06/15
Lamprophiidae	<i>Lycophidion capense capense</i>	Cape Wolf Snake	LC	1900/06/15
Scincidae	<i>Acontias gracilicauda</i>	Thin-tailed Legless Skink	LC	2013/03/08
Scincidae	<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC	2016/05/12
Scincidae	<i>Trachylepis varia sensu lato</i>	Common Variable Skink Complex	LC	1981/02/25
Varanidae	<i>Varanus niloticus</i>	Water Monitor	LC	2017/03/19