APPENDIX E

SPECIALIST REPORTS

APPENDIX E1: Freshwater Aquatic Impact Assessment

Freshwater Assessment for the proposed Oslaagte Solar 3 PV Facility, Free State Province, South Africa

28 MAY 2023

KROONSTAD SOUTH SOLAR PV CLUSTER, FREE STATE PROVINCE

Prepared by

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Executive Summary

Nitai Consulting (Pty) Ltd. was appointed by Nemai Consulting (Pty) Ltd. to undertake a freshwater aquatic assessment for the proposed 480 Mega Watt (MW) Oslaagte Solar 3 Photovoltaic (PV) Facility, Free State Province, South Africa.

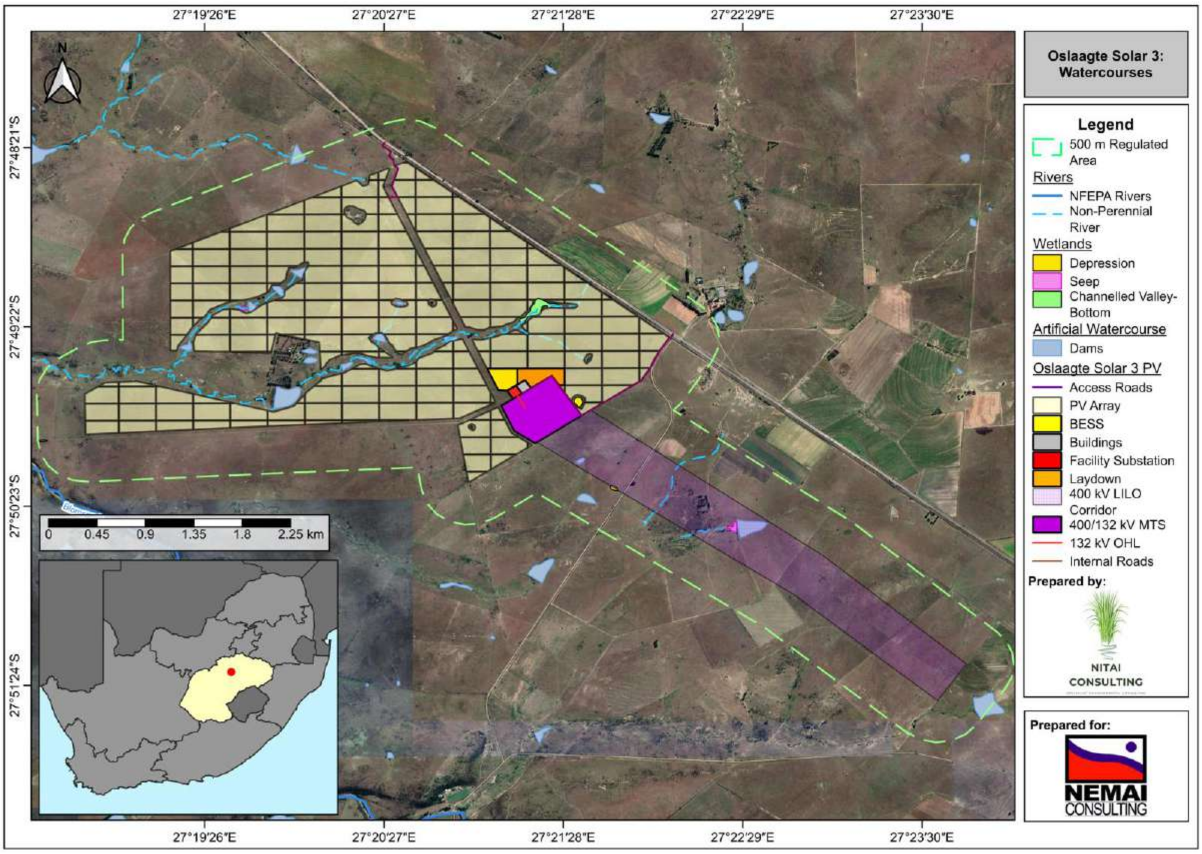
The terms of reference for this study are as follows:

- Identify and delineate of all associated wetlands within the proposed study area;
- Classify each watercourse according to the National Wetland Classification Systems;
- Compile a baseline description of all the potentially impacted aquatic environments according to Government Notice (GN) No. 320, March 2020;
- Assess the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of all identified wetlands; and
- Comply with Appendix 6 of the EIA Regulations by undertaking a risk assessment and identifying suitable mitigation measures.

According to the National Web Based Environmental Screening Tool of the Department of Forestry, Fisheries and the Environment, the proposed site sensitivity is **Low** in terms of the Aquatic Biodiversity Theme. However, with the Alternative 1 layout, the site sensitivity is classified as **Medium**. Therefore, a freshwater impact assessment was undertaken for the proposed Oslaagte Solar 3 PV Facility (study area).

During site visits to the study area, several non-perennial rivers and stormwater lines were identified in the central, eastern, southern and western portions of the proposed Oslaagte Solar 3 PV facility (Alternative 1) (see Figure below). In addition, one non-perennial and stormwater line is located in the central parts of the PV site (Alternative 1). No wetlands were identified within the footprint of the Oslaagte Solar 3 PV facility. Furthermore, majority of the PV site was classified as **Low** sensitivity while the “no-go” areas as **Medium** and **High** sensitivity. Due to sensitive features identified within the Alternative 1 layout, the layout has been subsequently revised. Therefore, with new revised layout, the Alternative 2 has accommodated these sensitivity features (non-perennial rivers and its associated 32 m buffer zones) (see Figure below). Importantly, due to the low ecological and ecosystem service value of these stormwater lines, these lines were classified as **Low** sensitivity. In addition, the stormwater lines can be used, to their benefit, in conjunction with the stormwater management of the proposed development.

Based on the findings, it is the opinion of the specialist that the proposed development will have a low impact given that the Alternative 2 layout is used as well as following the proposed mitigation and best pollution control measures. The specialist has confirmed the **Low** sensitivity and recommends that the development of the PV facility with the use of **Alternative 2 as layout** may proceed with low impacts on the freshwater features.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Oslaagte Solar 3: Watercourses
Legend
500 m Regulated Area
Rivers
NFEPA Rivers
Non-Perennial River
Wetlands
Depression
Seep
Channelled Valley-Bottom
Artificial Watercourse
Dams
Oslaagte Solar 3 PV
Access Roads
PV Array
BESS
Buildings
Facility Substation
Laydown
400 kV LILO Corridor
400/132 kV MTS
132 kV OHL
Internal Roads
Prepared by:
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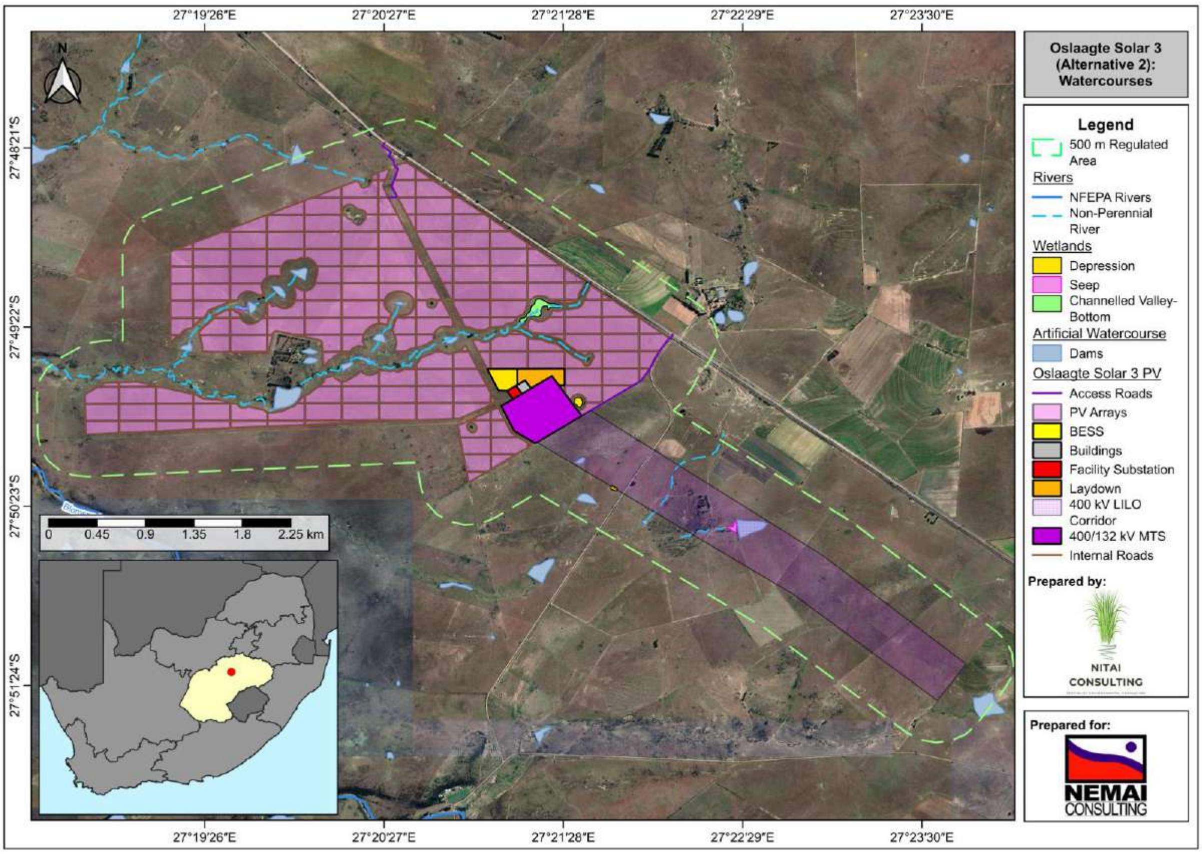
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List of Abbreviations

BA	Basic Assessment
BESS	Battery Energy Storage System
CBA	Critical Biodiversity Area
CR	Critical
CVB	Channel Valley-Bottom
C-Plan	Conservation Plan
Dep	Depression
DFFE	Department of Forestry, Fisheries & the Environment
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EC	Ecological Category
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
F	Floodplain
FL	Flat
FS	Free State
GIS	Geographic Information System
GN	Government Notice
ha	Hectares
HGM	Hydrogeomorphic
km	Kilometer (1 000m)
kV	Kilovolt
LC	Least Concern
LILO	Loop In-Loop Out
MAP	Mean Annual Precipitation
m	Meters
MTS	Main Transmission Substation
MW	Mega Watt
NBA	National Biodiversity Assessment

NEMA	National Environmental Management Act (No. 107 of 1998)
NFEPA	National Freshwater Priority Areas
NWA	National Water Act
NWCS	National Wetland Classification System
NWM	National Wetland Map
NW	North West
PES	Present Ecological State
PV	Photovoltaic
REC	Recommended Ecological Category
REMP	River Ecostatus Monitoring Program
S	Seep
SAIIEA	South Africa Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SWA	Strategic Water Areas
UCVB	Unchanneled Valley-Bottom
VEGRAI	Riparian Vegetation Response Assessment Index
VU	Vulnerable
WMA	Water Management Area
WRC	Water Research Commission
WUL	Water Use License
WULA	Water Use License Application
WSS	Water Supply Scheme
WTW	Water Treatment Works

1 INTRODUCTION

1.1 Background

Oslaagte Solar 3 (Pty) Ltd. (hereafter referred to as the proponent) proposes the 480MW Oslaagte Solar 3 PV Facility (hereafter referred to as the study area) near Kroonstad, Free State Province, South Africa (Figure 1). South Africa has committed itself to contribute to the global effort to address the challenge of climate change through the Paris Agreement. Therefore, with South Africa's heavy reliance on coal to produce electricity, this has increased the carbon footprint and electricity generation sources need to be diversified to ensure security of supply and reduction of its carbon footprint. As such, with the ever-increasing demand of electricity in Southern Africa, alternative measures to generate electricity needs to be employed to meet these demands. One of these alternative measures South Africa is exploring is Solar energy (Naicker, 2023). Nitai Consulting was appointed to conduct a wetland delineation and risk assessment as part of the Environmental Impact Assessment (EIA) of the proposed Oslaagte Solar 3 PV Facility.

The presence of possible wetlands within the development area triggers the need for wetland delineation and risk assessment. Moreover, this assessment was done in accordance with the Environmental Impact Regulations (EIA) that were published under GN No. 982 in Gazette No. 38282 of 4 December 2014 and amended by GN 326 of 7 April 2017 published in Gazette No. 40772 (hereafter referred to as "the EIA Regulations") promulgated in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). Furthermore, the findings of this report are in accordance with the requirements of Appendix 6 of the EIA Regulations or to the Procedures for the. Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GN No. 320 in Government Gazette No. 43110 of 20 March 2020) (see Table 1 for the minimum requirements and criteria for Appendix 6 and Aquatic Biodiversity Themes).

The National Water Act (Act No. 36 of 1998) (NWA) ensures that South Africa's water resources are "protected, used, developed, conserved, managed and controlled." As such, any activity taking place within the regulated area of a watercourse, as defined in GN 509 published in the Government Gazette 40229 of 26 August 2016, would require authorisation in terms of NWA.

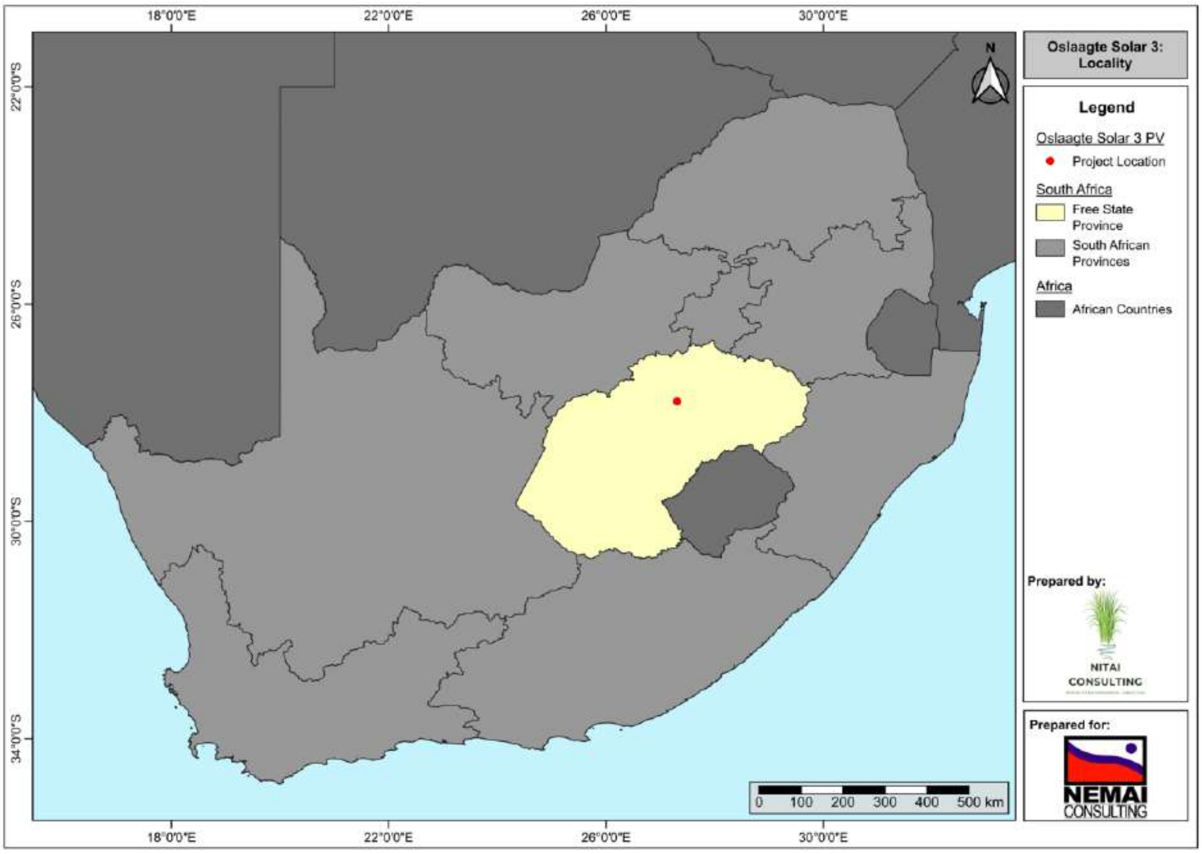

Figure 1: Study area locality in relation to South Africa

1.2 Importance of wetlands

A wetland is defined as per the NWA as "land that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil" (NWA, 1998).

The term "Wetlands" describes a variety of aquatic ecosystems, ranging from rivers, springs, seeps and mires in the upper catchment, to midlands marshes, pans and floodplains, to coastal lakes, mangrove swamps and estuaries at the bottom of the catchment (DWAF, 2005).

For an ecosystem to be identified as a wetland, it should comprise the following attributes:

- Hydromorphic soils that display characteristics resulting from prolonged saturation;
- Presence, at least occasionally, of water loving plants (hydrophytes); and,
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil.

Wetlands play valuable functions in the landscape and more importantly, they also provide a wide range of ecosystem goods and services such as (DWAF, 2008) such as:

- Flood attenuation;

- Sediment trapping and stabilisation;
- Biodiversity support; and,
- Water quality improvement.

The primary task of wetlands is to regulate runoff and process water. They act as sponges where they hold water during floods and releases it during the dry periods. Therefore, during flooding, wetlands regulate water flows to reduce flood damage and aids in preventing soil erosion. Wetlands recharge groundwater resources and also removes pollutants from water. They are natural filters and aid in purifying water through trapping many pollutants, including sediment, heavy metals and disease-causing organisms (DWAF, 2005).

1.3 Terms of Reference

The aim of the study was to provide a baseline wetland delineation and risk assessment of all associated wetlands within the study area. This was achieved through the following:

- Identify and delineate of all associated wetlands within the proposed study area;
- Classify each watercourse according to the National Wetland Classification Systems;
- Compile a baseline description of all the potentially impacted aquatic environments according to GN No. 320, March 2020 (Table 1);
- Assessing the PES and EIS for all identified wetlands; and
- Comply with Appendix 6 of the EIA Regulations by undertaking a risk assessment and identifying suitable mitigation measures.

1.4 Structure of the report

The report has been structured as follows:

- Introduction;
- Legislation;
- Project Description;
- Methodology;
- Status Quo Analysis;
- Findings of the Assessment; and
- Conclusion.

Table 1: Compliance with Appendix 6 and criteria and minimum requirements for the various environmental themes as published in GN 320, March 2020

Nr.	Content	Reference
a	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 1
2.7	SACNASP Qualification and field of practice	Appendix 1
b	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 1
2	The assessment must be undertaken on the preferred site and within the proposed development footprint	Section 3.2
2,3	Threat status of the ecosystem and species as identified by the DEA screening tool	Section 6.4.2
c	An indication of the scope of, and the purpose for which, the report was prepared;	Section 1
cA	An indication of the quality and age of base data used for the specialist report;	Section 2 and Section 4.1.2
cB	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
d	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 6.3
e	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
2.3	Description of the aquatic biodiversity and ecosystems on the site including: • aquatic ecosystem types • Presence of aquatic species, and compositions of aquatic species communities their habitat, distribution and movement patterns	Section 6.3
2,3,4	A description of the ecological importance and sensitivity of the aquatic ecosystem including: • a) The description (spatially if possible) of the ecosystem process that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of	Section 6.3.7

	• surface water and subsurface water, recharge, discharge, sediment transport etc.); • b) The historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and or estuaries in terms of possible changes to channel and flow regime (surface and groundwater)	
f	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6 and Section 7
g	An identification of any areas to be avoided, including buffers;	Section 6.4.2 and 6.4.3
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 6.4.3
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4.1.9
j	A description of the findings and potential implications of such findings on the impact of the proposed activity (including identified alternatives on the environment) or activities;	Executive Summary, Section 6
	The following questions should be answered: • Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal? • Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	Section 6
	How will the development impact on fixed and dynamic ecological processes that operate within or across the site: • a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); and • b) Change in the sediment regime (e.g. sand movement, meandering river mouth /estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub -catchment; • c) The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary, seasonal, permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.).	Section 7.1.1

	• d) to what extent will the risk associated with water uses and related activities change?	
2,5	How will the proposed development impact on the functioning of the aquatic feature? This must include: • a) Base flows (e.g. too little/too much water in terms of characteristics and requirements of system) • b) Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over - abstraction or instream or off -stream impoundment of a wetland or river) • c) Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley -bottom wetland to a channelled valley -bottom wetland). • d) Quality of water (e.g. due to increased sediment load, contamination by chemical and /or organic effluent, and /or eutrophication) • e) Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal). • f) The loss or degradation of all or part of any unique or important features (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.) associated with or within the aquatic ecosystem.	Section 7.1.1
2,5	How will the development impact on key ecosystem regulating and supporting services especially: • a) Flood attenuation • b) Stream flow regulation • c) Sediment trapping • d) Phosphate assimilation • e) Nitrate assimilation • f) Toxicant assimilation • g) Erosion Control • h) Carbon Storage?	Section 7.1.1
2,5	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Refer to Terrestrial Biodiversity Report
k	Any mitigation measures for inclusion in the EMPr;	Section 7.1.1.
l	Any conditions for inclusion in the environmental authorisation;	Section 7.1.1
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7.1.1
n	A reasoned opinion—	Executive Summary

	i. [as to] whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	and Section 8
o	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q	Any other information requested by the competent authority.	None

2 LEGISLATION

2.1 South African Legislation

In South Africa, there are a wealth of policies and legislation dealing directly or indirectly with environmental protection and management. Aquatic ecosystems, and in particular wetlands, have been protected and management over the years through various policies and legislation. These include:

- Constitution of the Republic of South Africa (Act 108 of 1996);
- NEMA;
- EIA Regulations
- NWA;
- General Authorisations (GA's);
- National Environmental Management: Biodiversity Act (Act 10 of 2004); and
- National Environmental Management: Protected Areas Act (Act 57 of 2003).

2.1.1 Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution of the Republic of South Africa (Act 108 of 1996) aims to provide an environment that is protected, for the benefit of the present and future generations, through reasonable legislative and other measures that –

- Prevent pollution and ecological degradation;
- Promote conservation; and,
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

2.2 National Environmental Management Act (NEMA, Act 107 of 1998)

The aims of the NEMA are "to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for co-ordinating environment functions exercised by organs of state; to provide for certain aspects of the administration and enforcement of other environmental management laws; and to provide for matters connected therewith".

NEMA and the EIA Regulations, states that prior to any development, an Environmental Authorisation (EA) application process should be followed. For an EA application, either a Basic Assessment (BA) process or an EIA process can be followed depending on the scale of the Environmental Impact. On 20 March 2020, new regulations were gazetted (GN No. 43110) that has replaced the requirements of Appendix 6 of the EIA Regulations and therefore provides criteria and minimum requirements for the various environmental themes in terms of Section 24(5)(a) and (h) and Section 44 of the NEMA when applying for an EA (refer back to Table 1).

2.3 Legislation Governing Watercourses

2.3.1 National Water Act (NWA, Act 36 of 1998)

The NWA aims to achieve a balance between the use and protection of the country's water resources, where the entire aquatic ecosystem – not merely the water it provides – is recognised as "the water resource". Moreover, the NWA has redefined the concept of water resource use and protection so that it not only includes water but the full range of goods and services that aquatic ecosystems provide (DWAF, 2008).

A watercourse is defined as:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and,
- Any collection of water which the Minister may, by notice in the *Gazette*, declare to be a watercourse.

According to the Water Use Registration Regulations published under GN R1352 in Government Gazette 20606 of 12 November 1999, any person who uses water as contemplated under Section 21 of the NWA must, register the relevant water use. The registration of a water use must be done by notifying the DWS and complete the registration process. According to the Act and Section 21, water uses include:

(a) Taking water from a water resource;
(b) Storage of water;
(c) Impeding or diverting the flow of water in a watercourse;

(d) Engaging in a stream flow reduction activity contemplated in Section 36;
(e) Engaging in a controlled activity identified as such in Section 37(1) or declared under Section 38(1);
(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource;
(h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
(i) Altering the bed, banks, course or characteristic of a watercourse;
(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and,
(k) Using water for recreational purposes.

The regulated area of a watercourse for Section 21(c) and (i) water uses is defined as follows in Government Gazette No. 40229 of 26 August 2016:

- The outer edge of the 1 in 100 year flood line and /or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to Section 144 of the NWA); or
- A 500 m radius from the delineated boundary (extent) of any wetland or pan.

2.3.2 National Environmental Management: Biodiversity Act (NEM:BA, Act 10 of 2004)

The main aim of NEM:BA is to protect species and ecosystems while promoting the sustainable use of indigenous biological resources. Moreover, the act addresses the need for protecting threatened ecosystems. Furthermore, the act aims to provide the South African National Biodiversity Institute (SANBI) the tools to assist in achieving the objectives of this act.

2.3.3 National Environmental Management: Protected Areas Act (NEM:PA, Act 57 of 2003)

The aim of NEM:PA is to provide the declaration and management of protected areas (within the framework of national legislation, including NEMA). In addition, the act aims to effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity. Also, NEM:PA wants to promote sustainable utilisation of protected areas in such a way that it would preserve the ecological character of protected areas.

3 Project Description

3.1 Study location

The proposed Oslaagte Solar 3 PV Facility is situated west of Kroonstad, Free State Province, South Africa (see Figure 2 below). Moreover, the proposed study area is located within the Fezile Dabi District Municipality and the Moqhaka Local Municipality. The study area can be accessed via the N1.

3.2 Project Description

The proponent proposes the development of two Alternative Layout options of the 480MW Oslaagte Solar 3 PV Facility located on Portion 0 of the Farm Oslaagte No. 2564, south east of Kroonstad, in the Free State Province (Figure 3).

The proposed Solar PV Facility will be comprised of the following:

- PV modules and mounting structures that will consist of either Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems;
- Inverters and transformers;
- A Battery Energy Storage System (BESS) (up to 4 hectares (ha)),
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance;
- Facility grid connection infrastructure, including:
    - 33 kilovolt (kV) cabling between the project components and the facility substation;
    - A 132 kV facility substation;
    - 33 kV or 132 kV cabling or powerline between the facility substation and the proposed Main Transmission Substation (MTS).
- Temporary construction laydown area (up to 5 ha);
- Permanent laydown area (up to 1 ha) and located within the demarcated temporary laydown area;
- Internal roads (up to 6 m wide) providing access to Solar PV panels; and finally,
- Main access road (up to 8 m wide).

Figure 2: Regional Locality of the proposed study area (Alternative 1)

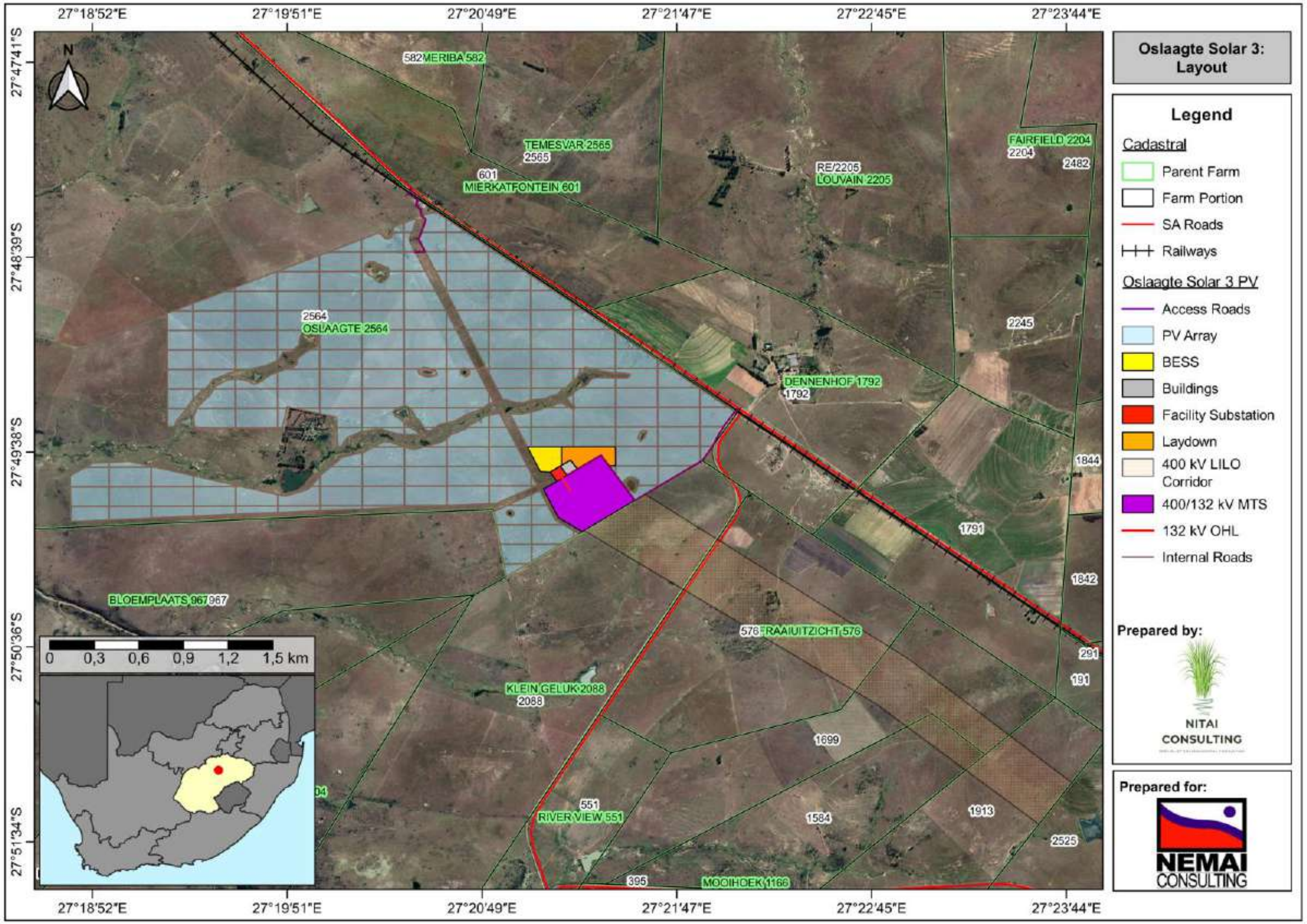

Figure 3: Proposed Alternative 1 layout of the Oslaagte Solar 3 PV Facility

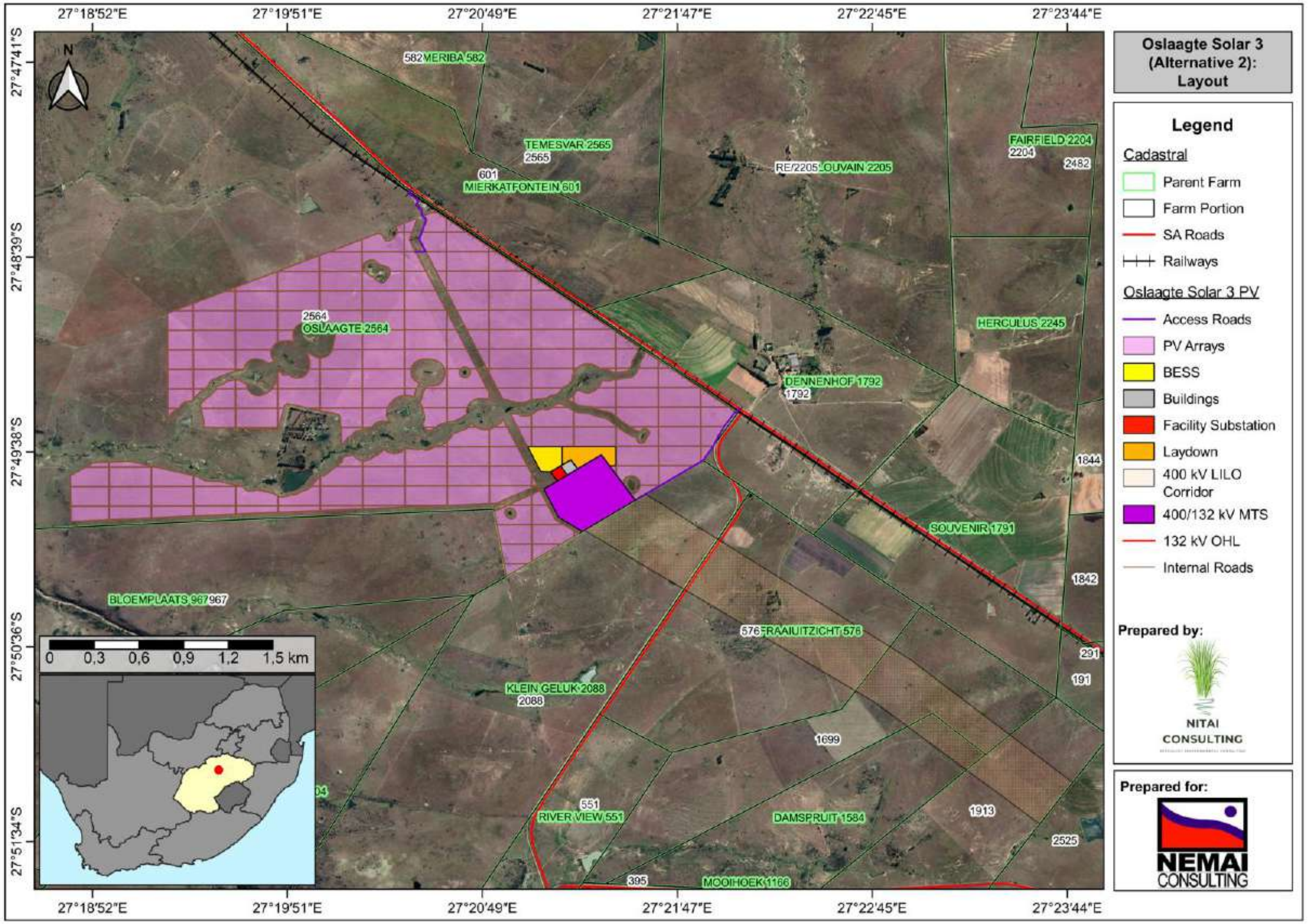

Figure 4: Proposed Alternative 2 layout (Preferred Layout) of the Oslaagte Solar 3 PV Facility

4 METHODOLOGY

The following sections provide an overview of the methodology used for this assessment.

4.1 Approach

4.1.1 Desktop Study

The preliminary mapping and classification of rivers and wetlands within the proposed footprint of Oslaagte Solar 3 PV Facility was undertaken using the latest and historic aerial imagery (Google Earth Pro).

4.1.2 Spatial Data Consulted

The spatial data used over the course of the assessment include the following:

- Aerial imagery (Google Earth Pro);
- National Freshwater Ecosystem Priority Areas (NFEPA) (rivers and wetlands) (Nel *et al*., 2011);
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (van Deventer *et al*., 2018);
- South African Inventory of Inland Aquatic Ecosystems (van Deventer *et al*., 2019);
- 5m Contours;
- Geology;
- South African Vegetation Map (Mucina & Rutherford 2018);
- Free State Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESA's) (Collins, 2016);
- Strategic Water Source Areas (SWA's) (Nel *et al*., 2013);
- Protected Areas and Protected Areas Expansion Strategy; and,
- DWA Eco-Regions (Kleynhans *et al*., 2005).

4.1.3 Identification and mapping of wetlands

The South African National Biodiversity Institute developed the National Wetland Classification Systems (NWCS) that was considered for this assessment. This is a system that is comprised of a hierarchical classification process that defines a wetland based on the principles of the hydrogeomorphic (HGM) approach.

Wetlands are delineated based on the guidelines set out by DWAF (2005) in their Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas. As stated earlier, wetlands are a land that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface (see Figure 5 on a cross-section through a wetland). The outer edge of a wetland is delineated by means of considering the following four wetland indicators:

- The Terrain Unit Indicator: Helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator: Identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation;
- The Soil Wetness Indicator: Identifies the morphological “signatures” developed in the soil profile as a result of prolonged and frequent saturation;
- The Vegetation Indicator: Identifies hydrophilic vegetation associated with frequently saturated soils.

According to the NWA, vegetation is the primary indicator, which must be present under normal circumstances. However, in practice the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

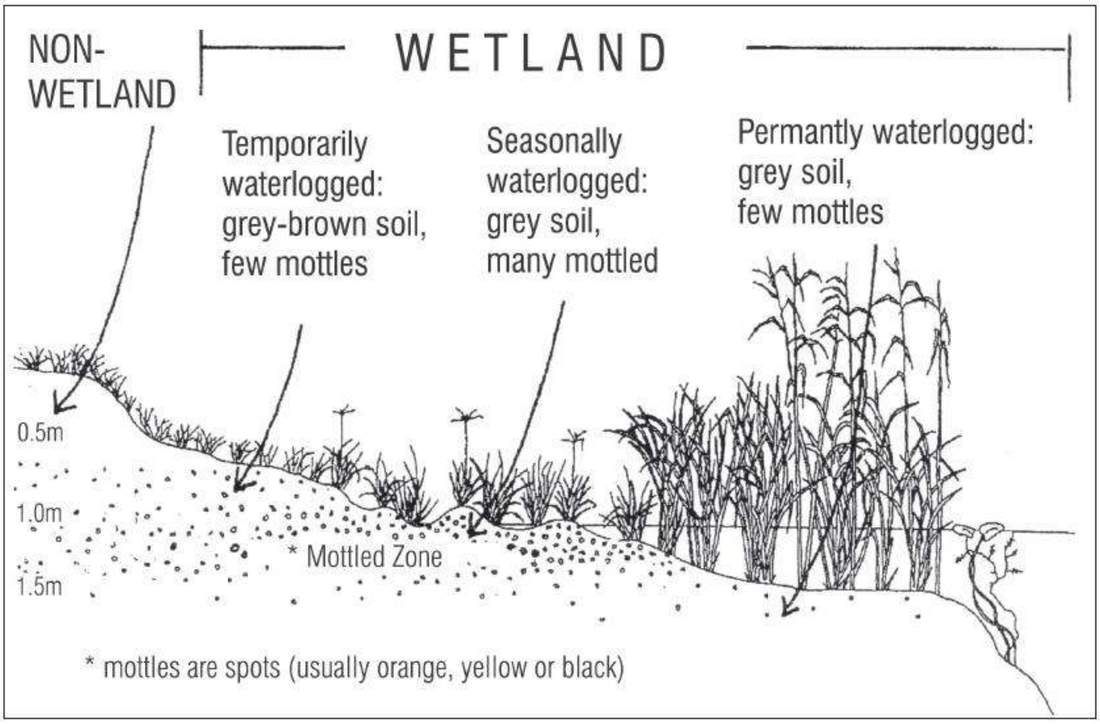

Figure 5: Cross-section through a wetland, indicating how soil wetness and vegetation indicators changes as one moves along a gradient (Extracted from DWAF 2005).

4.1.4 Present Ecological State (PES) of associated watercourses

The approach is to quantify the impacts of human activity or clearly visible impacts on wetland health and then convert it to impact scores to a PES score (Table 2). The PES scores provide an overall indication of the health or integrity of biophysical attributes which is determined through a comparison of the current condition to the natural (or close to natural), so-called “reference” condition (DWAF, 2007). The PES scores are calculated based on four key inter-related drivers namely; hydrology, geomorphology, water quality and vegetation. Moreover, the PES is assessed through evaluating the extent to which anthropogenic activities have altered wetland characteristics across the four inter-related components of wetland health (Macfarlane *et al*., 2020).

Table 2: Present Ecological State categories and Impact Scores (adapted from Macfarlane et al., 2009)

PES	Description	Impact Score Range	Impact Category
A	Unmodified, natural.	0 to 0.9	None
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	Small
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2.0 to 3.9	Moderate
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	Large
E	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6.0 to 7.9	Serious
F	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10.0	Critical

4.1.5 Present Ecological Category (EC) of Riparian Zones

To determine the EC of riparian zones, the method of Kleynhans *et al*. (2007): Module F: Riparian Vegetation Response Assessment Index (VEGRAI) was used. The Excel-based tool combines the degree of change of marginal and non-marginal vegetation to provide an Ecological Category or EC score for the riparian zones. Please see Table 3 below for EC and their scores.

Table 3: Generic Ecological Categories for EcoStatus components (adapted from Kleynhans, 1996 & Kleynhans, 1999)

Ecological Category	Description	% Score
A	Unmodified, natural.	90 – 100
B	Largely natural with few modifications. A small change in in natural habitats and biota may have taken place. However, ecosystem functions remain unchanged.	80 – 89
C	Moderately modified. Loss and change of natural habitats and biota have taken place but ecosystem functions remain predominantly unchanged.	60 – 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem function has occurred.	40 – 59
E	Seriously modified. An extensive loss of natural habitat, biota and basic ecosystem function has occurred.	20 – 39
F	Critically modified. Modifications has reached a critical point and the lotic system has been completely modified	0 – 19

	with an almost complete loss of natural habitat and biota. Worst case, basic ecosystem function has been destroyed and changes are irreversible.	

4.1.6 Ecological Importance and Sensitivity (EIS) of associated watercourses

To determine the EIS, the method of Rountree *et al*. (2013): Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0) was used. This is specifically important to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. The determination of the EIS category takes into account the PES scores calculated for WET-Health together with the function and service provision that enables the assessor to determine the EIS category for the wetland or group being assessed. The method uses a scale from 0 to 4 to determine the EIS category where 0 to <=1 is low/marginal importance; >1 to <=2 is moderate; >2 and <=3 is high and >3 to <=4 is very high (Rountree *et al*., 2013).

Table 4: Ecological Importance and Sensitivity Categories (Adapted from Rountree et al., 2013)

Recommended Ecological Management Class	Range of Mean	EIS Category
A	3.0 to 4.0	Very High
B	2.0 to 3.0	High
C	1.0 to 2.0	Moderate
D	0 to 1.0	Low/marginal

4.1.7 The National Wetland Classification System (NWCS)

The SANBI together with the Water Research Commission (WRC) developed the NWCS will be used for this assessment. The basis of this Classification System uses a hierarchical system of defining a wetland based on the HGM units. The wetland HGM units considered are as follows (Ollis *et al*., 2013):

- Unchanneled valley bottom wetland (UCVB);
- Channelled valley bottom wetland (CVB);
- Seep (S);
- Floodplain (F);
- Depression (D); and
- Flat (FL).

4.1.8 Determination of Buffer Zones

The appropriate buffer zones for the proposed Oslaagte Solar 3 PV Facility were determined using the "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands, and Estuaries" by Macfarlane and Bredin (2017).

4.1.9 Risk Assessment of associated watercourses

The Risk-Based Assessment was conducted in accordance with the DWS water use authorisation risk assessment matrix guidelines. The significance ratings were calculated according to Table 5:

Table 5: Significance ratings, classes and management description of the DWS water use authorisation risk assessment matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. License required.

4.1.10 Assumptions and limitations

The following assumptions and limitations accompany this assessment:

- This report is based on the information and layout received from the proponent;
- The findings, observations, conclusions and recommendations are based on the author's best professional and scientific knowledge; and
- **The assessment of wetlands presented in this report is limited to the proposed project footprint and does not include the extended 500 m radius regulated area of the Oslaagte Solar 3 PV Facility. Therefore, this report cannot be used for WUL application.**

5 STATUS QUO ANALYSIS

The following sections provide context of the aquatic environment in relation to the proposed Oslaagte Solar 3 PV Facility.

5.1 Regional context

5.1.1 Climate

The study area is within the BSk (cold semi-arid steppe) climate according to the Koppen-Geiger classification. The area is characterised by summer-rainfall seasonal precipitation with an overall Mean Annual Precipitation (MAP) of 560 mm. Most of the study area's rainfall is of convectional origin and peaks in December and January. Temperatures around the study area is around 15 ºC. In addition, incidence of frost is relatively (43 days on average) (Mucina & Rutherford, 2006).

5.1.2 Ecoregion

South Africa is a geologically, geomorphologically, climatically and ecologically complex country that has a diverse range of ecosystems, including freshwater wetlands and rivers (Kleynhans *et al*., 2005). It is important to understand the biophysical drivers that affect the characteristics of water resources in the region when analysing the ecology of any area. River ecoregional classification or "typing" will allow the grouping of rivers according to similarities based on a top-down nested hierarchy. This aids in simplifying and contextualising assessments and statements on ecological water requirements. One of the big advantages of this systems is the extrapolation of information from data rich rivers to data poor rivers within the same hierarchical typing context (Kleynhans *et al*., 2005).

Ecological regions are regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic and terrestrial) (Kleynhans *et al*., 2005). The proposed study is located within the **Highveld** ecoregion. A summary of this ecoregion is provided in Table 6 with the location and extent shown in Figure 6.

Table 6: Description of the Ecoregion classified for the study area

Ecoregion (Level I)	Ecoregion (Level II)	Description
11	11.03 & 11.08	**Highveld:** Plains with moderate to low relief, as well as various grassland vegetation types (with moist types present towards the east and drier types towards the west and south), define this high lying region.

Figure 6: Map indicating the location of the Ecoregion relevant to the study area (Preferred Layout)

5.1.3 Geology and Soils

The underlying geology of the study area varies, and is comprised of Mudstone and Arenite. Both these geology types are part of the Karoo Supergroup formation (mostly Adelaide Subgroup and the Beaufort Group) (Figure 5 and Figure 6). These formations and types give rise to vertic, melanic and red soils (typical soils forms include Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg). In addition, soil forms such as Clovelly, Avalon and Westleigh also occur. The dominant land type is Bd (Eutrophic; red soils not widespread), however, Bc (Eutrophic; red soils widespread), Ae (Red, high base status, >300 mm deep (no dunes), Dc (One or more of: vertic, melanic, red structured horizons) and Ba (Dystrophic and/or mesotrophic; red soils widespread) land types also occur (Mucina & Rutherford, 2006; van der Waals *et al*., 2019). From spatial data, the study area is comprised of various different soil types that includes Valsrivier, Swartland, Westleigh, Bonheim, Mispah and Kroonstad (Figure 7).

Between the different land types the soil moisture regime varies. In the Ae land type, the soil moisture leaches from profiles, but can also be one of free drainage. Soils in this land type do not typically show mottling or redox morphology. Wetlands could occur within these land types, however, they are confined to the immediate watercourse in depressions (van der Waals *et al*., 2019). Within the B land type (Plinthic landscapes with almost no upland duplex and margalitic soils), the moisture regime is dominated by the presence of restricting rock layers at depths that leads to perching of water in localised water tables and lateral seepage zones. As such, soils tend to express clear redox morphology characteristics due to distinctive zones of water fluctuation and prolonged saturation zones. In addition, zones where water manifests close to the surface is also prominent in this land type. Moreover, land types Ba and Bc (red soil dominated plinthic landscapes) tends to express smaller wetland soil distributions than the Bb and Bd land types (bleached and yellow soil dominated plinthic landscapes) (van der Waals *et al*., 2019). The D land type is characterised as Duplex soils with distinct differences between saturated and unsaturated hydraulic connectivity. Within this land type, wetlands are often in areas identified with E horizons and shallow lateral seepage as a result of perching of the water on the structure subsoil (van der Waals *et al*., 2019).

Figure 7: Map indicating the various Geology types associated with the study area (Preferred Layout)

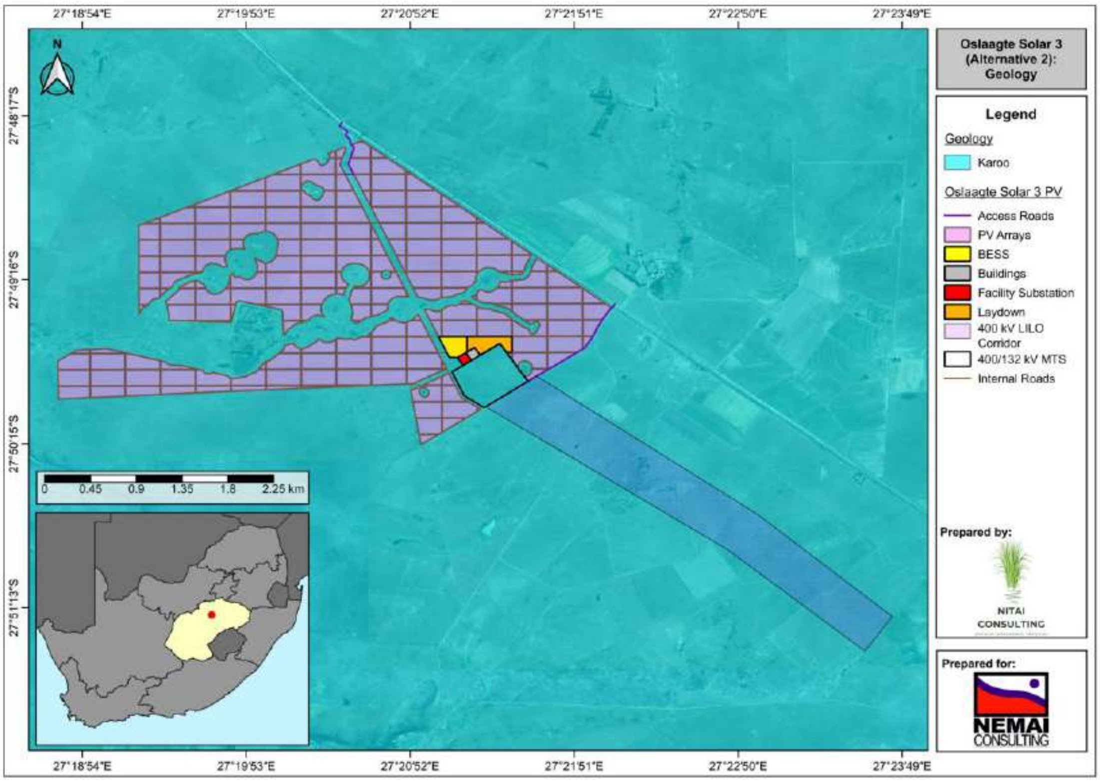

Figure 8: Map indicating the extent of the various different Geology groups associated with the study area (Preferred Layout)

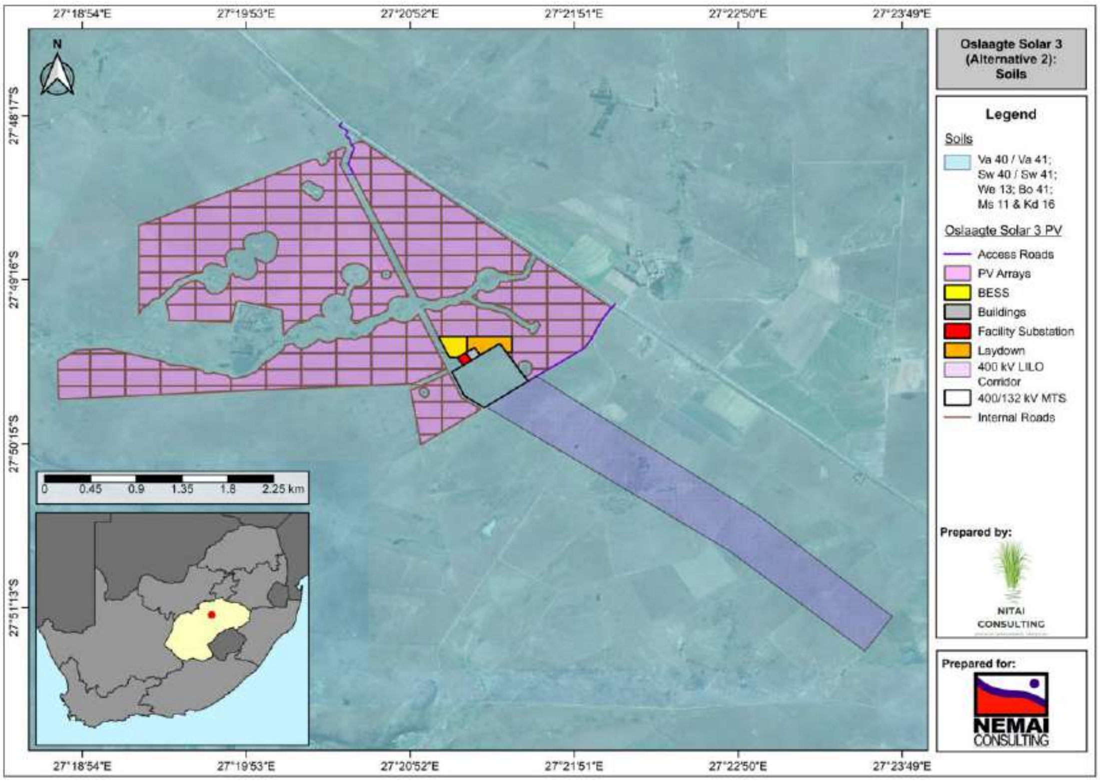

Figure 9: Soil map indicating the various different soil forms associated with the study area (Preferred Layout)

5.1.4 Vegetation characteristics

The study area falls within the Dry Highveld Grassland Bioregion (Gh6) and is characterized as the Central Free State Grassland (Figure 10). The Central Free State Grassland is characterized as undulating plains supporting short grassland, in natural condition dominated by *Themeda triandra* while *Eragrostis curvula* and *E. chloromelas* become dominant in degraded habitats (Mucina & Rutherford, 2006). The dwarf karoo bushes establish in several degraded clayey bottomlands while in heavy clayey the encroachment of *Acacia karroo* are very prominent in overgrazed and trampled low-lying areas (Mucina & Rutherford, 2006).

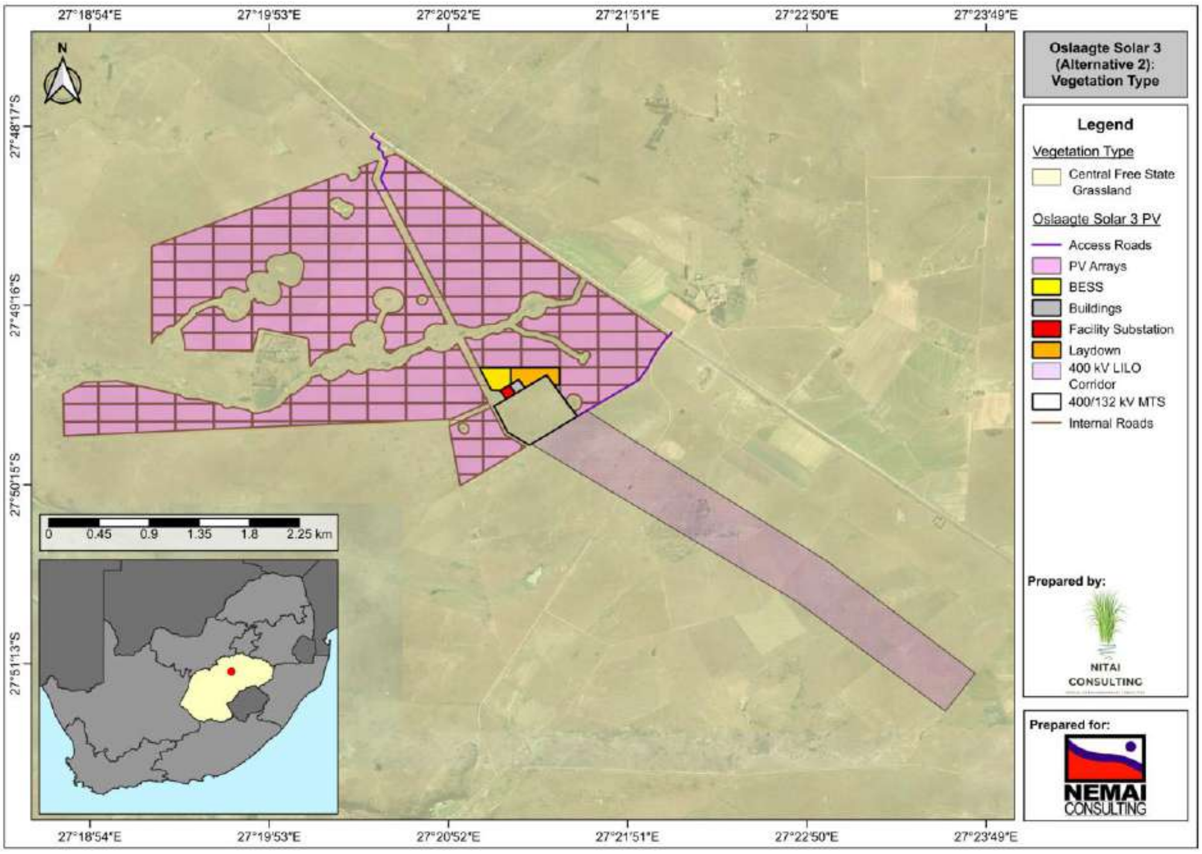

Figure 10: Vegetation type associated with the study area (Preferred Layout)

5.1.5 Water Management Areas and Quaternary Catchment

Previously, the Vaal Water Management Area (WMA) was divided into three categories, namely the Lower Vaal, Middle Vaal and the Upper Vaal WMA's (DWAF, 2004a). However, under the most recent GN 1056 No. 40279 of 16 September 2016, the WMA's has been refined into Limpopo, Olifants, Inkomati-Usuthu, Pongola-Mtamvuna, Vaal, Orange, Mzimvubu-Tsitsikamma, Breede-Gouritz and Berg-Olifants. The study area is located within one WMA. The proposed study area is situated within the middle region of the Vaal WMA (Figure 11). The middle region is part of a large water supply system which includes adjacent WMA's. It is situated downstream of the confluence of the Vaal and Rietspruit rivers and upstream of Bloemhof Dam. The region extends to the headwaters of the Schoonspruit River in the north and the Vet River in the south (DWAF, 2002). The land use within the middle region is characterized by agriculture (irrigation crops – wheat, groundnuts, sorghum and sunflowers). In addition, extensive gold mining activities are located within the Middle Vaal region (DWAF, 2004b).

The major rivers within this region are the Schoonspruit, Rhenoster, Vals, Vet and Vaal rivers and the Middle Vaal comprises of C24, C25, C41, C43, C60 and C70 quaternary catchments (DWAF, 2004b). The Middle Vaal is very much dependent on the water releases from the Upper Vaal region to meet its bulk water requirements for urban, mining, and industrial sectors. In addition, local resources are mainly being used for irrigation and smaller towns (DWAF, 2004b). Within the Vaal WMA, mining activities (gold mines) threatens water quality while large volumes of water are returned via treated effluent to the river systems from the urban areas and mine dewatering which further places stress on the water quality of this sub-catchment (DWAF, 2004b).

The study area is located within the C60F Quaternary Catchment (Blomspruit sub-catchment) (see Figure 12). The DWS has determined PES and EIS scores for each Quaternary Catchment area in Southern Africa back in 2014 (DWS, 2014). As such, for the C60F Quaternary Catchment, DWS has determined a PES as C (Moderately modified). In addition, the EIS was determined as C (Moderate Ecological Importance and Sensitivity) (DWS, 2014). According to the Classes and Resource Quality Objectives of Water Resources for Catchments of the Middle Vaal (GN No. 469 in Government Gazetted No. 39943 published on 22 April 2016), the Recommended Ecological Category (REC) for the Blomspruit sub-catchment has been determined as C (Moderate) (DWS, 2014).

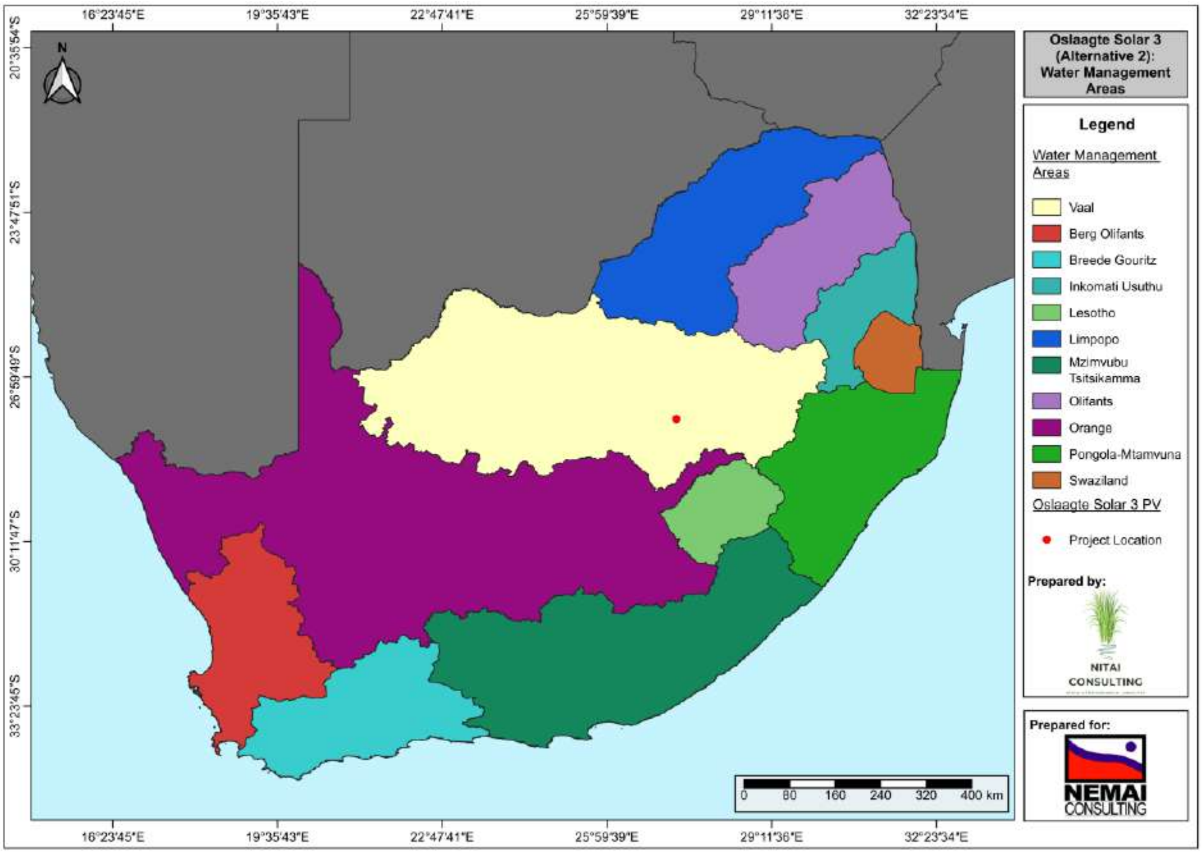

Figure 11: Water Management Area associated with the study area

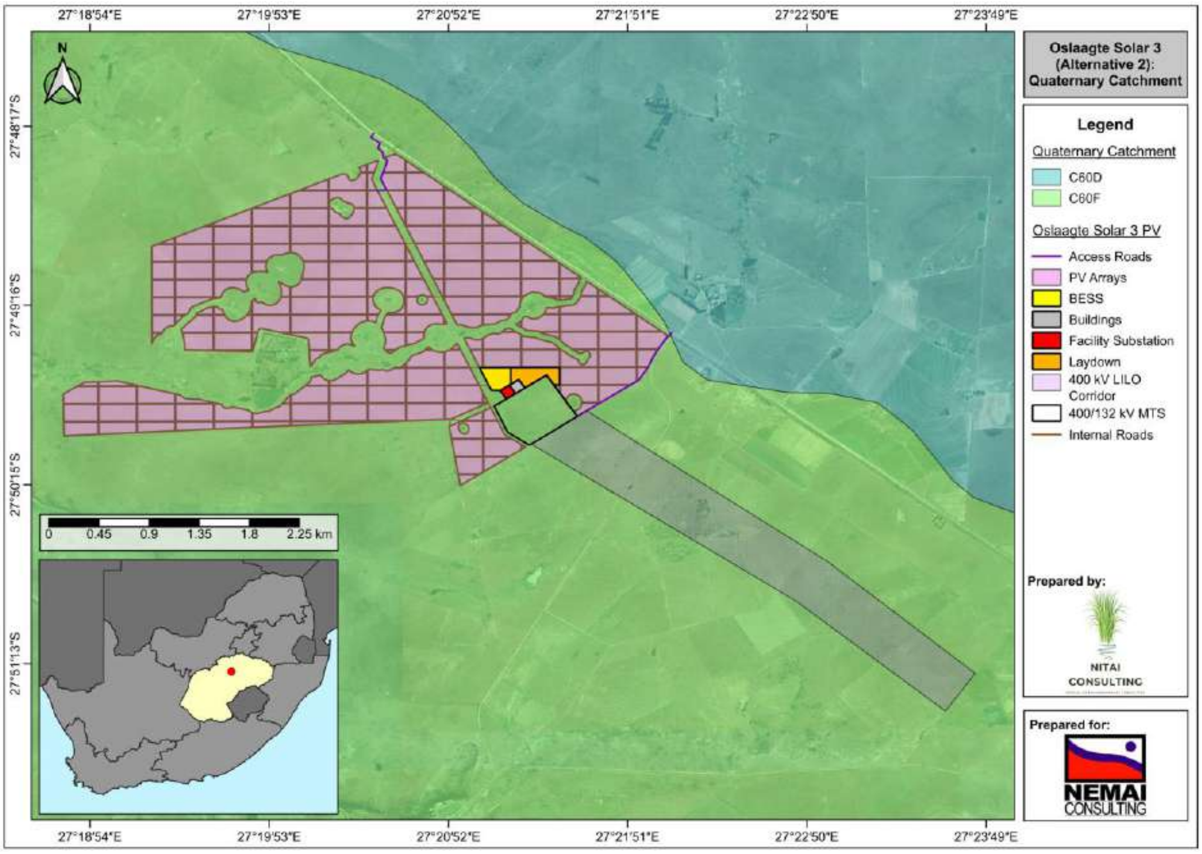

Figure 12: Quaternary Catchments associated with the study area (Preferred Layout)

5.2 Conservation context

5.2.1 National Conservation Priorities

5.2.1.1 National Threatened Ecosystems

A list of threatened ecosystems that are currently under threat of being transformed by other land uses has been identified in a national process. A few different versions of the list of threatened ecosystems have been released since the first release back in December 2011 (NEM:BA: National list of ecosystems that are threatened and in need of protection, G34809, GN 1002, December 2011). The main aim of identifying the threatened ecosystems is to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI, 2011). The NEMA has divided ecosystems into four groups namely; Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected.

Figure 13 shows the remaining extent of Threatened Ecosystems in the region surrounding the study area. Majority of Oslaagte Solar 3 PV is situated within **Least Concern (LC)** areas while parts of the PV site is within **Unclassified** areas. Additionally, majority of the grid connection is within **Least Concern** areas while parts of the grid connection is in **Unclassified** areas (Figure 13).

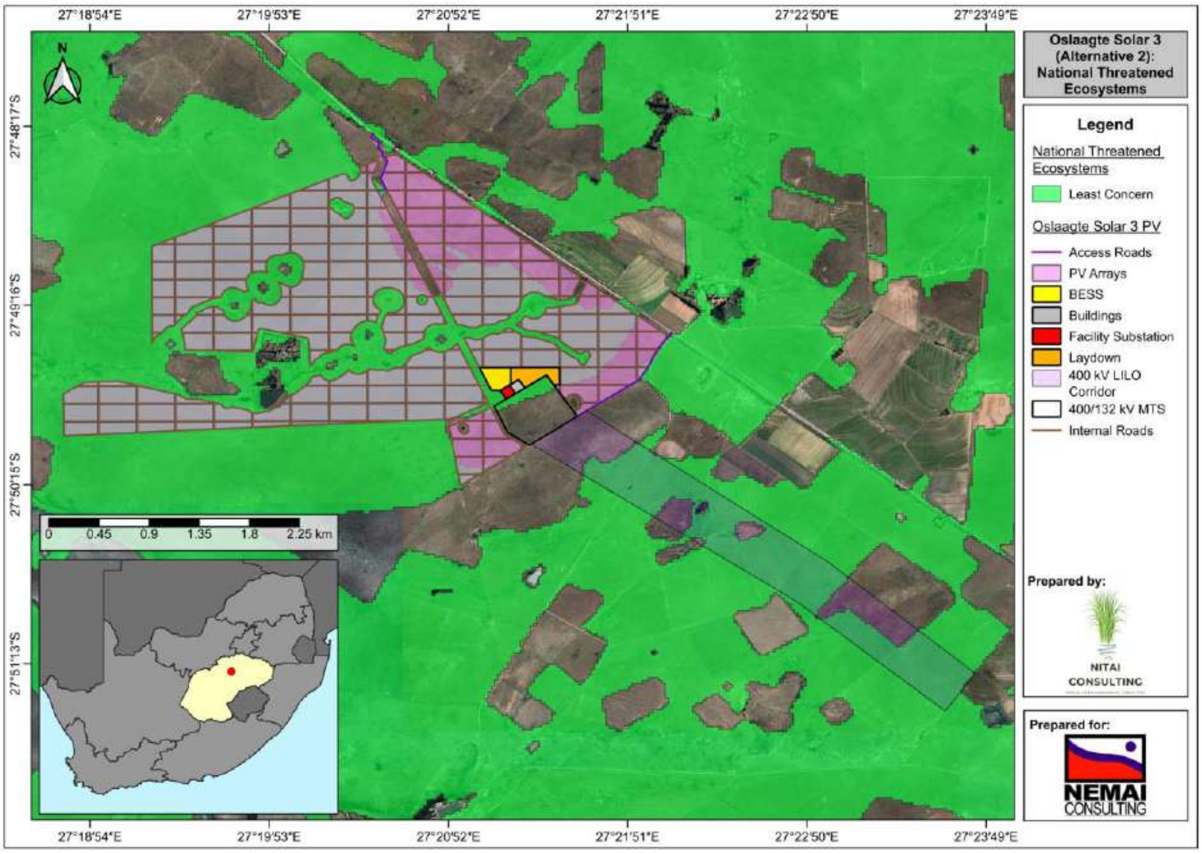

Figure 13: Map showing the location of the study area (Preferred Layout) in relation of the estimated remaining extent of the identified Threatened Ecosystems (SANBI, 2021)

5.2.1.2 National Protected Area Expansion Strategy (NPAES)

The location and extent of the existing National Protected Area Expansion Strategy (NPAES) is shown in Figure 14. The study area is situated in unclassified land and **Priority Focus Areas**. In addition, small areas of the PV site is within **Unclassified** areas. Finally, the grid connection crosses a **Protected Area** as well as **Priority Focus Area** and **Unclassified** areas.

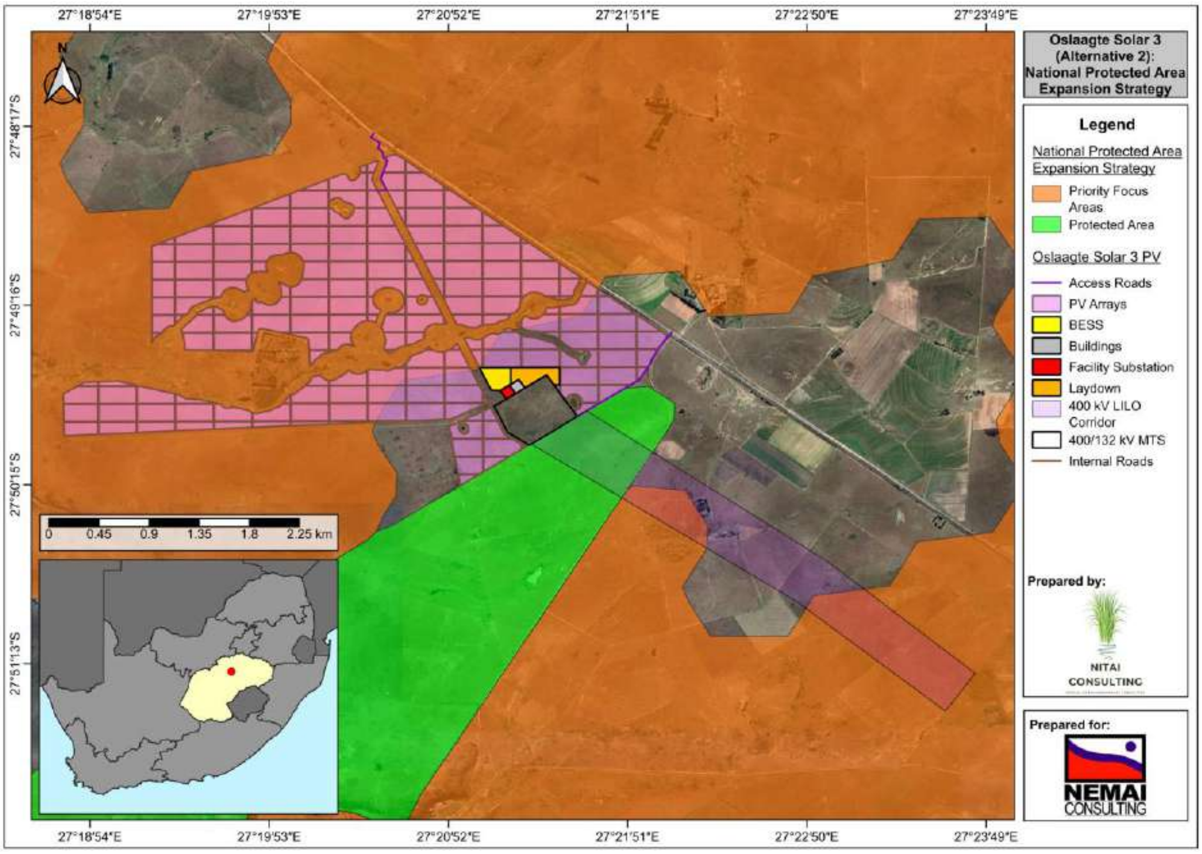

Figure 14: Map showing the study area (Preferred Layout) in relation to the National Protected Areas Expansion Strategy

5.2.1.3 Watercourses

National Freshwater Ecosystem Priority Areas (NFEPA) rivers

The watercourses map in Figure 15 highlights the NFEPA rivers, non-perennial rivers and dams associated with the study area (Alternative 1). The Blomspruit (a tributary of the Vals River) is the largest perennial river the flows in a northerly direction before draining into the Vals River further north. Furthermore, several small non-perennial rivers are found within the northern, south eastern, southern and western parts of the study area. A few small and large agricultural dams are located in these non-perennial rivers. Not much information on the Blomspruit is currently available. Due to these non-perennial rivers, the layout has been revised to accommodate these rivers. As such, the new layout (also the preferred layout) is situated outside any sensitive features (Figure 16). The study area is not situated within any river FEPA catchments (areas that achieve biodiversity targets for river ecosystems and fish species) and these catchments are identified in rivers that are currently in good condition (Ecological category of A or B).

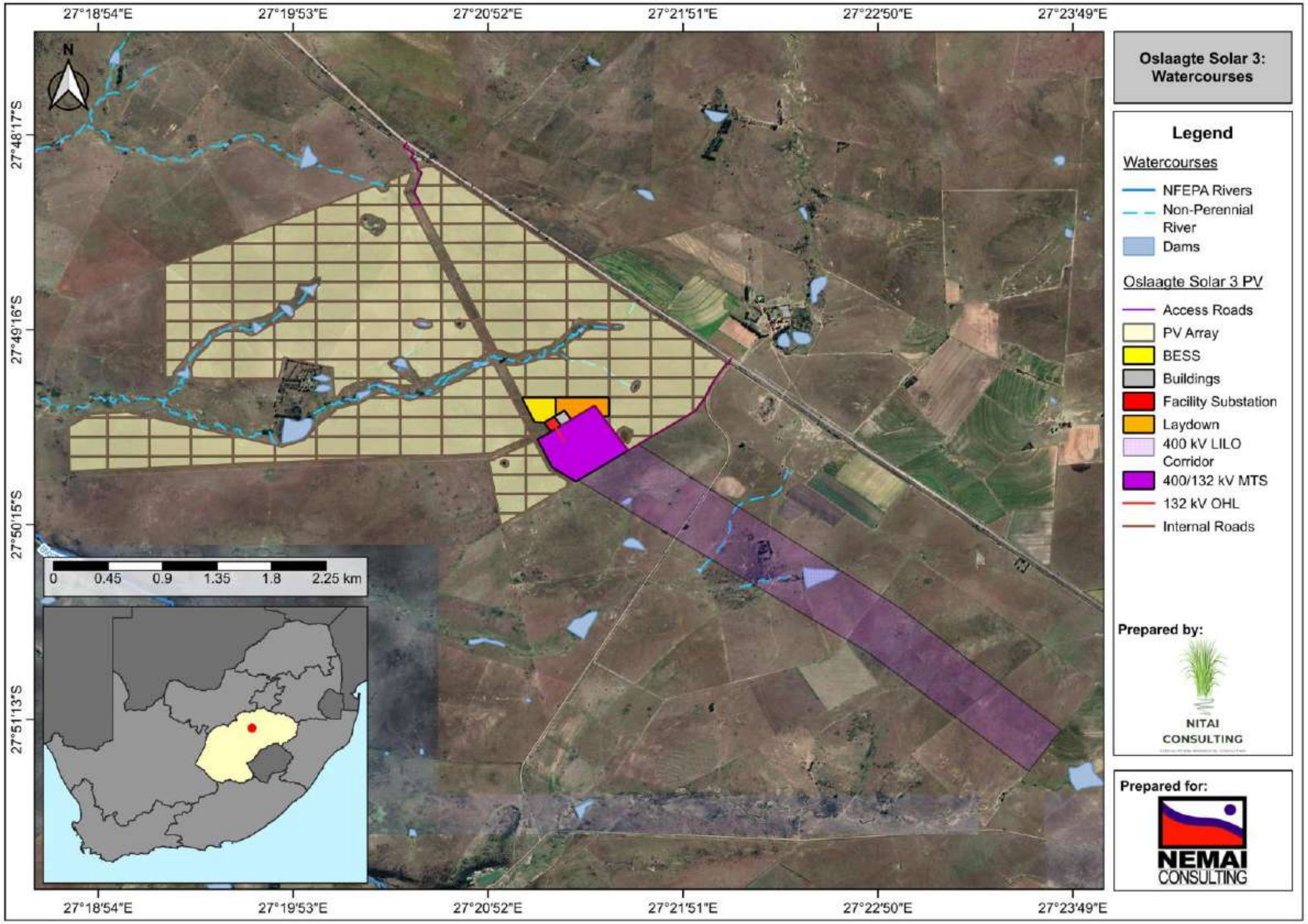

Figure 15: Map showing watercourses (NFEPA rivers, non-perennial rivers and Dams) associated with the study area (Alternative 1)

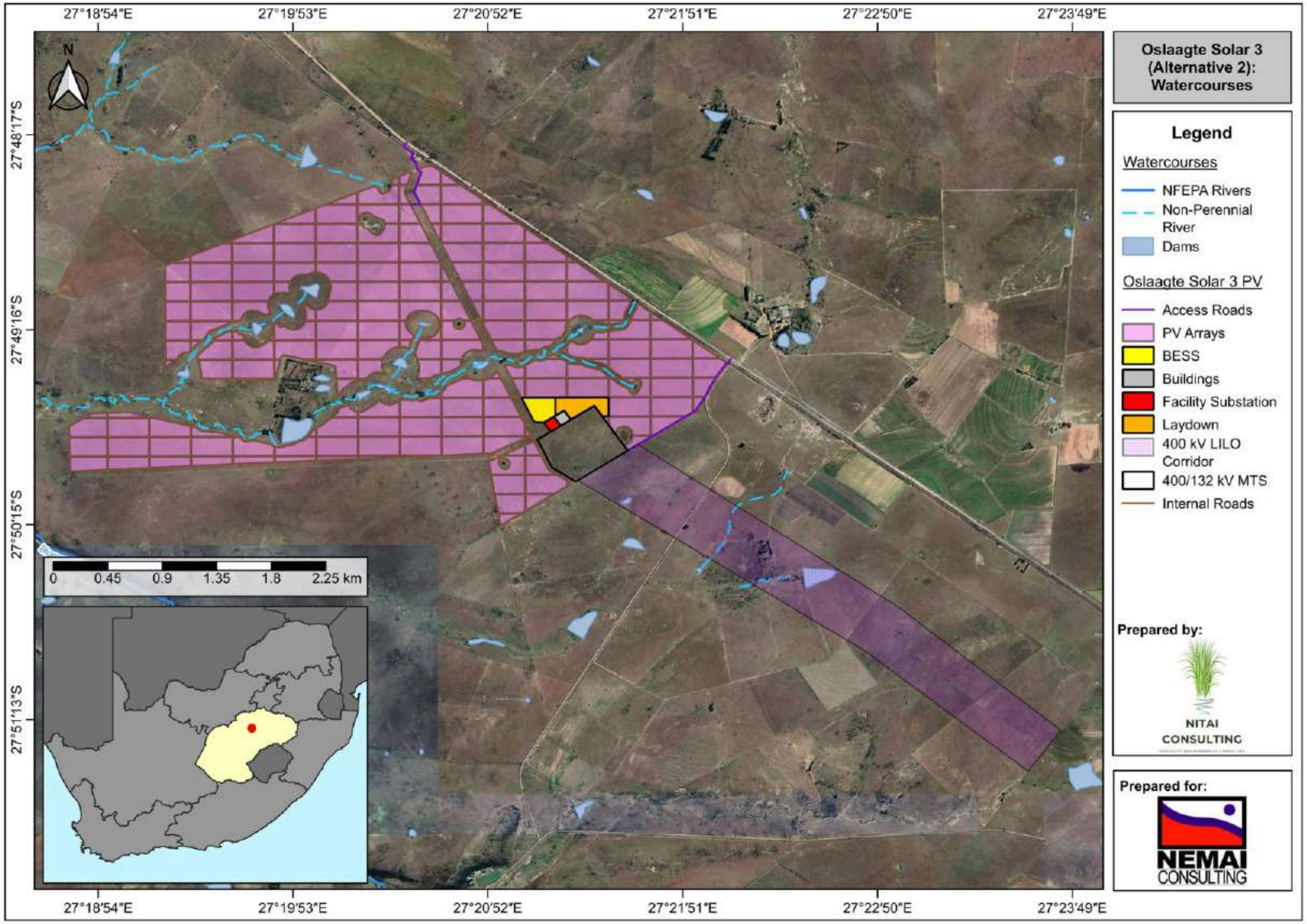

Figure 16: Map showing watercourses (NFEPA rivers, non-perennial rivers and Dams) associated with the study area (Alternative 2 & Preferred Layout)

National Biodiversity Assessment (NBA) 2018 National Wetland Map (NWM) 5

A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established in 2018 during the National Biodiversity Assessment (Van Deventer *et al*., 2018). This inventory highlights a collection of data layers pertaining to ecosystem types and pressures for rivers and inland wetland types. This includes the different wetland HGM units (CVB, UCVB, S, Dep, F and FL) as well its protection level (Well protected, Moderately protected, Poorly protected and Not protected) and threat status (Critical, Endangered, Vulnerable and Least Concern). Within the footprint of the study area, and within the 500 m regulated area, there is no HGM units according to the NBA 2018 NWM 5 spatial data (Figure 17).

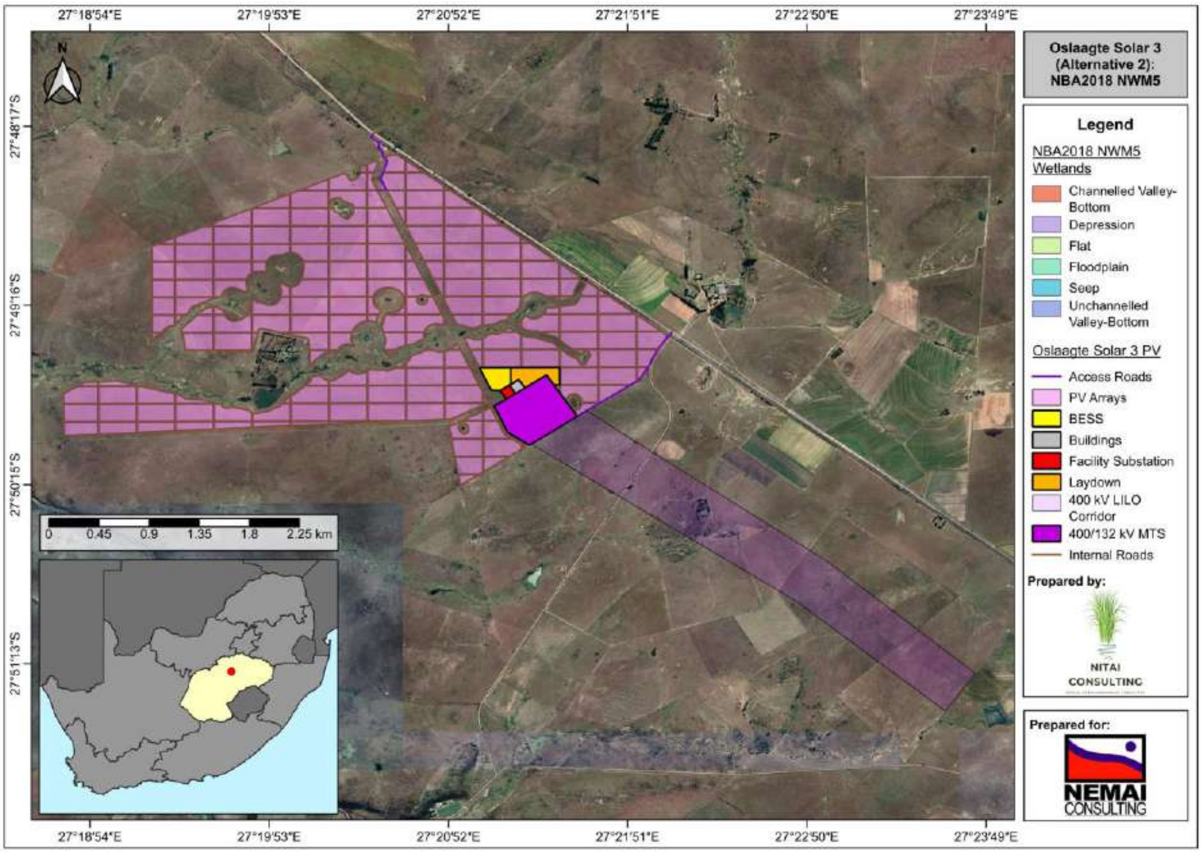

Figure 17: Map indicating the wetland hydrogeomorphic units associated with the study area (Preferred Layout)

5.2.1.4 Strategic Water Source Areas (SWSA's)

Strategic Water Source Areas (SWSA) are either (a) areas that supply an uneven (large quantity) amount of mean annual surface water runoff in relation to their size and are therefore considered to be nationally important or (b) have high groundwater recharge and where the groundwater forms nationally important resource or (c) areas that meat both criteria (a) and (b) (Nel *et al*., 2013; Le Maitre *et al*., 2018). Areas that supply these disproportionate amounts of water can be because of climatic conditions such as high rainfall, or physical properties (ability of the soils and underlying weathered material and rocks to store water as groundwater) (Le Maitre *et al*., 2018). In South Africa, 22 SWSA surface water and 37 SWSA groundwater areas has been identified to be strategically important at national level for water and economic security (Le Maitre *et al*., 2018). The study area is not situated within any of South Africa's three SWSA's (Figure 18).

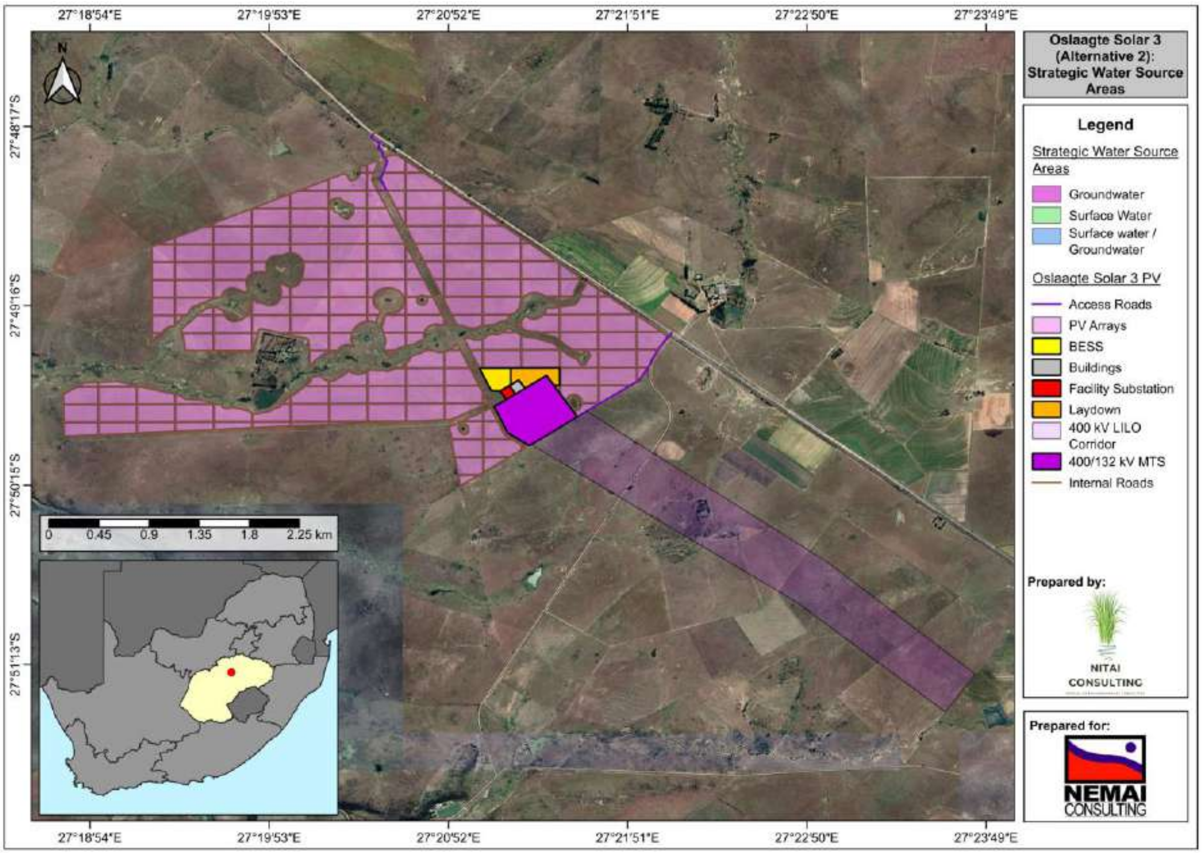

Figure 18: Map indicating the Strategic Water Source Areas in relation to the study area (Preferred Layout)

5.2.2 Regional context

5.2.2.1 Critical Biodiversity Areas (CBA's)

On a regional scale, terrestrial and aquatic biodiversity conservation priorities are highlighted in the Free State (FS) Biodiversity Plan (Collins, 2016). The biodiversity plan identifies areas that are important for the representation and persistence of terrestrial and aquatic species and ecosystems. These areas are referred to as Critical Biodiversity Areas (CBA's) which is the minimum area required to ensure the persistence and representation of biodiversity (Collins, 2016). Critical Biodiversity Areas within the FS are planning units that when not included in the final portfolio will result in targets not being met. As such, these areas are identified based on irreplaceability output of the Conservation Plan (C-Plan) or the frequency of selection analysis of Marxan (Collins, 2016). Furthermore, CBA 1 and CBA 2 areas are areas of high biodiversity that will result in targets not achieved when excluded from the final portfolio (CBA 1) and areas that will not necessarily result in loss of achievable targets from the final portfolio

(CBA 2). These areas account for 12 % of the biodiversity plan (Collins, 2016). Importantly, aquatic features have yet to be included in the FS Biodiversity Plan, with the exception of FEPA catchments and wetland clusters (which is included as Ecological Support Areas).

The spatial dataset from Collins (2016) highlights that the proposed Oslaagte Solar 3 PV facility is not located within either CBA 1 or CBA 2 areas (Figure 19).

5.2.2.2 Ecological Support Areas (ESA's)

Ecological Support Areas (ESA's) are areas required to support the persistence of terrestrial and/or aquatic species. In the Free State, the ESA's covers a total of 53% area of the biodiversity plan (Collins, 2016).

From the FS Biodiversity spatial data, majority of the PV site is located within areas classified as Other while small sections is located within an ESA 1. In addition, some of the PV site is in Degraded areas while majority of the proposed grid connection is in Other (Figure 19) (Collins, 2016).

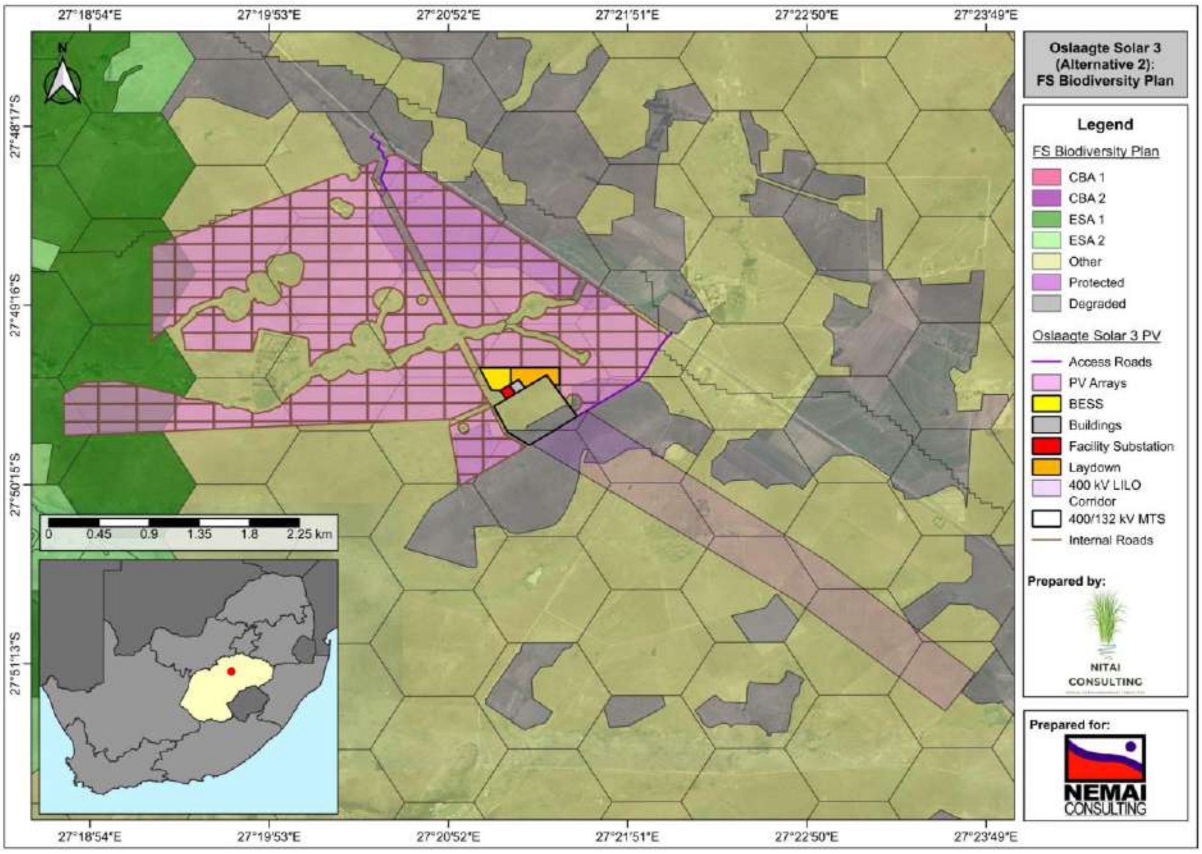

Figure 19: Map indicating the Free State Biodiversity Plan in relation to the study area (Preferred Layout)

6 FINDINGS OF THE ASSESSMENT

6.1 Desktop mapping and identifying resources

All areas of interest or potential of wetlands were identified, and pin drops were placed around the perimeter of the area of interest. This was done using the latest satellite aerial imagery from Google Earth. All pin drops "flagged" on Google Earth were visually inspected during the site visit (Figure 20).

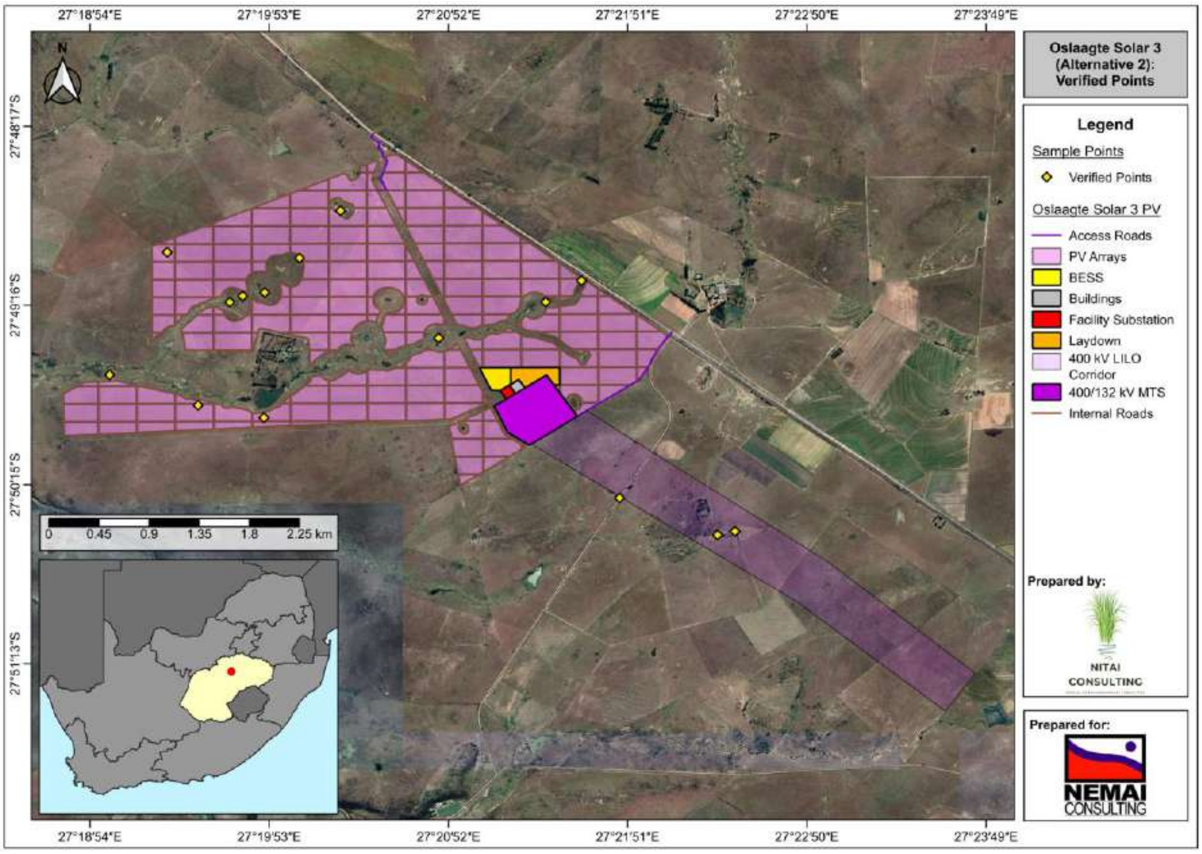

Figure 20: Map indicating the flagged potential wetland areas within the study area (Alternative 2)

6.2 Available information (rivers and wetlands)

To date, no previous Freshwater Assessments have been conducted within the study area. The Blomspruit is located to the west of the study area and flows in a north westerly direction before draining into the Vals River. Little to no information is available on the Blomspruit. The PES and EIS categories have been calculated by DWS (2014) for the Blomspruit and the PES and EIS have been calculated as C (Moderately modified) and C (Moderate Ecological Importance and Sensitivity). Furthermore, the study has concluded that the Riparian and Wetland zone continuity modifications is small, meaning that, the modifications are limited to very few localities and the impact on habitat quality, diversity, size, and variability are also very small. In addition, the potential flow modifications are regarded as serious, meaning that, the modifications are frequently present and that habitat quality, diversity, size, and variability in almost the whole of the defined area are affected. Only small areas are not influenced (DWS, 2014).

6.3 Ecological findings of the Assessment

During the site visits to the study area in Fall (11 – 13 April 2023), the study area is situated within and within the 500 m regulated area of several identified watercourses (wetlands, rivers and stormwater line) (see Figure 21 below). Due to freshwater sensitivity within the Alternative 1 layout, the proponent has revised the layout (hereafter referred to as Alternative 2). As such, each section of the ecological findings was sub-divided into Alternative 1 and Alternative 2.

Alternative 1

During site visits to the study area, the study area is situated within and within the 500 m regulated area of several identified watercourses (wetlands and non-perennial rivers) (Figure 21). Furthermore, the proposed grid connection is also situated within two wetlands (a S and a Dep wetland) while also crossing a few non-perennial rivers. In addition, several agricultural dams are located in close proximity to the study area (see Figure 21). The non-perennial rivers identified on site flows in a westerly direction before draining into the Blomspruit (Figure 21).

Alternative 2

The 2nd alternative option takes into account majority of the identified watercourses within the study area (Figure 22). As such, the Oslaagte Solar 3 PV footprint is outside of all delineated watercourses (wetlands and non-perennial rivers).

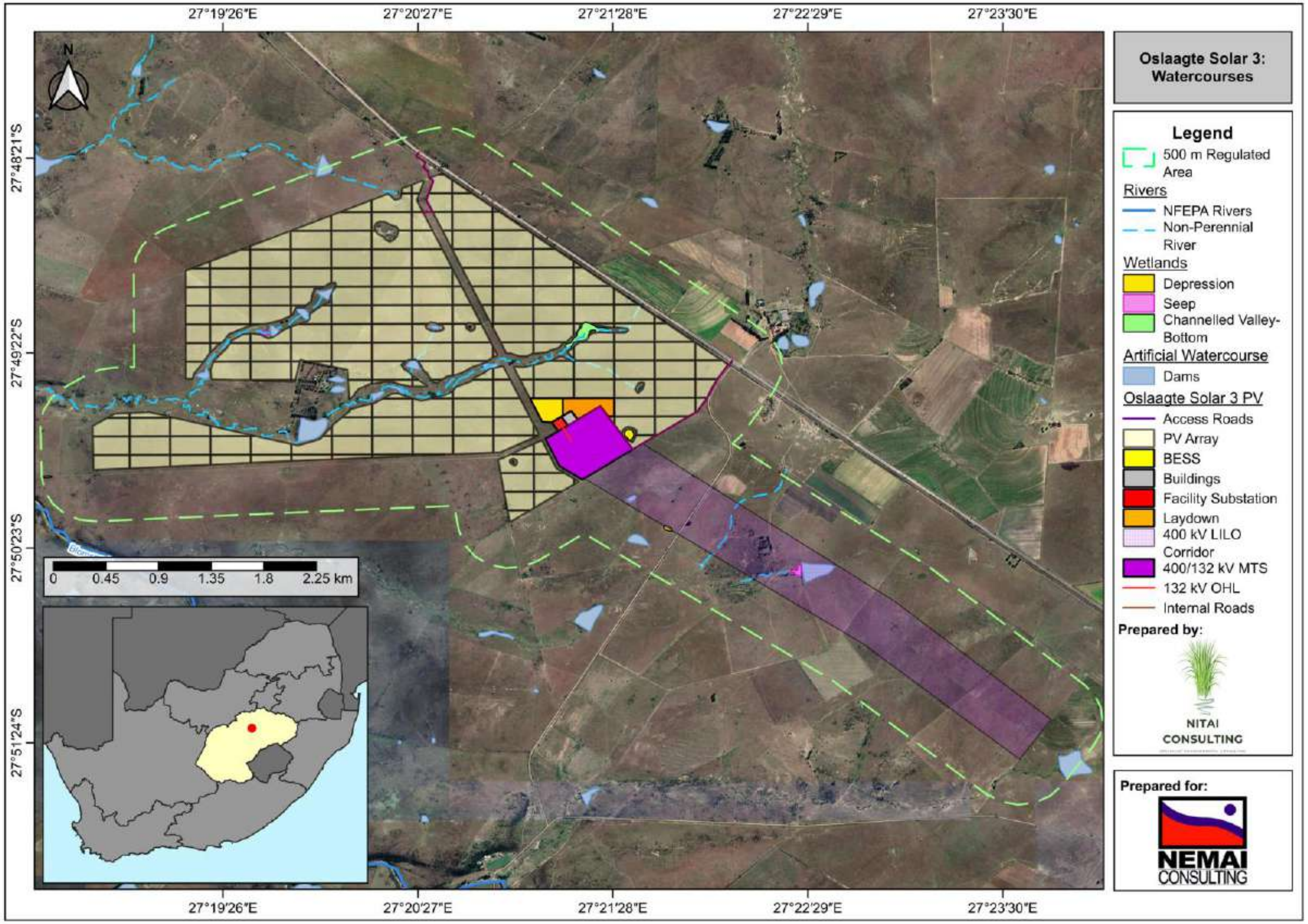

Figure 21: All watercourses associated with Alternative 1 of the Oslaagte Solar 3 PV Facility as well as the 500 m regulated area

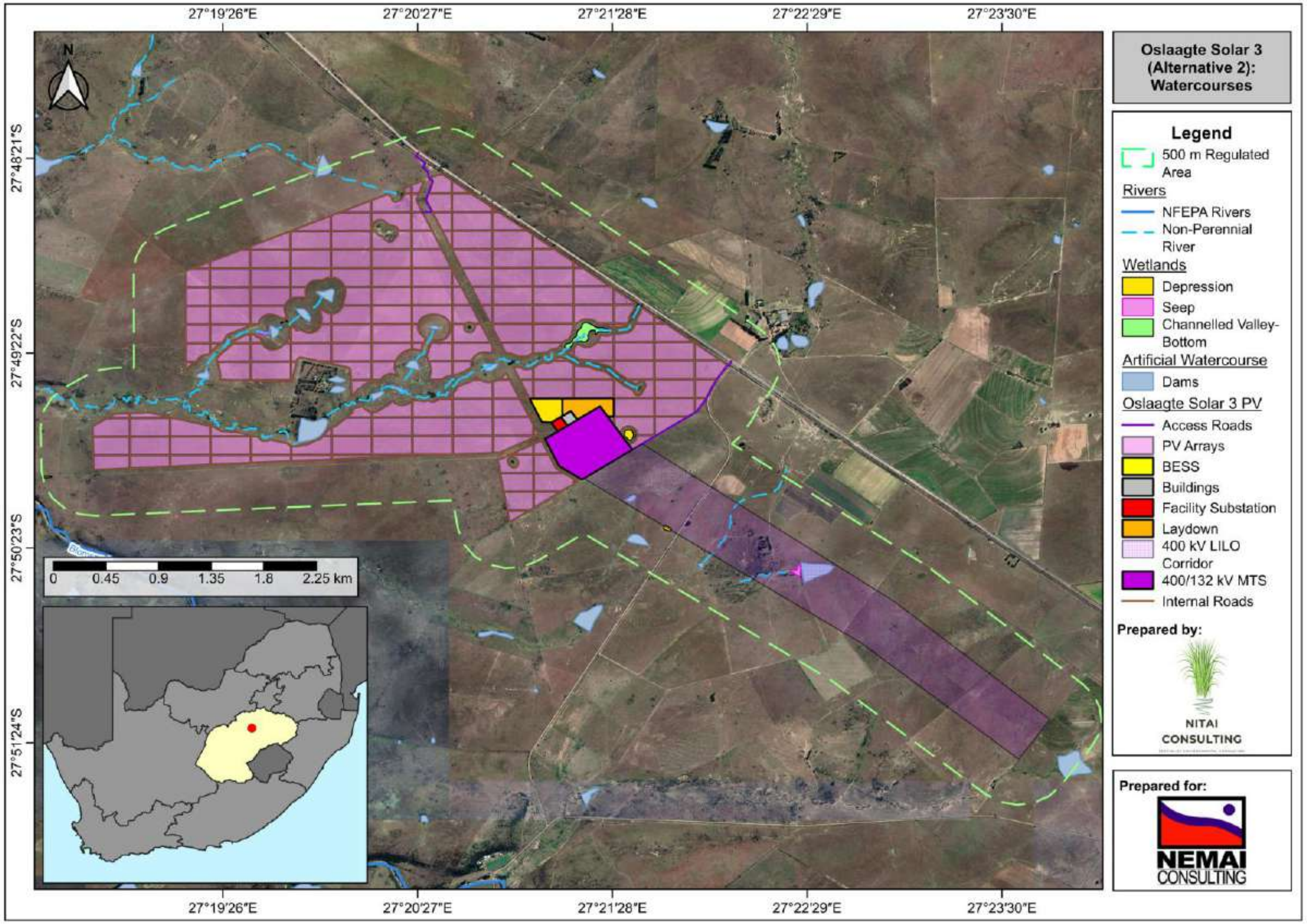

Figure 22: All watercourses associated with Alternative 2 of the Oslaagte Solar 3 PV Facility as well as the 500 m regulated area

6.3.1 Wetlands

6.3.1.1 Alternative 1

Several different HGM units were identified during the site visits to the study area. As such, the PV site encroaches into small sections of a CVB wetland in the eastern portion of the PV site (Figure 23). Furthermore, a Dep wetland is located in the southern portion of the PV site. In addition, two small Dep is located outside the western portion of the PV site near an agricultural dam while a small S wetland is located below the dam (Figure 23).

6.3.1.2 Alternative 2

The Alternative 2 layout has incorporated the presence of these wetlands and is therefore situated outside of these wetlands (Figure 24).

6.3.2 Rivers

6.3.2.1 Alternative 1

One perennial river (Blomspruit) was identified to the west of the proposed Oslaagte Solar 3 PV facility (Figure 25). In addition, several small non-perennial rivers were identified and is connected to the above-mentioned Blomspruit. Also, some of these non-perennial rivers were identified to be within the PV site (Figure 25). General photographs of these rivers are shown in Table 7 below. As a result, a freshwater sensitivity map was generated to highlight the Low, Medium and High sensitivities associated with the proposed development. Please refer to **Section 6.4: Sensitivities and Buffer Zones** and Figure 33 for the Sensitivity Map of the Alternative 1 Layout.

6.3.2.2 Alternative 2

The revised layout for Oslaagte Solar 3 PV has taken into account the several non-perennial channels draining into several agricultural dams before further draining into the Blomspruit (Figure 26). The Sensitivity Map for the Preferred Alternative 2 layout can be found in **Section 6.4: Sensitivities and Buffer Zones** as well as Figure 34.

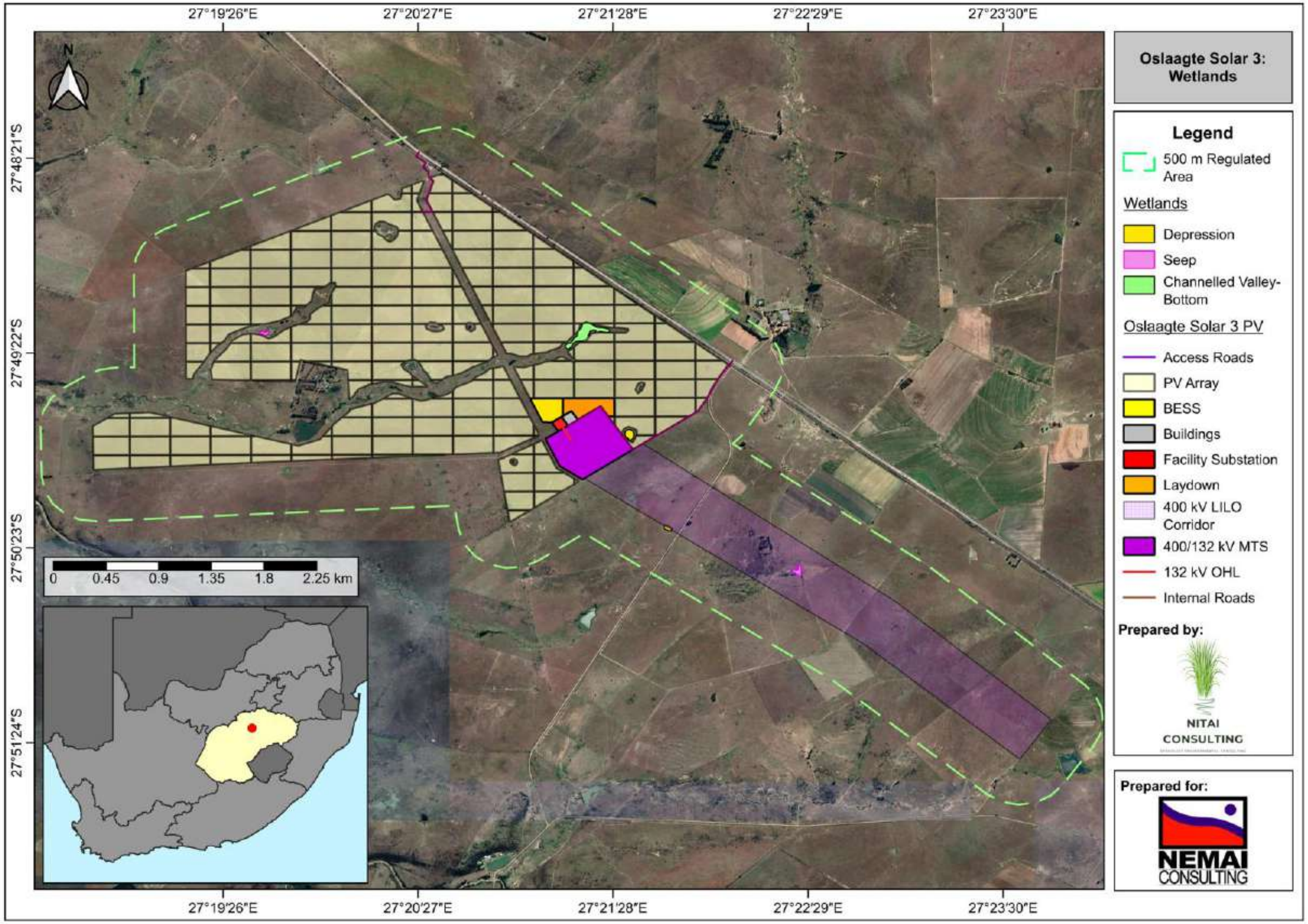

Figure 23: All wetlands associated with the Alternative 1 layout of Oslaagte Solar 3 PV

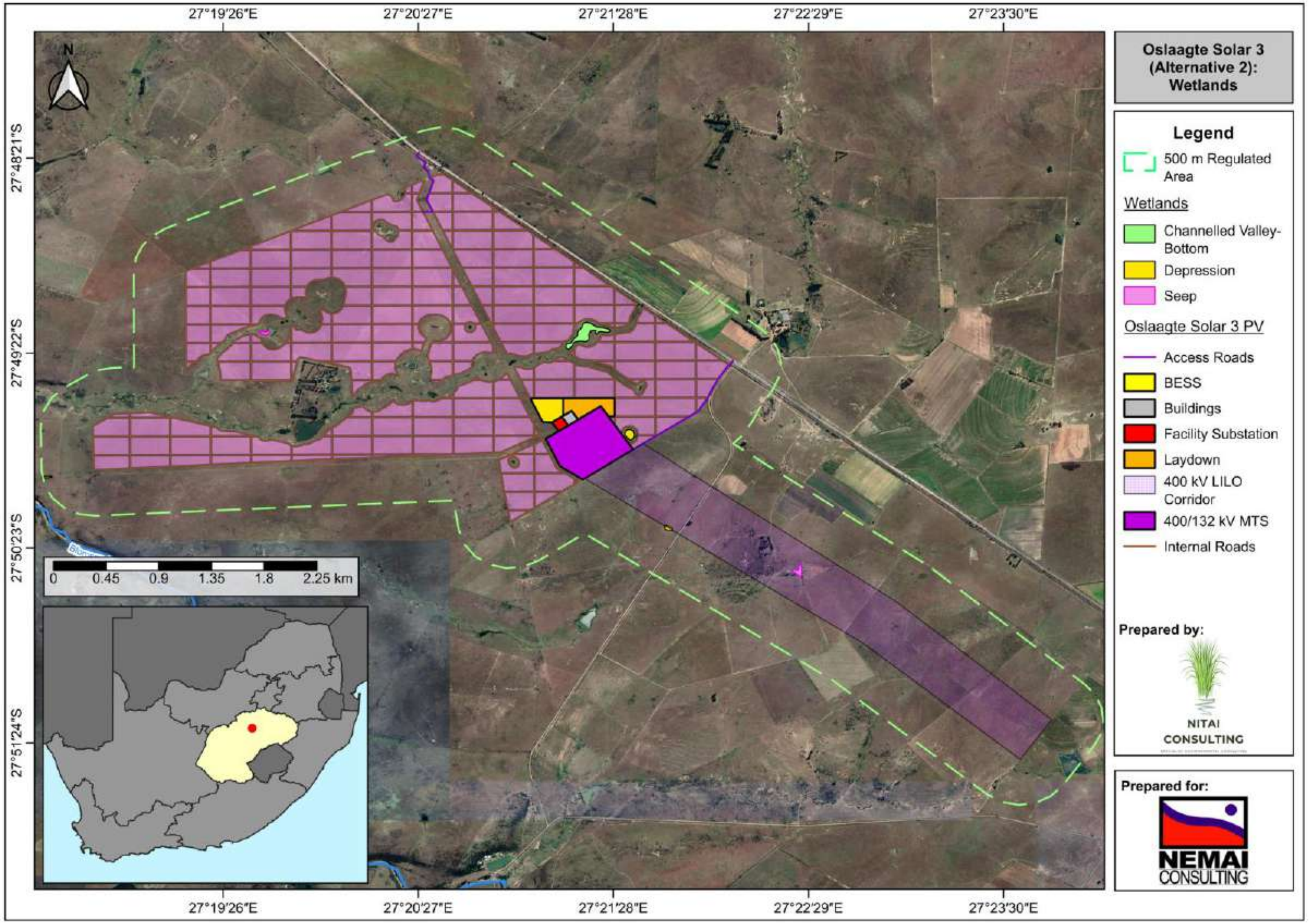

Figure 24: All wetlands associated with the Alternative 2 layout of the Oslaagte Solar 3 PV

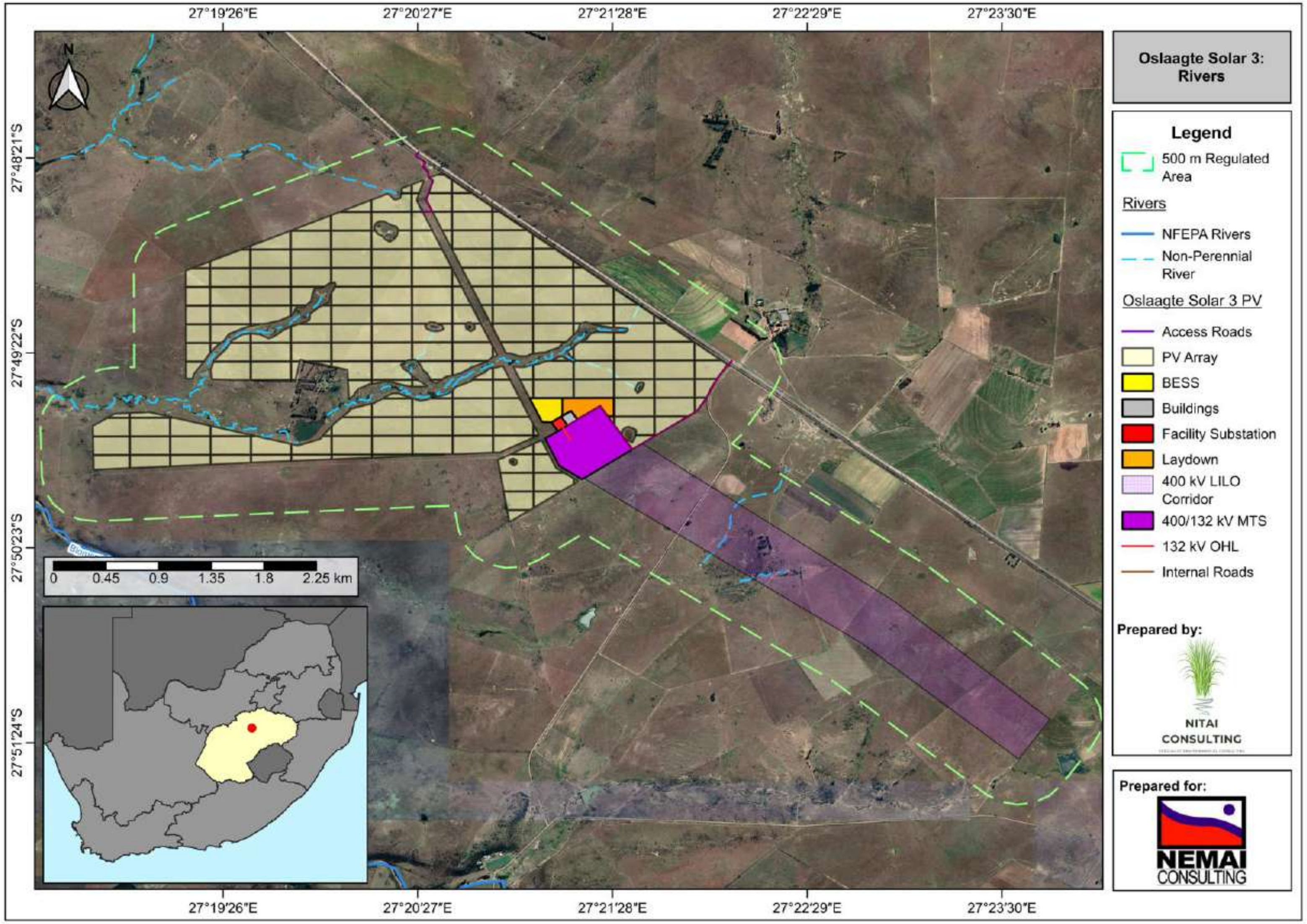

Figure 25: All identified rivers within the Alternative 1 Layout of the study area

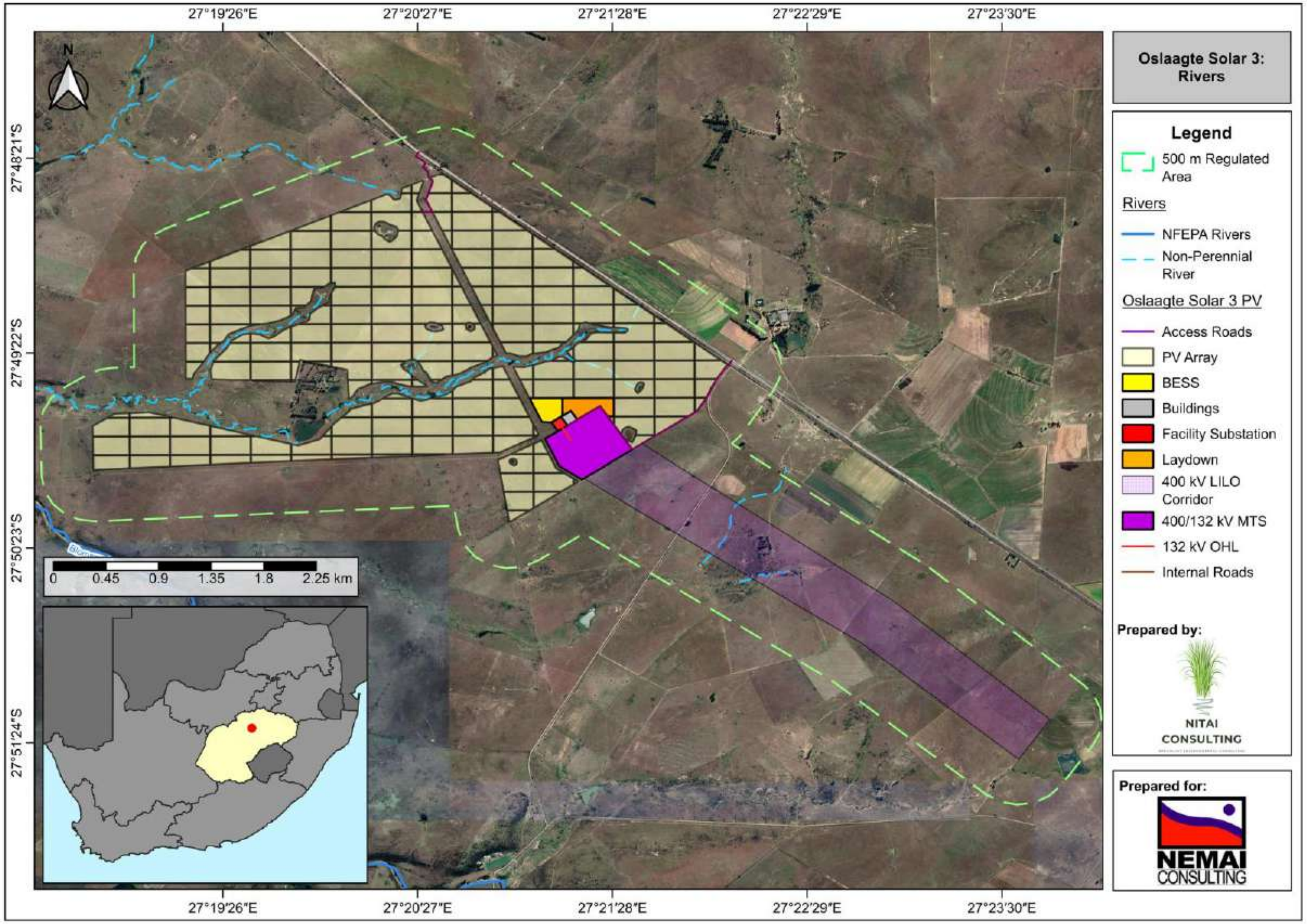

Figure 26: All identified rivers within the Alternative 2 Layout of the study area (Preferred Layout)

Table 7: Rivers flowing adjacent to the study area as well as within 500 m regulated area

River	Upstream	Downstream
Blomspruit		
Non-perennial Rivers		

6.3.3 Other watercourses

Several agricultural dams are situated within close proximity to the study area (Figure 27). Additionally, the grid connection crosses a few agricultural dams. Some of these dams are highlighted in Figure 28 below. Figure 29 below shows the general environment around areas of interest within the study area.

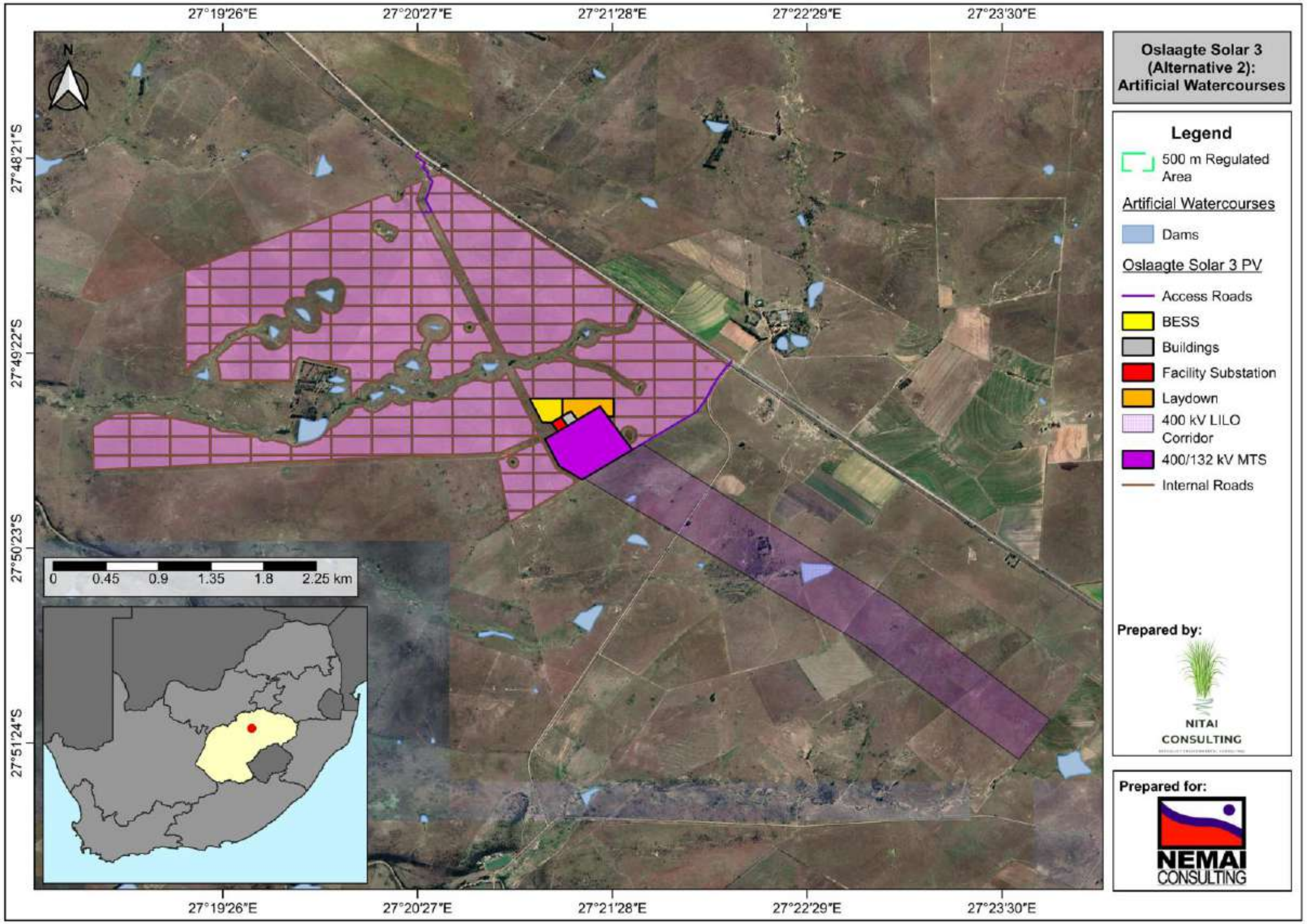

Figure 27: Map showing the location of the dams in and around the study area (Alternative 2: Preferred Layout)

Figure 28: Photographs showing some of the dams located within and around the study area

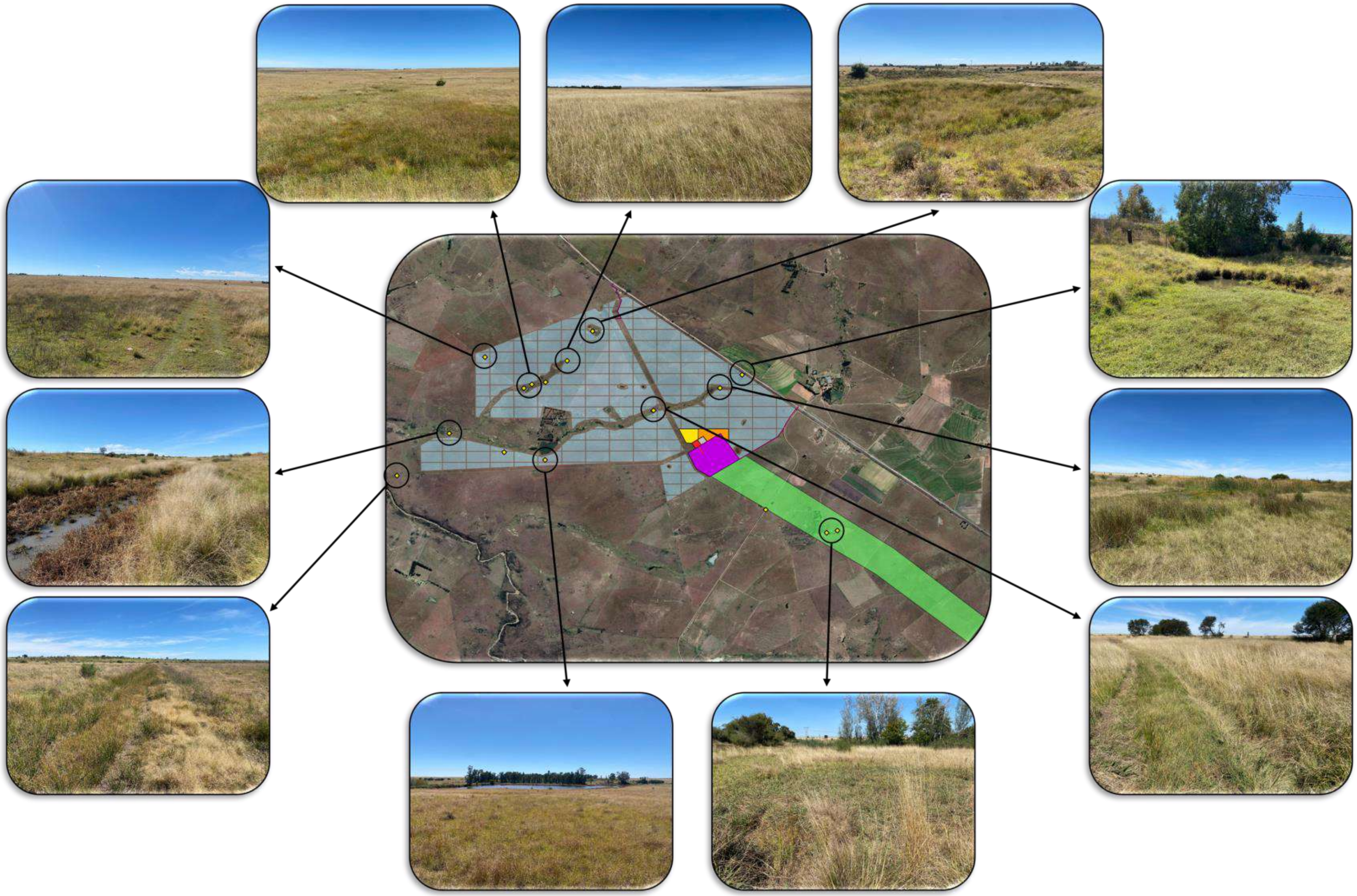

Figure 29: Photographs indicating the general environment around areas of interest within the study area

6.3.4 Vegetation characteristics

The study area is largely comprised of indigenous terrestrial vegetation, and no plants indicative of a moisture gradient were recorded in the targeted areas. In fact, the only vegetation species indicative of a moisture gradient was rather limited to within the agricultural dams as well as within the non-perennial rivers itself. These species include, *Cyperus fastigiatus*, *Phragmites australis Juncus effesus*, and *Paspalum dilatatum* (Figure 30).

Figure 30: Vegetation species indicating a moisture gradient found within agricultural dams and non-perennial watercourses. Photographs highlight the different species (Juncus effesus, Juncus punctorius, Phragmites australis, and Paspalum dilatatum

6.3.5 Soil characteristics

Soil samples collected along these rivers did exhibit mottling characteristics (Figure 31a and Figure 31b) whereas soil samples collected outside these "wet" areas did not exhibit any mottling (Figure 31c and Figure31d). Soils in and around the non-perennial rivers were identified as Sepane (orthic A-horizon over a Pedocutanic B-horizon with Unconsolidated material with signs of wetness). This soil falls within categories of soils indicating signs of wetness (van der Waals *et al*., 2019). Furthermore, soils in terrestrial habitats were identified as Bonheim (Melanic A-horizon over a Peducutanic B-horizon) soils. According to the DWAF guidelines (2005) this soil is not regarded as soils indicating signs of wetness (DWAF, 2005; van der Waals *et al*., 2019). In addition, all three soils do tend to show high clay content meaning that these soils have a high potential to hold water for long periods of time.

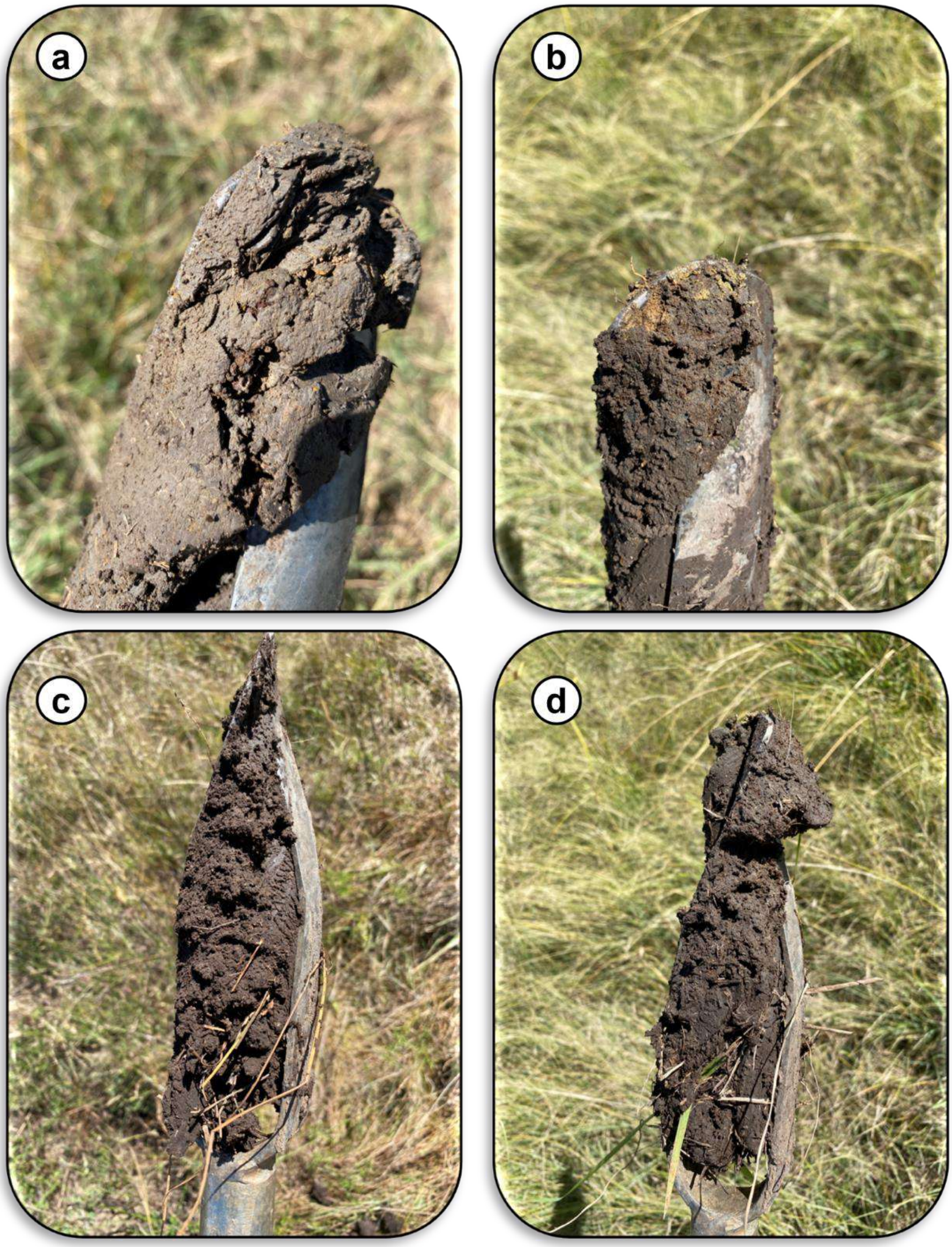

Figure 31: Photographs indicating the presence of mottling characteristics within wetlands and near non-perennial rivers (a and b – Sepane soils) and Photographs indicating no mottling characteristics in terrestrial habitats (c and d – Bonheim soils)

6.3.6 Present Ecological Status: Wetlands

The PES (Macfarlane *et al*., 2020) has been determined for the three HGM units (Dep, S and CVB) verified on site during site visits to the study area. Present Ecological State was calculated for the Dep, S and CVB as D (Largely Modified), C (Moderately Modified) and D (Largely Modified), respectively (Table 8). Water quality was not included in the PES calculations as water quality did not form part of the overall assessment.

Table 8: Present Ecological State scores calculated for the three HGM units

HGM Unit	Hydrology	Geomorphology	Vegetation	Overall
Depression	D (Largely Modified) Impact Score: 5.1	C (Moderately Modified) Impact Score: 2.8	D (Largely Modified) Impact Score: 5.0	D (Largely Modified) Impact Score: 4.5
Channelled Valley-Bottom	D (Largely Modified) Impact Score: 5.8	D (Largely Modified) Impact Score: 4.9	C (Moderately Modified) Impact Score: 3.0	D (Largely Modified) Impact Score: 4.1
Seep	C (Moderately Modified) Impact Score: 2.4	C (Moderately Modified) Impact Score: 3.6	C (Moderately Modified) Impact Score: 3.0	C (Moderately Modified) Impact Score: 3.4

6.3.7 Present Ecological Category (EC): Riparian Zone

The PES has not been determined for the rivers and was only determined for the non-perennial riparian zone using the Riparian Vegetation Response Assessment Index (VEGRAI) (Kleynhans *et al*., 2007). In addition, the only intact riparian zone found on site was the riparian zone of the large non-perennial river to the east of the proposed footprint, therefore the VEGRAI was only determined for that watercourse. The VEGRAI for the non-perennial riparian zone was determined as a Category D (Largely Modified) (Table 9). The assessment considered the severe influences of cattle grazing. The high density of livestock in areas along the riparian zone has contributed to the change and loss of natural habitat. Therefore, the riparian zone ecosystem function has been modified due to existing disturbances.

Table 9: Riparian Vegetation Response Assessment Index score calculated for the non-perennial riparian zone

Level 3 Assessment					
Metric Group	Calculated Rating	Weighted Rating	Confidence	Rank	% Weight
Marginal	63.3	28.1	3.3	2.0	80.0
Non-marginal	40.0	22.2	3.3	1.0	100.0
	2.0				180.0
Level 3 VEGRAI (%)				**50.4**	
VEGRAI EC				**D**	
Average Confidence				3.3	

6.3.8 Ecological Importance and Sensitivity (EIS)

Following the method of Rountree *et al*. (2013), the EIS was determined for the unnamed non-perennial river adjacent and to the east of the Oslaagte Solar 3 PV footprint (Table 10). The EIS for the non-perennial river was determined as 1.40 which translates to a Category C (**Moderate**). The score reflects the Ecological Importance and Sensitivity due to the riparian zone located within an ESA. In addition, the score also reflects the Hydrological/Functional Importance of the Riparian Zone in the role it plays in flood attenuation and sediment trapping for the downstream Blomspruit. The EIS determine for the CVB, D and S wetlands were C (**Moderate**), D (**Low/Marginal**), and C (**Moderate**) (Table 10). The EIS score for majority of the wetlands reflects the moderate importance due to the wetlands being in an ESA.

Table 10: Ecological Importance and Sensitivity of all watercourses verified on site

River	Ecological Importance and Sensitivity
Non-perennial River	**Moderate (1,40)** • Ecological Importance & Sensitivity: 2.0 • Hydrological/Functional Importance: 1.9 • Direct Human Benefits: 0.3
Channelled Valley-Bottom	**Moderate (1,85)** • Ecological Importance & Sensitivity: 2.3 • Hydrological/Functional Importance: 2.4 • Direct Human Benefits: 0.8
Depression	**Low/Marginal (0.94)** • Ecological Importance & Sensitivity: 1.4 • Hydrological/Functional Importance: 1.3 • Direct Human Benefits: 0.2
Seep	**Moderate (1,65)** • Ecological Importance & Sensitivity: 2.3 • Hydrological/Functional Importance: 2.1 • Direct Human Benefits: 0.5

6.3.9 Wetland Ecosystems Services

The Wetland Ecosystem Services (Kotze *et al*., 2020) was determined for the unnamed non-perennial river adjacent and east of the PV site (Table 11). Please refer to Table 133 for description of impact category ratings. The riparian zone is moderately important for food for livestock and cultivated foods since the area is being used for livestock grazing as well as game. In addition, the riparian zone is situated within an ESA that increases its importance in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. Moreover, the riparian zone is of low importance for harvestable resources and cultivated foods.

Additionally, Wetland Ecosystem Services were also determined for the wetlands on site (Table 12). The Dep is of Moderate importance for food for livestock while it has a low importance for sediment trapping and biodiversity maintenance. Furthermore, the S wetland is of low importance for stream regulation, flood attenuation, sediment trapping and harvestable sources. In addition, the S wetland is moderately-low important for food for livestock while moderately important for biodiversity maintenance. Finally, the CVB wetland is moderately important for flood attenuation, stream regulation, sediment trapping and biodiversity maintenance. The wetland further has moderately-low harvestable resources.

Table 11: Wetland Ecosystem Services calculated for the non-perennial river Riparian Zone

Ecosystem Services		Score	
		Non-perennial River Score	Importance
Regulating and Supporting Services	Flood attenuation	0.0	Very Low
	Stream flow regulation	0.0	Very Low
	Sediment trapping	0.3	Very Low
	Erosion control	0.4	Very Low
	Phosphate assimilation	0.1	Very Low
	Nitrate assimilation	0.0	Very Low
	Toxicant assimilation	0.0	Very Low
	Carbon storage	0.2	Very Low
	Biodiversity maintenance	0.2	Very Low
Provisioning services	Water for human use	0.0	Very Low
	Harvestable resources	0.5	Very Low
	Food for livestock	2.2	Moderate
	Cultivated foods	1.0	Low
Cultural Services	Tourism and Recreation	0.0	Very Low
	Education and Research	0.0	Very Low
	Cultural and Spiritual	0.0	Very Low

Table 12: Wetland Ecosystem Services calculated for the three HGM units

Ecosystem Services		Score					
		Depression Score	Importance	Seep Score	Importance	Channelled Valley-Bottom	Importance
Regulating and Supporting Services	Flood attenuation	0.0	Very Low	1.0	Low	2.2	Moderate
	Stream flow regulation	0.0	Very Low	1.2	Low	1.7	Moderate
	Sediment trapping	0.8	Low	0.9	Low	1.2	Low
	Erosion control	0.6	Very Low	0.7	Very Low	1.1	Low
	Phosphate assimilation	0.5	Very Low	0.3	Very Low	0.6	Very Low
	Nitrate assimilation	0.3	Very Low	0.4	Very Low	0.4	Very Low
	Toxicant assimilation	0.1	Very Low	0.1	Very Low	0.2	Very Low
	Carbon storage	0.0	Very Low	0.0	Very Low	0.0	Very Low
	Biodiversity maintenance	1.0	Low	2.2	Moderate	2.0	Moderate
Provisioning services	Water for human use	0.0	Very Low	0.0	Very Low	0.2	Very Low
	Harvestable resources	0.5	Very Low	0.8	Low	1.5	Moderately-Low
	Food for livestock	2.5	Moderately-High	1.6	Moderately-Low	0.9	Low
	Cultivated foods	0.0	Very Low	0.0	Very Low	0.0	Very Low
Cultural Services	Tourism and Recreation	0.0	Very Low	0.0	Very Low	0.0	Very Low
	Education and Research	0.0	Very Low	0.0	Very Low	0.0	Very Low
	Cultural and Spiritual	0.0	Very Low	0.0	Very Low	0.0	Very Low

Table 13: Importance Category ratings

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

6.4 Site Sensitivity Verification and Buffer Zones

6.4.1 Desktop sensitivity assessment (DFFE Screening Tool)

During the Desktop study for the Oslaagte Solar 3 PV Facility an Environmental Screening tool from Department of Forestry, Fisheries & the Environment (DFFE) was queried. The Screening Tool allows for the generation of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended, whereby a Screening Report is required to accompany any application for Environmental Authorisation.

The DFFE Screening Tool Report has identified that Aquatic Biodiversity Theme for the study area is **Low** sensitivity for the PV site (Figure 32). The very high sensitivity south of the PV site highlights the Blomspruit.

Figure 32: Aquatic Biodiversity Sensitivity Theme from the Department of Forestry, Fisheries & the Environment Screening Tool

6.4.2 Ground Truthing

Ground truthing the Alternative 1 layout with site visits during Fall (11 – 13 April 2023), the study area could be classified as **Medium** sensitivity due to the PV site encroaching into a few non-perennial rivers and one wetland (CVB). In addition, majority of the Alternative 1 layout was classified as **Low** sensitivity whereas the non-perennial rivers, wetlands and its associated buffer zones was classified as **High** and **Medium** sensitivity, respectively (Figure 33).

As a result, the PV site layout has been revised and the Alternative 2 layout (preferred layout) is outside of these non-perennial rivers, wetlands as well as their associated buffer zones (discussed below) (Figure 34). Therefore, the Alternative 2 layout has an overall **Low** sensitivity to freshwater features. Importantly, based on these sensitivity classifications, the **Preferred Alternative for the proposed development is Alternative 2**.

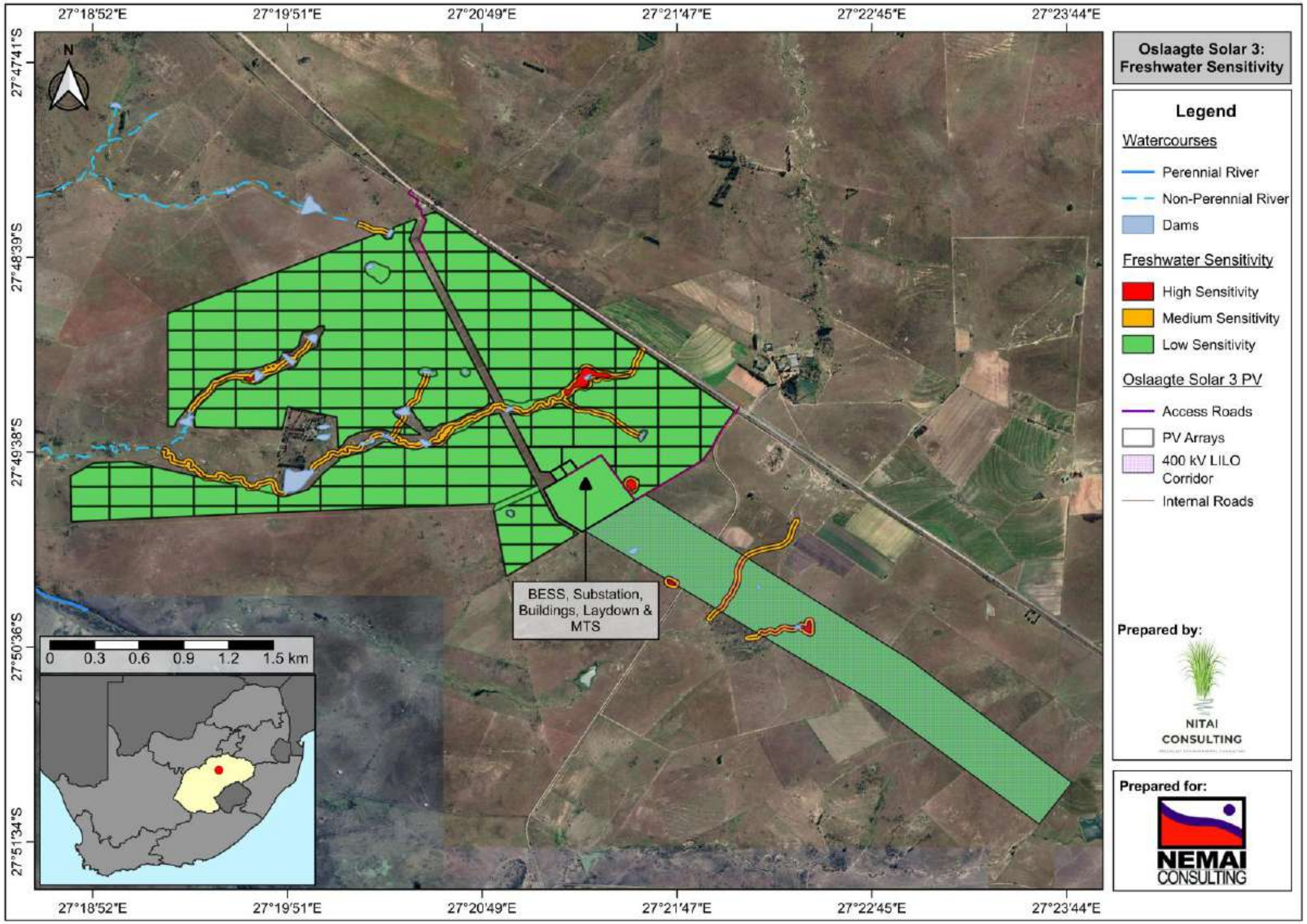

Figure 33: Freshwater Sensitivity surrounding the proposed Alternative 1 Layout of Oslaagte Solar 3 PV

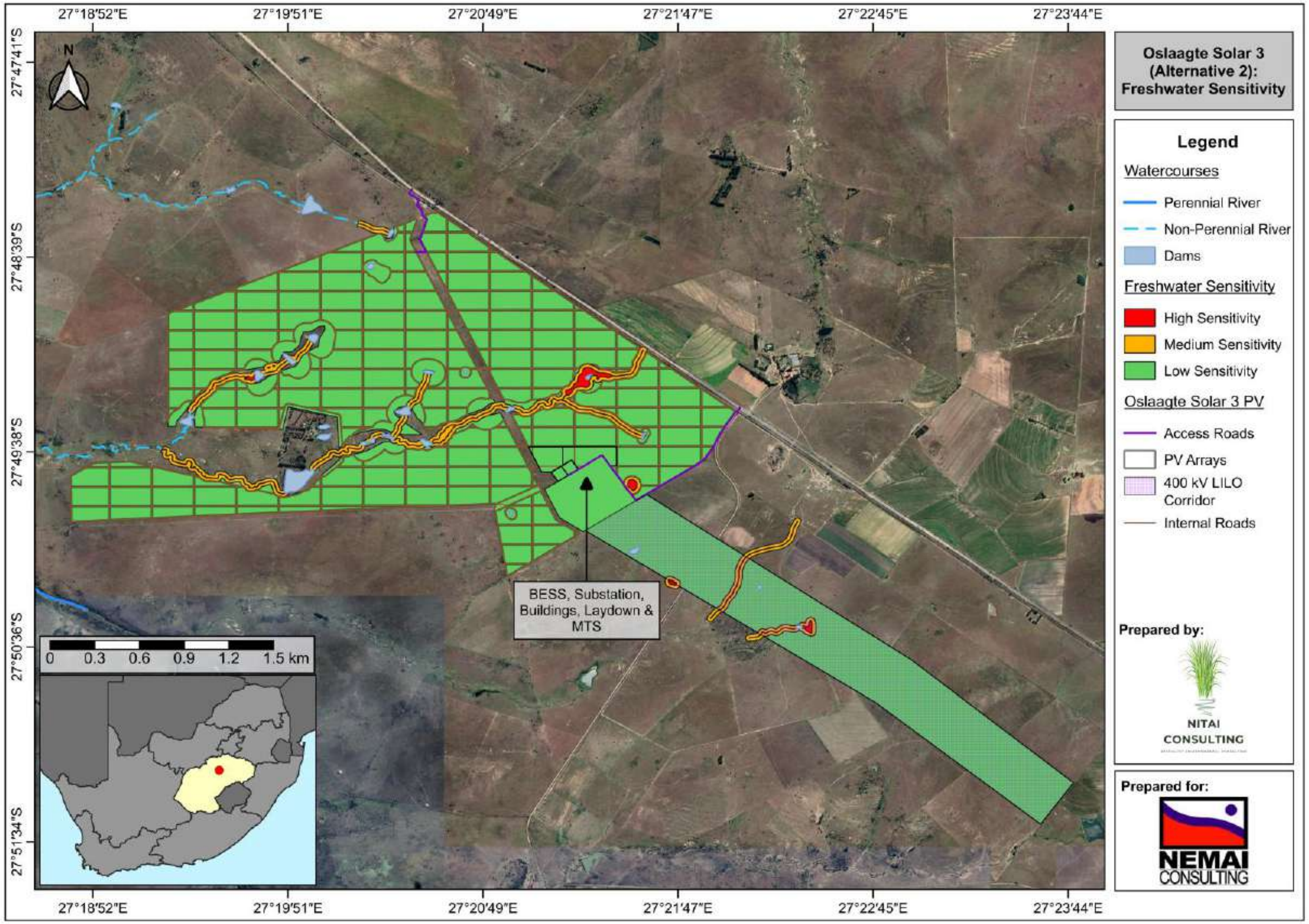

Figure 34: Freshwater Sensitivity surrounding the proposed Alternative 2 Layout of Oslaagte Solar 3 PV

6.4.3 Buffer Zones

Buffer zones for all non-perennial watercourses (rivers) were determined based on the current condition of these watercourses. The buffer zones determined for the rivers and drainage lines were based on the Macfarlane and Bredin (2017) guidelines. As such, the minimum buffer zones were determined as 32 m (Figure 36 and Figure 37).

Between the two alternatives for Oslaagte Solar 3 PV Facility, Alternative 1 is encroaching the 32 m buffer zones of the non-perennial rivers as well as the buffer zone of the CVB wetland. Also, the layout not only encroaches into the buffer zones, but the non-perennial rivers and CVB wetland as well (Figure 36). Alternative 2 has made provision for the non-perennial rivers, wetlands and its associated 32 m buffer zones and therefore avoids these freshwater features (Figure 37).

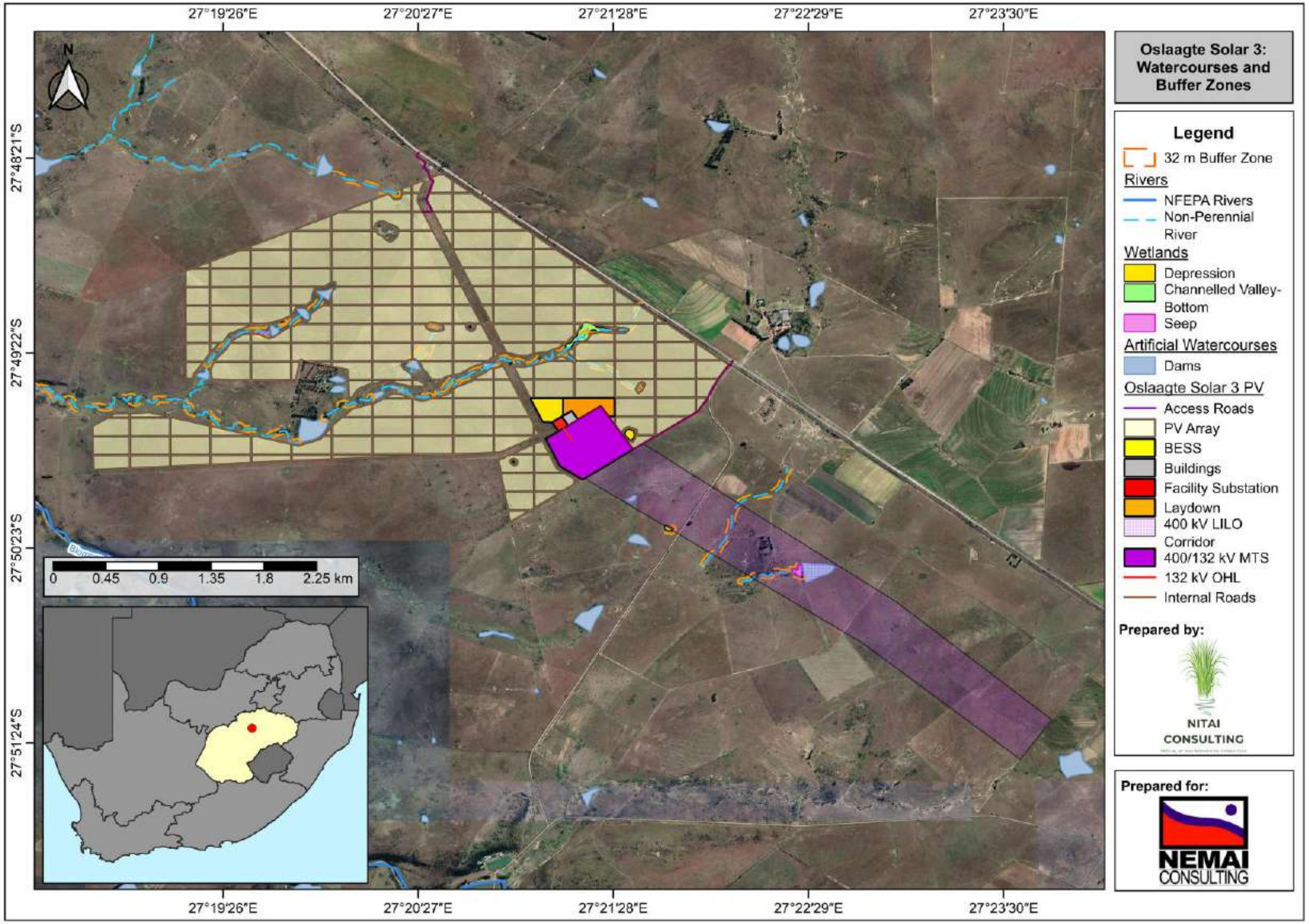

Figure 35: Buffer zones determined for all watercourses associated with the Alternative 1 Layout

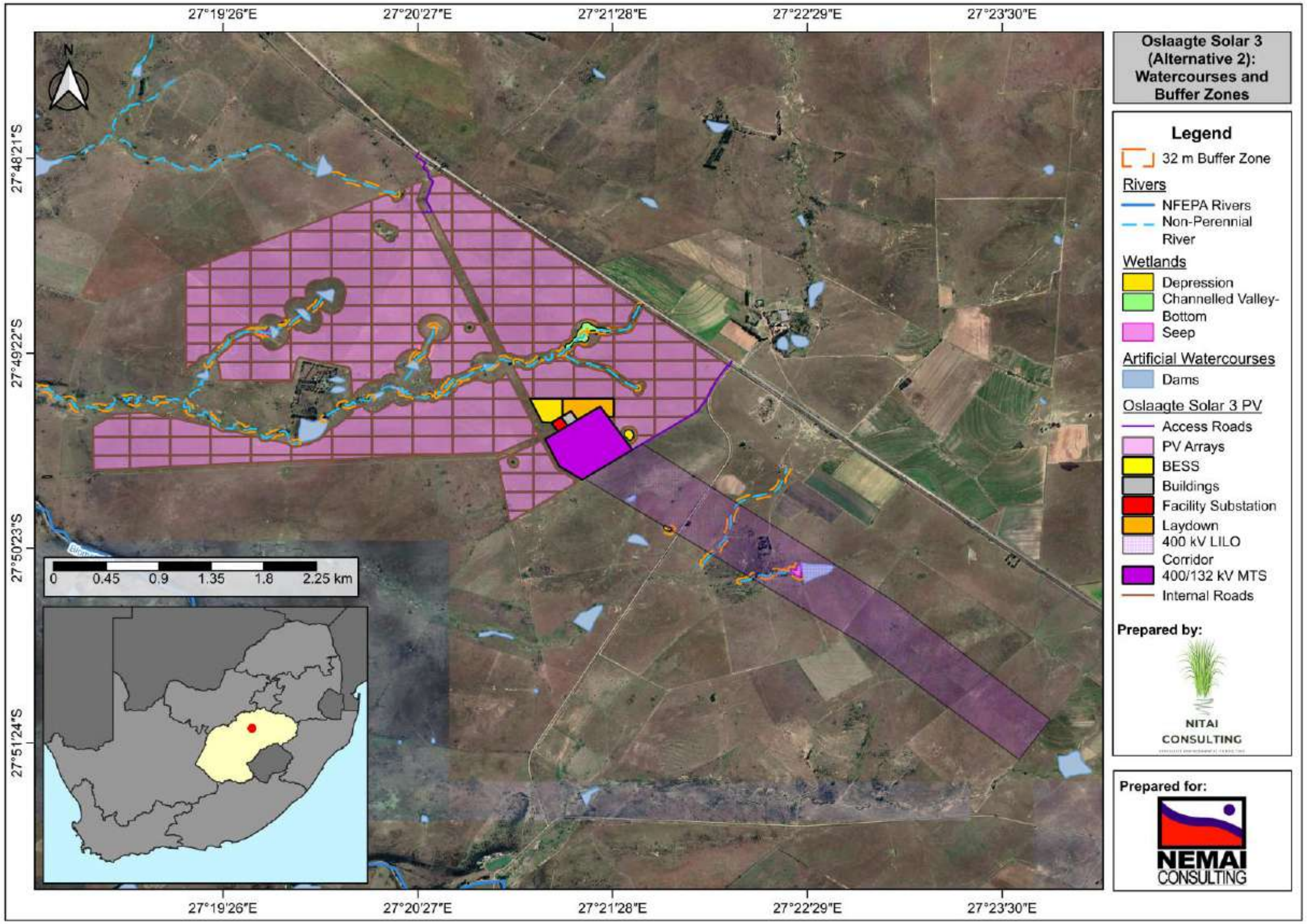

Figure 36: Buffer zones determined for all watercourses associated with the Alternative 2 Layout

7 Risk-based Impact Assessment

7.1 Impacts and Mitigation Framework

Since watercourses have been identified within the study area and that could be potentially significantly affected by the proposed development of the Oslaagte Solar 3 PV Facility, a Risk-based Impact Assessment were conducted.

All impacts are analysed in the section to follow with regard to their nature, probability, duration, extent, magnitude, likelihood and significance.

The following criteria for nature, probability, duration, extent, magnitude and significance were used:

Table 14: Probability descriptors, definitions and rating scores

Descriptors	Definitions	Score
Rare/Remote	May occur only in exceptional circumstances.	**1**
Unlikely	Could occur at some time.	**2**
Moderate	Should occur at some time.	**3**
Likely	Will probably occur in most circumstances.	**4**
Almost certain	Expected to occur in most circumstances.	**5**

Table 15: Duration descriptors, definitions and rating scores

Descriptors	Definitions	Score
Temporary	Impact is only for a short period (0-1 years).	**1**
Short term	Impact is for a period of 1 – 5 years.	**2**
Medium	Impact is for a period of 5 – 15 years.	**3**
Long term	Impact ceases after operational life cycle of the activity either because of natural processes or by human intervention.	**4**
Permanent	Impact will continue indefinitely.	**5**

Table 16: Extent descriptors, definitions and rating scores

Descriptors	Definitions	Score
Site only	Impact on the extent of the site only.	**1**
Local	Impact on the immediate surroundings.	**2**
Regional	Impact on the region but within the province.	**3**
National	Impact on an interprovincial scale.	**4**
International	Impact outside South Africa.	**5**

Table 17: Magnitude descriptors, definitions and rating scores

Descriptors	Definitions	Score
Negligible	Ecosystem pattern, process and functioning are not affected, although there is a small negative impact on quality of the ecosystem.	**1**
Minor	A minor impact on the environment and processes will occur.	**2**
Low	Natural and socio-economic functions and processes are not affected or minimally affected.	**4**
Moderate	Valued, important, sensitive or vulnerable systems or communities are negatively affected, but ecosystem pattern, process and functions can continue albeit in a slightly modified way.	**6**
High	Natural or socio-economic functions or processes could be substantially affected altered to the extent that they could temporarily cease.	**8**
Very High	Natural or socio-economic functions or processes could be substantially affected altered to the extent that they could permanently cease.	**10**

The significance of impacts will be calculated through the combination of the above-mentioned criteria using the following formula:

Significance = (Extent + Duration + Magnitude) x Probability

Descriptors	Definitions	Score
Low	Perceived impact will not have a noticeable negative impact on the environment. Unlikely to require management intervention.	**0 – 19**
Low to Moderate	Perceived impact is acceptable, and application of recommended mitigation measures recommended.	**20 – 39**
Moderate	Perceived impact is likely to have negative impact on the environment, and is likely to influence decision to approve the activity. Implementing recommended mitigation measures are required as a routine monitoring to ensure effectiveness of recommended mitigation measures.	**40 – 59**
Moderate to High	Perceived impact will have significant impact on the environment and will likely influence the decision-making process. Strict implementation of provided mitigation measures is required. Strict monitoring and high levels of compliance and enforcement in respect of the impact are required.	**60 – 79**
High	Perceived impact on the environment will be significantly high and likely to be irreversible and therefore will result in a highly likely fatal flaw for the project. Any alternatives for the proposed activity should be considered as the impact will influence the decision-making process.	**80 – 100**

7.1.1 NEMA (2014) Impact Assessment

Table 18 to Table 21 below indicate the impact scores for the potential watercourse impacts surrounding the construction and operational phases of Oslaagte Solar 3 PV Facility. Furthermore, the tables below indicates the impact scores for both alternative options.

Table 18: Impacts to hydrological function

Nature: Changes to flood regimes of the watercourse through, for example, flood suppression, unseasonal flooding or the loss of flood attenuation capacity.				
ACTIVITY: Sources include the compaction of soil, vegetation removal, redirecting surface water, changes to the surface water characteristics or through construction of roads.				
	Alternative 1		**Alternative 2**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Moderate (3)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Medium (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Regional (3)	Local (2)	Regional (3)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)

Significance	**36 (Low to Moderate)**	**16 (Low)**	**18 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Moderate (3)	Unlikely (2)	Minor (1)	Rare (1)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Regional (3)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Minor (2)	Minor (2)
Significance	**36 (Low to Moderate)**	**16 (Low)**	**12 (Low)**	**6 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Positive
Reversibility	Low	Moderate	Moderate	High
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- The entire footprint should avoid the delineated boundaries of watercourses as well as its buffer zones;
- The area is still likely prone to erosion around these areas should poor stormwater management be implemented. As such, a comprehensive stormwater management plan is required for the project;
- Effective stormwater and erosion management plans should be in place during both the construction and operational phases. This should also be monitored as part of the EMPr;
- Appropriate stormwater structures should be in place to control run-off and minimize erosion;
- All stormwater runoff from the panels should enter the systems through diffuse channels fitted with flow attention/energy dissipation structures;
- Stormwater runoff and runoff from the cleaning of panels would be increased and therefore increases the erosion potential in the surrounding areas;
- Panels should be fitted with stormwater gutters to control the runoff in an ecologically sensitive manner to prevent erosion;
- With regards to the powerline and road construction, the recommended buffer zones must be strictly adhered to during the construction phase with the exception when activities and structures required to traverse the watercourse. Pylons should be constructed outside the delineated watercourses;
- All areas where vegetation was cleared should be re-vegetated in order to limit the erosion potential;
- Sedimentation and erosion protection measures (such as sand bags, silt traps and fences) should be installed prior to construction;
- Roads crossing low-lying areas/potentially wet areas require permeable paving in order to lower the risk of habitat damage and possible erosion;
- Inspect all pylons, road network and influences areas 1 month following the conclusion of the construction activities as well as after the first rainfall event. Routing monitoring should take place for the duration of the project. Should erosion develop, then eroded areas should be immediately addresses through appropriate measures;
- All roads traversing delineated low-lying areas should be kept to a minimum to ensure hydrological connectivity;

• Construction of watercourse crossings (if needed) must take place from existing disturbed areas; • Prevent uncontrolled access of vehicles through the watercourse which can impact the hydrology and alluvial soil structure; and, • All no-go areas should be clearly demarcated prior to commencement of construction activities.
Cumulative impacts: Low to moderate and could possibly include edge effects to remaining natural vegetation as the footprint activities may result in vegetation clearing. This could lead to increase in sedimentation as well as introduction of alien and invasive species.
Residual Risks: Expected to be low given that all structures are situated outside the delineated sensitive areas and that stormwater is managed effectively.

Table 19: Impacts to sediment

Nature: Change in sedimentation patterns, changes in sediment in watercourses and sub-catchment due to the removal of soil.				
ACTIVITY: Construction activities and maintenance of solar plant would result in earthworks as well as causing soil and vegetation disturbances. Loss of topsoil, sedimentation in rivers that would cause an increase in turbidity. Other potential impacts include; earthworks, clearing of vegetation would result in bare soil that could be washed into the river, erosion, disturbance of slopes through road works next to watercourses.				
	Alternative 1		**Alternative 2**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Likely (4)	Moderate (3)	Unlikely (2)	Unlikely (2)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**44 (Moderate)**	**24 (Low to Moderate)**	**16 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Moderate (3)	Unlikely (2)	Unlikely (2)	Rare (1)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**33 (Low to Moderate)**	**16 (Low)**	**16 (Low)**	**6 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Positive
Reversibility	Low	Moderate	Moderate	High
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation: • Install sediment traps; • Remove topsoil and keep topsoil stockpiles free of any weeds to keep topsoil viable for rehabilitation; • All stockpiles should be safeguarded against rain wash; • Ensure that stockpiles are covered during windy conditions • Remove only vegetation in areas essential for construction; • Excess water flow should be managed efficiently to avoid any impacts on rivers; • Protect all areas susceptible to erosion through installing erosion berms that can prevent gully formation and siltation of watercourses; • All soil and topsoil removed should not be stockpiled within any watercourse and should take place outside delineated watercourses. All stockpiles should be protected from erosion and stored on flat surfaces; • Avoid using chemicals for cleaning of solar panels to lower the risk of polluting soils, and in times of flow will pollute surface runoff from contaminated soils; • Monitor sediment pollution; • Construction activities should take place in low flow period (as much as possible). This will lower the risk of erosion, sedimentation and polluting downstream water resources; • All stationary vehicles should be equipped with drip trays; • Avoid parking of vehicles close to any watercourses; • No dumping of waste or any other materials near delineated and buffered areas; and • All areas affected by construction activities should be rehabilitated upon completion of the construction phase. Areas where vegetation was removed, should be reseeded with indigenous grasses as per recommendations from Terrestrial Report.
Cumulative impacts: Low to moderate and could possibly include edge effects to remaining natural vegetation as the footprint activities may result in vegetation clearing. This could lead to increase in sedimentation as well as introduction of alien and invasive species.
Residual Risks: Expected to be low given that all structures are situated outside the delineated sensitive areas and that stormwater is managed effectively.

Table 20: Introduction and spread of alien and invasive species

Nature: Introduction and spread of alien and invasive species.				
ACTIVITY: The removal and movement of soil and vegetation could result in opportunistic invasions after such disturbances as well as the introduction of seed in building materials and on vehicles. In addition, invasions of alien vegetation species can have an impact on hydrology through reducing the water quantity entering a watercourse and it can outcompete natural vegetation and therefore decrease natural biodiversity.				
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Unlikely (2)	Rare (1)	Unlikely (2)	Rare (2)
Duration	Short term (2)	Short term (2)	Short term (3)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Low (4)	Low (4)	Low (4)	Low (4)
Significance	**16 (Low)**	**8 (Low)**	**16 (Low)**	**8 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative

Operational Phase				
Probability	Rare (1)	Rare (1)	Rare (1)	Rare (1)
Duration	Short term (2)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Site-only (1)	Local (2)	Site-only (1)
Magnitude	Low (4)	Minor (2)	Low (4)	Minor (2)
Significance	**8 (Low)**	**5 (Low)**	**8 (Low)**	**5 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- Monitor for early detection, to find species when they first appear on site. This should be as per the frequency specified in the management plan and should be conducted by an experienced person. Early detection should provide a list of species and locations where they have been detected. Summer (vegetation maximum growth period) is usually the most appropriate time, but monitoring can be adaptable, depending on local conditions – this must be specified in the management plan;
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action; and,
- Monitor for the effect of management actions on non-target species and habitats.

Cumulative impacts: Limited alien and Invasive plant species were observed on site, cumulative impacts can be Low to Moderate. As such, continuous monitoring should be implemented during the different phases of development and rehabilitation as well as a period after rehabilitation is completed.

Residual Risks: Expected to be limited given that an Alien and Invasive Plant Management Plant forms part of the operational processes of the PV facility.

Table 21: Activities causing pollution

Nature: Surface water, groundwater and sediment pollution.

ACTIVITY: Accidental spillages of wet concrete, chemical hazardous substances, oil and diesel spillages may result in surface water, groundwater and sediment pollution.

	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Likely (4)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Medium term (3)	Medium term (3)	Medium term (3)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Moderate (6)	Low (4)	Low (4)
Significance	**44 (Moderate)**	**22 (Low to Moderate)**	**18 (Low)**	**16 (Low)**

Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Likely (4)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Short term (2)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**40 (Moderate)**	**16 (Low)**	**16 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Moderate	Moderate
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- The development footprint should remain outside the delineated rivers, riparian and buffer zones;
- Concrete mixing should be done outside the buffer zones and should be done on an impermeable surface;
- All stationary vehicles should be equipped with drip trays;
- No servicing of vehicles or construction equipment should take place near delineated or buffer areas and should be done on an impermeable surface area;
- No washing of construction equipment is allowed in any watercourse;
- All hazardous substances should be safely stored on an impermeable surface within the construction site camp;
- No ablution facilities should be located within 50 m of watercourses and should be outside the 1:100 year flood line;
- Construction camp, storage of construction equipment and materials, and chemicals should be located outside the 1: 100 year flood line;
- No dumping of waste near or within delineated watercourses and should be adequately stored and removed from site by waste facility;
- All waste and refuse should be removed from site and disposed in adequate storage containers before being disposed at a registered landfill site;
- All accidental spillages should be rehabilitated immediately and contaminated soil should be adequately disposed off;
- No vehicle or construction machinery are allowed within the watercourse; and,
- Only use clean water in the washing of the solar panels.

Cumulative impacts: Impacted water quality will not only affect local water quality but regional water quality as well. This is considered as a significant cumulative impact.

Residual Risks: Since pollution can be controlled and to a large extent be prevented, the impact of spillages will have a significant residual impact on local watercourses and as such should be considered a significant residual risk.

8 CONCLUSION AND RECOMMENDATIONS

The proposed Oslaagte Solar 3 PV facility is situated in the Moqhaka Local Municipality, near Kroonstad, Free State Province, South Africa. According to the spatial data, there are several non-perennial rivers flowing either through the PV site or adjacent the boundary of the PV site. Furthermore, the study area encroaches into majority of these non-perennial rivers. In addition, several agricultural dams are located within and near the study area. One wetland (Channelled Valley-Bottom) has been identified to be within the Alternative 1 layout. Moreover, the Alternative 1 layout encroaches into small sections of this wetland. Additionally, several other wetlands (Seeps and Depressions) were identified to be in close proximity (within 100 m) to the PV site as well as the grid connection. These findings were verified based on wetland soil (red-yellow mottling) characteristics and vegetation species.

Due to these freshwater sensitivities and the 32 m buffer zone around these features, the proponent has revised the layout for Oslaagte Solar 3 PV facility. Based on this revised layout, Alternative 2 has accommodated the presence of freshwater features and it subsequent 32 m buffer zone. Therefore, it is of the opinion that the proposed works will have a low impact on all associated freshwater features given that above-mentioned mitigation measures are followed and best practise pollution control. Importantly, based on the current condition of the surrounding habitat of the proposed Oslaagte Solar 3 PV facility and the mitigations provided above, the surrounding areas can be successfully rehabilitated back to its current condition.

The DFFE Screening Tool has identified the area as a **Low** sensitivity from an Aquatic Biodiversity Theme perspective. This was confirmed (if Alternative 2 layout is used) by the specialist. **As such, the specialist recommends that the development of the PV facility with the use of Alternative 2 as layout may proceed with low impacts on the freshwater features.**

9 REFERENCES

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Appendix 1: Specialist details, qualifications and expertise

1 Personal Particulars

Profession:	Aquatic and Wetland Specialist
Date of Birth:	20 December 1993
Name of Firm:	Nitai Consulting
Name of Staff:	Divan van Rooyen
Nationality:	RSA
Membership of Professional Societies	SACNASP (Can. Sci. Nat. 151272), IAIAsa (7063)

2 Education:

- Ph.D. Environmental Science (Aquatic Ecosystem Health), NWU, South Africa, 2022
- M. Sc. Environmental Science (Ecological Remediation and Sustainable Development), NWU, South Africa, 2017
- B.Sc. Hons Environmental Science (Ecological Remediation and Sustainable Development), NWU, South Africa, 2015
- B.Sc. Tourism, Geography and Zoology, NWU, South Africa, 2014

Publications:

- van Rooyen, D., Gerber, R., Smit, N.J. & Wepener, V. 2022. An assessment of water and sediment quality of aquatic ecosystems within South Africa's largest floodplain. *African Journal of Aquatic Sciences, 474 – 488*.
- Schaeffner, B.C. van Rooyen, D., Gerber, R., Scholz, T. & Smit, N.J. 2020. *Wenyonia gracilis* sp. n. (Cestoda: Caryphyllidea) from *Synodontis zambezensis* (Siluriformes: Mochokidae): the first native caryophyllidean tapeworm from southern Africa. Folia Parasitologica, 67: 035.
- van Rooyen, D., Erasmus, J.H., Gerber, R., Nachev, M., Sures, B., Wepener, V. & Smit, N.J. 2023. Bioaccumulation and trophic transfer of total mercury through the aquatic food webs of an African sub-tropical wetland system. *Science of the Total Environment,* https://doi.org/10.1016/j.scitotenv.2023.164210

3 EMPLOYMENT RECORD:

- 2022 – Present Aquatic and Wetland Specialist, Nitai Consulting

  Conduct Wetland Delineations and Impact Assessments;

  Conduct Aquatic Ecological Assessments;

  SASS5 Assessments;

  Aquatic and Wetland Monitoring Programs; and,

  GIS Mapping

- March 2022 – November 2022 Environmental Consultant and Aquatic Specialist, Enviroworks

  Environmental Control Officer;

  Water Use Licensing;

  Environmental Auditing;

  Report Writing.

- January 2022 – February 2022 Environmental Intern, ABS-Africa (PTY) Ltd

  Environmental Auditing;

  Groundwater quality monitoring;

  Data interpretation and evaluation; and

  Report writing

- 2017 – 2021 Research and Field Assistant, North West University (NWU-Water Research Group)

  Assisting UNISA and NWU Zoology students with module practical's;

  Supervisor to 3rd year Zoology students on a Water Quality Project;

  Fish specialist for a fish translocation study at Lethabo Power Station (ESKOM);

  Junior Aquatic Specialist for aquatic biomonitoring at Khumba Iron Ore Mining (Joint Amanzi Aquatics and NWU-WRG);

  Junior Aquatic Specialist for biomonitoring at a WWTW (Ecosphere & NWU-WRG); and

  Assisted students with aquatic biomonitoring assessments (FRAI, MIRAI, FROC, Fish identification and SASS under the supervision of Dr. Wynand Malherbe).

4 SELECTED CONSULTANCIES

4.1 Fish Translocation study (NWU – WRG), Lethabo Power Station (ESKOM)

2016 - 2021 – Fish Specialist, Fish Translocation at ESKOM, South Africa, Sampling of fish species in ESKOM Cooling Towers and translocating them to the NWU.

4.2 Aquatic Biomonitoring at Khumba Iron Ore Mining (Joint with Amanzi Aquatics and NWU – WRG)

2019, Junior Aquatic Specialist, Aquatic Biomonitoring at Khumba Iron Ore Mining (Joint Amanzi Aquatics and NWU – WRG), South Africa, Undertake aquatic biomonitoring in nearby rivers surrounding Khumba Iron Ore to assess fish community structures.

4.3 Aquatic Biomonitoring at a WWTW near Greylingstad (Joint with Ecosphere and NWU – WRG)

2022, Junior Aquatic Specialist, Aquatic biomonitoring (SASS5, water and sediment quality and fish community structure), South Africa, Undertake aquatic biomonitoring in nearby rivers surrounding Khumba Iron Ore to assess fish community structures.

4.4 Kroonstad Solar PV Facilities

2022, Aquatic and Wetland Specialist, Development of three Solar PV facilities near Kroonstad, Free State Province, South Africa, Assess and map all wetlands associated with the three solar PV facilities as well as perform aquatic biomonitoring of the Vals River.

4.5 Kroonstad South Solar PV Facilities

2022, Aquatic and Wetland Specialist, Development of five Solar PV facilities near Kroonstad, Free State Province, South Africa, Assess and map all wetlands associated with the five solar PV facilities as well as perform aquatic biomonitoring of the Blomspruit.

4.6 Proposed Nketoana Regional Bulk Water Scheme Project

2022, Aquatic and Wetland Specialist, Nketoana Local Municipality is experiencing severe water shortages in its towns Reitz/Petsana/ Petrus Steyn/ Mamafubedu/ Arlington/ Leratswana and Lindley. Solutions to the water shortages are the proposed Nketoana Regional Bulk Water Scheme Pipeline, South Africa, Perform aquatic biomonitoring and assessing all wetlands within a 500m radius of the bulk water scheme project.

4.7 Rustenburg Solar PV Facilities

2022, Aquatic and Wetland Specialist, Development of three Solar PV facilities near Rustenburg, North West Province, South Africa, Assess and map all wetlands associated with the three solar PV facilities as well as perform aquatic biomonitoring of the Elands River.

4.8 Grootvlei Solar PV Facility

2022, Aquatic and Wetland Specialist, Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Assess and map all wetlands associated with the one solar PV facility.

4.9 400kV Transmission and 132kV distribution power lines for the Apollo-Lepini-Mesong Project

2023, Aquatic and Wetland Specialist, Proposed development of a 400kV transmission and 132kV power lines for the Apollo-Lepini-Mesong Project, Gauteng Province, South Africa, Undertake and Aquatic and Wetland Impact Assessment along the proposed routes for the 400kV and 132kV power lines.

4.10 CCUS 3D Seismic Survey & Drilling

2023, Wetland Specialist. Proposed 3D Seismic Survey within the Leandra area, Mpumalanga Province, South Africa, Assess and map all wetlands within the footprint of the survey area.

4.11 CCUS 3D Seismic Survey & Drilling

2023, Wetland Specialist, Proposed CCUS Injection within the Leandra area, Mpumalanga Province, South Africa, Assess and map all wetlands within the footprint of the survey area.

4.12 Paulputs 400 kV Strengthening (Transmission Line Loop in Loop Out) Project

2022, Aquatic and Wetland Specialist, Proposed Paulputs 400kv Strengthening Project (Transmission Line Loop In Loop Out From Aries – Kokerboom Transmission Line), South Africa, Assess and map all wetlands associated with the power line as well as aquatic biomonitoring.

4.13 Seelo Solar PV Facilities

2022, Aquatic and Wetland Specialist, Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Assess and map all wetlands associated with the three solar PV facilities as well as perform aquatic biomonitoring of the Mooirivierloop.

4.14 Arnot-Kendal power line re-stringing

2023, Wetland Specialist, Proposed Eskom Arnot-Kendal power line re-stringing, Mpumalanga Province, South Africa, Conduct a Risk Matrix for an General Authorisation.

5 LANGUAGES:

English - excellent speaking, reading, and writing

Afrikaans – excellent speaking, reading and writing

Appendix 2: Reviewers details, qualifications and expertise (Elzet Human)

1. Personal Particulars

Profession:	Biodiversity Specialist
Date of Birth:	13 March 1987
Name of Firm:	Nitai Consulting
Name of Staff:	Elzet Human
Nationality:	RSA
Membership of Professional Societies	SACNASP (Pr. Sci. Nat. 147031)

2. Education:

- M-Tech Nature Conservation, (Plant DNA Barcoding and phylogenetics), TUT, South Africa, 2021
- B-Tech Nature Conservation, (Resource Management, Vegetation ecology and rehabilitation) TUT, South Africa, 2011
- N. Dip Nature Conservation, TUT, South Africa, 2008

3. Employment Record:

- 2022 – Present Biodiversity Specialist, Nitai Consulting

  Conduct Biodiversity Impact Assessments.

  Conduct Plant Ecological Assessments.

  Conduct Animal Ecological Assessments

  Biodiversity monitoring programs; and,

  GIS Mapping

- 2013 – 2022 Lecturer: Nature Management, Centurion academy

  Lectured various subjects for undergraduate students in Nature Management:

Botany and Vegetation Ecology, Zoology, Animal Health, Conservation Development, Ecology, Game Ranch Management, Biostatistics, Research Methodology, Genetics, Soil Science

- 2009 – 2013 HOD Rangers Department, Zebula Gold Estate and Spa

  Ecological Monitoring, Reserve Maintenance, Animal Husbandry, Neonatal care of Endangered carnivore species, Zoological display, and permit compliance

- 2008 – Conservation Student, Ann van Dyk Cheetah Research Centre

  Neonatal Care of Carnivore species,

  Veterinary assistance work – vaccine, diets, Endo scoping, pregnancy tests, health monitoring, quarantine care of species, emergency c-sections, bleeding procedures on vultures

  Enclosure Maintenance

  Tracking wild cheetahs

  Rewilding cheetahs

  Anatolian Shepard project assistance

4. Selected Consultancies

4.1 Ecological assessment for Victorius Game farm, Visgat, Ellisras, Limpopo

2018, Ecologist, Ecological condition assessment and game carrying capacity for game farm. Habitat evaluation and rehibition program for problem areas

4.2 Elephant impact study on Mabula Game Reserve, Bela-Bela, Limpopo,

2019, Ecologist, Ecological impact study on Private Nature reserve to see extent of elephant utilisation and impact. Woody species analysis – structure classification and net primary production. Elephant movement patterns and carrying capacity. Identification of vulnerable habitats and management program.

4.3 Faan Meintjies Municipal Nature Reserve, Matlosana, North West

2018-2022, Ecologist, Habitat assessments, game carrying capacities, ecological condition assessments, game counts and game recommendations, ecological rehabilitation programs, white rhino monitoring, anti-poaching programs, Environmental Education programs.

4.4 Kroonstad Solar PV Facilities

2022, Biodiversity Specialist. Development of three Solar PV facilities near Kroonstad, Free State Province, South Africa, Assess and map all wetlands associated with the three solar PV facilities as well as perform aquatic biomonitoring of the Vals River.

4.5 Kroonstad South Solar PV Facilities

2022, Biodiversity Specialist. Development of five Solar PV facilities near Kroonstad, Free State Province, South Africa, Assess and map all wetlands associated with the five solar PV facilities as well as perform aquatic biomonitoring of the Blomspruit.

4.6 Proposed Nketoana Regional Bulk Water Scheme Project

2023, Biodiversity Specialist. Nketoana Local Municipality is experiencing severe water shortages in its towns Reitz/Petsana/ Petrus Steyn/ Mamafubedu/ Arlington/ Leratswana and Lindley. Solutions to the water shortages are the proposed Nketoana Regional Bulk Water Scheme Pipeline, South Africa, Assess and map all biodiversity, plant and animal features associated within the footprint of the bulk water scheme project.

4.7 Rustenburg Solar PV Facilities

2023, Biodiversity Specialist. Development of three Solar PV facilities near Rustenburg, North West Province, South Africa, Assess and map all biodiversity, plant and animal features associated with the three solar PV facilities.

4.8 Grootvlei Solar PV Facility

2023, Biodiversity Specialist. Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Assess and map all biodiversity, plant and animal features associated with the one solar PV facility.

4.9 400kV Transmission and 132kV distribution power lines for the Apollo-Lepini-Mesong Project

2023, Biodiversity Specialist. Proposed development of a 400kV transmission and 132kV power lines for the Apollo-Lepini-Mesong Project, Gauteng Province, South Africa, undertake assessments and map all biodiversity, plant, and animal features along the proposed routes for the 400kV and 132kV power lines.

4.10 CCUS 3D Seismic Survey & Drilling

2023, Biodiversity Specialist. Proposed 3D Seismic Survey within the Leandra area, Mpumalanga Province, South Africa Assess and map all biodiversity, plant and animal features within the footprint of the survey area.

4.11 Paulputs 400 kV Strengthening (Transmission Line Loop in Loop Out) Project

2023, Biodiversity Specialist. Proposed Paulputs 400kv Strengthening Project (Transmission Line Loop In Loop Out From Aries – Kokerboom Transmission Line), South Africa, Assess and map all biodiversity, plant and animal features within the power line footprint as well as perform biodiversity monitoring.

4.12 Seelo Solar PV Facilities

2023, Biodiversity Specialist. Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Assess and map all biodiversity, plant, and animal features within the three solar PV facilities as well as perform biodiversity monitoring.

5 LANGUAGES:

English - excellent speaking, reading, and writing

Afrikaans – excellent speaking, reading and writing

APPENDIX 2: REVIEWERS DETAILS, QUALIFICATIONS AND EXPERTISE (ANTOINETTE BOOTSMA)

1. PROFESSIONAL AFFILIATIONS

- Professional Natural Scientist (SACNASP) # 400222-09 Botany and Ecology
- South African Wetland Society # NA6RY2FP
- Grassland Society of South Africa

2. QUALIFICATIONS

- **M.SC** (Environmental Science), University of South Africa, 2017. *Awarded with distinction*. Project Title: Natural mechanisms of erosion prevention and stabilization in a Marakele peatland; implications for conservation management.

3. PUBLICATIONS

- A.A. Boostma, S. Elshehawi, A.P. Grootjans, P.L Grundling, S. Khosa, M. Butler, L. Brown, P. Schot. 2019. Anthropogenic disturbances of natural ecohydrological processes in the Matlabas mountain mire, South Africa. South African Journal of Science Volume 115| Number 5/6, May/June 2019, P1 to 8.

4. EMPLOYMENT HISTORY

- Director at Limosella Consulting (Pty) Ltd - 2009 – ongoing
- Senior Wetland Specialist at Strategic Environmental Focus – 2007 to 2009
- Technical Assistant at the Conservation Ecology Research Unit, University of Pretoria, Richards Bay field station, 2005 to 2007.

5. Summary of Key skills

- Management of projects in terms of specialist input, including quotations, planning, technical review, submission of reports and invoicing;
- Fine scale wetland delineations and functional assessments;
- Strategic wetland assessments and open space management and planning;
- General Rehabilitation, Monitoring and Mitigation assessments;
- Wetland offset strategies;
- Hydropedological investigations; and
- Implementation of wetland assessment tools including the DWS (2016) Risk Assessment, Present Ecological Status (PES) Macfarlane et al, (2020), Ecological Importance and Sensitivity (EIS) (DWAF, 1999), Recommended Ecological Category (REC) Rountree et al (2013), Riparian Vegetation Response Assessment Index (VEGRAI) (Kleynhans et al, 2007) and QHI (Quick Habitat Integrity).

6. Short summary of Experience

- Numerous external peer reviews as part of mentorship programs for companies including Galago Environmental Consultants, Lidwala Consulting Engineers, Bokamoso Environmental Consultants, Gibb, 2009 – ongoing;
- Wetland specialist input into the Kloof Mine wetland sediment interim management, remediation and rehabilitation plan, 2022;
- Wetland Assessments for the upgrade of 7 culverts and bridges in Vereeniging, Gauteng, July 2021
- Input into the Environmental Management Plan for repair to 90 bridges in the City of Johannesburg, 2020;
- Wetland specialist input into the City of Tshwane Open Space Framework, 2019;
- Wetland specialist input into the North West Environmental Outlook, 2018;
- Wetland specialist input into the Gauteng Environmental Outlook, 2017;
- Wetland specialist input into the Open Space Management Framework for Kyalami and Ruimsig, City of Johannesburg, 2016;
- Kangra Maquasa East and Maquasa West and Nooitgesien Mine, Mpumalanga Province: Rehabilitation and Monitoring Assessment. June 2018; and
- Mbuyelo Coal Welstand Reserve Amendment: Wetland assessment. June 2017.

Appendix 3: Signed Declaration Independence

I, **Divan van Rooyen**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

28/05/2023

Dr Divan van Rooyen (Can. Sci. Nat. 151272) **Date**

Aquatic and Wetland Specialist

I, **Elzet Human**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

28/05/2023

Elzet Human (Pri. Sci. Nat. 147031) **Date**

Terrestrial Ecologist

I, **Antoinette Bootsma**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

AB Bootsma

_____________________________________ **29/05/2023**

Antoinette Bootsma (Pri. Sci. Nat. 400222-09) **Date**

Wetland Specialist

APPENDIX E2: Terrestrial Biodiversity Compliance Statement

Terrestrial Biodiversity Compliance Statement for the proposed Oslaagte Solar 3 PV Facility, Free State Province, South Africa

TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

09 May 2023

Submitted to : Nemai Consulting

NEMAI CONSULTING

Prepared by:

Helena Elizabeth Human (Pr. Sci. Nat 147031)

Nitai Consulting (PTY) Ltd.

147 Bram Fischer Drive

Ferndale

2194

NITAI CONSULTING

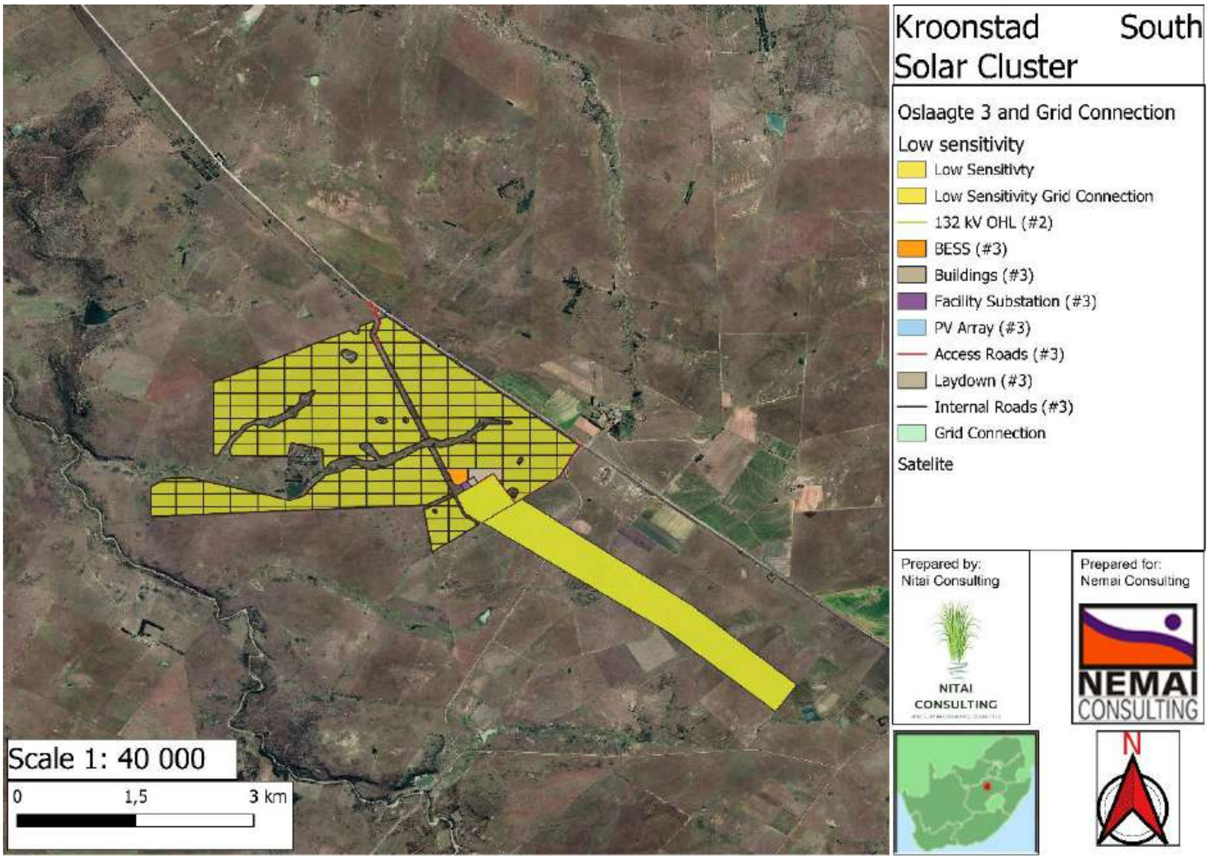
SPECIALIST ENVIRONMENTAL CONSULTING

Executive Summary

Nitai Consulting (Pty) Ltd. was appointed by Nemai Consulting (Pty) Ltd. to undertake a terrestrial biodiversity assessment for the proposed Kroonstad Cluster Solar project in the Free State Province, South Africa.

According to the National Web Based Environmental Screening Tool (the "Screening Tool"), the terrestrial biodiversity sensitivity theme is "Very High" due to the presence of an Ecological Support Areas and Protected Areas expansion Strategy and being near a Protected Area.

Based on the site surveys undertaken, it was clearly evident that there was no sensitive biodiversity features/SCC's as the project development area has been heavily overgrazed by large livestock i.e. cattle.



A site survey was undertaken to verify the site sensitivity in compliance with the section 3.2 of the protocols and found that the area has experienced long-term and continuous disturbance, mostly due to the grazing practices and associated impacts. The area has a lack of suitable habitat for SCC for permanent residence or breeding. The project area is modified and degraded and as such is assigned a sensitivity rating of 'Low' in terms of terrestrial biodiversity.

The screening report classified the plant sensitivity theme as 'Low' and the animal sensitivity theme as 'medium'. Following the field survey findings, the animal species themes has been re-classified as having 'Low' sensitivities. This is since there is limited suitable habitat available to support the regular occurrence of any faunal SCC within the project area.

The completion of the Terrestrial Biodiversity Assessment led to a confirmation of 'Low' classification for the plant species theme sensitivity as allocated by the National Environmental Screening Tool. The provincially protected plant species are not threatened and occur commonly throughout the country. These species are also indicators of environmental degradation. There was a dispute of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The project area has instead been assigned a 'Low' sensitivity, because of the extent of environmental disturbance that has taken place, and the fact that no SCC were observed (provincially protected plants) and favour the degradation and disturbance of the system to proliferate.

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List of Abbreviations

CBA	Critical Biodiversity Area
CR	Critical
DFFE	Department of Forestry, Fisheries & the Environment
DWS	Department of Water and Sanitation
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
GN	Government Notice
ha	Hectares
km	Kilometer (1 000m)
LC	Least Concern
MAP	Mean Annual Precipitation
m	Meters
NEMA	National Environmental Management Act (No. 107 of 1998)
NFEPA	National Freshwater Priority Areas
NWA	National Water Act
SANBI	South African National Biodiversity Institute
VU	Vulnerable

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Terrestrial Biodiversity

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Biodiversity. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

1. General information

1.1. An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of “very high sensitivity” for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.

1.2. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being “low sensitivity” for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.

1.3. However, where the information gathered from the site sensitivity verification differs from the designation of “very high” terrestrial biodiversity sensitivity on the screening tool and it is found to be of a “low” sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

1.4. Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a “low” terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.

1.5. If any part of the proposed development footprint falls within an area of “very high” sensitivity, the assessment and reporting requirements prescribed for the “very high” sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

2. Terrestrial Biodiversity Specialist Assessment

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.

2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:

2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;

2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;

2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;

2.3.4. the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;

2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including:

(a) main vegetation types;

(b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;

(c) ecological connectivity, habitat fragmentation, ecological processes and fine- scale habitats; and

(d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement

patterns identified;

2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification; and

2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:

2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:

(a) the reasons why an area has been identified as a CBA;

(b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;

(c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);

(d) the impact on ecosystem threat status;

(e) the impact on explicit subtypes in the vegetation;

(f) the impact on overall species and ecosystem diversity of the site; and

(g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;

2.3.7.2. terrestrial ecological support areas (ESAs), including:

(a) the impact on the ecological processes that operate within or across the site;

(b) the extent the proposed development will impact on the functionality of the ESA; and

(c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;

2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-

(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;

2.3.7.4. priority areas for protected area expansion, including-

(a) the way in which the proposed development will compromise or contribute to the

expansion of the protected area network;

2.3.7.5. SWSAs including:

(a) the impact(s) on the terrestrial habitat of a SWSA; and

(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);

2.3.7.6. FEPA sub catchments, including-

(a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;

2.3.7.7 indigenous forests, including:

(a) impact on the ecological integrity of the forest; and

(b) percentage of natural or near natural indigenous forest area lost and a statement on the

implications in relation to the remaining areas.

2.4. The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.

4. Terrestrial Biodiversity Compliance Statement

4.1. The compliance statement must be prepared by a specialist registered with the SACNASP and having expertise in the field of ecological sciences.

4.2. The compliance statement must:

4.2.1. be applicable to the preferred site and proposed development footprint;

4.2.2. confirm that the site is of “low” sensitivity for terrestrial biodiversity; and

4.2.3. indicate whether or not the proposed development will have any impact on the biodiversity feature.

4.3. The compliance statement must contain, as a minimum, the following information:

4.3.1. the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;

4.3.2. a signed statement of independence by the specialist;

4.3.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

4.3.4. a baseline profile description of biodiversity and ecosystems of the site;

4.3.5. the methodology used to verify the sensitivities of the terrestrial biodiversity features on the site, including equipment and modelling used, where relevant;

4.3.6. in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;

4.3.7. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;

4.3.8. a description of the assumptions made and any uncertainties or gaps in knowledge or data; and

4.3.9. any conditions to which this statement is subjected.

4.4. A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report

1.1.2 Terrestrial Plants

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Plant Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

1. General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “very high” or “high” sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Specialist Assessment Report.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “medium sensitivity” for terrestrial plant species, must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “low” sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Compliance Statement.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “very high” or “high” for terrestrial plant species sensitivity on the screening tool, and it is found to be of a “low” sensitivity, then a Terrestrial Plant Species Compliance Statement must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “low” terrestrial plant species sensitivity and it is found to be of a “very high” or “high” terrestrial plant species sensitivity, a Terrestrial Plant Species Specialist Assessment must be conducted.

1.6 If any part of the development falls within an area of confirmed “very high” or “high” sensitivity, the assessment and reporting requirements prescribed for the “very high” or “high” sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The Terrestrial Plant Species Specialist Assessment and the Terrestrial Plant Species Compliance Statement must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

2. Terrestrial Plant Species Specialist Assessment

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups (“taxa”) for which the assessment is being undertaken.

2.2 The assessment must be undertaken within the study area.

2.3 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.3.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.3.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.3.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.3.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.3.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, Red List of South African Plants, and/or other relevant databases;

2.3.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.3.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.3.8 identify any dynamic ecological processes occurring within the broader landscape, that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;

2.3.9 identify any potential impact on ecological connectivity within the broader landscape, and resulting impacts on the identified SCC and its long term viability;

2.3.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC; and

2.3.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species; and

2.3.12 identify any alternative development footprints within the preferred development site which would be of “low” sensitivity” or “medium” sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.4 The findings of the assessment must be written up in a Terrestrial Plant Species Specialist Assessment Report.

Terrestrial plant species compliance statement

Where the sensitivity in the Screening Report from the web-based Online Screening Tool has been confirmed to be LOW, a Plant Species Compliance Statement is required, either (1) for areas where no natural habitat remains, or (2) in natural areas where there is no suspected occurrence of SCC.

The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).

<u>The compliance statement must:</u>

1. be applicable within the study area

2. confirm that the study area is of "low" sensitivity for terrestrial plant species; and

3. indicate whether or not the proposed development will have any impact on SCC.

The compliance statement must contain, as a minimum, the following information:

1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;

2. a signed statement of independence by the specialist;

3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

4. a baseline profile description of biodiversity and ecosystems of the site;

5. the methodology used to verify the sensitivities of the terrestrial biodiversity and plant species features on the site including the equipment and modelling used where relevant;

6. in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;

7. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;

8. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and

9. any conditions to which this statement is subjected.

A signed copy of the compliance statement must be appended to the Basic Assessment

Report or Environmental Impact Assessment Report

1.1.3 Terrestrial Animals

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Animal Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

1. General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “very high” or “high” sensitivity for terrestrial animal species, must submit a Terrestrial Animal Species Specialist Assessment Report.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “medium sensitivity” for terrestrial animal species, must submit either a Terrestrial Animal Species Specialist Assessment Report or a Terrestrial Animal Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “low” sensitivity for terrestrial animal species, must submit a Terrestrial Animal Species Compliance Statement.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “very high” or “high” for terrestrial animal species sensitivity on the screening tool, and it is found to be of a “low” sensitivity, then a Terrestrial Animal Species Compliance Statement must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “low” terrestrial animal species sensitivity and it is found to be of a “very high” or “high” terrestrial animal species sensitivity, a Terrestrial Animal Species Specialist Assessment must be conducted.

1.6 If any part of the development falls within an area of confirmed “very high” or “high” sensitivity, the assessment and reporting requirements prescribed for the “very high” or “high” sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

2. Terrestrial Animal Species Specialist Assessment

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.

2.2 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.2.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.2.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.2.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.2.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.2.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;

2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.2.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.2.8 identify any dynamic ecological processes occurring within the broader landscape, that might be

disrupted by the development and result in negative impact on the identified SCC, for example, fires in fireprone systems;

2.2.9 identify any potential impact on ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long term viability;

2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;

2.2.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species, or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity; and

2.2.12 identify any alternative development footprints within the preferred development site which would be of “low” or “medium” sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.3 The findings of the assessment must be written up in a Terrestrial Animal Species Specialist Assessment Report.

5. Terrestrial Animal Species Compliance Statement

5.1 The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).

5.2 The compliance statement must:

5.2.1 be applicable within the study area;

5.2.2 confirm that the study area is of “low” sensitivity for terrestrial animal species; and

5.2.3 indicate whether or not the proposed development will have any impact on SCC.

5.3 The compliance statement must contain, as a minimum, the following information:

5.3.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;

5.3.2 a signed statement of independence by the specialist;

5.3.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

5.3.4 a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;

5.3.5 the mean density of observations/ number of samples sites per unit area;

5.3.6 where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;

5.3.7 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

5.3.8 any conditions to which the compliance statement is subjected.

A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.

2 LEGISLATION

Legislation relevant to this project is discussed below.

2.1 Convention on Biological diversity (CBD)

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

2.2 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person’s constitutional right to an environment that is not harmful to his or her health or wellbeing. It is administered by the Department of Forestry, Fisheries and the Environment (DFFE) but several functions have been delegated to the provincial environment departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The Act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws. NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable";
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied"; and
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions".

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

2.3 National Environmental Management: Biodiversity Act, Act No. 10 of 2004 (NEM:BA)

As the principal national act regulating biodiversity protection, NEM:BA, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. In terms of NEM:BA, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA Regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area is in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species".

Alien and Invasive Species

Chapter 5 of NEMBA relates to species and organisms posing a potential threat to biodiversity. The Act defines alien species and provides lists of invasive species. The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEMBA, was published in Government Notice R598 in

Government Gazette 37885 in 2014 (NEMBA, 2014). The Alien and Invasive Species (AIS) lists were subsequently published in Government Notice R 864 of 29 July 2016 (NEMBA, 2016).

NEMBA regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

a) to prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "Restricted activities involving alien species":

1) A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7. Restricted activities include the following:
    a) Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
    b) Having in possession or exercising physical control over any specimen of a listed invasive species. c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
    c) Conveying, moving or otherwise translocating any specimen of a listed invasive species.
    d) Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
    e) Spreading or allowing the spread of any specimen of a listed invasive species.
    f) Releasing any specimen of a listed invasive species. h. Additional activities that apply to aquatic species.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An **"alien species**" is defined in the Act as:

a. a species that is not an indigenous species; or
b. an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by means of migration or dispersal without human intervention.

According to Section 71 of the Act, "**Restricted activities involving listed invasive species**":

1. A person may not carry out a restricted activity involving a specimen of a listed invasive species without a permit issued in terms of Chapter 7.

2. A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**invasive species**" is defined in the Act as any species whose establishment and spread outside of its natural distribution range:

a. threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and
b. may result in economic or environmental harm or harm to human health.

A **"listed invasive species**" is defined in the Act as any invasive species listed in terms of section 70(1). According to Section 73 of the Act, "Duty of care relating to listed invasive species":

2) A person who is the owner of land on which a listed invasive species occurs must:
   a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
   b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and c) take all the required steps to prevent or minimize harm to biodiversity.

According to Section 75 of the Act, "Control and eradication of listed invasive species":

1. Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
2. Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
3. The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

Government Notice No. 47526 of 2022: The revised National List of ecosystems that are threatened and in need of protection.

This notice, published under Section 52(1)(a) of NEMBA, provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List

Published under Section 56(1) of NEMBA.

GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List
Published under Section 56(1) of NEMBA.

Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy

Published under NEMA. The aim of the Policy is to ensure that significant residual impacts of developments are remedied as required by NEMA, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the Mitigation Sequence has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact. The Policy specifies that one impact that has come across consistently as unmitigatable is the rapid and consistent transformation of certain ecosystems and vegetation types, leading to the loss of ecosystems and extinction of species. The Policy specifically targets ecosystems where the ability to reach protected area targets is lost or close to being lost. However, the Policy states that *"[w]here ecosystems remain largely untransformed, intact and functional, an offset would not be required for developments that lead to transformation, provided they have not been identified as a biodiversity priority"*. Biodiversity offsets should be considered to remedy residual negative impacts on biodiversity of 'medium' to 'high' significance. Residual impacts of 'very high' significance are a fatal flaw for development and residual biodiversity impacts of 'low' significance would usually not require offsets. The Policy indicates that impacts should preferably be 18 avoided in protected areas, Critical Biodiversity Areas (CBA), verified wetland and river features and areas earmarked for protected area expansion.

2.4 National Forests Act, Act no. 84 of 1998

Protected trees

According to this Act, the Minister may declare a tree, group of trees, woodland, or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. Forests Prohibits the destruction of indigenous trees in any natural forest without a licence.

2.5 National Water Act, Act 36 of 1998

Any areas that are defined in the National Water Act as a water resource that might be impacted on by certain activities that are contemplated require authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (Act 36 of 1998) means:

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

2.6 Conservation of Agricultural Resources, Act No. 43 of 1983 as amended in 2001.

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

2.7 National Veld and Forest Fire Act, Act No. 101 of 1998

Provides requirements for veldfire prevention through firebreaks and required measures for firefighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

2.8 Free State Nature Conservation Ordinance, No 8 of 1969

This Act provides for the management and conservation of the Free State Province's biophysical environment and protected areas within the framework of the National Environmental Management Act, 1998 (Act No 107 of 1998); to provide for the protection of species and ecological- systems that warrant provincial protection; to provide for the sustainable use of indigenous biological resources; and to provide for matters connected therewith.

Amongst other regulations, the following may apply to the current project:

- Various species are protected;
- The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province.

The Act provides lists of protected species for the province. According to the Free State Nature Conservation Ordinance, a permit is required for the removal of any species on this list.

3 PROJECT DETAILS

3.1 Project Background and Motivation

The South African Government ratified the Paris Agreement in 2016, and thereby showed the country's commitment to contribute to the global effort to address the challenge of climate change. Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA) on coal to produce electricity. The electricity demand is increasing in SA, and in order to match that demand there is a need to supply a diversified power generation that includes renewable energy technologies. These technologies include solar, wind, small utility scale hydro, biomass, biogas and energy storage that the Department of Mineral Resources and Energy (DMRE) intends to develop and implement as identified in the approved Integrated Resource Plan (IRP) 2019.

The Applicant has proposed the development of the 240MW Oslaagte Solar 3 PV Project south east of Kroonstad, in the Free State Province. The electricity generated by the Project will be transferred via 132 kV powerlines, 3.35km in length, from the facility substation to a new 132/400 kV Main Transmission Substation (MTS). The Applicant also proposed the development of the 400/132kV Main Transmission Substation (MTS) and 400 kV LILO Powerlines between the new MTS and existing Eskom 400kV Powerlines.

The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

3.2 Project Description

The Applicant has proposed the development of the 480MW Oslaagte Solar 3 PV Project south east of Kroonstad, in the Free State Province. The electricity generated by the Project will be transferred via 33kV or 132kV cabling or powerline between the facility substation and the proposed Eskom collector switching station/Main Transmission Substation (MTS). The Applicant also proposes the development of the 400/132kV Main Transmission Substation (MTS) and 400 kV LILO Powerlines between the new MTS and existing Eskom 400kV Powerlines.

The Project is located approximately 20km to the south east of Kroonstad's central business district (CBD) and falls within Ward 1 of the Moqhaka Local Municipality (MLM), in the Free State Province. The R76 runs along the eastern boundary of the site. (**Error! Reference source not found.**).

The proposed Oslaagte 3 Solar PV facility will cover approximately 810 ha and will include the following infrastructure:

- PV Panel Arrays
- PV modules and mounting structures
- Inverters and transformers
- Battery Energy Storage System (BESS)
- Site and internal access roads (up to 8m wide)
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance.
- Temporary and permanent laydown area
- Facility grid connection infrastructure, including:
    - 33 kV cabling between the project components and the facility substation
    - An 132 kV facility substation
    - 33kV or 132 kV powerline between the Eskom collector switching station/Main Transmission Substation (MTS)
    - 400/132kV MTS (600m x 600m). The MTS includes a switching station.
    - 400kV LILO powerlines between the new proposed MTS and the existing Eskom 400kV powerlines

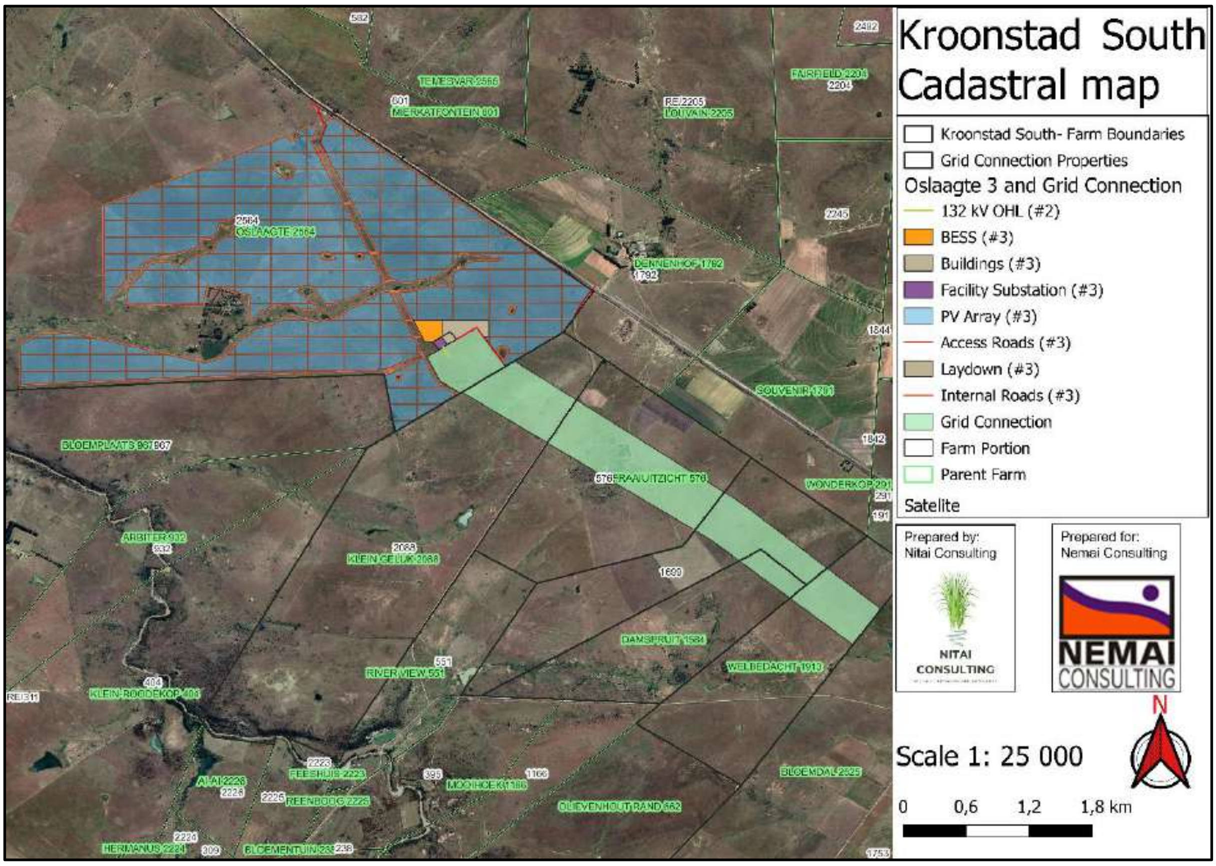
3.3 Technical Details of the PV Plants

Capacity of on-site substation	It is estimated that the maximum size of the facility substation will not exceed 1ha. The facility substation will collect the power from the facility and transform it from 33 kV to 132 kV. Each facility will require inverter-stations, transformers, switchgear, and internal electrical reticulation (underground cabling).
PV array	Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems. Area: Up to 760 ha
Area occupied by both permanent and construction laydown areas	Temporary construction laydown area up to 7 ha.

	Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown)
Area occupied by buildings	Approximately 1.5 ha
Length of internal roads	33 km – internal
Width of internal roads	The internal roads will be up to 6 m wide. The access roads will be up to 8 m wide.
Height of fencing	Up to 3.5m

3.4 Location

The Project is located approximately 20km to the south east of Kroonstad's central business district (CBD) and falls within Ward 1 of the Moqhaka Local Municipality (MLM), in the Free State Province. The R76 runs along the eastern boundary of the site. (**Error! Reference source not found.**). The project footprint covers a combined area of approximately 810hectares (ha) on the farms Oslaagte 2564, Mooidraai 953, Wolwekop 314, Klein Geluk 2088, Fraaiuitzicht 576 and Zonderweg 1699.



Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

Figure 1: Project Locality

4 METHODS

4.1 Geographic Information Systems (GIS) Mapping

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

- Free State Biodiversity Sector Plan of 2016 (DETEA, 2016)
- 2022 National Biodiversity Assessment (DFFE, 2022);
- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006);
- SA Protected and Conservation Areas Databases, 2022 (DFFE 2022);
- National Protected Areas Expansion Strategy, 2016 (DEA, 2016);
- Important Bird and Biodiversity Areas, 2015 (Marnewick *et al.,* 2015);

Brief descriptions of the standardised methodologies applied are provided below. More detailed descriptions of survey methodologies are available upon request.

4.2 Desktop Vegetation and Botanical Assessment

The desktop vegetation and botanical assessment encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of pre-anthropogenic habitat types as well as the identification of any Red Data and protected species within the known distribution of the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA-POSA, 2019), which was used to access distribution records on Southern African plants and generate an expected species list (Figure 2). This new database replaces the old Plants of Southern Africa database which provided distribution data of flora at the quarter degree square resolution. The Red List of South African Plants website (SANBI, 2016) was used to provide the most current account of the national conservation status of flora.

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

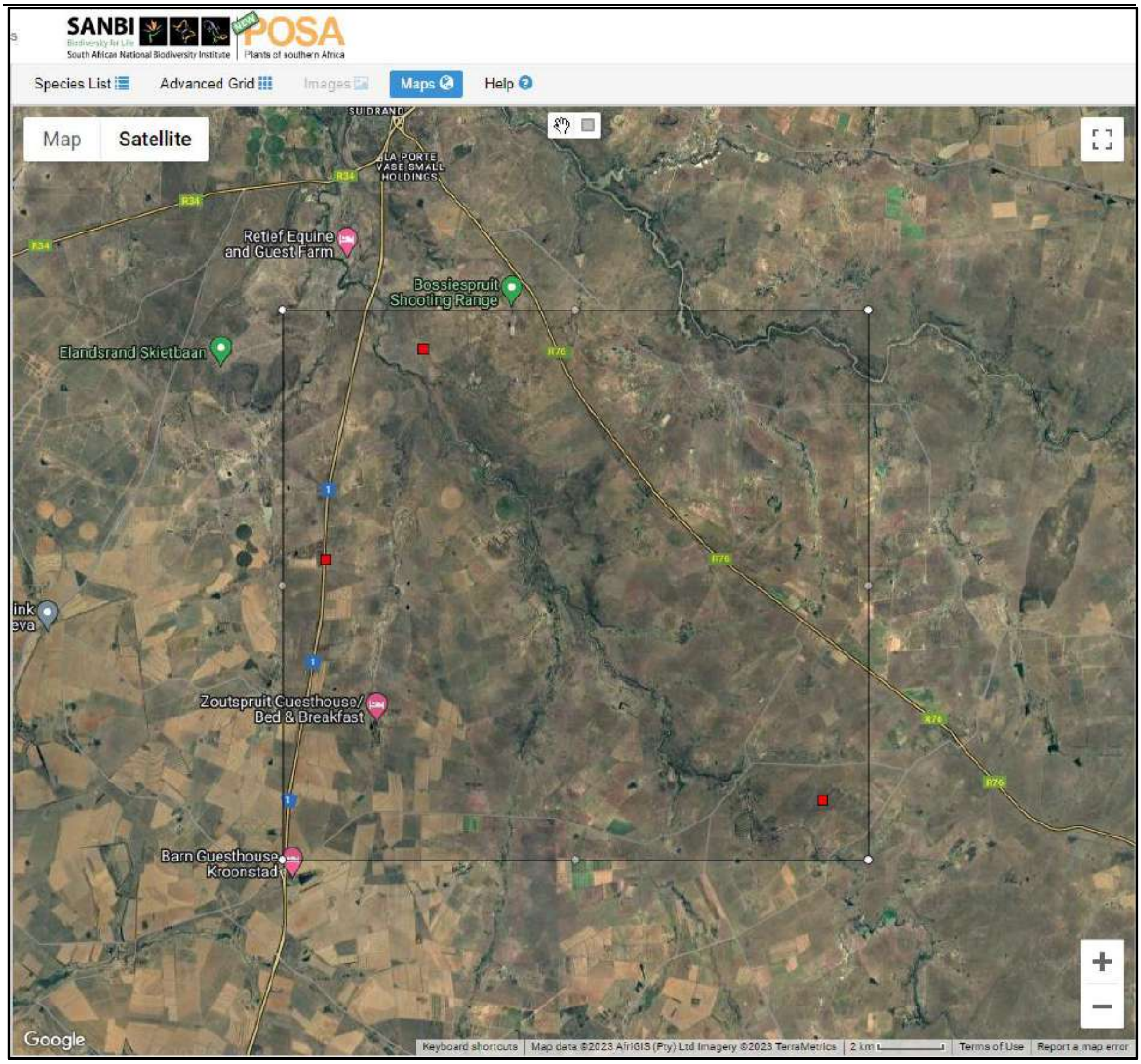


Figure 2: Plant distribution data.

Additional information regarding ecosystems, vegetation types, protected flora, and Species of Conservation Concern (SCC) was obtained from the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012);
- Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2016); and
- List of Protected Tree Species (South African Government, 2014).

4.3 Floristic Fieldwork Survey and Analysis

The wet season fieldwork (completed during January and April 2023) and sample sites were placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the proposed project area.

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

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

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

Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- A field guide to Wild flowers (Pooley, 1998);
- Field Guide to the Wild Flowers of the Highveld (van Wyk & Malan, 1998);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Identification guide to southern African grasses. An identification manual with keys, descriptions and distributions (Fish et al., 2015); and
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997).

The field work methodology included the following survey techniques:

Timed meanders:

- Sensitivity analysis based on structural and species diversity;
- Identification of protected floral species; and
- Identification of floral red-data or red-listed species (Species of Conservation Concern).

4.4 Faunal Assessment

4.4.1 Desktop Assessment

The faunal desktop assessment involved the following:

- Compilation of expected species lists;

- Identification of any red-data/red-listed species or Species of Conservation Concern potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national, and international conservation importance.

Distribution and SCC data is generally obtained from the following information sources:

- Animal Demography Unit (https://vmus.adu.org.za/)); and Southern African Bird Atlas Project 2 (SABAP2, 2019);
- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates et al., 2014);
- Red Data Book of Birds (Birdlife South Africa, 2015);
- Atlas and Red Data Book of Frogs of South Africa (Mintner et al., 2004);
- South Africa's official site for Species Information and National Red Lists (SANBI, 2022);
- The 2016 Red List of Mammals of South Africa (EWT, 2016); and
- The IUCN Red List of Threatened Species. Version 2021-3 (IUCN, 2021).

4.4.2 Field Survey

The field survey component of the assessment utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations (involving the use of binoculars and specialist camera equipment);
- Active hand-searches, used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.);
- Identification of tracks and signs; and the utilization of local knowledge.

Relevant field guides and texts consulted for identification purposes in the field during the survey may include the following:

- Roberts Bird Guide, Second Edition (Chittenden et al., 2016);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Spiders of Southern Africa (Leroy & Leroy, 2003); and

4.5 <u>Site Ecological Importance</u>

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as information from available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of Species of Conservation Concern (SCC) and their ecosystem processes.

Site Ecological importance (SEI) is a function of the biodiversity importance (BI) of the receptor (e.g., species of conservation concern, the vegetation/fauna community or habitat type present on the site) and its resilience to impacts (receptor resilience [RR]) as follows:

SEI = BI + RR

BI in turn is a function of conservation importance (CI) and the functional integrity (FI) of the receptor as follows:

BI = CI + FI

Conservation importance (CI) is evaluated in accordance with recognised established internationally acceptable principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and Key Biodiversity Areas (KBA; IUCN, 2016; Table 1).

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

Table 1:Conservation importance (CI) criteria

Conservation importance	Fulfilling criteria
Very high	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare[23] or Critically Rare[24] species that have a global EOO of < 10 km^2.
	Any area of natural habitat[25] of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent[26]) of natural habitat of EN ecosystem type.
	Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining.
	Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type.
	Presence of Rare species.
	Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals.
	Any area of natural habitat of threatened ecosystem type with status of VU.
	Presence of range-restricted species.
	> 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC.
	No confirmed or highly likely populations of range-restricted species.
	< 50% of receptor contains natural habitat with limited potential to support SCC.
Very low	No confirmed and highly unlikely populations of SCC.
	No confirmed and highly unlikely populations of range-restricted species.
	No natural habitat remaining.

[23] For butterflies, as per Armstrong *et al*. (2013).
[24] For plants, as per Raimondo *et al*. (2009).
[25] This excludes areas of transformed habitat within a defined ecosystem even if these are partially restored, e.g. Highveld grasslands that have been converted to maize fields and then abandoned so that some form of functional grassland is restored; this is not natural habitat as it does not and will not in the future have species composition representative of the original natural habitat.
[26] This can be calculated from the threatened ecosystem of South Africa shapefile available from the SANBI (current available version 2011: http://bgis.sanbi.org/Projects/Detail/49).
[27] Persistent ecological disruptors must not include components that landowners are legally obliged to address or that should be addressed as norm for best practice. Wilful neglect of these legal obligations or the presence of invasive alien species that can practically be controlled through management actions should not negatively influence the FI score to a major extent.

Functional integrity (FI) of the receptor (e.g. the vegetation/fauna community or habitat type) is defined here as the receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions (Table 2).

Table 2:Functional integrity (FI) criteria.

Functional integrity	Fulfilling criteria
Very high	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

Recalling that biodiversity importance (BI) is a function of conservation importance (CI) and the functional integrity (FI) of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

Table 3:Determining the BI

Biodiversity importance		Conservation importance				
		Very high	High	Medium	Low	Very low
Functional integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

Receptor resilience (RR) (Table 4) is defined here as: 'The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention'.

Table 4: Resilience criteria

Resilience	Fulfilling criteria
Very high	Habitat that can recover rapidly (~ less than 5 years) to restore > 75%[28] of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Finally, after the successful evaluation of both BI and RR as described above, it is possible to evaluate SEI from the final matrix as follows (Table 5) and interpreted accordingly (Table 6):

Table 5: Determining the SEI.

Site ecological importance		Biodiversity importance				
		Very high	High	Medium	Low	Very low
Receptor resilience	Very low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very high	Medium	Low	Very low	Very low	Very low

Table 6: Guidelines for interpreting SEI in the context of the proposed development activities.

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

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

4.6 Limitations and Assumptions

The following limitations and assumptions should be noted for the assessment:

- It is assumed that all information received from the client is accurate;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The handheld GPS utilised for the fieldwork had a maximum accuracy of 5 m. As such, any features spatially logged and mapped as part of this report may be offset by approximately 5 m; and
- Only a single season survey was conducted for the respective studies, this would constitute a wet season survey, however the data received is considered sufficient to derive a meaningful baseline; since most species are present during the wet season survey apart from winter flowering plants.

5 Receiving Environment

5.1 Desktop Spatial Baseline

Table 7: Desktop Spatial features below has been produced in terms of the spatial data collected and analysed (as provided by various sources such as the national and provincial environmental authorities

and SANBI). It presents a summative breakdown of the ecological boundaries considered and the associated relevance that each has to the region or project area. Where a feature is regarded as relevant it is considered an ecologically important landscape feature and discussed further as part of the sub-sections that follow.

Table 7: Desktop Spatial features examined.

Desktop Information considered	Relevant	Reasoning	Section
Free State Biodiversity plan of (2016)	Yes	Project area overlaps with an ESA and Degraded area.	5.1.1
Ecosystem Protection Level (SANBI & DFFE, 2021)	Yes	The project falls within an ecosystem of “Least Concern” and is considered “Endemic”.	5.1.2.1
National Protected Areas Expansion Strategy, 2016 (DEA, 2016)	Yes	The project area does overlap with a priority focus area	5.1.3
Important Bird and Biodiversity Areas, 2015	No	No IBAs occur nearby	-
South African Protected and Conservation Areas Databases, 2022	Yes	Protected areas within 5 km of the the study site.	5.1.4

5.1.1 Free State Biodiversity Sector Plan

The Free State Biodiversity Sector Plan (FSBSP) strives to improve landscape level conservation and management of biodiversity and ecosystems in the province. This is achieved by providing information on biodiversity in a standardised format that can be used to inform forward planning (e.g. Spatial Development Frameworks) and reactive management (e.g. environmental impact assessment) processes.

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

- Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses.
    - The Free State Biodiversity Sector plan (FSBSP) differentiates between **CBA 1 and CBA 2.**
        - CBA 1 (Irreplaceable) areas include: Critical Patches: Ecosystem Status – Critically Endangered Ecosystems; irreplaceable Sites; Critical Biodiversity Corridors Linkages; Important Terrestrial Habitats: Expert Areas; and Important Terrestrial Habitats: Kloofs.
            - A site that is irreplaceable or near irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with the site. Such sites are therefore critical and they need to be maintained to ensure that features targets are achieved and that such features persist.
        - CBA2 (Optimal) areas include: Critical Patches: Ecosystem Status – Endangered and Vulnerable Ecosystems; Important Habitats: Features; and Important Habitats: Focus Wildlife Areas.
            - A site that has been selected based on its complementarity for meeting biodiversity targets. CBA Optimal sites are therefore important but their maintenance is not critical to ensure that features targets are achieved and that such features persist.
- Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs.

The project area does fall in an ESA category and is designated as “ESA1” and overlaps with the “Protected areas Expansion Strategy” (Figure 3).

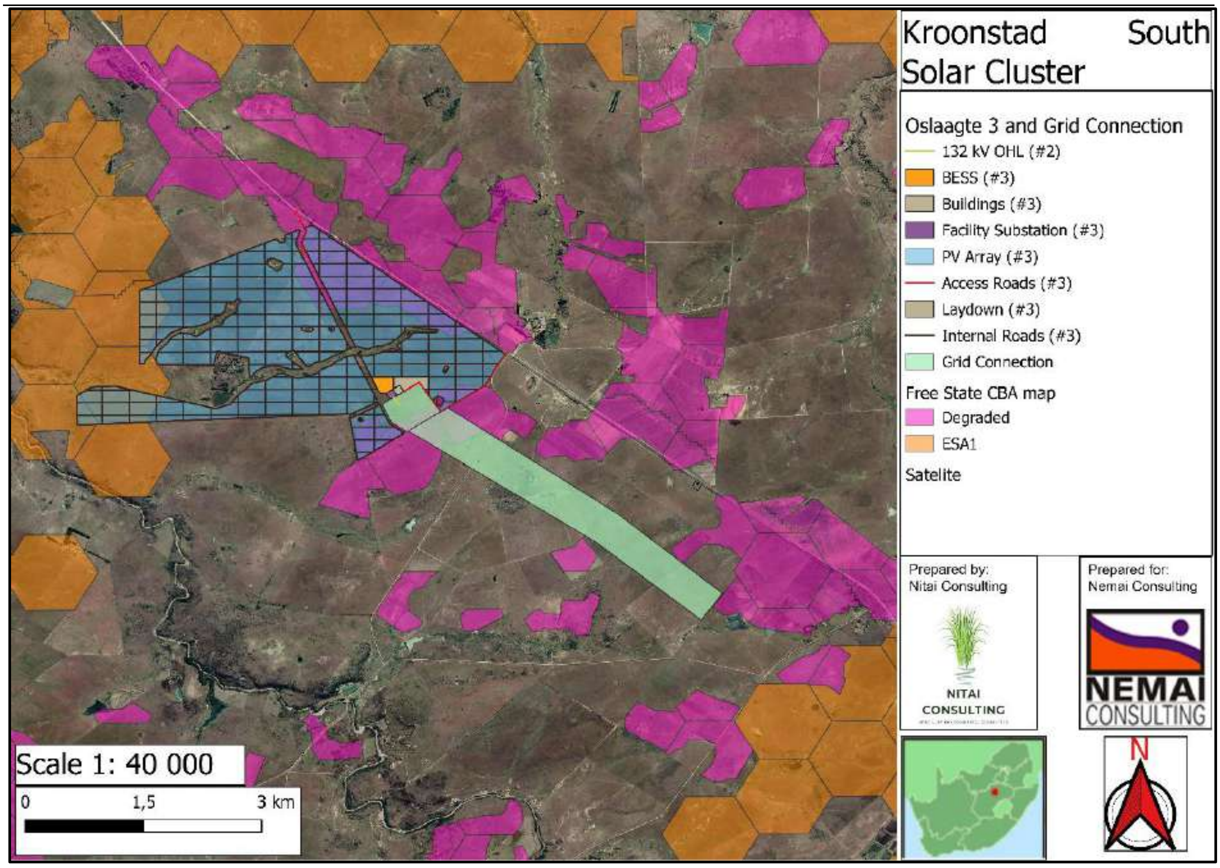


Figure 3: CBA areas for study site.

5.1.2 The National Biodiversity Assessment

5.1.2.1 Ecosystem Threat status

The 2011 list focussed on terrestrial ecosystems and is referred to in Listing Notice 3 (Government Notice R985, published under NEMBA in 2014) which identifies activities that require environmental authorisation when undertaken in a threatened ecosystem, as identified in the list.

The 2011 list has also been used throughout South Africa as a decision-making support tool, especially in environmental authorisation application processes and to inform bioregional planning. The revised list, known as the 2022 Red List of Ecosystems, was developed between 2016 and 2021, incorporating the best available information on terrestrial ecosystem extent, condition, pressures, and drivers of change.

The revised list is based on assessments that followed the International Union for Conservation of Nature (IUCN) Red List of Ecosystems Framework (version 1.1) and covers all 456 terrestrial ecosystem types described in South Africa. The updated input data and alignment with global methods provides for a substantially improved list but also limits direct comparison between 2011 and 2022 because some ecosystem types have changed threat status category due to the change in methods, and others have changed due to land cover change or other pressures in the landscape.

Going forward, comparisons between versions of the list will be possible, facilitating trend analysis and monitoring. The 2022 Red List of Ecosystems identifies 120 threatened terrestrial ecosystem types (55 Critically Endangered, 51 Endangered and 14 Vulnerable types).

The project area was superimposed on the Ecosystem Protection Level map to assess the protection status of the terrestrial ecosystem associated with the project area. Based on the dataset, the ecosystem is rated as least concern but is endemic (Figure 4 and Figure 5).

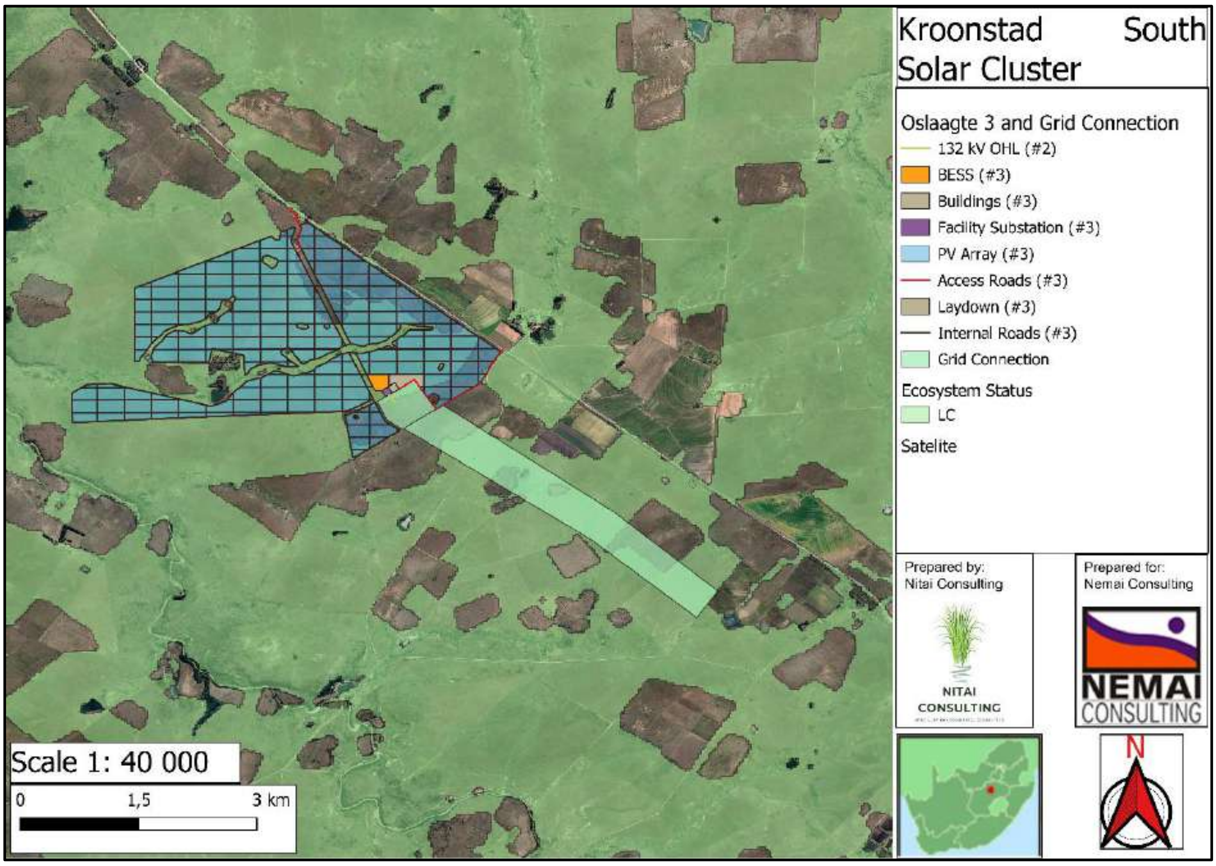


Figure 4: Red list Ecosystem status.

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

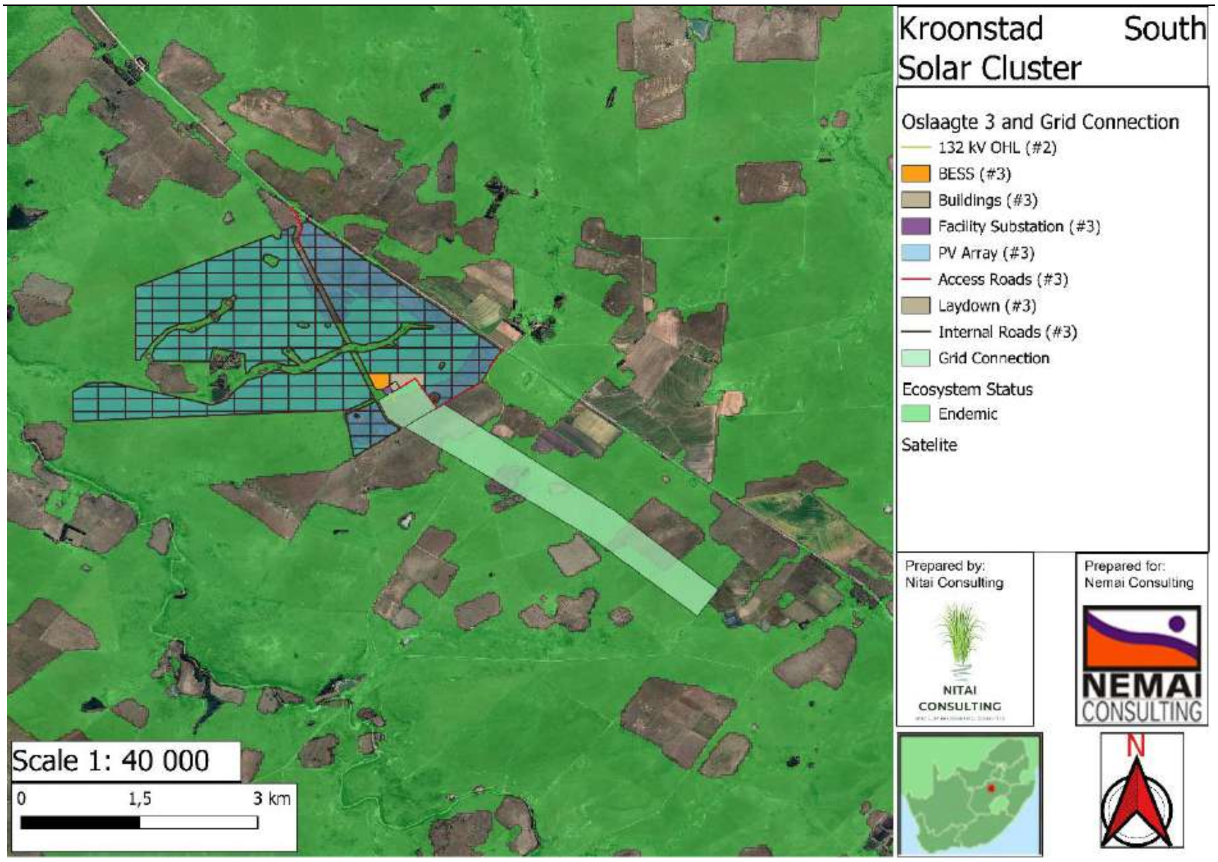


Figure 5: Ecosystem endemism status.

5.1.3 South African Protected and Conservation Areas

The Department of Environmental Affairs (now the Department of Forestry, Fisheries and the Environment) led the development of the National Protected Areas Expansion Strategy (NPAES) in consultation with the protected area agencies and other key private and public sector stakeholders. The need for the development of the NPAES was established in the National Biodiversity Framework in 2009. The NPAES is a 20-year strategy with 5-year implementation targets aligned with a 5-year revision cycle. (DEA, 2016).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are therefore of high importance for biodiversity, climate resilience and freshwater protection (DEA, 2016).

The project area does overlap with a priority focus area for expansion according to the 2016 NPAES dataset but is not under negotiation and the habitat is disturbed and degraded and does not contribute significantly to ecological corridors (Figure 6).

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

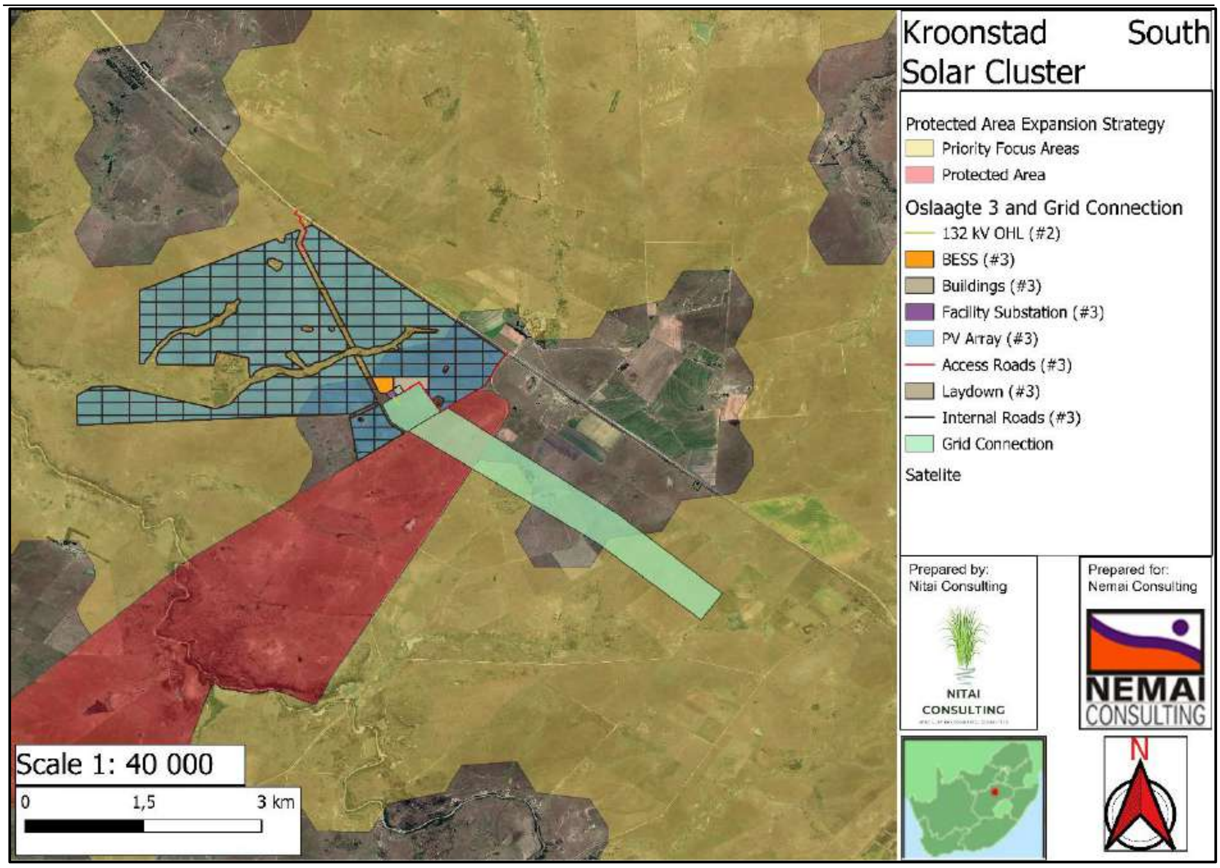


Figure 6: Protected Areas Expansion Framework for study site.

5.1.4 Protected Areas

According to the spatial data for SAPAD (2022) and SACAD (2022), the main project area lies inside the 5 km buffer for Serendipidie Private Nature Reserve and is thus within any regulated area. There is an existing OHL traversing Serendipidie Nature reserve (Figure 7, Figure 8).

Figure 7: OHL line traversing the Nature Reserve.

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

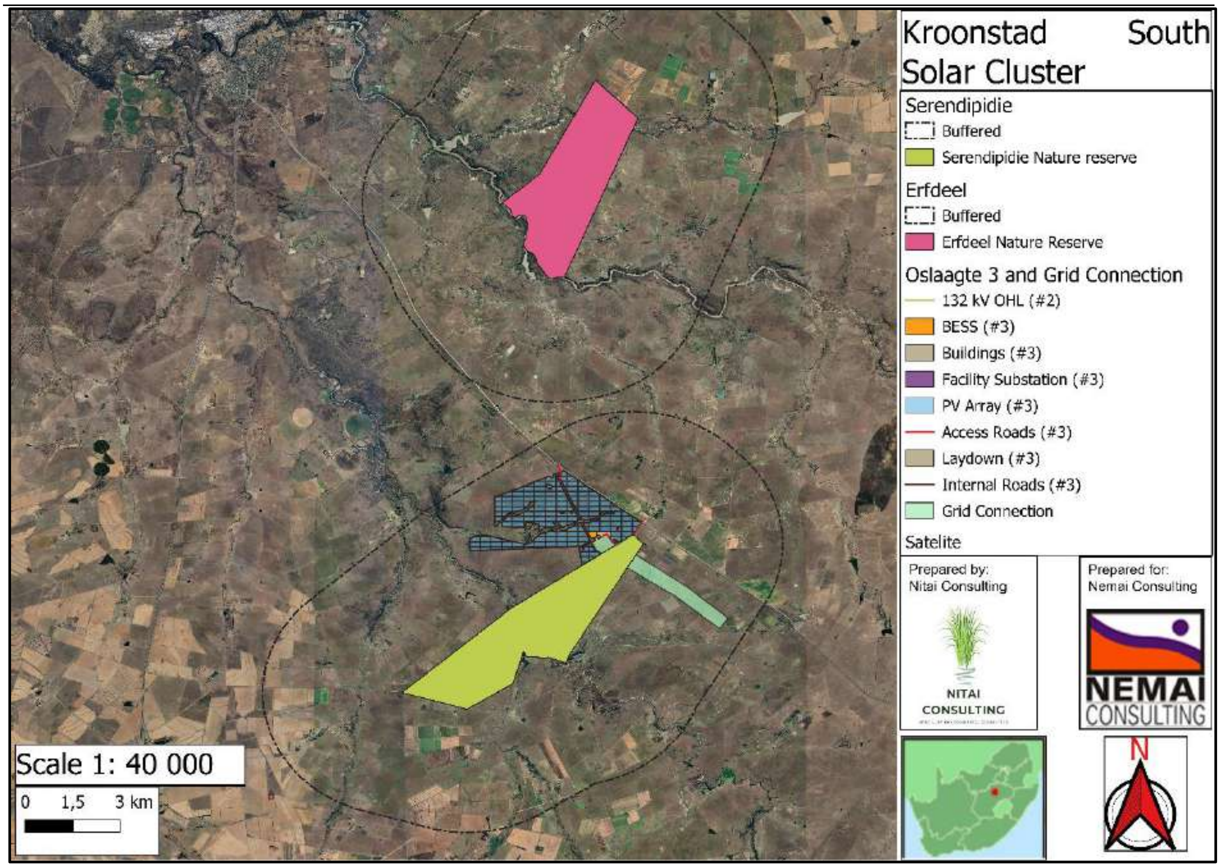


Figure 8: Map illustrating the project area in relation to the nearest protected areas.

5.2 Ecological Desktop Baseline

5.2.1 Vegetation Assessment

The project area is situated within the Grassland Biome. In South Africa, the Grassland Biome occurs mainly on the high central plateau (Highveld), the inland areas of the eastern seaboard, the mountainous areas of KwaZulu-Natal (KZN) and the central parts of the Eastern Cape (Mucina & Rutherford, 2006). However, grasslands can also be found below the Drakensberg, both in KZN and the Eastern Cape, with floristic links to the high-altitude Drakensberg grassland (Mucina & Rutherford, 2006).

The topography is mainly flat to rolling, but also includes mountainous regions and the Escarpment (Mucina & Rutherford, 2006). Altitude is mostly from about 300 to 400 m.a.s.l, but reaches up to 3 482 m on Thabana Ntlenyana, the highest mountain in southern Africa (Mucina & Rutherford, 2006). In terms of climate, the temperate grasslands of the Highveld in South Africa have cold and dry conditions, with rainfall during the summer (which can sometimes be a strong summer rainfall) and winter drought (Mucina & Rutherford, 2006).

Frost is common and there is a high risk of lightning-induced fires (Mucina & Rutherford, 2006). In terms of vegetation structural composition, grasslands are characteristically dominated by grasses of the Poaceae Family (Mucina & Rutherford, 2006). On the Lesotho Plateau and highest peaks of the Drakensberg, grassland plants xeromorphic characteristics due to the severity of the climate in these places (Mucina & Rutherford, 2006).

On a fine-scale vegetation type, the project area overlaps with the Central free Sate Grassland (Figure 9).

5.2.1.1 Central Free State Grassland

Distribution: Free State Province and marginally into Gauteng Province: A broad zone from around Sasolburg in the north to Dewetsdorp in the south. Other major settlements located within this unit include Kroonstad, Ventersburg, Steynsrus, Winburg, Lindley and Edenville

Altitude: 1 300–1 640 m.

Vegetation & Landscape Features: Undulating plains supporting short grassland, in natural condition dominated by *Themeda triandra* while *Eragrostis curvula* and *E. chloromelas* become dominant in degraded habitats. Dwarf karoo bushes establish in severely degraded clayey bottomlands. Overgrazed and trampled low-lying areas with heavy clayey soils are prone to *Acacia karroo* encroachment.

Geology & Soils: Sedimentary mudstones and sandstone mainly of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as those of the Ecca Group (Karoo Supergroup) found in the extreme northern section of this grassland, giving rise to vertic, melanic and red soils (typical forms are Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg)—typical of Dc land type (dominating the landscape). The less common intrusive dolerites of the Jurassic Karoo Dolerite Suite support dry clayey soils typical of the Ea land type

Climate: Summer-rainfall seasonal precipitation region, with MAP 560 mm. Much of the rainfall is of convectional origin and peaks in December to January. The overall MAT around 15°C. Incidence of frost relatively high (43 days on average).

Important Taxa

<u>Graminoids:</u> *Aristida adscensionis (d), A. congesta (d), Cynodon dactylon (d), Eragrostis chloromelas (d), E. curvula (d), E. plana (d), Panicum coloratum (d), Setaria sphacelata (d), Themeda triandra (d), Tragus koelerioides (d), Agrostis lachnantha, Andropogon appendiculatus, Aristida bipartita, A. canescens, Cymbopogon pospischilii, Cynodon transvaalensis, Digitaria argyrograpta, Elionurus muticus, Eragrostis lehmanniana, E. micrantha, E. obtusa, E. racemosa, E. trichophora, Heteropogon contortus, Microchloa caffra, Setaria incrassata, Sporobolus discosporus.*

<u>Herbs:</u> *Berkheya onopordifolia var. onopordifolia, Chamaesyce inaequilatera, Conyza pinnata, Crabbea acaulis, Geigeria aspera var. aspera, Hermannia depressa, Hibiscus pusillus, Pseudognaphalium luteo-album, Salvia stenophylla, Selago densiflora, Sonchus dregeanus.*

<u>Geophytic Herbs:</u> *Oxalis depressa, Raphionacme dyeri. Succulent Herb: Tripteris aghillana var. integrifolia.*

Low Shrubs: *Felicia muricata (d), Anthospermum rigidum subsp. pumilum, Helichrysum dregeanum, Melolobium candicans, Pentzia globosa*.

Conservation Status: The ecosystem is rated as Least concern according to the 2022 Red List ecosystem data since there is 66% remaining of this ecosystem. It has experienced low rates of natural habitat loss and biotic disruptions, placing this ecosystem at low risk of collapse and 2.3% is currently formally protected (DFFE, 2022).

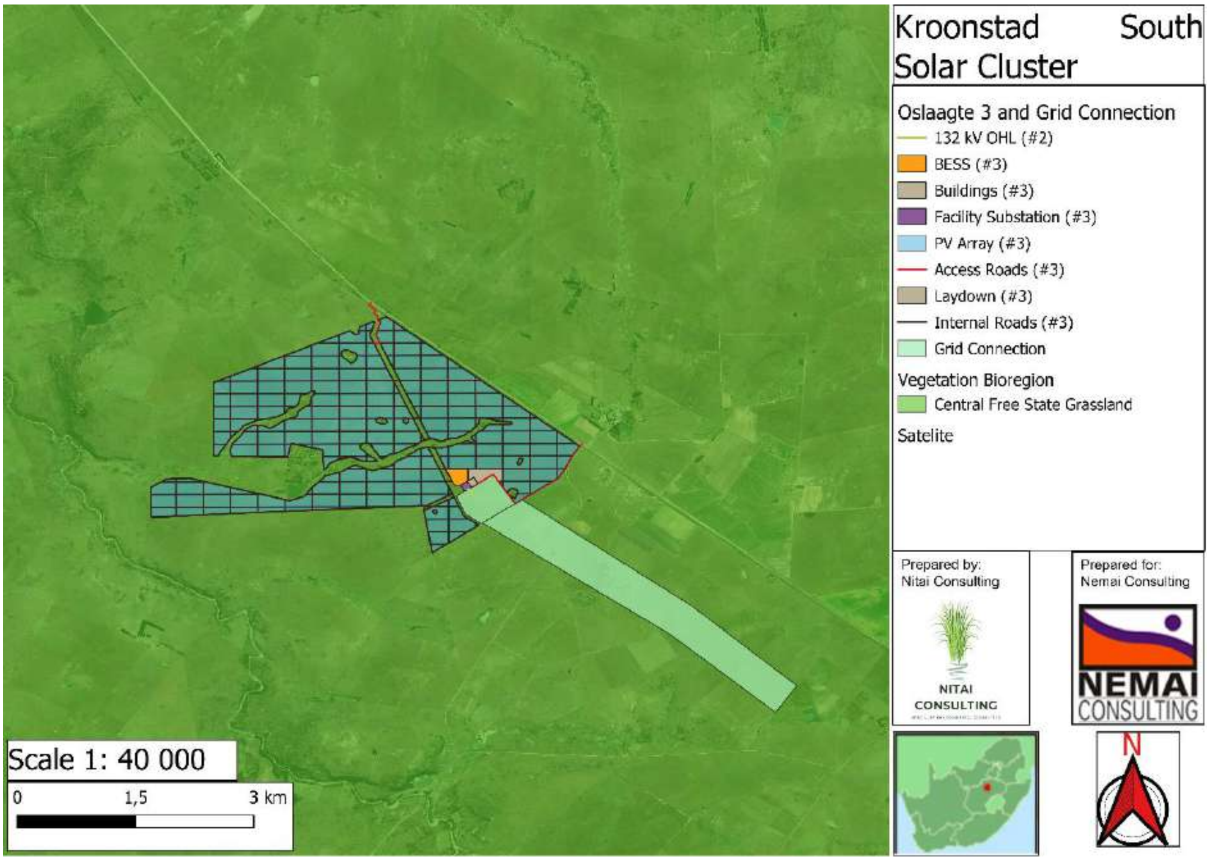


Figure 9: Vegetation region of study site.

5.2.1.2 Botanical Assessment

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, only 41 plant species could potentially occur on the study site. None are regarded as threatened. The screening tool identifies no potential SCC species and rated the area “Low”.

5.2.2 Faunal Assessment

Largely based on the South African Bird Atlas Project Version 2 (SABAP2, 2022), IUCN Digital Distribution Maps (IUCN, 2016), and the Animal Demography Unit (ADU, 2020) databases, Table 8 summarises the total number of animal species that have the potential to occur in or around the project area, and the corresponding number of SCC. A supplementary study for Sensitive species 15 was conducted to assess sensitivity and impacts on this species. See Appendix F section 7.1.5

Table 8: Total number of potential fauna species present, and corresponding SCC

Fauna type		Total potential number	Number of SCC
Avifauna		153	2
Mammals		57	5
Herpetofauna	Amphibians	15	0
	Reptiles	20	1

These numbers include animals that only occur within nature reserves and private reserves. Of the 2 avifaunal SCC, none are likely to be found resident in the project area due to a lack of suitable habitat and the associated modified nature of the project area and surrounds.

Of the 57 total mammals listed, none of the mammal SCC are likely to be found resident within the project area.

None of the herpetofauna SCC are likely to be found within the project area.

The general modified state of the area coupled with the with high levels of agricultural disturbance, results in a high level of disturbance degradation, and unsuitable environmental conditions.

6 Results

6.1 Field Survey

This section details the observations recorded during an on-site field survey conducted to ground truth the floral, faunal, and habitat features of the project area. Sampling took place the 17th and 18th of April 2023 from 7:00 to 16:00.

6.1.1 Terrestrial Flora and Fauna

During the terrestrial survey the floral and faunal communities within the project area were assessed and photographs were captured, some of which are provided in this section of the report. For ease of reading, the observations and discussions pertaining to the floral and the faunal species recorded are separated below.

6.1.1.1 Flora and Vegetation Condition

The project area was found in a heavily modified condition, mainly attributed to the agricultural practices and its impacts associated, resulting in the area being largely disturbed in some way. Grazing practices, old lands and piospheres have degraded the veld severely. These aspects further limit the functional capacity of the project area. Much of the development footprint is located within degraded areas or along roads or transformed areas and their associated servitudes, which are considered as low sensitivity. Species marked in blue are alien species but not classified as invasive. Species marked in green are alien invasive according to Nemba. Species marked in red are protected in Free State province. A total of 76 tree, shrub, herbaceous and graminoid plant species were recorded in the project area during the field assessment (Table 9). The three species protected provincially are of least concern according to the Red List of Plants and the IUCN database. These species indicate disturbance in ecosystems and are commonly found throughout the country.

Table 9: Trees, shrub and herbaceous plant species recorded in the project area.

Family	Taxon	Common name	Protection Status	Endemism	Invasive
Amaranthaceae	*Alternanthera pungens,*	Paper Thorn	LC	Not Indigenous, naturalised	
Amaranthaceae	*Gomphrena celosioides*	Batchelor's button	LC	Not Indigenous, naturalised	
Amaranthaceae	*Guilleminea densa,*	Small matweed	LC	Not Indigenous, naturalised	
Amaranthaceae	*Kyphocarpa angustifolia*	Silver Burrweed	LC	Indigenous	
Asparagaceae	*Asparagus laricinus*	Emperor's asparagus	LC	Indigenous	
Asteraceae	*Arctotis arctotoides,*	Botter blom	LC	Indigenous	
Asteraceae	*Felicia muricata*	Bloublommetjie	LC	Indigenous; Endemic	
Asteraceae	*Geigeria burkei,*	Vermeerbos	LC	Indigenous	
Asteraceae	*Helichrysum acutatum*	Sticky Everlasting	Protected FS	Indigenous	Protected Free State

Asteraceae	*Helichrysum nudifolium*	Hottentot's Tea	Protected FS	Indigenous	Protected Free State
Asteraceae	*Helichrysum rugulosum*	Wrinkly Everlasting	Protected FS	Indigenous	Protected Free State
Asteraceae	*Nidorella hottentotta,*	Grassland Vleiweed	LC	Indigenous	
Asteraceae	*Nidorella resedifolia*	Stinkkruid	LC	Indigenous	
Asteraceae	*Senecio inaequidens*	Canary Weed	LC	Indigenous	
Asteraceae	*Seriphium plumosa*	Bankrupt bush	LC	Indigenous	
Asteraceae	*Tagetes minuta*	Khaki weed	LC	Not indigenous; Naturalised; Invasive	
Caryophyllaceae	*Pollichia campestris*	Barley Sugar Bush	LC	Indigenous	
Cyperaceae	*Bolboschoenus glaucus,*	Glaucus tuber-bulrush	LC	Indigenous	
Cyperaceae	*Bulbostylis hispidula,*	Slender Sedge	LC	Indigenous	
Cyperaceae	*Cyperus congestus,*	Purple Umbrella Sedge	LC	Indigenous	
Cyperaceae	*Cyperus denudatus,*		LC	Indigenous	
Cyperaceae	*Cyperus fastigiatus,*		LC	Indigenous	
Cyperaceae	*Kyllinga alba*	Witbiesie	LC	Indigenous	
Cyperaceae	*Kyllinga erecta,*	Greater Kyllinga	LC	Indigenous	
Dipsacaceae	*Scabiosa columbaria*	Rice Flower	LC	Indigenous	
Fabaceae	*Vachelia robusta*	Ankle thorn	LC	Indigenous	
Geraniaceae	*Monsonia glauca*	Grey Dysentery-Herb	LC	Indigenous	
Juncaceae	*Juncus oxycarpus,*		LC	Indigenous	
Lamiaceae	*Ocimum americanum,*	Wild Basil	LC	Indigenous	
Malvaceae	*Hibiscus trionum,*	Venice Mallow	LC	Indigenous	

Phyllanthaceae	*Phyllanthus angolensis*		LC	Indigenous	
Poaceae	*Aristida canescens*	Pale Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. barbicollis,*	Spreading Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. congesta*	Tassle Three-Awn	LC	Indigenous	
Poaceae	*Brachiaria serrata,*	Velvet Signal Grass	LC	Indigenous	
Poaceae	*Chloris virgata*	Feather-top Chloris	LC	Indigenous	
Poaceae	*Cymbopogon caesius,*	Broad-leaved Turpentine Grass	LC	Indigenous	
Poaceae	*Cymbopogon pospischilii*	Bushveld turpentine Grass	LC	Indigenous	
Poaceae	*Cynodon dactylon,*	Couch Grass	LC	Indigenous	
Poaceae	*Eragrostis chloromelas,*	Blue Lovegrass	LC	Indigenous	
Poaceae	*Eragrostis curvula,*	Weeping Love Grass	LC	Indigenous	
Poaceae	*Eragrostis gummiflua*	Gum Grass	LC	Indigenous	
Poaceae	*Eragrostis obtusa*	Dew Grass	LC	Indigenous	
Poaceae	*Eragrostis superba,*	Saw tooth love Grass	LC	Indigenous	
Poaceae	*Hyparrhenia hirta*	Common Thatching grass	LC	Indigenous	
Poaceae	*Melinis repens,*	Natal Red Top	LC	Indigenous	
Poaceae	*Panicum coloratum,*	Bamboeskweek	LC	Indigenous	
Poaceae	*Panicum maximum,*	Guinea Grass	LC	Indigenous	
Poaceae	*Perotis patens.*	Cat's tail	LC	Indigenous	
Poaceae	*Setaria pumila*	Garden Bristle Grass	LC	Indigenous	

Poaceae	*Setaria sphacelate var torta*	Creeping Bristle Grass	LC	Indigenous	
Poaceae	*Sporobolus africanus.*	Rats tail dropseed	LC	Indigenous	
Poaceae	*Sporobolus ioclados*	Pan Dropseed	LC	Indigenous	
Poaceae	*Sporobolus pyramidalis,*	Vlei Grass	LC	Indigenous	
Poaceae	*Themeda triandra*	Red Grass	LC	Indigenous	
Poaceae	*Tragus berteronianus,*	Carrot Seed Grass	LC	Indigenous	
Poaceae	*Urochloa mossambicensis*	Bushveld Signal Grass	LC	Indigenous	
Rubiaceae	*Oldenlandia herbacea*	False Spurry	LC	Indigenous	
Rubiaceae	*Pygmaeothamnus zeyheri,*	Common Sand Apple	LC	Indigenous	
Solanaceae	*Solanum elaeagnifolium*	Silverleaf Nightshade	LC	Not Indigenous, Invasive	Nemba 1b
Solanaceae	*Solanum mauritianum*	Bugweed	LC	Not Indigenous, Invasive	Nemba 1b
Verbenaceae	*Verbena bonariensis*	Wild Verbena	LC	Not Indigenous, Invasive	Nemba 1b
Verbenaceae	*Verbena tenuisecta*		LC	Not indigenous; Naturalised	

Refer to the images below for photographs showing the habitats and the overall state of the project area (Figure 10).

6.1.1.2 Fauna

Mammal activity was low, due to the extent of disturbance in general with cattle grazing the area, as well as the poor habitat condition. The species present are most likely not resident due to the modified state of the area. No SCC were observed during the field survey.

Figure 10: General condition of the study site

6.1.2 Habitat Survey and Site Ecological Importance

The main habitat types identified across the project area were initially identified and pre-delineated largely based on aerial satellite imagery. These habitat types were then refined based on the field coverage and data collected during the survey.

The degraded habitat has been modified from its natural state, and it represents habitat that has been historically impacted, and has not recovered. This habitat is largely limited to areas that have been impacted through effects from agricultural grazing practices and associated impacts, roads, and land use, as well as mismanagement and inadequate rehabilitation procedures. These habitats are not entirely transformed, but exist in a constant degraded state, as they cannot recover to a more natural state, due to the ongoing disturbances and impacts received.

Transformed habitat was present in the form of the existing roads, existing infrastructure, or any other areas devoid of vegetation, artificially. Due to the transformed nature of this habitat, it is regarded as having a low sensitivity.

Based on the criteria provided in section 4.5 of this report, the three delineated habitat types have each been allocated a sensitivity category, or SEI, and this breakdown is presented in Table 10 below. To identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivities of each of the habitat types delineated within the project area are mapped in (Figure 11).

It is important to note that this map does not replace any local, provincial, or national government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

Table 10: Site Ecological Importance assessment summary of the habitat types delineated within the project area.

Habitat Type	Conservation Importance	Functional Integrity	Biodiversity importance	Receptor resilience	Site Ecological Importance
Transformed	Low (No confirmed or highly likely populations of SCC).	Medium (Mostly minor current negative ecological impacts with some major impacts).	Low	Medium (Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality)	Low
Degraded Grassland	Low (No confirmed or highly likely populations of SCC).	Medium (Mostly minor current negative ecological impacts with some major impacts).	Low	Medium (Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and	Low

				functionality of the receptor functionality)	

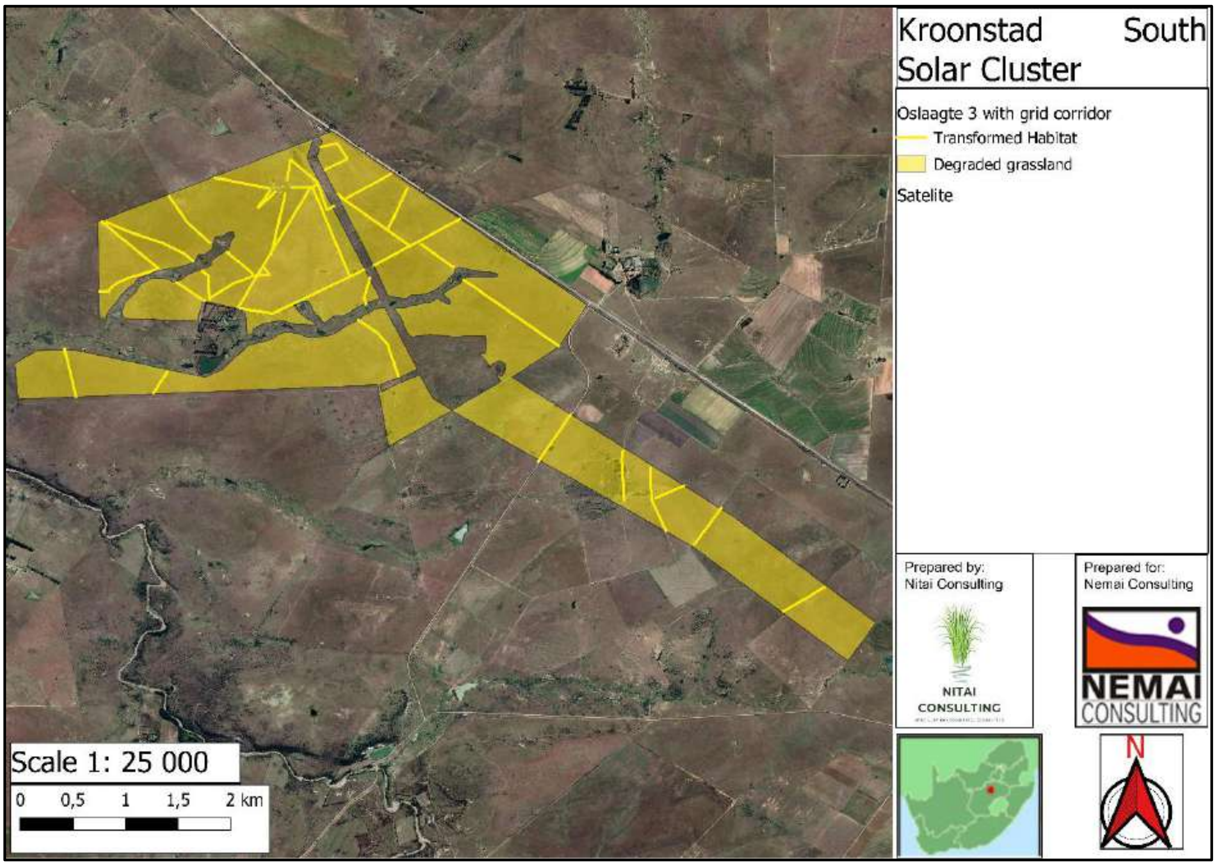


Figure 11:Biodiversity SEI delineation relevant to the project area

6.2 Site Sensitivity Verification

The terrestrial biodiversity theme sensitivity as indicated in the screening report (compiled by the National Web based Environmental Screening Tool) was derived to be 'Very High' due to the presence of an ESA 1, being part of the Protected Areas expansion Strategy as well as being in close proximity ot Serendipidie Nature reserve (Figure 12).

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

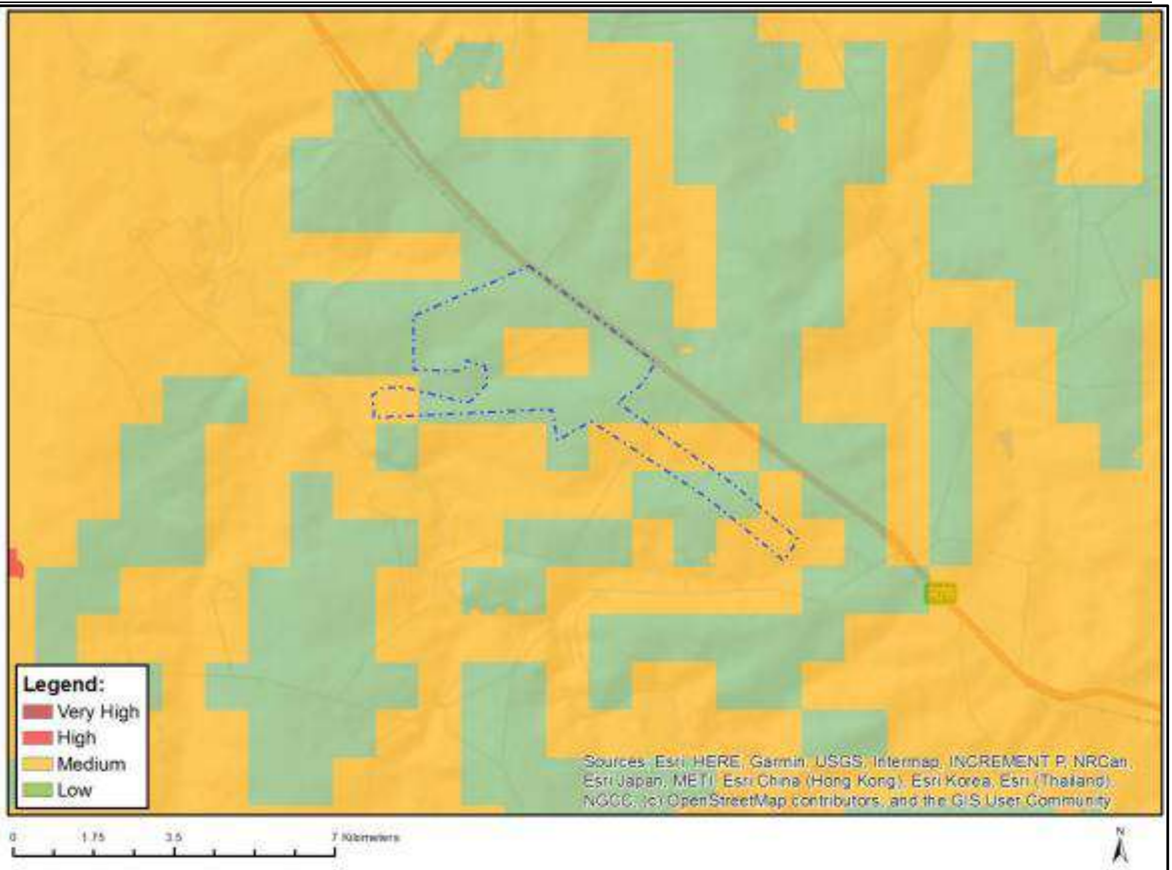
Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Ecological support area 1
Very High	Protected Areas Expansion Strategy
Very High	Serendipidie Private Nature Reserve

Figure 12: Biodiversity Sensitivity of the project area according to the Screening Report.

The completion of the terrestrial desktop and field studies disputes the 'Very High' sensitivity presented by the screening report. As discussed above (**Error! Reference source not found.**, Table 10, Figure 11), the project area is largely modified, it is not under negotiation for the Priority focus Area and there is already an existing OHL running through the Nature reserve and as such is assigned a sensitivity rating of 'Low'.

The screening report classified the animal theme sensitivity as 'medium' (Figure 13).



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Subject to confirmation
Medium	Mammalia-Hydrictis maculicollis

Figure 13: Animal Sensitivities theme according to the Screening tool.

Following the field survey findings, the animal species themes may be re-classified as having 'low' sensitivity. As discussed above (**Error! Reference source not found.**, Table 10, Figure 11) this is since there is limited suitable habitat available to support the regular occurrence of any faunal SCC within the project area.

The Screening toll classified the plant theme sensitivity as 'low' (Figure 14).

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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Figure 14: Plant theme sensitivity according to the Screening tool.

During the field surveys it was confirmed that the plant sensitivity is indeed 'low' (**Error! Reference source not found.**, Table 10, Figure 11).

7 PROPOSED IMPACT MANAGEMENT OUTCOMES

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr) for the project, which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines.

The focus of impact management outcomes is to reduce the significance of potential impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities within the CBA and ESA areas in the vicinity of the project area;
- Reduce the negative fragmentation effects of the development and enable the safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of floral and faunal species and communities (including any potential Species of Conservation Concern nearby).

The following mitigation measures are recommended to address potential impacts:

7.1.1 Vegetation and habitats

- Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. All activities must be restricted within the low/medium sensitivity areas. No further loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.
- Existing access routes, especially roads must be made use of
- All laydown, chemical toilets etc. should be restricted to medium/low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. All livestock must always be kept out of the project area, especially areas that have been recently revegetated.

- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.
- It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.
- Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any threatened/protected plants in order to avoid any damage or destruction of these specimens.
- Infrastructure, development areas and routes where protected plants cannot be avoided, these plants mainly being succulents should be removed from the soil and relocated/ re-planted in similar habitats where they should be able to resprout and flourish again.
- A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.
- Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.
- Restrict impact to development footprint only and limit disturbance in surrounding areas.
- Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled.
- Prior to commencement of construction, compile and implement a stormwater management plan including monitoring specifications.
- Monitor surfaces for erosion, repair and/or upgrade, where necessary.

- Prior to decommissioning commencing, compile a Rehabilitation Plan in compliance with the regulatory requirements at the time of decommissioning.

7.1.2 Fauna

- A qualified environmental control officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated. In situations where the threatened and protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species.
- Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.
- Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods or louvres to also be used to reduce light spill.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits (30km/h) must still be enforced to ensure that road killings and erosion is limited.
- The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments,
    - Signs must be put up to enforce this.
- No trapping, killing, or poisoning of any wildlife is to be allowed
    - Signs must be put up to enforce this;
- Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits (30km/h) must still be enforced to ensure that road killings and erosion is limited.
- All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken

- Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight;
    - Should the holes be left open overnight they must be covered temporarily to ensure no small fauna species fall in.
- Ensure that cables and connections are insulated successfully to reduce electrocution risk
- Any exposed parts must be covered (insulated) to reduce electrocution risk.
- Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna
- Use environmentally friendly cleaning and dust suppressant products
- Fencing mitigations:
    - Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed every 50 m along the fence (with a size of 30 x 20 cm), the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.

7.1.3 Alien Species

- Compilation of and implementation of an alien vegetation management plan.
- The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site.
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used.

7.1.4 Dust

- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces.
    - No non environmentally friendly suppressants may be used as this could result in pollution of water sources

7.1.5 Waste Management

- Waste management must be a priority and all waste must be collected and stored effectively
- Litter, spills, fuels, chemicals and human waste in and around the project area

- A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area
- The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility
- Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site.
- Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.

7.1.6 Environmental Awareness Training

The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility. All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of protected species, their identification, conservation status and importance, biology, habitat requirements and management requirements as within the Environmental Authorisation and EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the “no-go” to be avoided.

7.1.7 Erosion

- Speed limits must be put in place to reduce erosion.
  - Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds;
  - Signs must be put up to enforce this.
- Where possible, existing access routes and walking paths must be made use of.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds.
- A stormwater management plan must be compiled and implemented.

7.2 Summary of Monitoring recommendations

Specific monitoring recommendations should be provided in the Alien Invasive Management Plan, and the Rehabilitation Plan. The following are broad recommendations:

Alien Invasive Species: see Appendix E: Alien plant and Rehabilitation Plan

- Monitor for early detection, to find species when they first appear on site. This should be as per the frequency specified in the management plan and should be conducted by an experienced botanist. Early detection should provide a list of species and locations where they have been detected. Summer (vegetation maximum growth period) is usually the most appropriate time, but monitoring can be adaptable, depending on local conditions – this must be specified in the management plan.
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action.
- Monitor for the effect of management actions on non-target species and habitats.

Rehabilitated areas: see Appendix E: Alien plant and Rehabilitation Plan

- Rehabilitation Plan must be compiled by an approved ecologist prior to achieving COD and prior to the start of decommissioning.
- All management actions associated with rehabilitation must be recorded after each management action has taken place.
- All rehabilitated areas should be monitored to assess vegetation recovery. This should be for a minimum of three years after post-construction rehabilitation, but depends on the assessed trajectory of rehabilitation (whether it is following a favourable progression of vegetation establishment or not – this depends on the total vegetation cover present, and the proportion that consists of perennial growth of desired species). For each monitoring site, an equivalent comparative site in adjacent undisturbed vegetation should be similarly monitored. Monitoring data collection should include the following:
  - total vegetation cover and height, as well as for each major growth form;
  - species composition, including relative dominance;
  - soil stability and/or development of erosion features;
  - representative photographs should be taken at each monitoring period.
- Monitoring of rehabilitated areas should take place at the frequency and for the duration determined in the rehabilitation plan, or until vegetation stability has been achieved.

8 Conclusion

The area has experienced long-term and continuous disturbance, mostly due to the agricultural grazing practices and associated impacts. The project area is modified and as such is assigned a sensitivity rating of ‘Low’.

The screening report classified both the animal and plant theme sensitivity as ‘medium’ and ‘low’. Following the field survey findings, the plant species theme is confirmed as ‘Low’, but the animal theme may be re-classified as having ‘Low’ sensitivities. This is since there is limited suitable habitat available to support the regular occurrence of any faunal SCC within the project area.

Completion of the Terrestrial Biodiversity Assessment led to a dispute of ‘Very High’ classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool and to a dispute of the ‘medium’ classification for the animal theme sensitivity as allocated by the National Environmental Screening Tool. The project area has instead been assigned a ‘Low’ sensitivity, because of the extent of environmental disturbance that has taken place, and the fact that limited SCC were observed and are unlikely to frequently occur within the project area.

8.1 Specialist Statement

The development of the project area is likely to result in negligible negative impacts, especially considering the extent of ‘Low’ sensitivity areas confirmed. Therefore, the specialist is of the opinion that the development of the project area may be favourably considered for environmental authorisation, provided that the mitigation measures and recommendations presented above be adhered to.

Consider the following guidelines when interpreting SEI in the context of any proposed development or disturbance activities:

- Very Low: Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.
- Low: Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.

9 References

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10 Appendix A: Specialist Declaration

I, **Helena Elizabeth Human**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

______________________________ **10/05/2023**

Helena Elizabeth Human (Pr. Sci. Nat. 147031) **Date**

Terrestrial Biodiversity Specialist

11 Appendix B: Specialist CV

1 Personal Particulars

Profession:	Biodiversity Specialist
Date of Birth:	13 March 1987
Name of Firm:	Nitai Consulting
Name of Staff:	Elzet Human
Nationality:	RSA
Membership of Professional Societies	SACNASP (Pr. Sci. Nat. 147031)

2 Education:

M-Tech Nature Conservation, (Plant DNA Barcoding and phylogenetics), TUT, South Africa, 2021

B-Tech Nature Conservation, (Resource Management, Vegetation ecology and rehabilitation) TUT, South Africa, 2011

N. Dip Nature Conservation, TUT, South Africa, 2008

3 Employment Record:

2022 – Present Biodiversity Specialist, Nitai Consulting

Conduct Biodiversity Impact Assessments.

Conduct Plant Ecological Assessments.

Conduct Animal Ecological Assessments

Biodiversity monitoring programs; and,

GIS Mapping

2013 – 2022 Lecturer: Nature Management, Centurion academy

Lectured various subjects for undergraduate students in Nature Management:

Botany and Vegetation Ecology, Zoology, Animal Health, Conservation Development, Ecology, Game Ranch Management, Biostatistics, Research Methodology, Genetics, Soil Science

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

2009 – 2013 HOD Rangers Department, Zebula Gold Estate and Spa

Ecological Monitoring, Reserve Maintenance, Animal Husbandry, Neonatal care of Endangered carnivore species, Zoological display, and permit compliance

2008 – Conservation Student, Ann van Dyk Cheetah Research Centre

Neonatal Care of Carnivore species,

Veterinary assistance work – vaccine, diets, Endo scoping, pregnancy tests, health monitoring, quarantine care of species, emergency c-sections, bleeding procedures on vultures

Enclosure Maintenance

Tracking wild cheetahs

Rewilding cheetahs

Anatolian Shepard project assistance

4 SELECTED CONSULTANCIES

4.1 Ecological assessment for Victorius Game farm, Visgat, Ellisras, Limpopo

2018, Ecologist, Ecological condition assessment and game carrying capacity for game farm. Habitat evaluation and rehibition program for problem areas

4.2 Elephant impact study on Mabula Game Reserve, Bela-Bela, Limpopo,

2019, Ecologist, Ecological impact study on Private Nature reserve to see extent of elephant utilisation and impact. Woody species analysis – structure classification and net primary production. Elephant movement patterns and carrying capacity. Identification of vulnerable habitats and management program.

4.3 Faan Meintjies Municipal Nature Reserve, Matlosana, North West

2018-2022, Ecologist, Habitat assessments, game carrying capacities, ecological condition assessments, game counts and game recommendations, ecological rehabilitation programs, white rhino monitoring, anti-poaching programs, Environmental Education programs.

4.4 Kroonstad South Solar PV Facilities

2022, Biodiversity Specialist. Development of five Solar PV facilities near Kroonstad, Free State Province, South Africa, Assess and map all wetlands associated with the five solar PV facilities as well as perform aquatic biomonitoring of the Blomspruit.

Proposed solar photovoltaic (PV) (Kroonstad South) projects located south of Kroonstad, Free State Province.

4.5 CCUS 3D Seismic Survey & Drilling

2023, Biodiversity Specialist. Proposed 3D Seismic Survey within the Leandra area, Mpumalanga Province, South Africa Assess and map all biodiversity, plant and animal features within the footprint of the survey area.

4.6 Rustenburg Solar PV Facilities

2023, Biodiversity Specialist. Development of three Solar PV facilities near Rustenburg, North West Province, South Africa, Assess and map all biodiversity, plant and animal features associated with the three solar PV facilities.

4.7 Grootvlei Solar PV Facility

2023, Biodiversity Specialist. Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Assess and map all biodiversity, plant and animal features associated with the one solar PV facility.

4.8 Paulputs 400 kV Strengthening (Transmission Line Loop in Loop Out) Project

2023, Biodiversity Specialist. Proposed Paulputs 400kv Strengthening Project (Transmission Line Loop In Loop Out From Aries – Kokerboom Transmission Line), South Africa, Assess and map all biodiversity, plant and animal features within the power line footprint as well as perform biodiversity monitoring.

4.9 400kV Transmission and 132kV distribution power lines for the Apollo-Lepini-Mesong Project

2023, Biodiversity Specialist. Proposed development of a 400kV transmission and 132kV power lines for the Apollo-Lepini-Mesong Project, Gauteng Province, South Africa, undertake assessments and map all biodiversity, plant, and animal features along the proposed routes for the 400kV and 132kV power lines.

5 LANGUAGES:

English - excellent speaking, reading, and writing

Afrikaans – excellent speaking, reading and writing

12 Appendix C: List of Plant species found

Family	Taxon	Common name	Protection Status	Endemism	Invasive
Amaranthaceae	*Alternanthera pungens,*	Paper Thorn	LC	Not Indigenous, naturalised	
Amaranthaceae	*Gomphrena celosioides*	Batchelor's button	LC	Not Indigenous, naturalised	
Amaranthaceae	*Guilleminea densa,*	Small matweed	LC	Not Indigenous, naturalised	
Amaranthaceae	*Kyphocarpa angustifolia*	Silver Burrweed	LC	Indigenous	
Asparagaceae	*Asparagus laricinus*	Emperor's asparagus	LC	Indigenous	
Asteraceae	*Arctotis arctotoides,*	Botter blom	LC	Indigenous	
Asteraceae	*Felicia muricata*	Bloublommetjie	LC	Indigenous; Endemic	
Asteraceae	*Geigeria burkei,*	Vermeerbos	LC	Indigenous	
Asteraceae	*Helichrysum acutatum*	Sticky Everlasting	Protected FS	Indigenous	
Asteraceae	*Helichrysum nudifolium*	Hottentot's Tea	Protected FS	Indigenous	
Asteraceae	*Helichrysum rugulosum*	Wrinkly Everlasting	Protected FS	Indigenous	
Asteraceae	*Nidorella hottentotta,*	Grassland Vleiweed	LC	Indigenous	
Asteraceae	*Nidorella resedifolia*	Stinkkruid	LC	Indigenous	
Asteraceae	*Senecio inaequidens*	Canary Weed	LC	Indigenous	
Asteraceae	*Seriphium plumosa*	Bankrupt bush	LC	Indigenous	
Asteraceae	*Tagetes minuta*	Khaki weed	LC	Not indigenous; Naturalised; Invasive	
Caryophyllaceae	*Pollichia campestris*	Barley Sugar Bush	LC	Indigenous	

Cyperaceae	*Bolboschoenus glaucus,*	Glaucus tuber-bulrush	LC	Indigenous	
Cyperaceae	*Bulbostylis hispidula,*	Slender Sedge	LC	Indigenous	
Cyperaceae	*Cyperus congestus,*	Purple Umbrella Sedge	LC	Indigenous	
Cyperaceae	*Cyperus denudatus,*		LC	Indigenous	
Cyperaceae	*Cyperus fastigiatus,*		LC	Indigenous	
Cyperaceae	*Kyllinga alba*	Witbiesie	LC	Indigenous	
Cyperaceae	*Kyllinga erecta,*	Greater Kyllinga	LC	Indigenous	
Dipsacaceae	*Scabiosa columbaria*	Rice Flower	LC	Indigenous	
Fabaceae	*Vachelia robusta*	Ankle thorn	LC	Indigenous	
Geraniaceae	*Monsonia glauca*	Grey Dysentery-Herb	LC	Indigenous	
Juncaceae	*Juncus oxycarpus,*		LC	Indigenous	
Lamiaceae	*Ocimum americanum,*	Wild Basil	LC	Indigenous	
Malvaceae	*Hibiscus trionum,*	Venice Mallow	LC	Indigenous	
Phyllanthaceae	*Phyllanthus angolensis*		LC	Indigenous	
Poaceae	*Aristida canescens*	Pale Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. barbicollis,*	Spreading Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. congesta*	Tassle Three-Awn	LC	Indigenous	
Poaceae	*Brachiaria serrata,*	Velvet Signal Grass	LC	Indigenous	
Poaceae	*Chloris virgata*	Feather-top Chloris	LC	Indigenous	
Poaceae	*Cymbopogon caesius,*	Broad-leaved Turpentine Grass	LC	Indigenous	
Poaceae	*Cymbopogon pospischilii*	Bushveld turpentine Grass	LC	Indigenous	

Poaceae	*Cynodon dactylon,*	Couch Grass	LC	Indigenous	
Poaceae	*Eragrostis chloromelas,*	Blue Lovegrass	LC	Indigenous	
Poaceae	*Eragrostis curvula,*	Weeping Love Grass	LC	Indigenous	
Poaceae	*Eragrostis gummiflua*	Gum Grass	LC	Indigenous	
Poaceae	*Eragrostis obtusa*	Dew Grass	LC	Indigenous	
Poaceae	*Eragrostis superba,*	Saw tooth love Grass	LC	Indigenous	
Poaceae	*Hyparrhenia hirta*	Common Thatching grass	LC	Indigenous	
Poaceae	*Melinis repens,*	Natal Red Top	LC	Indigenous	
Poaceae	*Panicum coloratum,*	Bamboeskweek	LC	Indigenous	
Poaceae	*Panicum maximum,*	Guinea Grass	LC	Indigenous	
Poaceae	*Perotis patens.*	Cat's tail	LC	Indigenous	
Poaceae	*Setaria pumila*	Garden Bristle Grass	LC	Indigenous	
Poaceae	*Setaria sphacelate var torta*	Creeping Bristle Grass	LC	Indigenous	
Poaceae	*Sporobolus africanus.*	Rats tail dropseed	LC	Indigenous	
Poaceae	*Sporobolus ioclados*	Pan Dropseed	LC	Indigenous	
Poaceae	*Sporobolus pyramidalis,*	Vlei Grass	LC	Indigenous	
Poaceae	*Themeda triandra*	Red Grass	LC	Indigenous	
Poaceae	*Tragus berteronianus,*	Carrot Seed Grass	LC	Indigenous	
Poaceae	*Urochloa mossambicensis*	Bushveld Signal Grass	LC	Indigenous	
Rubiaceae	*Oldenlandia herbacea*	False Spurry	LC	Indigenous	

Rubiaceae	*Pygmaeothamnus zeyheri,*	Common Sand Apple	LC	Indigenous	
Solanaceae	*Solanum elaeagnifolium*	Silverleaf Nightshade	LC	Not Indigenous, Invasive	Nemba 1b
Solanaceae	*Solanum mauritianum*	Bugweed	LC	Not Indigenous, Invasive	Nemba 1b
Verbenaceae	*Verbena bonariensis*	Wild Verbena	LC	Not Indigenous, Invasive	Nemba 1b
Verbenaceae	*Verbena tenuisecta*		LC	Not indigenous; Naturalised	

13 Appendix D: List of Animals Potentially occurring on site.

Family	Scientific name	Common name	Red list category
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern (IUCN, 2016)
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)
Bufonidae	*Sclerophrys capensis*	Ranger's Toad	Least Concern (IUCN, 2016)
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern (IUCN, 2016)
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern (IUCN, 2013)
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern (IUCN 2020)
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Amietia fuscigula*	Cape Rana	Least Concern (IUCN, 2016)

Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	Least Concern (IUCN, 2016)
Pyxicephalidae	*Cacosternum boettgeri*	Boettger's caco	Least Concern (IUCN, 2016)
Pyxicephalidae	*Pyxicephalus adspersus*	African Bullfrog	Least Concern (IUCN, 2016)
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern (IUCN, 2016)
Pyxicephalidae	*Tomopterna cryptotis*	Common Sand Frog	Least Concern (IUCN, 2016)
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern (IUCN, 2016)
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern (IUCN, 2016)

Family	**Scientific name**	**Common name**	**Red list category**
Amphisbaenidae	*Monopeltis capensis*	Cape Worm Lizard	Least Concern (IUCN, 2017)
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (IUCN, 2017)
Cordylidae	*Smaug giganteus*	Giant Girdled Lizard	Vulnerable (IUCN, 2017)
Elapidae	*Elapsoidea sundevalli*	Sundevall's Garter Snake	Least Concern (IUCN, 2017)
Elapidae	*Naja nivea*	Cape Cobra	Least Concern (IUCN, 2017)
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (IUCN, 2017)
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (IUCN, 2017)

Lacertidae	*Nucras holubi*	Holub's Sandveld Lizard	Least Concern (IUCN, 2017)
Lacertidae	*Nucras intertexta*	Spotted Sandveld Lizard	Least Concern (IUCN, 2017)
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand Lizard	Least Concern (IUCN, 2017)
Lamprophiidae	*Lamprophis aurora*	Aurora House Snake	Least Concern (IUCN, 2017)
Lamprophiidae	*Lycophidion capense*	Cape Wolf Snake	Least Concern (IUCN, 2017)
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (IUCN, 2017)
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Least Concern (IUCN, 2017)
Psammophiidae	*Psammophis leightoni*	Cape Whip Snake	Least Concern (IUCN, 2017)
Psammophiidae	*Psammophylax rhombeatus*	Rhombic Skaapsteker	Least Concern (IUCN, 2017)
Scincidae	*Trachylepis punctatissima*	Montane Speckled Skink	Least Concern (IUCN, 2017)
Scincidae	*Trachylepis varia*	Common Variable Skink Complex	Least Concern (IUCN, 2017)
Testudinae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern (IUCN, 2017)
Varanidae	*Varanus albigularis*	Rock Monitor	Least Concern (IUCN, 2017)
Varanidae	*Varanus niloticus*	Water monitor	Least Concern (IUCN, 2017)

Chamaeleonidae	*Chamaeleo dilepis*	Flap necked chameleon	Least Concern (IUCN, 2017)

Family	**Scientific name**	**Common name**	**Red list category**
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern (IUCN, 2016)
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (IUCN, 2016)
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern (IUCN, 2016)
Bovidae	*Connochaetes taurinus taurinus*	Blue Wildebeest	Least Concern (IUCN, 2016)
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (IUCN, 2016)
Bovidae	*Kobus ellipsiprymnus*	Waterbuck	Least Concern (IUCN, 2016)
Bovidae	*Oryx gazella*	Gemsbok	Least Concern (IUCN, 2016)
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (IUCN, 2016)
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (IUCN, 2016)
Bovidae	*Syncerus caffer*	African Buffalo	Least Concern (IUCN, 2016)
Bovidae	*Tragelaphus s oryx*	Common Eland	Least Concern (IUCN, 2016)
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (IUCN, 2016)

Erinaceidae	*Atelerix frontalis*	South African hedgehog	Least Concern (IUCN, 2016)
Felidae	*Caracal caracal*	Caracal	Least Concern (IUCN, 2016)
Felidae	*Felis lybica*	African Wildcat	Least Concern (IUCN, 2016)
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern (IUCN, 2016)
Herpestidae	*Ichneumia albicauda*	White Tailed Mongoose	Least Concern (IUCN, 2016)
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (IUCN, 2016)
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern (IUCN, 2016)
Hyaenidae	*Parahyaena brunnea*	Brown Hyena	Near Threatened (IUCN, 2016)
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern (IUCN, 2016)
Hyracoidea	*Procavia capensis*	Rock dassie	Least Concern (IUCN, 2016)
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern (IUCN, 2016)
Leporidae	*Lepus victoriae*	African Savanna Hare	Least Concern (IUCN, 2016)
Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	Least Concern (IUCN, 2016)
Molossidae	*Tadarida aegyptiaca*	Egyptian free-tailed bat	Least Concern (IUCN, 2016)

Muridae	*Aethomys ineptus*	Tete Veld Aethomys	Least Concern (IUCN, 2016)
Muridae	*Gerbilliscus brantsii*	Highveld Gerbill	Least Concern (IUCN, 2016)
Muridae	*Gerbilliscus leucogaster*	Bushveld Gerbil	Least Concern (IUCN, 2016)
Muridae	*Mastomys coucha*	Southern African Mastomys	Least Concern (IUCN, 2016)
Muridae	*Micaelamys namaquensis*	Namakwa Rock rat	Least Concern (IUCN, 2016)
Muridae	*Mus musculus*	Southern African Pygmy Mouse	Least Concern (IUCN, 2016)
Muridae	*Otomys auratus*	Vlei Rat	Near Threatened (IUCN, 2016)
Muridae	*Rattus rattus*	Roof Rat	Least Concern (IUCN, 2016)
Muridae	*Rhabdomys dilectus*	Mesic four-striped grass rat	Least Concern (IUCN, 2016)
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern (IUCN, 2016)
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern (IUCN, 2016)
Mustelidae	*Poecilogale albinucha*	African Stripe weasel	Least Concern (IUCN, 2016)
Nesomyidae	*Malacothrix typica*	Gerbil Mouse	Least Concern (IUCN, 2016)
Nesomyidae	*Mystromys albicaudatus*	White-tailed rat	Vulnerable (IUCN, 2016)

Nesomyidae	*Saccostomus campestris*	Southern African Pouched Mouse	Least Concern (IUCN, 2016)
Nesomyidae	*Steatomys krebsii*	Krebs's Fat Mouse	Least Concern (IUCN, 2016)
Nesomyidae	*Steatomys pratensis*	Common African Fat Mouse	Least Concern (IUCN, 2016)
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	Least Concern (IUCN, 2016)
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (IUCN, 2016)
Pedetidae	*Pedetes capensis*	South African Spring Hare	Least Concern (IUCN, 2016)
Pteropodidae	*Eidolon helvum*	Straw-coloured fruit bat	Least Concern (IUCN, 2016)
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's horseshoe bat	Least Concern (IUCN, 2016)
Rhinolophidae	*Rhinolophus darlingi*	Darling's horseshoe bat	Least Concern (IUCN, 2016)
Sciuridae	*Xerus inauris*	Ground Squirrel	Least Concern (IUCN, 2016)
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	Least Concern (IUCN, 2016)
Soricidae	*Suncus varilla*	Lesser dwarf Shrew	Least Concern (IUCN, 2016)
Suidae	*Phacochoerus africanus*	Common Warthog	Least Concern (IUCN, 2016)
Vespertilionidae	*Myotis welwitschii*	Welwitch's Bat	Least Concern (IUCN, 2016)

Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (IUCN, 2016)
Vespertilionidae	*Neoromicia zuluensis*	Zulu Serotine	Least Concern (IUCN, 2016)
Vespertilionidae	*Scotophilus dinganii*	Yellow-bellied House Bat	Least Concern (IUCN, 2016)
Viverridae	*Genetta genetta*	Small Spotted Genet	Least Concern (IUCN, 2016)

14 Appendix E: Alien plant and Rehabilitation Plan

Invasive Alien Plant Management

- The purpose of the invasive alien management plan is:
  - to ensure that alien plants do not become established on site;
  - to ensure that alien plant species do not become dominant in all or parts of the landscape;
  - to implement a monitoring programme to detect the presence of alien plant species as well as to monitor the success of the alien management plant

- Control Guidelines
  - Prevention
    - A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas. Prevention could also include measures such as washing the working parts and wheels of earth-moving equipment prior to it being brought onto site, visual walk-through surveys every three months.
  - Early identification and eradication

  - Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are spotted an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

- Containment and control

  - If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control.

- Alien invasive control methods

There are various means of managing invasive alien plants. These include mechanical, chemical and biological control.

- Mechanical control

  - This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

- Chemical control

  - Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must have a basic understanding of how herbicides function. The use of inappropriate herbicides and the incorrect use of the appropriate herbicides are wasteful, expensive practices and often do more harm than good, especially when working close to watercourses. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem.

Contractors using herbicides are required to have a permit according to Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a particular group of plants, e.g. those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present. Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape and paint).

- Biological control
  - Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro- organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilized. All of these outcomes will help to reduce the spread of the species. To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

Vegetation Rehabilitation programme

- No till planting technique is recommended to reduce further disturbance of soil and promoting opportunistic long lived alien species in the seedbank to grow.
- Reseeding of herbaceous plants typical to the area
  - All plant species for use by the project must be reviewed and approved by qualified specialists prior to use on site.
  - Sodding may be done at any time of the year, but seeding must be done by sowing appropriate seed mixtures at the most suitable time under the guidance of a qualified specialist.
  - Planting should preferably be done during the rainy season.
  - Establish further specifications for sods, runners and hand seeding

15 APPENDIX F: SENSITIVITY ASSESSMENT FOR SENSITIVE SPECIES 15

A

TERRESTRIAL ANIMAL SPECIES SPECIALIST REPORT FOR SITES IDENTIFIED FOR SOLAR FARM DEVELOPMENTS: KROONSTAD DISTRICT FREE STATE PROVINCE

GIANT GIRDLED LIZARD (Smaug giganteus)

Commissioned by Nitai Consulting

147 Bram Fischer Drive, Ferndale, 2194, South Africa

PROF BRIAN REILLY

ECOFIN & BK REILLY CONSULTING ECOLOGISTS

APRIL 2023

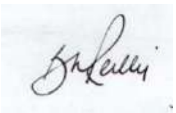
1 Contents

1.1 Table of Figures

1.2 List of Tables

1. DECLARATION OF INDEPENDENCE

I, Brian Kevin Reilly as sole proprietor of Ecofin Consulting Ecologists and BK Reilly Consulting Ecologist hereby confirm my independence as a specialist and declare that I have no interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Nitai Consulting or Nemai Consulting was appointed as environmental assessment practitioner 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 proposed new Kroonstad South Cluster Solar PV Facility near Kroonstad in the Free State Province. I further declare that I am confident in the results of the studies undertaken and conclusions drawn because of it – as is described in this report.



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Full Name: Brian Kevin Reilly

Title / Position: Ecologist

Qualification(s): BSc (Hons) Wildlife Management UP; MSc Wildlife management UP; PhD Nature Conservation US

Experience (years/ months): 40 years

Registration: SACNASP (400164/08)

Tel: +27 82 784 1895

Email: reillybk@tut.ac.za

2. TERMS OF REFERENCE

As part of the scoping process of the proposed developments the Endangered Wildlife Trust (EWT)[1] indicated that certain areas fall within the distribution of the Giant Girdled Lizard (*Smaug giganteus*) and requested a walk-through survey for presence or absence by a specialist specifically the farms Leeuspruit and Oslaagte in the proposed Kroonstad South development. Instruction was given by the primary consultants, Nitai Consulting[2] for walk-through surveys to be conducted on the Kroonstad South development sites.

These surveys were conducted on the 27th and 28th April 2023.

3. EXPERTISE OF SPECIALIST

Currently Extended Full Professor and retired Head of Department, Department of Nature Conservation, Tshwane University of Technology, Pretoria, Past Adjunct Associate Professor, Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota and Associated Full Professor and Fellow, Conservation Biology, University of Free State. He is a registered category A Professional Natural Scientist in the field of practice of ecology with the SA Council for Natural and Allied Scientific Professions and a member of the Royal Society of

[1] Plot 27 and 28 Austin Road, Glen Austin AH, Midrand, 1685 Gauteng, South Africa

[2] 147 Bram Fischer Drive, Ferndale, 2194, South Africa

SA. He has practiced as an ecologist since 1984 and has consulted widely on environmental, ecological and wildlife management issues both locally and internationally.

He specializes in wildlife management and monitoring, biological conservation, ecological decision support systems, corporate governance, sustainability, higher education and training and quantitative biology.

Widely published as a biologist with over a hundred authorships and co-authorships with 69 in scientific Journals. These include co-authoring the seven-volume *magnum opus "A critical evaluation of conservation and development in sub-Saharan Africa.* He has presented 73 papers and keynote addresses at scientific symposia including several workshops and keynote addresses.

He has specifically provided specialist inputs into impact studies for numerous developments since 1984 and these include developments by Anglo American, Anglo Platinum, Northam Platinum and Eskom in Limpopo, Mpumalanga, Northern Cape, Northwest, and KwaZulu Natal Provinces. Specific to these inputs he has undertaken the monitoring of girdled lizards for Eskom in Southeastern Mpumalanga.

4. AREA DESCRIPTION

The Kroonstad South Cluster (Leeuwspruit 1 and 2; Oslaagte 1, 2 and 3) is predominantly underlain mostly the Ecca group with parts underlain by the Ventersdorp Supergroup made up of andesite and gneiss and giving rise to more sandy soils with orthic A horizons. Vegetation is considered mostly Central Free State Grassland of Vaalvet Sandy Grassland from the southwest which is considered an endangered vegetation unit.

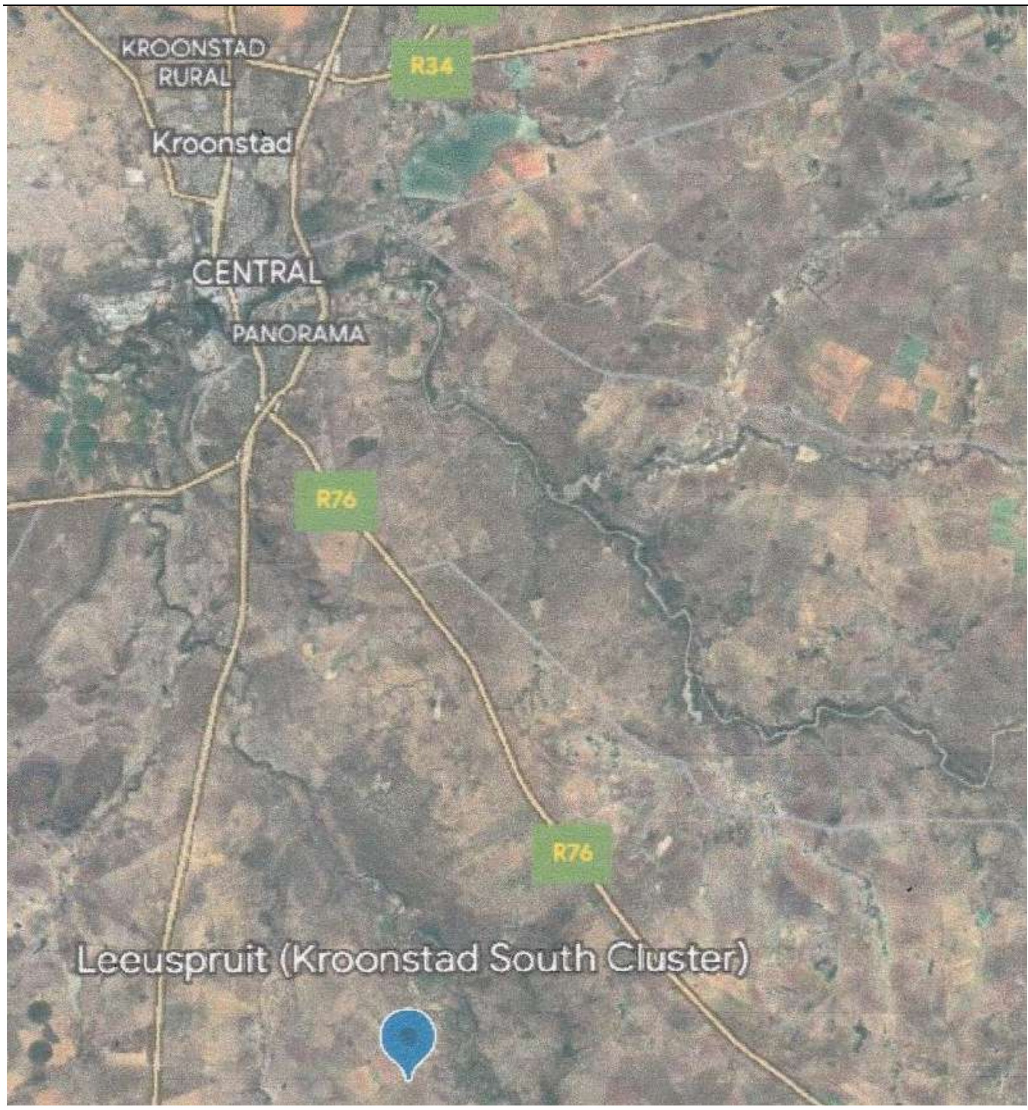

Figure 15: Google earth image showing orientation of the proposed development sites in relation to Kroonstad, northern Free State Province.

5. Methodology

Initial interaction with the primary consultant established the terms of reference and information was gleaned on their site surveys of the vegetation and general habitat. They provided comprehensive maps covering the sensitivity of the area and other basic information. A field walk-through survey was undertaken on the 27th and 28th April. This was preceded by vehicle reconnaissance to establish the boundaries of the sites, general familiarization, proposed development footprints and likely habitats. Likely habitats were then traversed on foot with the primary objective to identify burrows either abandoned or active. Special attention was given to more open sandy areas. An English pointer was also used to range the area in conjunction with the walk through as reptiles give off a strong scent. Informal conversations were held with landowners, managers and farm labourers on the potential occurrence and whereabouts of lizards and these areas used as focal points. Active interaction was undertaken with the EWT Highlands Grassland Field Officer Bradley Gibbons before and during the survey on their findings from recent field surveys. The terrestrial ecologist also completed a Specialist assessment during January and April and did not find evidence of lizard activity on Oslaagte 1,2, and 3.

6. THE GIANT GIRDLED LIZARD (*SMAUG GIGANTEUS*)

Smaug giganteus (formerly *Cordylus giganteus*) (fig 2) is the largest of the girdled lizard family and inhabits parts of the grasslands of Northwest Province, northern Free State and Mpumalanga (Bates *et al*. 2014). They are a large diurnal terrestrial lizard and are endemic to South Africa (Van Wyk 2000). They generally self-excavate burrows and occur in small groups (Gibbons 2014) at approximately four burrows per hectare (Jacobsen *et al*. 1990) in Mpumalanga and four to six burrows per hectare in the Free State (Stolz & Blom 1981). Jacobsen *et al*. (1990) found density to be relatively low at six and a half individuals per hectare whilst Van Wyk's (1992) seminal study in the northeastern Free State found between nine and 11 individuals per hectare. Females give birth to one or two live young after a long gestation period. They feed almost exclusively on invertebrates and are themselves preyed upon by various meso carnivores.

Figure 16: Smaug giganteus photographed on the 28th April east of the Kroonstad South Cluster

They are classified as vulnerable in the IUCN red list (Bates *et al*. 2014) and are under threat from the muthi trade, open cast mining and agriculture. Their threat status is directly aligned to the conservation status of South Africa’s grasslands and habitat fragmentation is probably the single greatest factor in isolating populations that cannot disperse and may ultimately sink below effective population size and ultimately disappear.

7. RESULTS

7.1. KROONSTAD SOUTH CLUSTER

7.1.1. LEEUSPRUIT 1

7.1.1.1 Sensitivity

The sensitivity map for the Leeuspruit 1 Alternative 1 PV is included as Figure 3 and is listed as moderately sensitive.

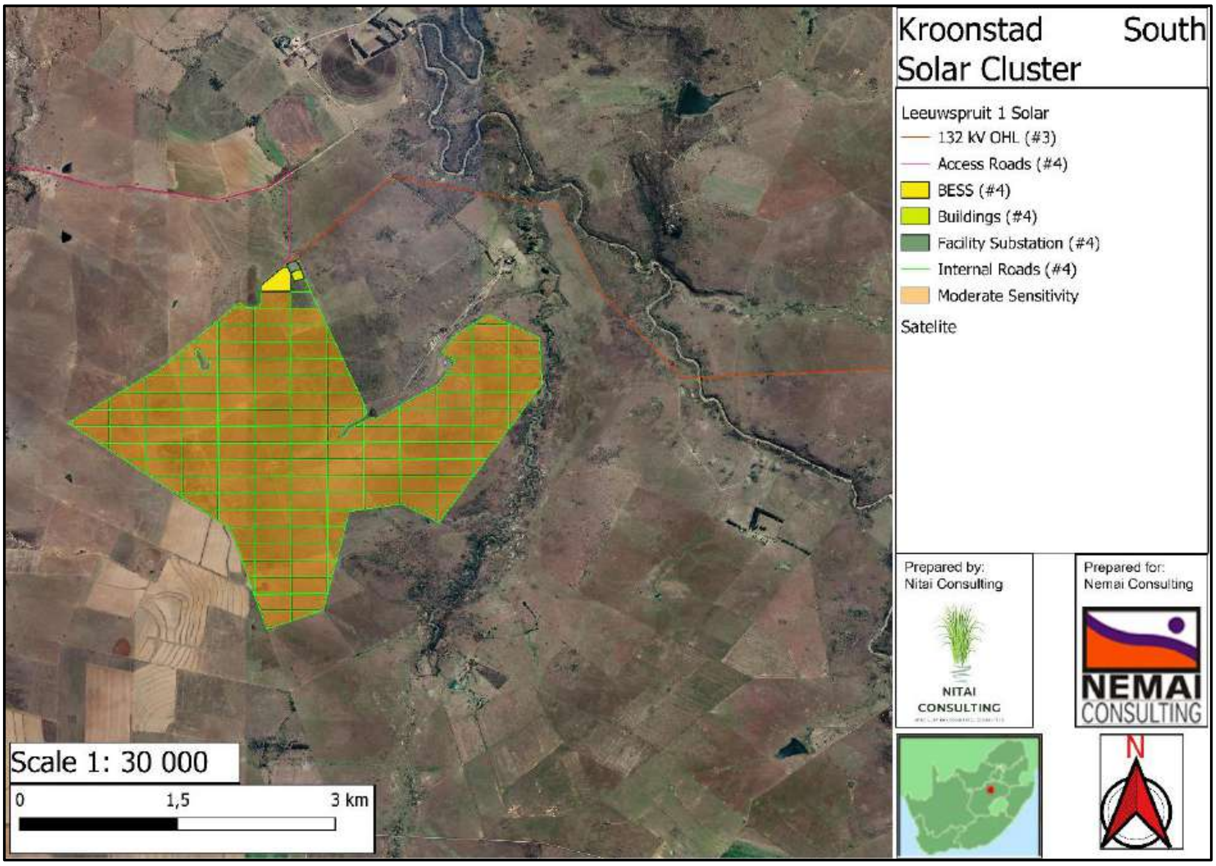

Figure 17: Proposed Leeuspruit 1 Alternative 1 PV development on the farms Leeuspruit 659 and Mooidraai 659.

This overlaps significantly with two ESA's on the farms Leeuspruit 659 and Mooidraai

653. These areas are highly sensitive as far as girdled lizards are concerned. The sandier soils (Avalon and Clovelly) of elements of the Vaalvet Sandy Grassland are suitable habitat in this area. A search centered on an area indicated by the landowner as historically having girdled lizards. These are upper landscapes to the southwest are grasslands used for grazing primarily and interspersed with drainage lines and streams. The latter dominated by shrubs and stunted trees are not suitable habitat. No evidence was found of burrows or lizards in the areas covered on the 28th of April although Gibbons (*pers comm*)[3] confirmed presence of lizards in this area and adjacent properties in the preceding week.

The Leeuwspruit 1 Alternative 2 sensitivity is regarded as low since all the sensitive areas are avoided an no suitable habitat for girdled lizards are found in Alternative 2 (Figure 4).

[3] Plot 27 and 28 Austin Road, Glen Austin AH, Midrand, 1685 Gauteng, South Africa

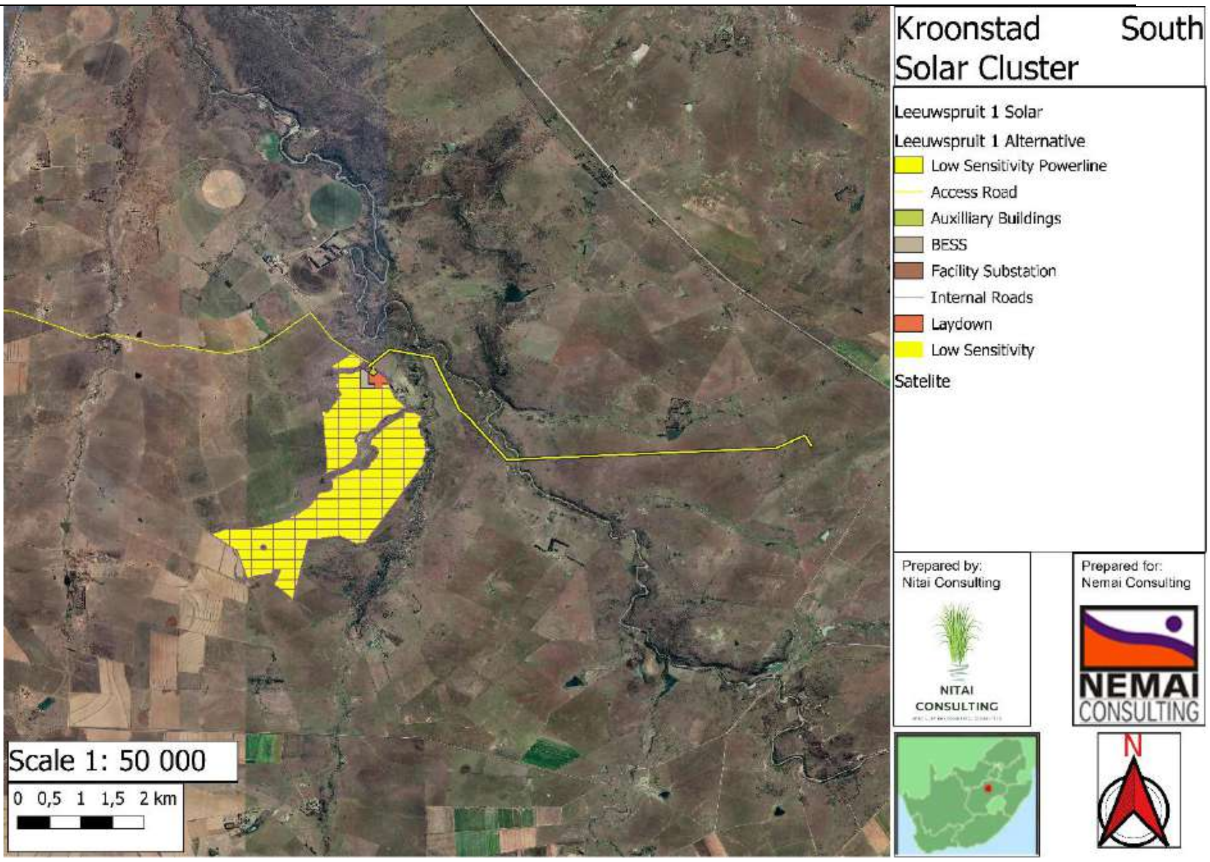

Figure 18: Proposed Leeuspruit 1 Alternative 2 PV development on the farms Mooidraai 659 and portion 1 of Vogelstruisfontein 311

7.1.1.2 Impacts

Current impacts include planted pastures and crop fields. Many historical grassland areas have differential anthropogenic histories of fire and overgrazing with some showing woody encroachment. This development could have a significant impact (Table 1) on remnant girdled lizard populations if Alternative 1 is chosen.

Table 11: Site Ecological Importance assessment summary of the habitat types delineated within the project area.

Habitat Type	Conservation Importance	Functional Integrity	Biodiversity importance	Receptor resilience	Site Ecological Importance

Disturbed Grassland	High	Medium	Medium	Medium	Medium

7.1.1.3 Mitigation

Leeuwspruit 1 Alternative 1

Development in this area would require significant mitigation and the following is suggested as possible scenarios:

- No development at all.
- Development with significant mitigation which would include avoidance of all areas where girdled lizards occur with significant buffer zones and corridors. This would have to be mapped and include an intensive ground survey and may include translocation of animals.
- Point 2 above with the addition of a significant offset at a ratio of 30:1 (lizard habitat) to be managed for biodiversity conservation with the girdled lizard as flagship species.
- Point 3 above with the creation of a conservation trust fund based on financial value of a proportion of power generated after a pre-determined profitability is achieved to create and manage offsets, conservation areas and corridors in perpetuity. This option will meet all requirements of Environmental, Social and Governance (ESG) standards and will serve as “non-financial profit” in sustainability reporting. Offsets to be owned by the trust.
- Points 2, 3 and 4 above can be included in any lease agreements with landowners.

Mitigation for alternative 2

Development of this proposed PV site would not require mitigation for girdled lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for girdled lizards.

7.1.2 LEEUWSPRUIT 2

7.1.2.1 Sensitivity

The sensitivity map of Leeuwspruit 2 Alternative 1 PV is displayed as figure 5. The sensitivity map of Leeuwspruit 2 Alternative 2 PV is displayed in figure 6.

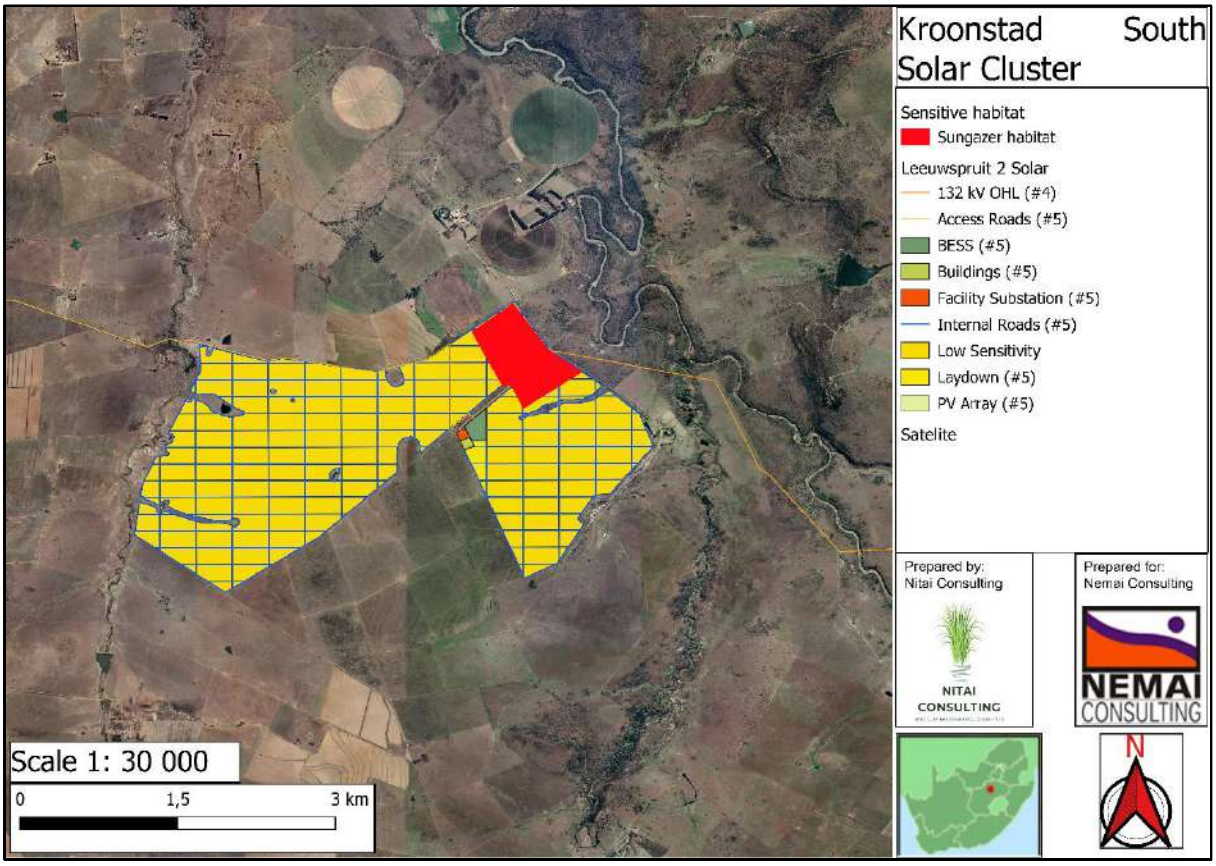

Figure 19: Proposed Leeuspruit 2 Alternative 1 PV development.

This overlaps significantly with two ESA's on the farms Leeuspruit 659 and Mooidraai 653. These areas are highly sensitive as far as girdled lizards are concerned. The sandier soils (Avalon and Clovelly) of the Vaalvet Sandy Grassland are the more suitable habitat in this area. Search centered on an area indicated by the landowner as historically having girdled lizards. These upper landscapes to the southwest are grasslands used for grazing primarily and interspersed with drainage lines and streams. The latter dominated by shrubs and stunted trees are not suitable habitat. No evidence was found of burrows or lizards in the areas covered on the 28th of April although Gibbons (*pers comm*)[4] confirmed presence of lizards in this area and adjacent properties in the preceding week.

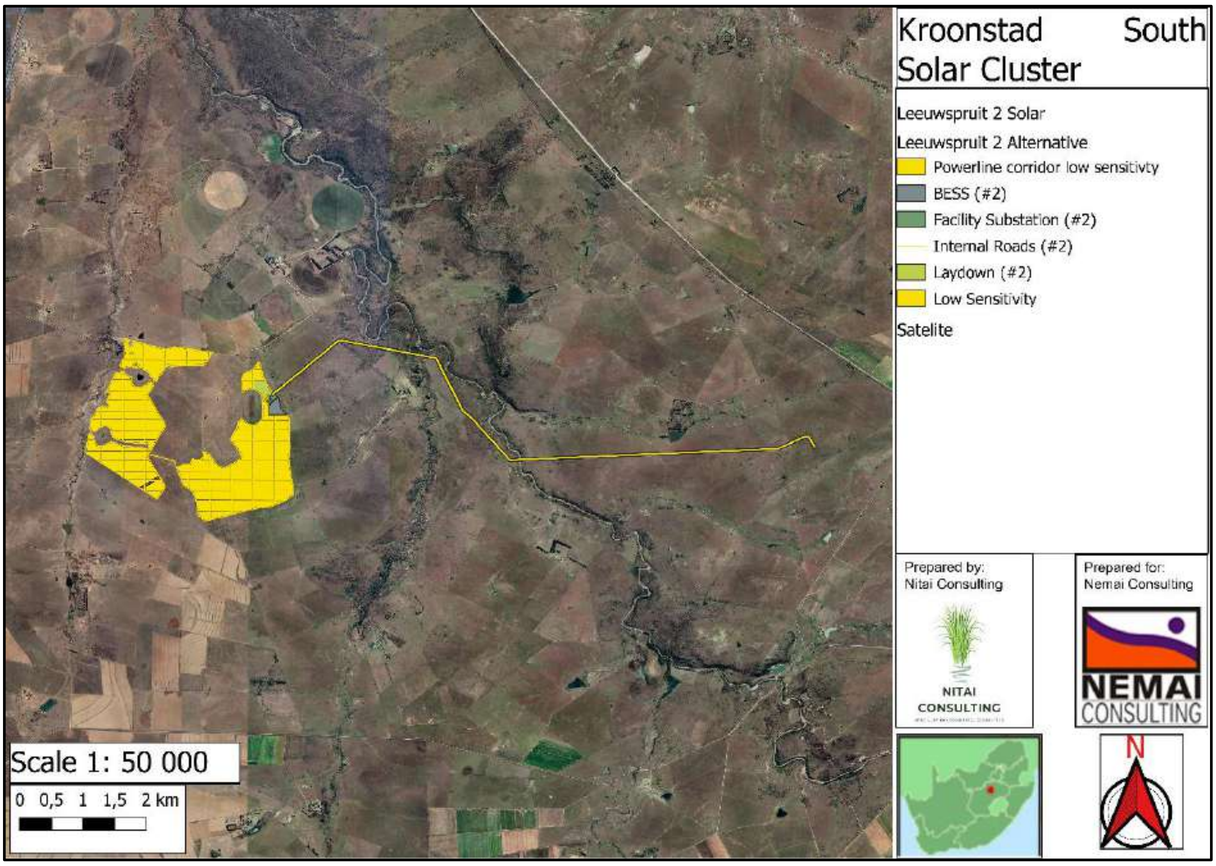

Figure 20: Proposed Leeuspruit 2 Alternative 2 PV development.

Alternative 2 of the project avoids all sensitive areas for girdled lizard habitat and as such has a low sensitivity. This is the preferred alternative for the project.

7.1.2.2 Impacts

Leeuwspruit 2 Alternative 1

The areas are currently impacted by mixed agriculture with planted fields and pastures.

[4] Plot 27 and 28 Austin Road, Glen Austin AH, Midrand, 1685 Gauteng, South Africa

Pastures have been heavily grazed with lack of fire and each camp exhibits individual unique anthropogenic derived histories. This development could have a significant impact on girdled lizard populations (Table 2).

Table 12: Site Ecological Importance assessment summary of the habitat types delineated within the project area for Alternative 1.

Habitat Type	**Conservation Importance**	**Functional Integrity**	**Biodiversity importance**	**Receptor resilience**	**Site Ecological Importance**
Historical habitat (remnants)	High	High	High	Medium	High
Degraded Grassland	Low	Medium	Low	Medium	Low
Woodland	Low	Medium	Low	Medium	Low

7.1.2.3 Mitigation for alternative 1

Development in this area would require significant mitigation and the following is suggested as possible scenarios:

1. No development at all.
2. Development with significant mitigation which would include avoidance of all areas where girdled lizards occur with significant buffer zones and corridors. This would have to be mapped and include an intensive ground survey and may include translocation of animals.
3. Point 2 above with the addition of a significant offset at a ratio of 30:1 (lizard habitat) to be managed for biodiversity conservation with the girdled lizard as flagship species.
4. Point 3 above with the creation of a conservation trust fund based on financial

value of a proportion of power generated after a pre-determined profitability is achieved to create and manage offsets, conservation areas and corridors in perpetuity. This option will meet all requirements of Environmental, Social and Governance (ESG) standards and will serve as "non-financial profit" in sustainability reporting. Offsets to be owned by the trust.

5. Points 2, 3 and 4 above can be included in any lease agreements with landowners.

Figure 21: Site on the farm Leeuspruit, Kroonstad South Cluster indicated by the landowner as a historical site of occurrence of girdled lizards.

7.1.2.4 Mitigation for alternative 2

Development of this proposed PV site would not require mitigation for girdled lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for girdled lizards.

7.1.3 OSLAAGTE 1

7.1.3.1 Sensitivity

This is displayed in Figure 10 and is considered low. This proposed development covers most of the eastern portion of the property Oslaagte 2564.

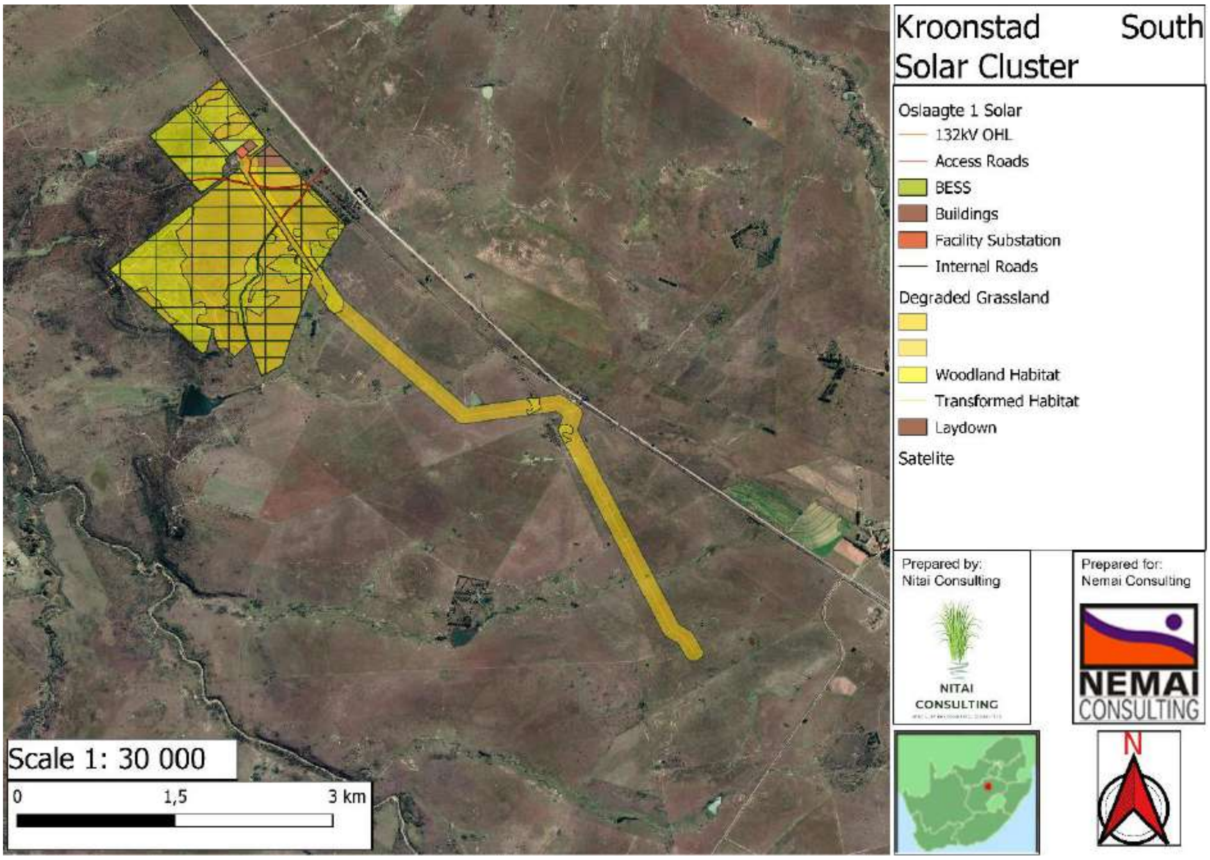

Figure 22: Sensitive areas of the proposed Oslaagte 1 PV.

7.1.3.2 Impacts

Current impacts arise mostly from various stages of over grazing by domestic stock and as the eastern floodplain of the Vals river lower landscapes are dominated by shrubs *Asparagus laricinus*, *Searsia pyroides* and stunted *Vachelia karoo.* There are also several intersecting drainage lines. Soils are generally unsuitable for girdled lizards.

7.1.3.3 Mitigation

Development of this proposed PV site would not require mitigation for girdled lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for girdled lizards.

7.1.4 OSLAAGTE 2

7.1.4.1 Sensitivity

Sensitivity is low and displayed in figure 9 and covers the property Oslaagte 2564.

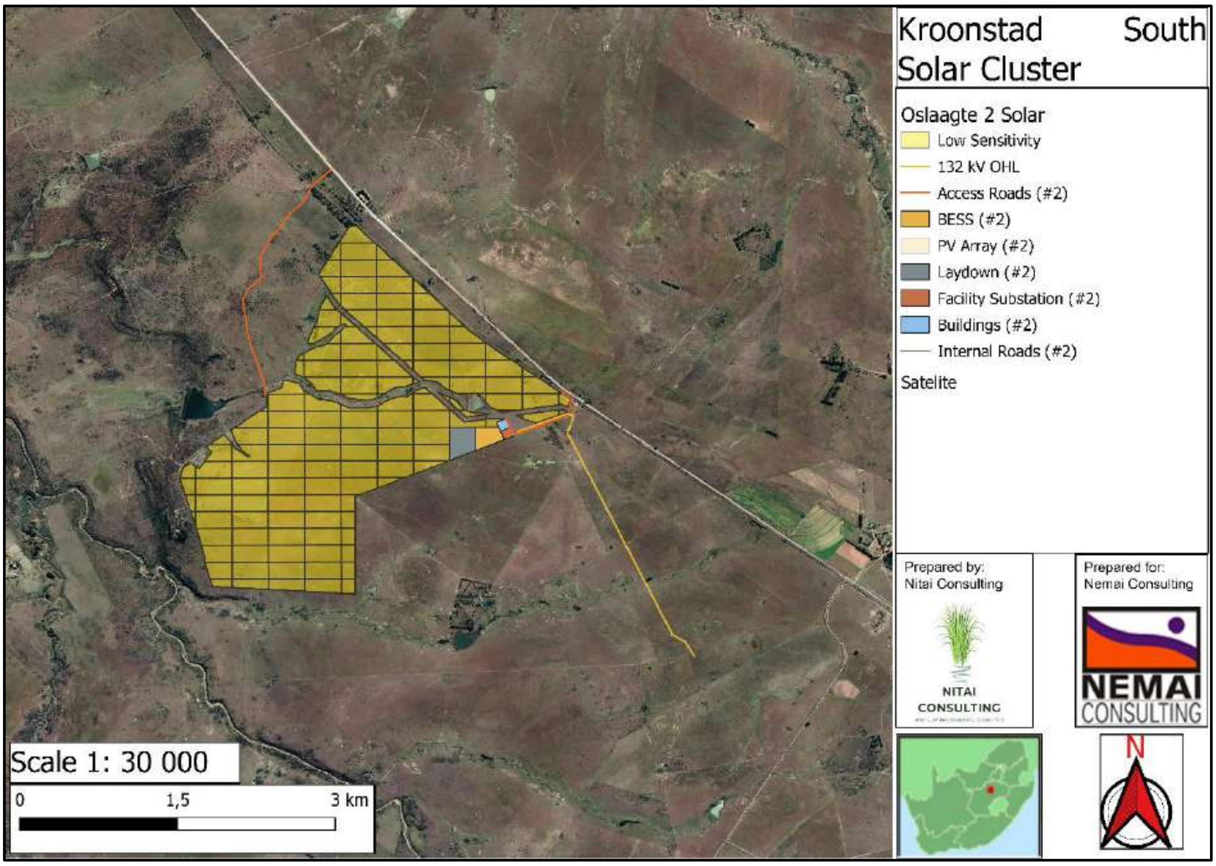

Figure 23: Sensitive areas in the proposed Oslaagte 2 PV development.

7.1.4.2 Impacts

Current impacts include planted pastures and crop fields. Many historical grassland areas have differential anthropogenic histories of fire and overgrazing with some showing woody encroachment. No active or inactive burrows were found in the field survey and this development is likely to have minor impact on any girdled lizards that may be present.

7.1.4.3 Mitigation

Development of this proposed PV site would not require mitigation for girdled lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for girdled lizards.

7.1.5 OSLAAGTE 3 AND GRID CONNECTION

7.1.5.1 Sensitivity

Sensitivity is low and displayed in figure 10 and covers the properties Oslaagte 2564, Welbedacht 1913, Zonderweg 1699, Fraaiuitzicht 576, Damspruit 1584 and Klein Geluk 2088.

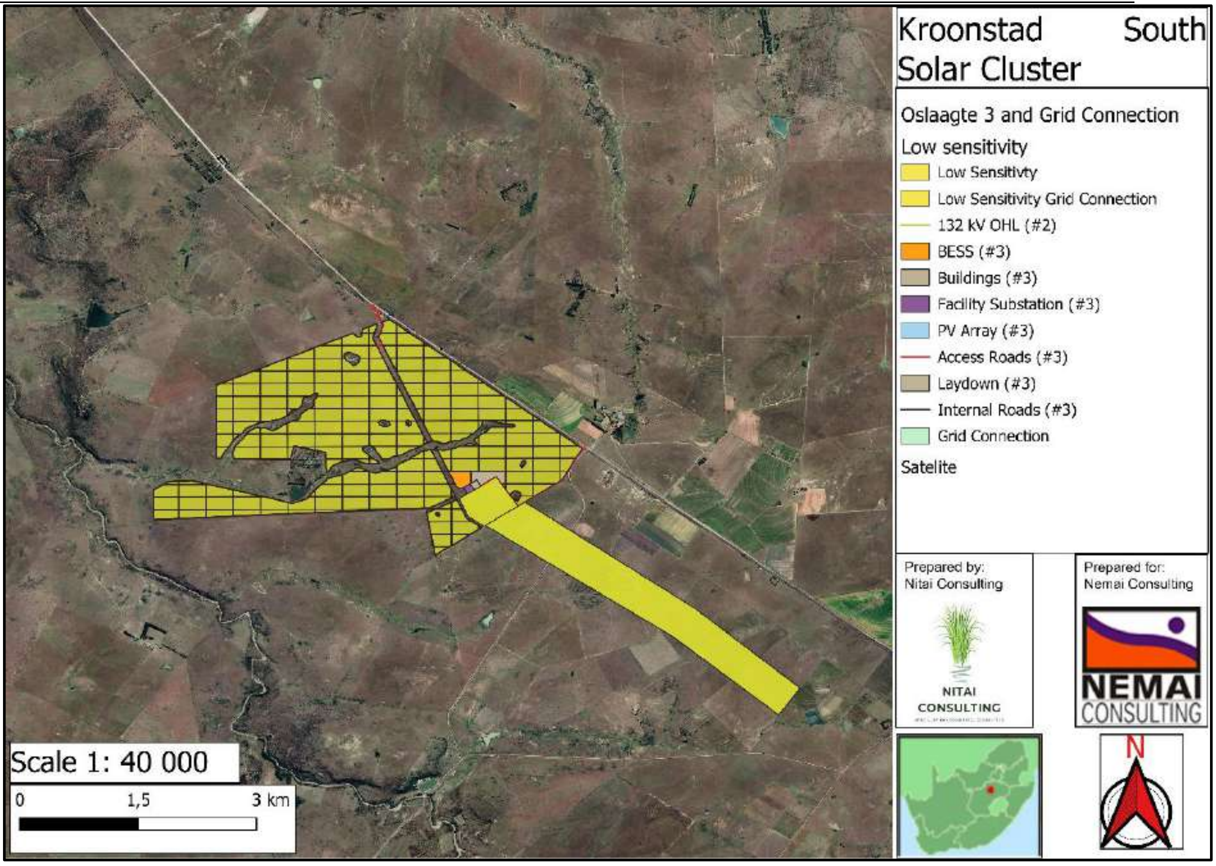

Figure 24: Sensitivity of properties envisaged in the Oslaagte 3 and grid connection.

7.1.5.2 Impacts

Current impacts include planted pastures and crop fields. Many historical grassland areas have differential anthropogenic histories of fire and overgrazing with some showing woody encroachment. No active or inactive burrows were found in the field survey and this development is likely to have minor impact on any girdled lizards that may be present.

7.1.5.3 Mitigation

Development of this proposed PV site would not require mitigation for girdled lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for girdled lizards.

8 SUMMARY AND CONCLUSION

Presence of girdled lizards could not be confirmed in this walk-through survey of the Kroonstad South Clusters. Historical evidence (previous 10 years)[5] and confirmation by the EWT survey of April 2023 does confirm their presence in the surrounding areas of the Kroonstad South Cluster.

The impacts for girdled lizards on Leeuwspruit 2 (Alternative 1) would be very high since this is suitable habitat for the species in which to occur and moderate for Leeuwspruit 1 (Alternative 1) since there is suboptimal habitat remaining in the sandy grassland areas. With consideration of Alternative option 2 for both sites the sensitivity is low since all sensitive areas and features have been avoided. The impact for the three Oslaagte sites is low since the habitat is degraded and overgrazed including incompatible soil types for girdled lizard burrows.

In areas of low sensitivity, no mitigation is required but for areas of moderate and high sensitivity the area should be totally avoided, or extensive mitigation measures are required in terms of substantial offsets, relocation of individuals the creation of corridors and buffer areas.

This survey was limited in terms of time during the optimal survey season and an intensive survey of both the Leeuwspruit Alternative 1 project footprints are recommended in the hot wet season of 2023 and 2024 immediately post good rains to accurately map their occurrence if development in Alternative 1 chosen. Their presence

[5] Landowner confirmed the presence of this species on his property in the past.

was confirmed by landowners approximately 4 kms east of the Kroonstad South Cluster at the time of the survey. These sites have been communicated to the EWT team but remain confidential.

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APPENDIX E3: Avifaunal Baseline and Impact Assessment

Avifauna Assessment for the proposed Oslaagte 3 Photovoltaic (PV) Facility

Kroonstad, Free State Province

April 2023

CLIENT

NEMAI CONSULTING

Prepared by:

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake an avifauna assessment for the proposed Kroonstad South Solar Photovoltaic (PV) cluster project (Figure 1-1 and Figure 1-2). The proposed cluster of Solar PV projects are located in the Free State Province, approximately 15 to 20 km south east of Kroonstad within the Moqhaka Local Municipality. A Regime 2 avifauna assessment was completed for this project, with surveys undertaken from 19th to the 23rd of December 2022 and from the 6th to 10th of March 2023. The field work component for these projects was conducted for the cluster, however the information in this report pertains only to Oslaagte Solar 3 (Figure 1-3).

The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). The National Web based Environmental Screening Tool has characterised the terrestrial theme sensitivity of the PAOI as "Very High" and the animal theme sensitivity as "Medium".

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Project Information

The details of the proposed Solar PV Projects are presented in Table 1-1 as per Nemai (2022).

Table 1-1 Details of the proposed Solar PV Projects

No	Applicant	MW output	Properties affected
1	Oslaagte Solar 1 Pty Ltd	Up to 240MW	Farm Oslaagte 2564, approximately 16,5 km south east of Kroonstad. The proposed Oslaagte Solar 1 will cover up to approximately 334 ha.
2	Oslaagte Solar 2 Pty Ltd	Up to 460MW	Farm Oslaagte 2564, approximately 17,5 km south east of Kroonstad. The proposed Oslaagte Solar 2 will cover up to approximately 600 ha.
3	Oslaagte Solar 3 Pty Ltd	Up to 480MW	Farm Oslaagte 2564, approximately 20 km south east of Kroonstad. The proposed Oslaagte Solar 3 will cover up to approximately 810 ha.
4	Leeuwspruit Solar 1 Pty Ltd	Up to 320MW	Farm Mooidraai 953, Portion 1 of the Farm Vogelstruis-Fontein 311 and the Farm Leeuwspruit 659, approximately 19 km south of Kroonstad. The proposed Leeuwspruit Solar 1 will cover up to approximately 490 ha.
5	Leeuwspruit Solar 2 Pty Ltd	Up to 300MW	Farm Mooidraai 953, the Farm Wolvekop 314 and the Farm Leeuwspruit 659, approximately 18 km south of Kroonstad. The proposed Leeuwspruit Solar 2 will cover up to approximately 450 ha.

Integrated Grid Connection

6		Farm Oslaagte 2564, , Farm Welbedatch 1913, Farm Zonderweg 1699, Farm Fraaiuitzicht 576, Farm Damspruit 1584 and the Farm Klein Geluk 2088.	A new 132/400 kV Main Transmission Substation (MTS). 400 kV powerlines (LILO) between the new proposed MTS and the existing Eskom 400 kV powerlines

The proposed Solar PV facilities include the following infrastructure:

- PV modules and mounting structures which will consist of either Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems;
- Inverters and transformers;
- Battery Energy Storage System (BESS) area;
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance;

Facility grid connection infrastructure, including:

- 33kV cabling between the project components and the facility substation;
- A 132kV facility substation;
- 33kV or 132kV cabling or powerline between the facility substation and the proposed Main Transmission Substation or the Kroonstad Switching Station;

Temporary construction laydown area;

- Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown);
- Internal roads will be up to 6 m wide, to allow access to the Solar PV modules for operations and maintenance activities.

Main access road is up to 8 m wide:

- For Oslaagte Solar 1, Oslaagte Solar 2 and Oslaagte Solar 3, the access road planned off the R76;
- For Leeuwspruit Solar 1 and Leeuwspruit Solar 2, the access road is off the N1.

The proposed Solar PV Projects have a design life of a minimum of 25 years. The extension of the life of the plant will be considered when assessing the plant's economic viability to remain operational after its end of life.

The proposed integrated grid connection infrastructure will include the following:

- A 132/400 kV Main Transmission Substation (MTS) with an extent of up to 600 m x 600 m.
- 400 kV powerlines (LILO) between the new proposed MTS and the existing Eskom 400 kV powerlines.

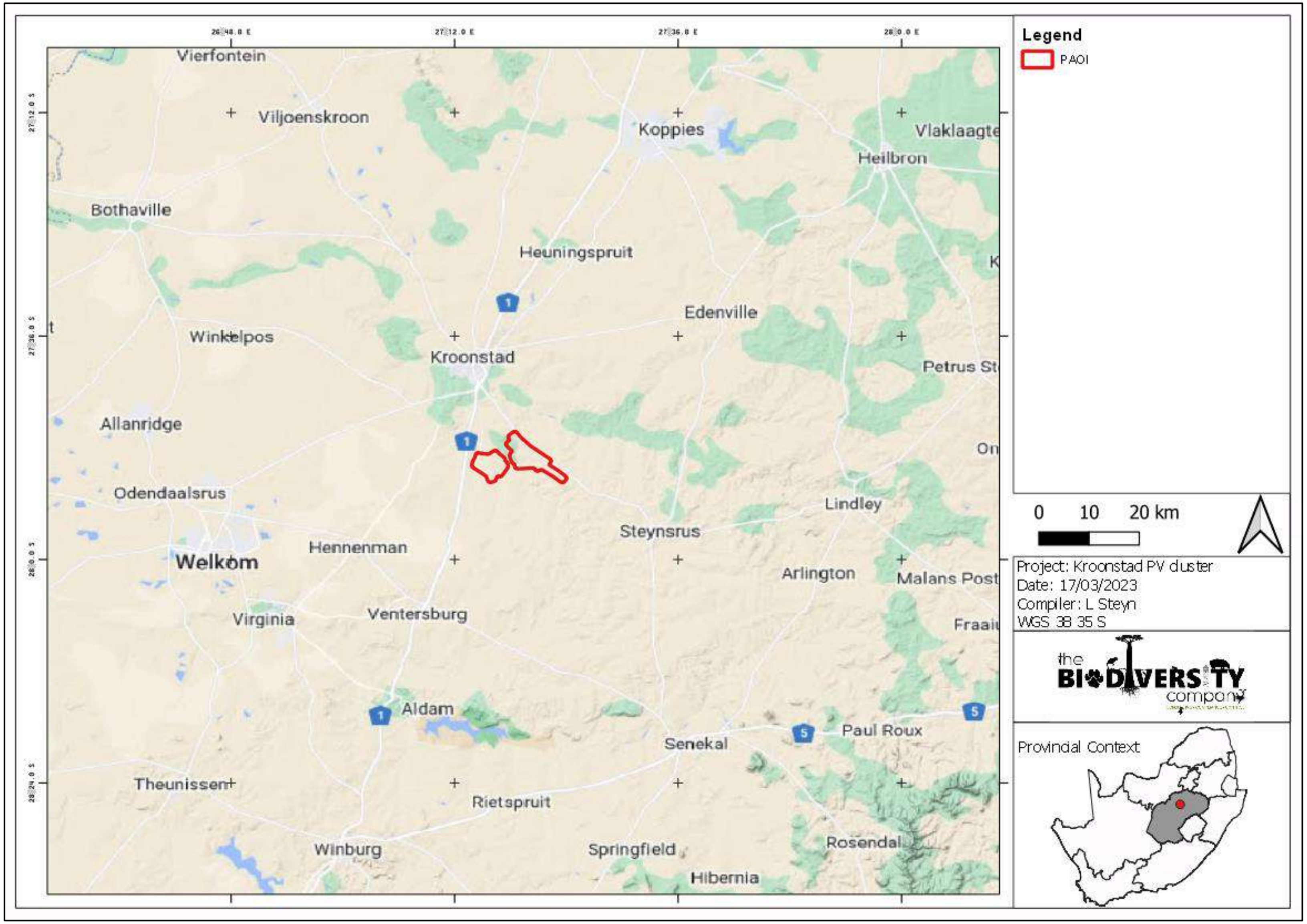


Figure 1-1 Proposed location of the cluster PAOI in relation to the nearby towns

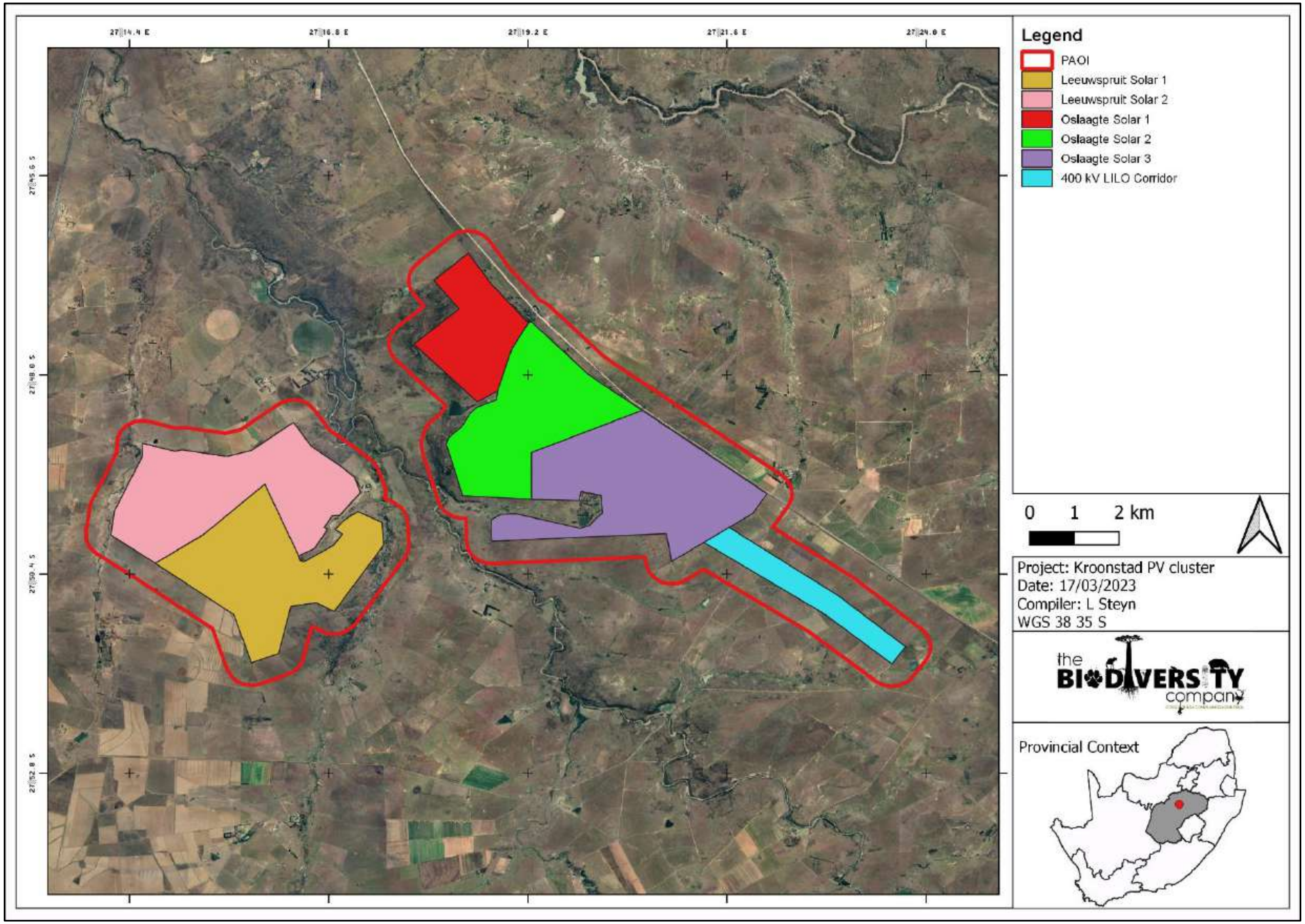


Figure 1-2 The cluster PAOI and the various solar projects associated with the project

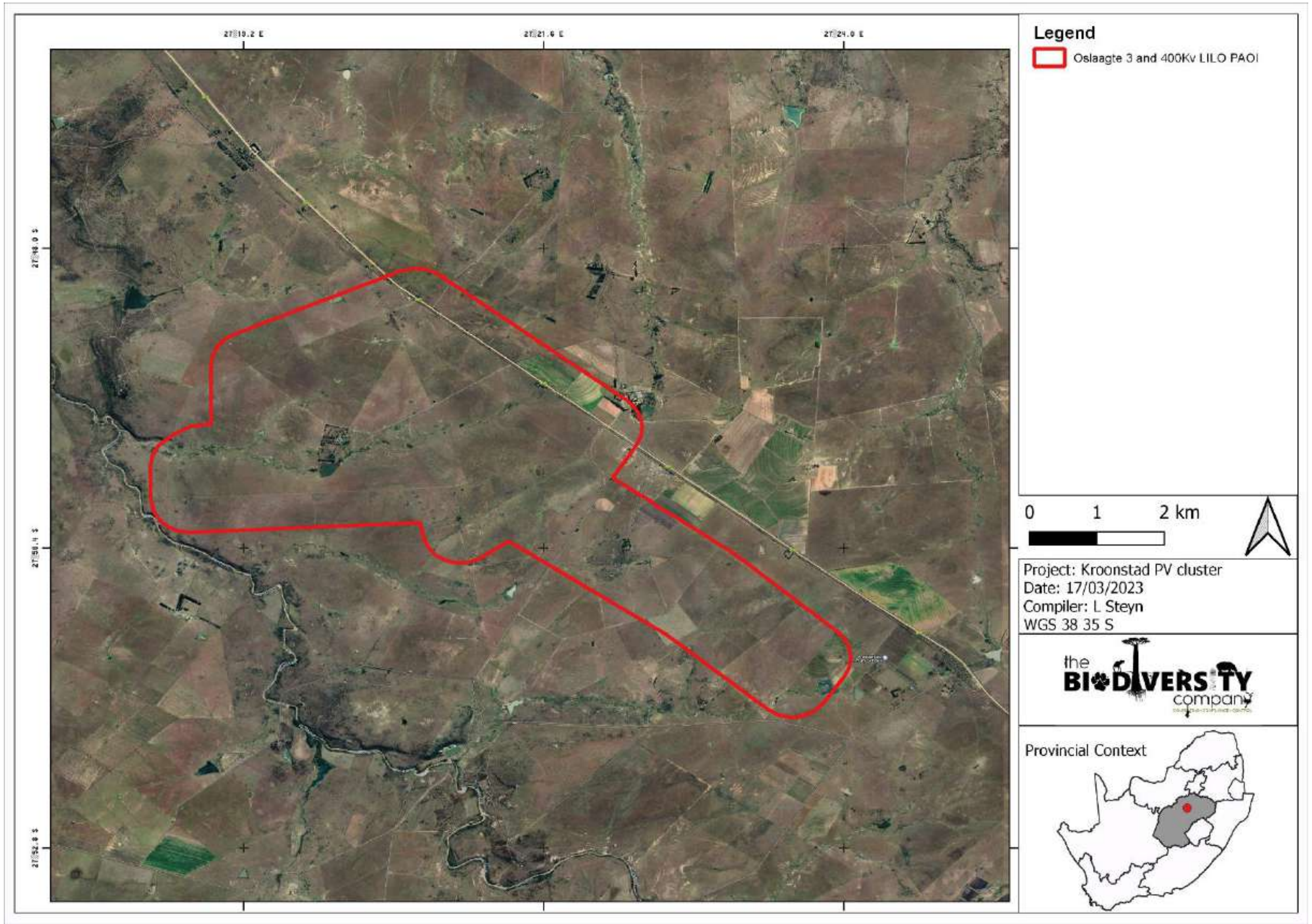


Figure 1-3 The Oslaagte Solar 3 PAOI

1.3 Specialist Details

Report Name	**Avifauna Assessment for the proposed Oslaagte 3 Photovoltaic (PV) Facility**	
Reference	**Kroonstad South PV**	
Submitted to	NEMAI CONSULTING	
Field Work	**Ernest Porter**	
	Ernest has gained birding experience in the Northern Cape, North West, Mpumalanga, Limpopo, KwaZulu Natal, Free State, Western Cape and also Gauteng. He is a qualified FGASA NQF2 Field Guide and a committee member of Black Eagle Project Roodekrans and The Botanical Society of South Africa (Bankenveld Branch).	
Report Writer	**Lindi Steyn**	
	Dr Lindi Steyn has completed her PhD in Biodiversity and Conservation from the University of Johannesburg. Lindi is a terrestrial ecologist with a special interest in ornithology. She has completed numerous studies ranging from Basic Assessments to Environmental Impact Assessments following IFC standards.	
Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

1.4 Scope of Work

The assessment was achieved according to the above-mentioned legislation and the best-practice guidelines and principles for Avifaunal Impact Assessments within the context of PVs as outlined by BirdLife South Africa (2017).

The scope of the avifaunal assessment included the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the PAOI and surrounding landscape;
- Desktop assessment to compile an expected species list and possible avifauna Species of Conservation Concern (SCC) that potentially occur within the PAOI;
- Description of the baseline avifauna species and Functional Feeding Guild (FFG) composition assemblage within the PAOI;
- Delineate site sensitivity or sensitivities i.e., the Site Ecological Importance (SEI) within the context of the avifauna species assemblage of the PAOI;
- Identify the manner that the proposed development impacts the avifauna community and evaluate the level of risk of these potential impacts; and
- Provide mitigation measures to prevent or reduce the possible impacts.

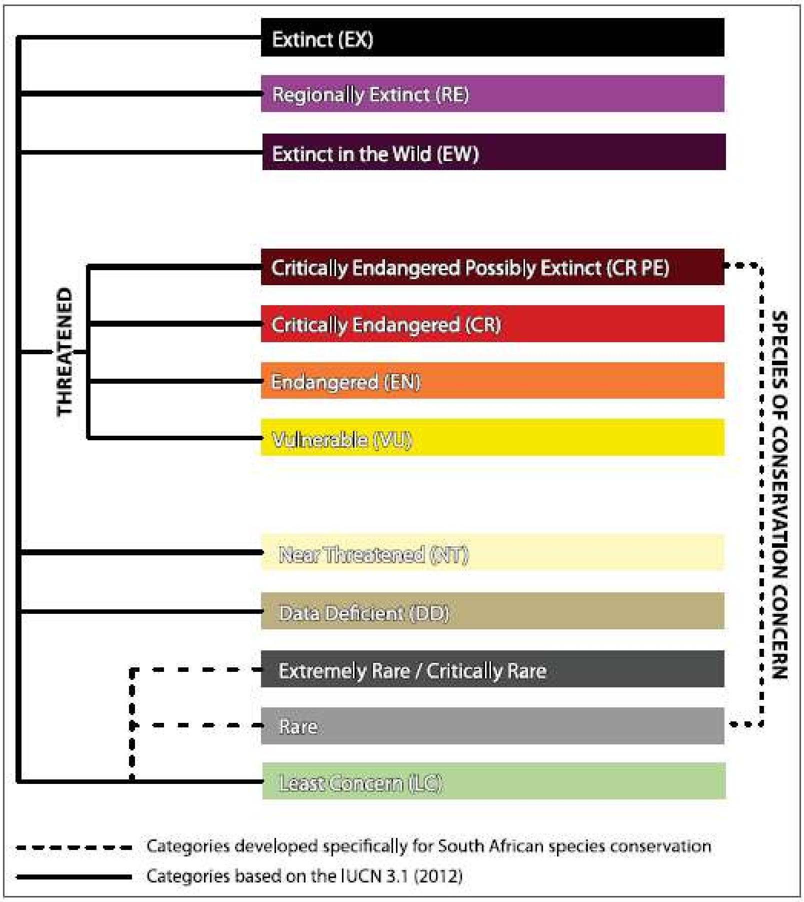


Figure 1-4 The different categories of Species of Conservation Concern modified from the IUCN's extinction risk categories. Source: SANBI (2020).

2 Key Legislative Requirements

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

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

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	Boputhatswana Nature Conservation Act 3 of 1973
	Free State Nature Conservation Ordinance 8 of 1969

3 Methods

3.1 Desktop Assessment

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

3.1.1 Desktop Avifaunal Assessment

The avifaunal desktop assessment comprised of the following, compiling an expected species list:

- Avifauna list, generated from the SABAP2 dataset by looking at pentads 740_2705; 2740_2710; 2740_2715; 2745_2705; 2745_2710; 2745_2715; 2750_2710; 2750_2715; 2735_2710; 2815_2705; 2815_2710.

3.1.2 Ecologically Important Landscape Features

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

- National Biodiversity Assessment 2018 (Skowno *et al*, 2019) (NBA) - The purpose of the NBA is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species, and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
  - *Ecosystem Threat Status* – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
  - *Ecosystem Protection Level* – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The SAPAD Database contains spatial data pertinent to the conservation of South African biodiversity. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
- National Protected Areas Expansion Strategy (NPAES) (SANBI, 2016) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Conservation/Biodiversity Sector Plan:

  A Free State Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

  - Critical Biodiversity Area 1;
  - Critical Biodiversity Area 2;
  - Ecological Support Area 1;
  - Ecological Support Area 2;
  - Other Natural Area;
  - Protected Area; and
  - Degraded.

- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2017) – IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and

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

3.1.3 Field Survey

Two field surveys were undertaken during the 19th to the 23rd of December 2022 and from the 6th to 10th of March 2023. Sampling consisted of standardized point counts as well as random diurnal incidental surveys. Standardised point counts (Buckland *et al*, 1993) were conducted to gather data on the species composition and relative abundance of species within the broad habitat types identified. The standardized point count technique was utilised as it was demonstrated to outperform line routes (Cumming & Henry, 2019). Each point count was run over a 10 min period. The horizontal detection limit was set at 150m. At each point the observer would document the date, start time, and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not be detected during the rigid point count protocol, diurnal and nocturnal incidental searches were conducted. This involved the opportunistic sampling of species between point count periods, random meandering and road cruising. Effort was made to cover all the different habitat types within the limits of time and access (Figure 3-1).

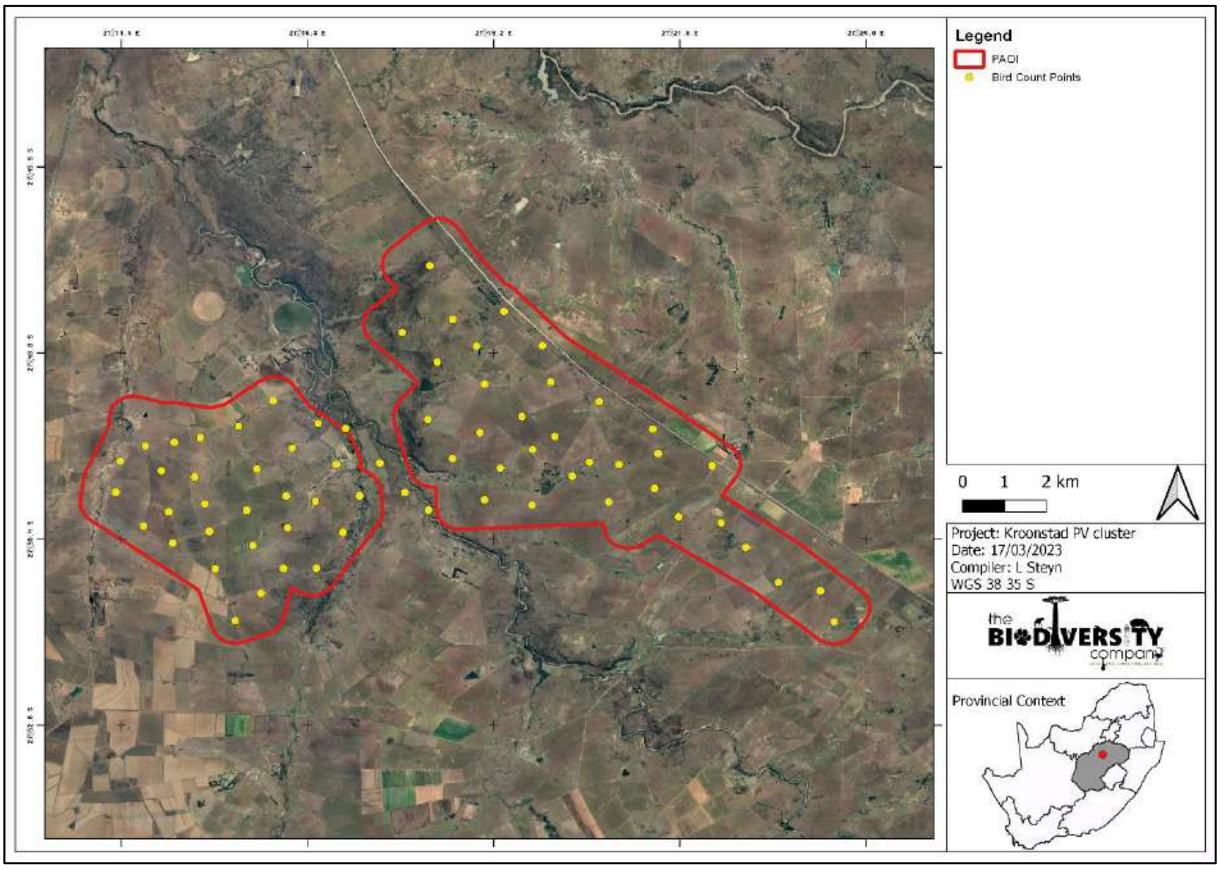


Figure 3-1 Map illustrating the field survey area and locations of standardised point counts for the proposed Solar PV PAOI

3.1.4 Data Analysis

The analyses described below only used the data collected from the standardised point counts. See Appendix A for the point count raw data.

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to distinguish similarities / differences in the species composition between the two identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix. The data was subject to fourth root transformation to downscale the contribution of very abundant species while upscaling the influence of less abundant species. However, the effect was negligible and ultimately the raw data proved more informative. Thirdly, raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. The Shannon Diversity Index (H') was the metric used to estimate diversity. Lastly, present, and potentially occurring species were assigned to 13 major trophic guilds loosely based on the classification system developed by González-Salazar *et al.* (2014). Species were first classified by their dominant diet (carnivore, herbivore, granivore, frugivore, nectarivore, omnivore), then by the medium upon / within which they most frequently forage (ground, water, foliage, air) and lastly by their activity period (nocturnal or diurnal).

3.1.5 Site Ecological Importance (SEI)

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

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

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 3-1 and Table 3-2, respectively.

Table 3-1 Summary of Conservation Importance (CI) criteria

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

Table 3-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

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

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

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

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 3-4.

Table 3-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.

Resilience	Fulfilling Criteria
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 3-5.

Table 3-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI)

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

Interpretation of the SEI in the context of the proposed development activities is provided in Table 3-6.

Table 3-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

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

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

3.2 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the assessment;

- Fieldwork was undertaken for the cluster, whereas reporting has made consideration for the separate Solar PV projects;
- No nocturnal assessments were conducted due to safety risks.

4 Results & Discussion

4.1 Desktop Assessment

4.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 4-1.

Table 4-1 Summary of relevance of the proposed project to ecologically important landscape features.

Desktop Information Considered	Description	Section
Ecosystem Threat Status	Overlaps with a Least Concern Ecosystem.	4.1.1.1
Ecosystem Protection Level	Overlaps with a Poorly Protected Ecosystem.	4.1.1.2
Protected Areas	The PAOI overlap with the Seredipendie Private Nature Reserve	4.1.1.4
National Protected Areas Expansion Strategy	The PAOI overlap with a priority focus area and a protected area	4.1.1.5
Critical Biodiversity Area	The PAOI overlaps with ESA1, ESA2, Other and Degraded classified areas	4.1.1.3
Important Bird and Biodiversity Areas	The PAOI is located 39 km from the Willem Pretorius Game Reserve IBA.	4.1.1.6
REDZ	The PAOI is 58 km from the Klerksdorp Renewable Energy Development Zone.	-
Powerline Corridor	The PAOI does not overlap with any Powerline Corridors.	-
South African Inventory of Inland Aquatic Ecosystems	The PAOI overlaps borders on a CR river.	4.1.1.7
National Freshwater Priority Area	The PAOI overlaps with numerous unclassified wetlands and an unclassified river.	4.1.1.8
Coordinated Avifaunal Road Count	The PAOI is 2.8 km from the closest CAR route	4.1.1.9
Coordinated Waterbird Count	The PAOI is 55 km from the Toronto Pan, Flamingo Pan, St Helena Mine Dam CWAC	4.1.1.10

4.1.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed PAOI overlaps with a LC ecosystem (Figure 4-1).

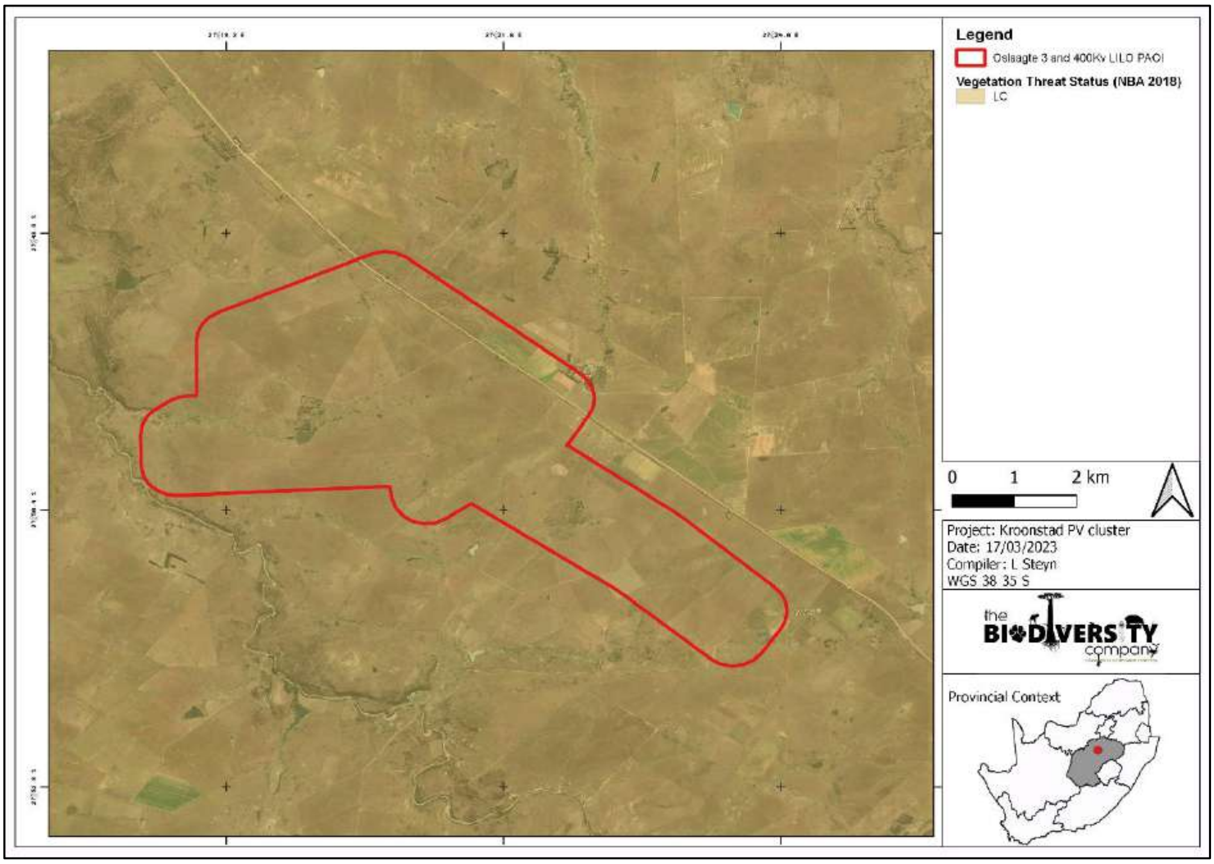


Figure 4-1 Map illustrating the ecosystem threat status associated with the PAOI

4.1.1.2 Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed PAOI overlaps with a PP ecosystem (Figure 4-2).

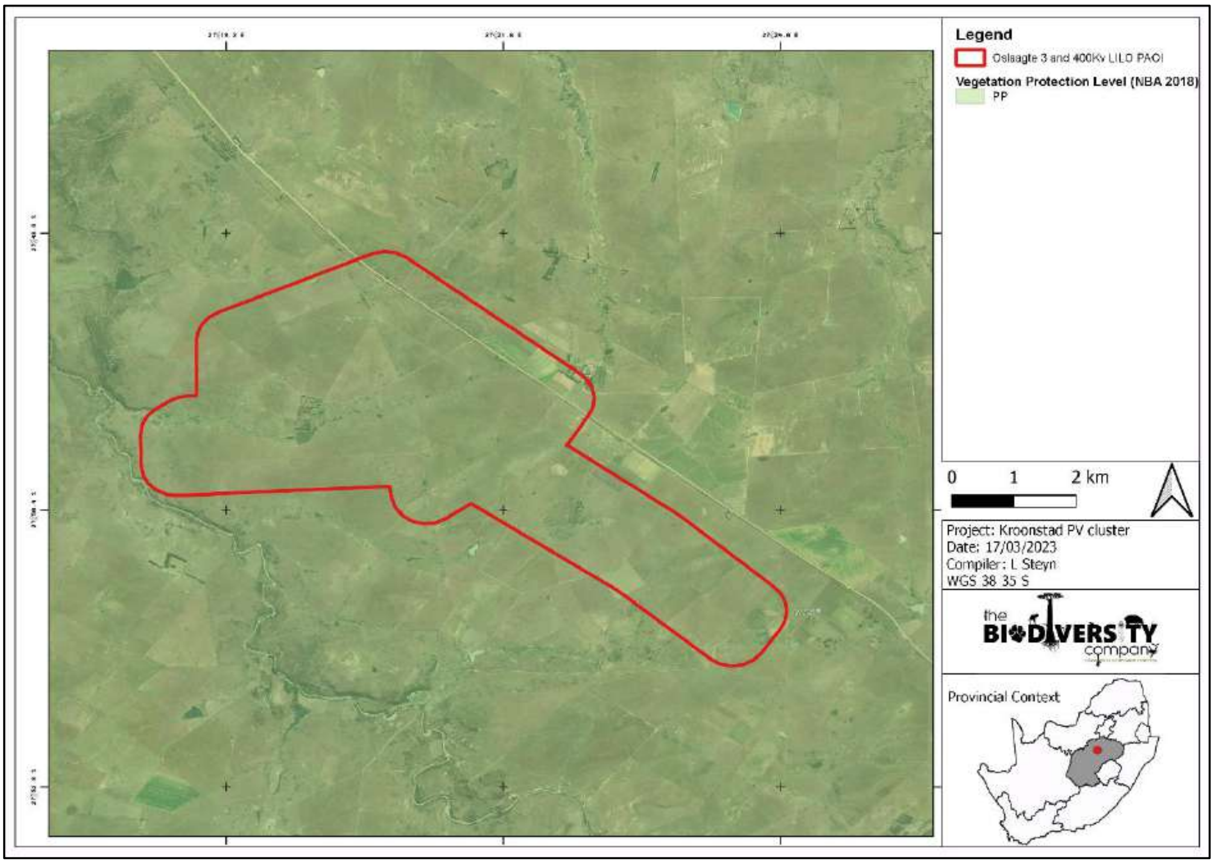


Figure 4-2 Map illustrating the ecosystem protection level associated with the PAOI

4.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

A Free State Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1;
- Critical Biodiversity Area 2;
- Ecological Support Area 1;
- Ecological Support Area 2;
- Other Natural Area;
- Protected Area; and
- Degraded.

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI, 2017).

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

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

Degraded areas are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations) (SANBI, 2017).

According to the Free State Terrestrial CBA Plan, the proposed PAOI is situated in an area which is regarded as ESA1, ESA2, Other and Degraded (Figure 4-3).

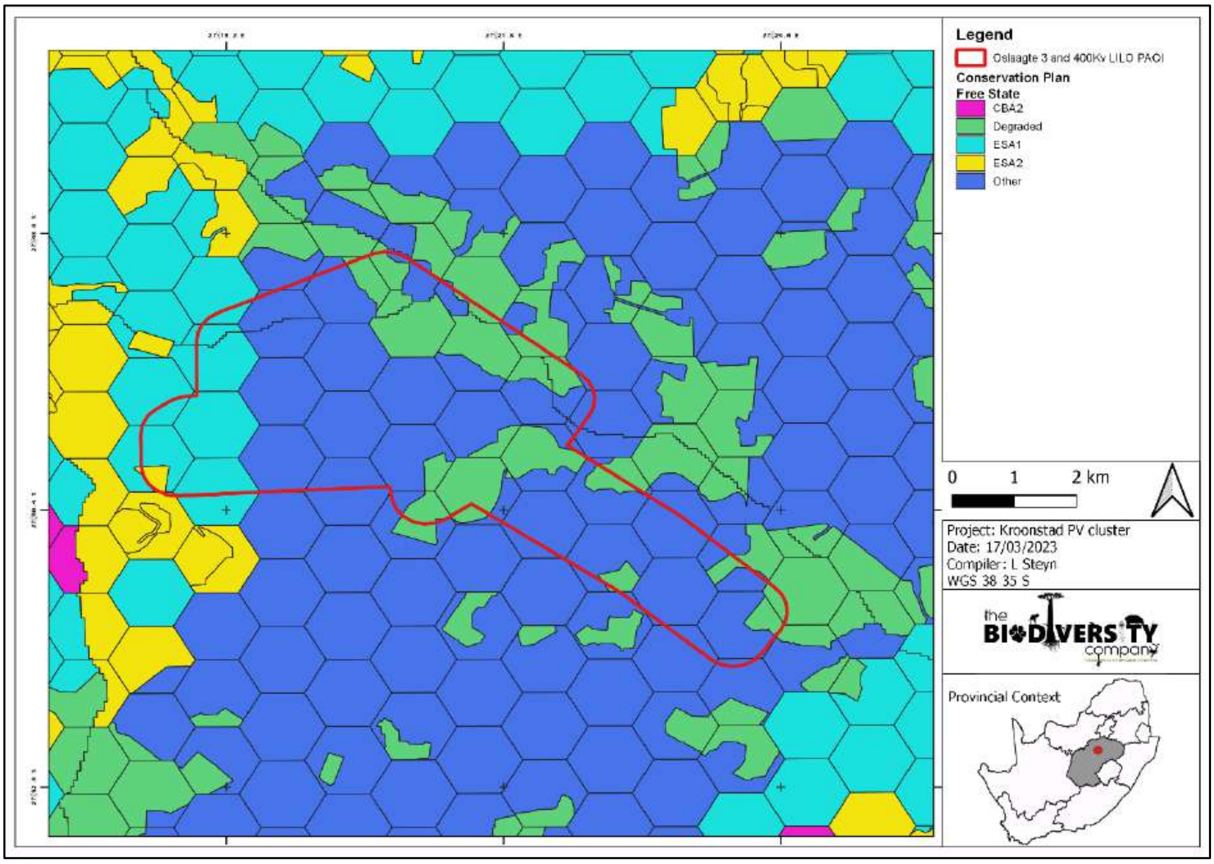


Figure 4-3 Map illustrating the locations of CBAs in the PAOI

4.1.1.4 Protected areas

According to the protected area spatial datasets from SAPAD (2022) and SACAD (2022), the PAOI overlap with the Seredipendie Private Nature Reserve (Figure 4-4).

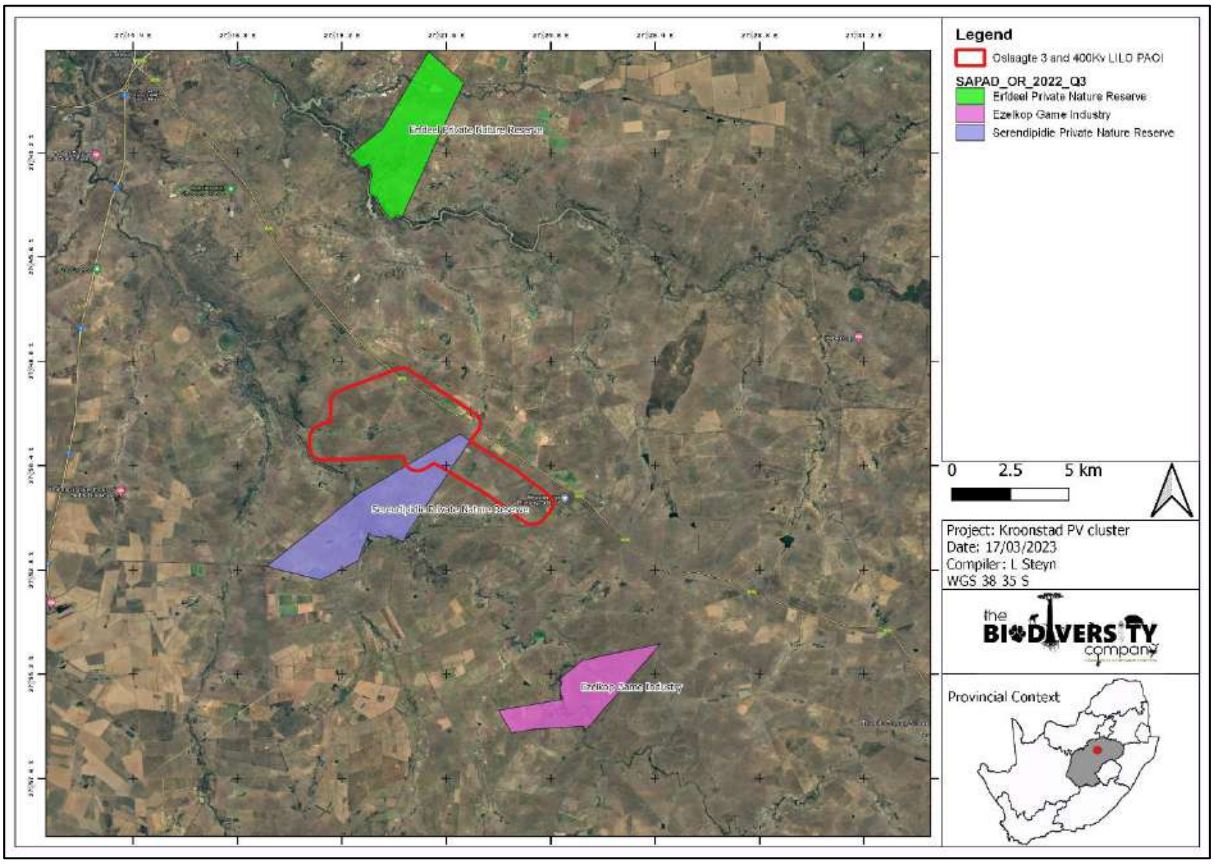


Figure 4-4 The PAOI in relation to the protected areas

4.1.1.5 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016).

The PAOI overlap with a priority focus area and a protected area (Figure 4-5).

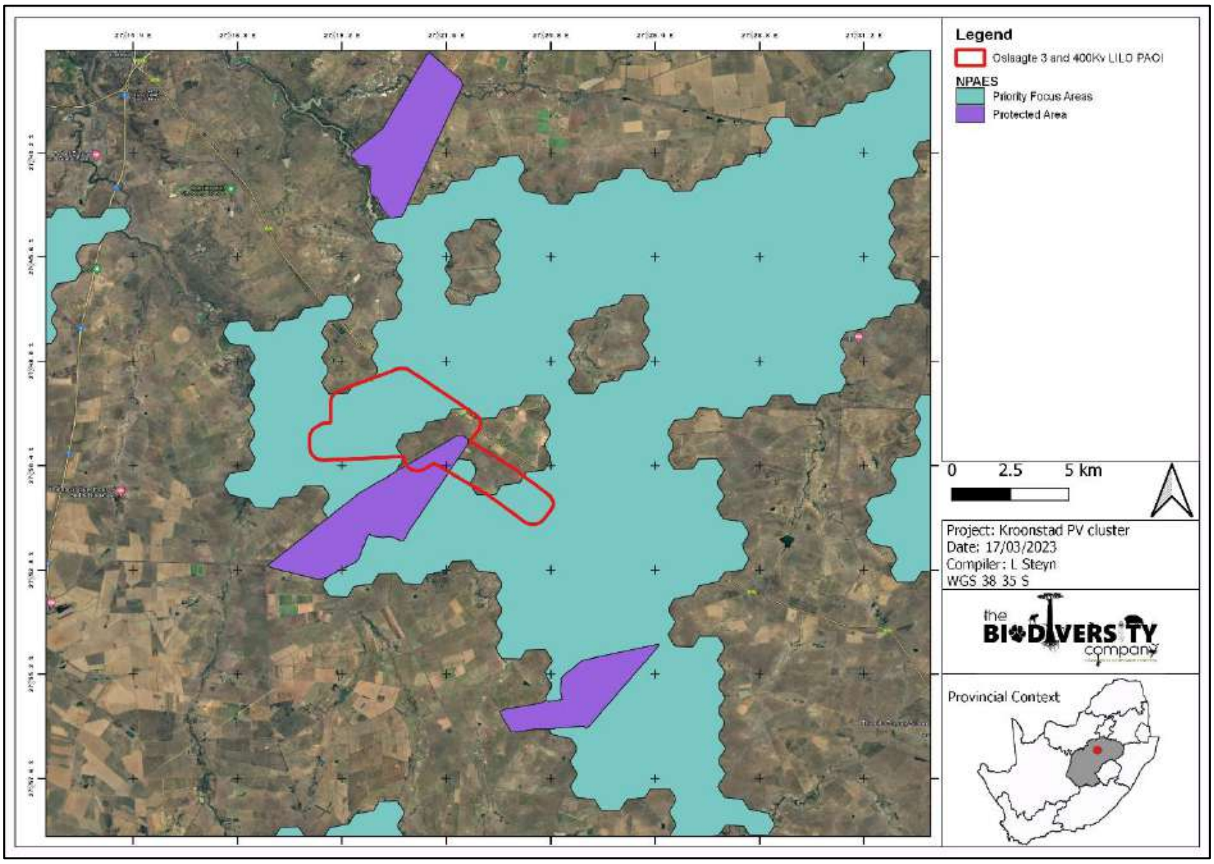


Figure 4-5 The PAOI in relation to the National Protected Area Expansion Strategy

4.1.1.6 Important Bird and Biodiversity Area

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

According to Birdlife South Africa (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 4-6 shows that the PAOI is located 39 km from the Willem Pretorius Game Reserve IBA.

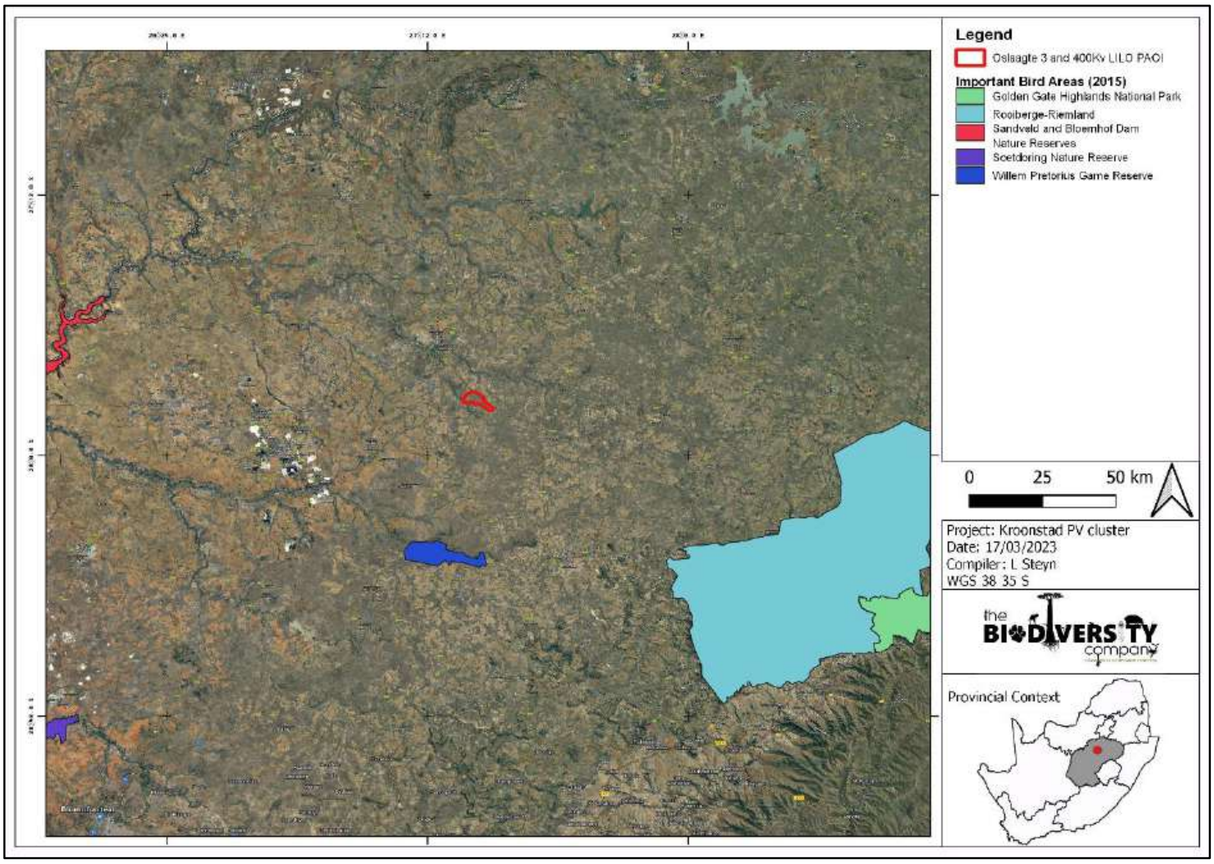


Figure 4-6 The PAOI in relation to the nearest IBAs

4.1.1.7 Hydrological Setting

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

The PAOI borders on a CR river (Figure 4-7).

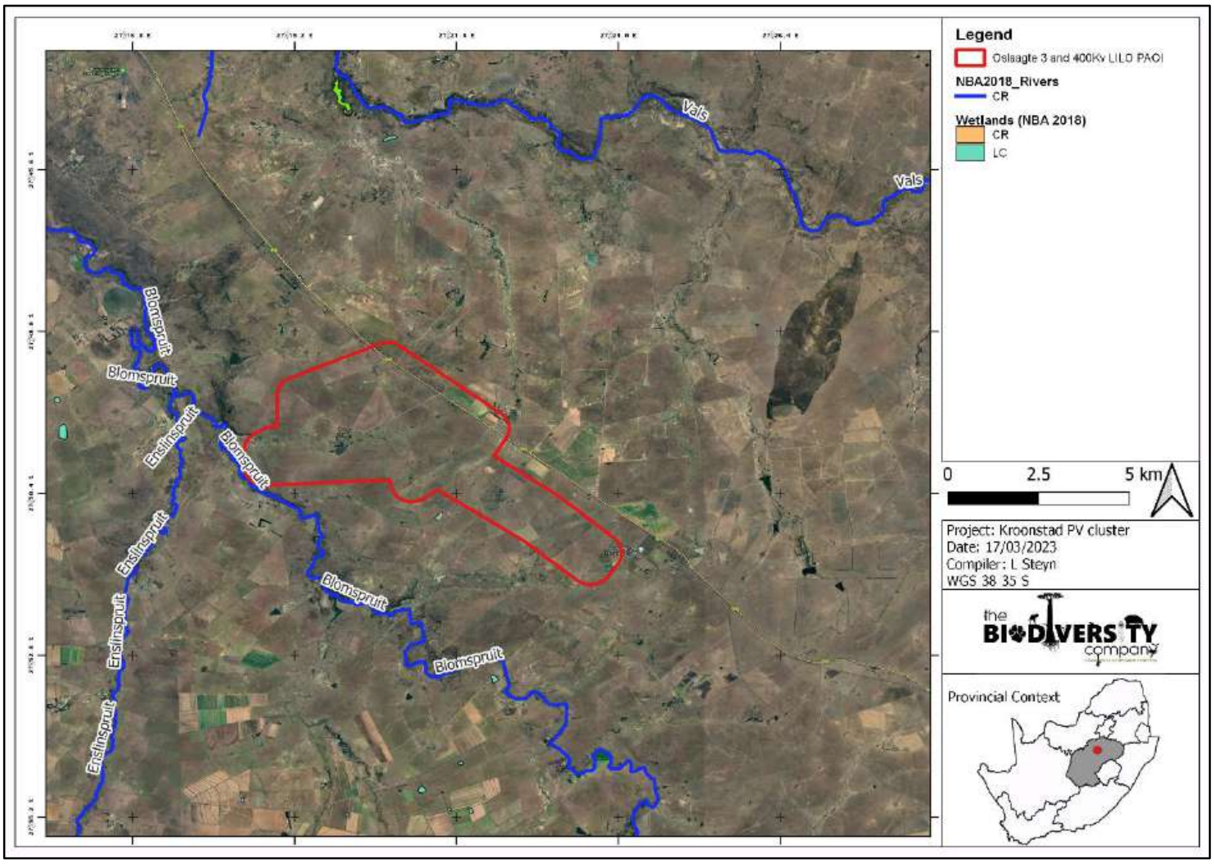


Figure 4-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in relation to the PAOI

4.1.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011). Figure 4-8 shows that the PAOI overlaps with numerous unclassified wetlands and borders on an unclassified river.

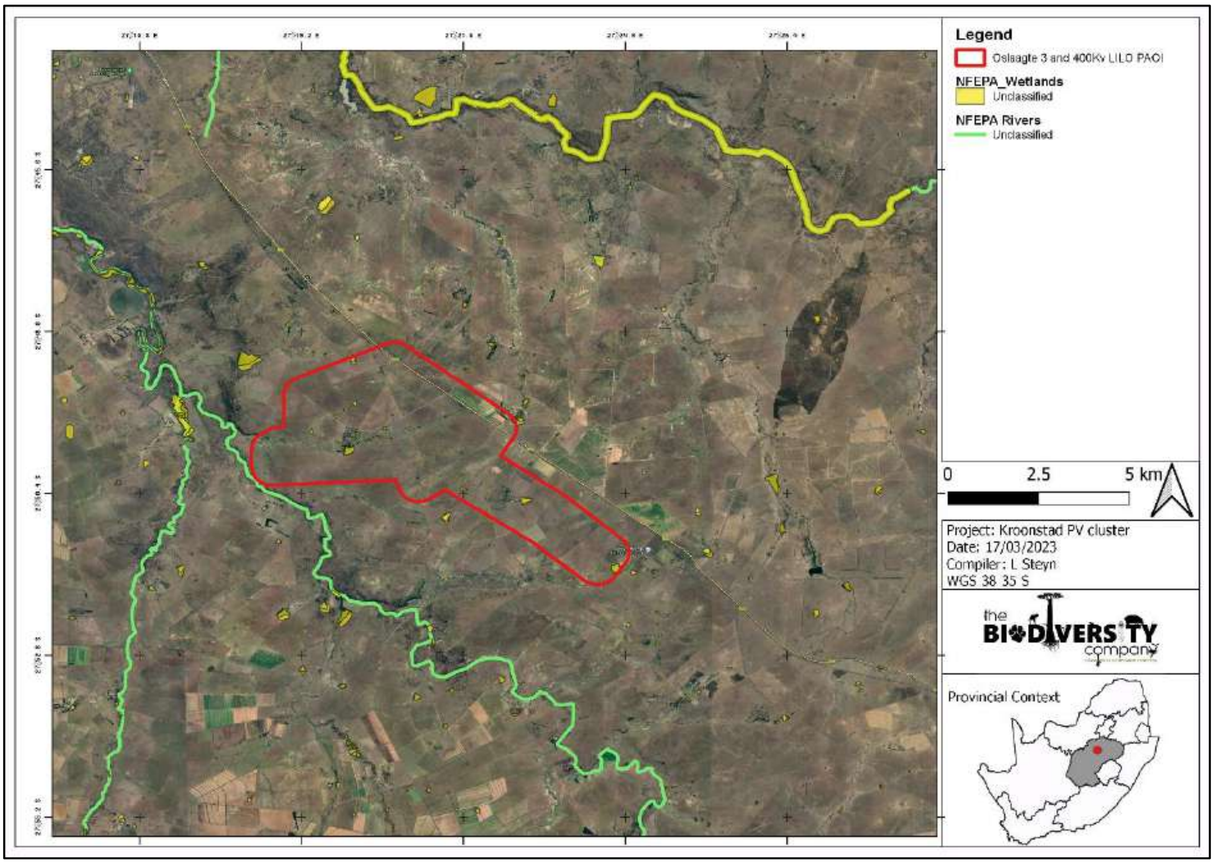


Figure 4-8 ***The PAOI in relation to the National Freshwater Ecosystem Priority Areas***

4.1.1.9 Coordinated Avifaunal Roadcount (CAR)

The ADU/Cape bird club pioneered avifaunal roadcount of larger birds in 1993 in South Africa. Originally it was started to monitor the Blue Crane *Anthropoides paradiseus* and Denham’s/Stanley's Bustard *Neotis denhami*. Today it has been expanded to the monitoring of 36 species of large terrestrial birds (cranes, bustards, korhaans, storks, Secretarybird and Southern Bald Ibis) along 350 fixed routes covering over 19 000 km. Twice a year, in midsummer (the last Saturday in January) and midwinter (the last Saturday in July), roadcounts are carried out using this standardised method. These counts are important for the conservation of these larger species that are under threat due to loss of habitat through changes in land use, increases in crop agriculture and human population densities, poisoning as well as man-made structures like power lines. With the prospect of wind and solar farms to increase the use of renewable energy sources monitoring of these species is most important (CAR, 2020). Figure 4-9 shows that the PAOI is 2.8 km from the closest CAR route.

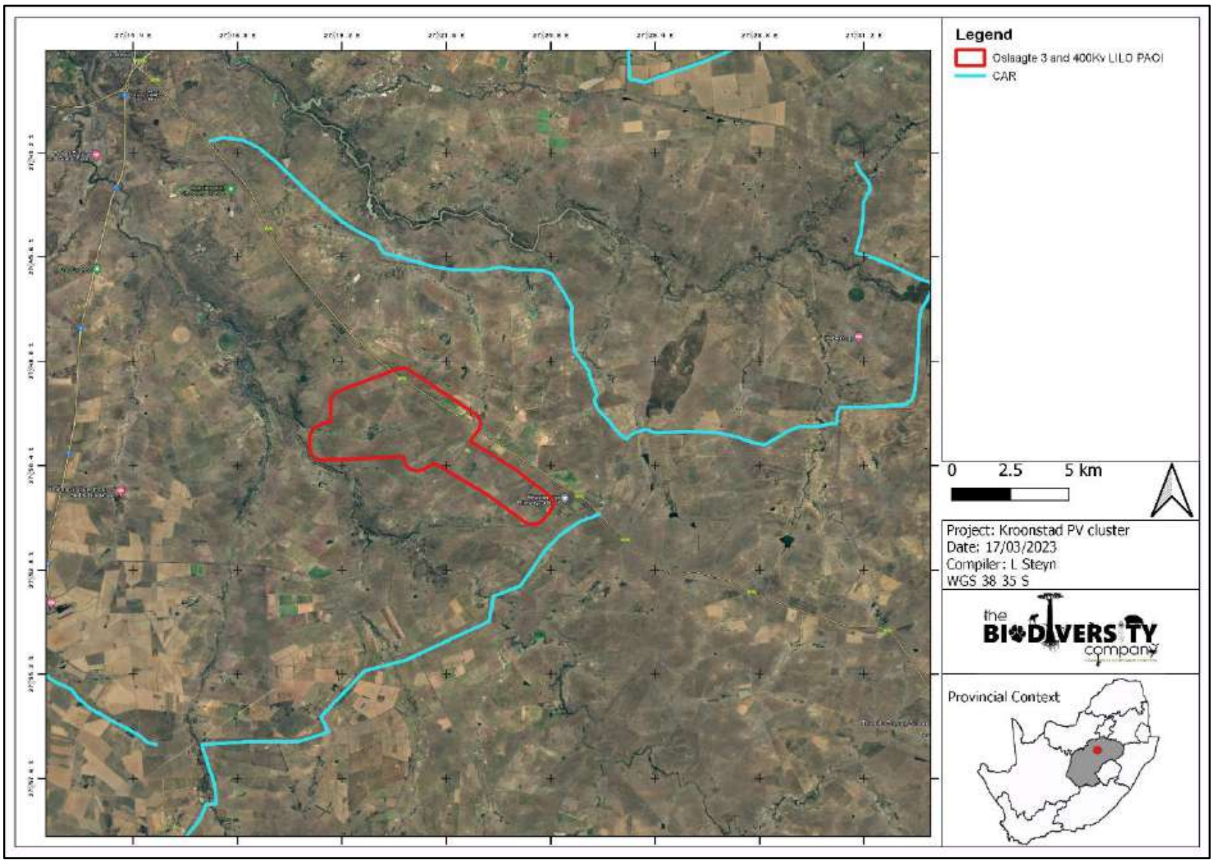


Figure 4-9 The PAOI in relation to the closest CAR route

4.1.2 Avifauna Expected

The SABAP2 Data lists 280 avifauna species that could be expected to occur within the PAOI (Appendix A). Seventeen (17) of these expected species are regarded as threatened (Table 4-2). Three (3) of the species have a low likelihood of occurrence due to the expected lack of suitable habitat in the PAOI, these species can however very likely still move over the PAOI and can still be influenced by the development.

Table 4-2 Threatened avifauna species that are expected to occur within the PAOI.

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Abdim's Stork	*Ciconia abdimii*	NT	LC	High
African Rock Pipit	*Anthus crenatus*	NT	LC	Low
Black Harrier	*Circus maurus*	EN	EN	Moderate
Black-winged Pratincole	*Glareola nordmanni*	NT	NT	Confirmed
Blue Korhaan	*Eupodotis caerulescens*	LC	NT	Confirmed
Caspian Tern	*Hydropogne caspia*	VU	LC	High
Curlew Sandpiper	*Calidris ferruginea*	LC	NT	Moderate
European Roller	*Coracias garrulus*	NT	LC	High
Greater Flamingo	*Phoenicopterus roseus*	NT	LC	Moderate
Lanner Falcon	*Falco biarmicus*	VU	LC	High
Lesser Flamingo	*Phoeniconaias minor*	NT	NT	Moderate
Maccoa Duck	*Oxyura maccoa*	NT	EN	High

Martial Eagle	*Polemaetus bellicosus*	EN	EN	Low
Red-footed Falcon	*Falco vespertinus*	NT	VU	High
Secretarybird	*Sagittarius serpentarius*	VU	EN	Confirmed
Verreaux's Eagle	*Aquila verreauxii*	VU	LC	Low
Yellow-billed Stork	*Mycteria ibis*	EN	LC	High

Ciconia abdimii (Abdim's Stork) is listed as NT on a local and international scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes (IUCN, 2017). Non-breeding visitor to southern Africa, departing from its northern breeding grounds in the period from May-August, eventually arriving in southern Africa at the onset of the rainy season in the period from October-December. It is nomadic in southern Africa, moving in response to food availability. It gathers in large flocks then departs in February, March and early April. It mainly eats large insects, doing most of its foraging on pastures, irrigated land and recently ploughed fields, usually in groups which split up to cover more ground. Suitable habitat can be found in the PAOI, therefore the likelihood of occurrence is rated as high.

Circus maurus (Black Harrier) is endemic to southern Africa, where its core range is in the Western Cape, but also occurs in the Eastern Cape, the Northern Cape and Free State (where it is irruptive in both areas), Lesotho and Namibia (BirdLife International, 2021b). The species occupies coastal and montane fynbos, highland grasslands, Karoo subdesert scrub, open plains with low shrubs and croplands. It often breeds close to coastal and upland marshes with tall shrubs or reeds, occurring in dry steppe and grassland areas further north in the non-breeding season. Local fluctuations in breeding numbers may be related to population cycles in its prey base, such as mice whose numbers fluctuate with rainfall, especially in the more arid regions. The total population is estimated at < 1 000 individuals in South Africa, Lesotho and Eswatini (Taylor *et al,* 2015) with only around 10 mature individuals outside this region. The population is thought to have undergone a major decline of 85% in the past 100 years (17% in 20 years) due to habitat loss (BirdLife International, 2021b). Habitat is primarily lost to agriculture, and this is compounded by the uncontrolled burning of fynbos and grassland, which renders these habitats unsuitable for breeding for about five years. Additional threats include low hatching rates due to pesticide use and overgrazing. This species could occur but the habitat is not ideal for the species.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to it's migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. This species was recorded in the PAOI.

Eupodotis caerulescens (Blue Korhaan) is endemic to South Africa and Lesotho and occurs in grassveld usually over 1 500 m above sea level, preferring open, fairly short grassland and a mixture of grassland and karoo dwarf-shrubland within 1 km of water, with termite mounds and few or no trees (BirdLife International, 2017). The total global population is estimated to number between 12 000-15 000 individuals, equivalent to 8 000-10 000 mature individuals, with a decreasing population trend. The main threat is intensive agriculture, especially within the east of its range. This species was recorded in the PAOI.

Sterna caspia (Caspian Tern) is native to South Africa and are known to occur in inland freshwater systems such as large rivers, creeks, floodlands, reservoirs and sewage ponds. Habitat suitability was found to be high and thus the likelihood of occurrence is high.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic, and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the presence of some of these habitat types within the PAOI the likelihood of occurrence of this species was rated as moderate.

Coracias garrulous (European Roller) is a summer migrant with the population from South-central Europe and Asia occurring throughout sub-Saharan Africa. The European Roller has a preference for bushy plains and dry savannah areas. It is globally listed as LC (BirdLife International, 2019a) but NT on a regional scale (Taylor *et al,* 2015). Threats include persecution on migration in some Mediterranean countries and numerous individuals are killed for food in Oman and India. The loss of suitable breeding habitat due to changing agricultural practices, conversion to monoculture, loss of nest sites, and use of pesticides (reducing food availability) are the main threats to the species in Europe (BirdLife International, 2019a). It is sensitive to loss of hedgerows and riparian forest in Europe which provide essential habitats for perching and nesting. Based on the suitable habitat in the PAOI the likelihood of occurrence is rated as high.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Some water sources could be suitable but is not ideal habitat, therefore the likelihood of occurrence is rated as moderate for both species.

Oxyura maccoa (Maccoa Duck) has a large range, divided into a northern population occurring in Eritrea, Ethiopia, Kenya and Tanzania, and a southern population found in Angola, Botswana, Namibia, South Africa and Zimbabwe. During the breeding season it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds and sedges on which it relies for nesting, although it can breed in anthropogenic systems such as farm dams and sewerage treatment plants (BirdLife International, 2021c). It exhibits a preference for habitats with a bottom of mud or silt and minimal amounts of floating vegetation, since this provides the best foraging conditions. Outside the breeding season it will wander over larger, deeper lakes and brackish lagoons. Currently the links between population trends and threats facing this species are poorly understood. Pollution is a primary concern, since the species feeds mainly on benthic invertebrates, and is therefore more vulnerable to bio-accumulation of pollutants than other duck species (BirdLife International, 2021c). Hunting and poaching, competition with alien benthic fish and habitat alteration by invasive plants are further threats. The species has a high likelihood of occurrence.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey *et al,* 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as high.

Sagittarius serpentarius (Secretarybird) is listed as VU regionally and EN on a global scale (BirdLife International, 2020). The species has a wide distribution across sub-Saharan Africa, but surveyed densities suggest that the total population size does not exceed a five-figure number. Ad-hoc records, localised surveys and anecdotal observations indicate apparent declines in many parts of the species' range, especially in South Africa where reporting rates decreased by at least 60% of quarter degree grid cells used in Southern African Bird Atlas Projects. Threats include excessive burning of grasslands that may suppress populations of prey species, whilst the intensive grazing of livestock is also probably degrading otherwise suitable habitat. Disturbance by humans is likely to negatively affect breeding. The species is captured and traded; however, it is unknown how many deaths occur in captivity and transit. Direct hunting and nest-raiding for other uses and indiscriminate poisoning at waterholes are also further threats. A proposed conservation action is that landowners of suitable properties should join biodiversity stewardship initiatives and to manage their properties in a sustainable way for the species' populations. This species was observed in the PAOI.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and LC on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of extensive water bodies within the project area creates a high possibility that this species may occur there.

5 Field Assessment

5.1 First Field Survey

5.1.1 Species List of First Field Survey

During the first assessment performed in the spring (19th to the 23rd of December 2022) 93 species were recorded during the point counts (Appendix B) and 17 during the incidental counts (Appendix C). Some species were observed both as incidental records and during the point counts. The total number of individual species accounts for approximately 33% of the total number of expected species.

Two SCC was recorded during the survey period i.e., *Eupodotis caerulescens* (Blue Korhaan) and *Sagittarius serpentarius* (Secretarybird) observed (Table 5-1 and Figure 5-1). Table 5-1 lists the species recorded, Figure 5-1 are photographic evidence of the species while Figure 5-2 shows the location of the observed species.

Table 5-1 Summary of the avifauna species of conservation concern recorded within the proposed PAOI during the field survey.

Common Name	Scientific Name	Conservation Status (Regional, Global)	Relative abundance	Frequency (%)
Blue Korhaan	*Eupodotis caerulescens*	LC, NT	0,001	1,493
Secretarybird	*Sagittarius serpentarius*	VU, EN	0,001	1,493

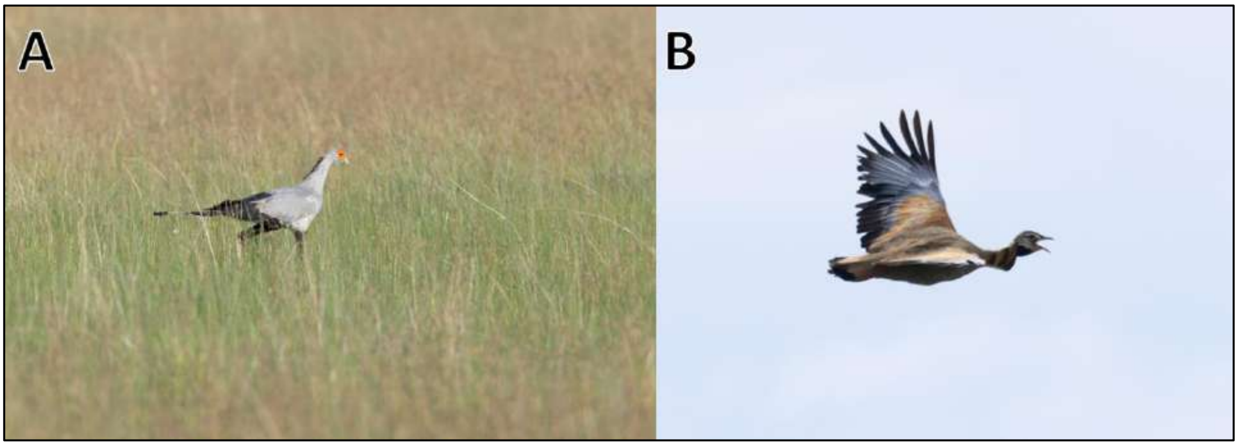


Figure 5-1 Photographs illustrating A) Secretary bird and B) Blue Korhaan recorded in the PAOI. Where the species were recorded is shown in Figure 5-2.

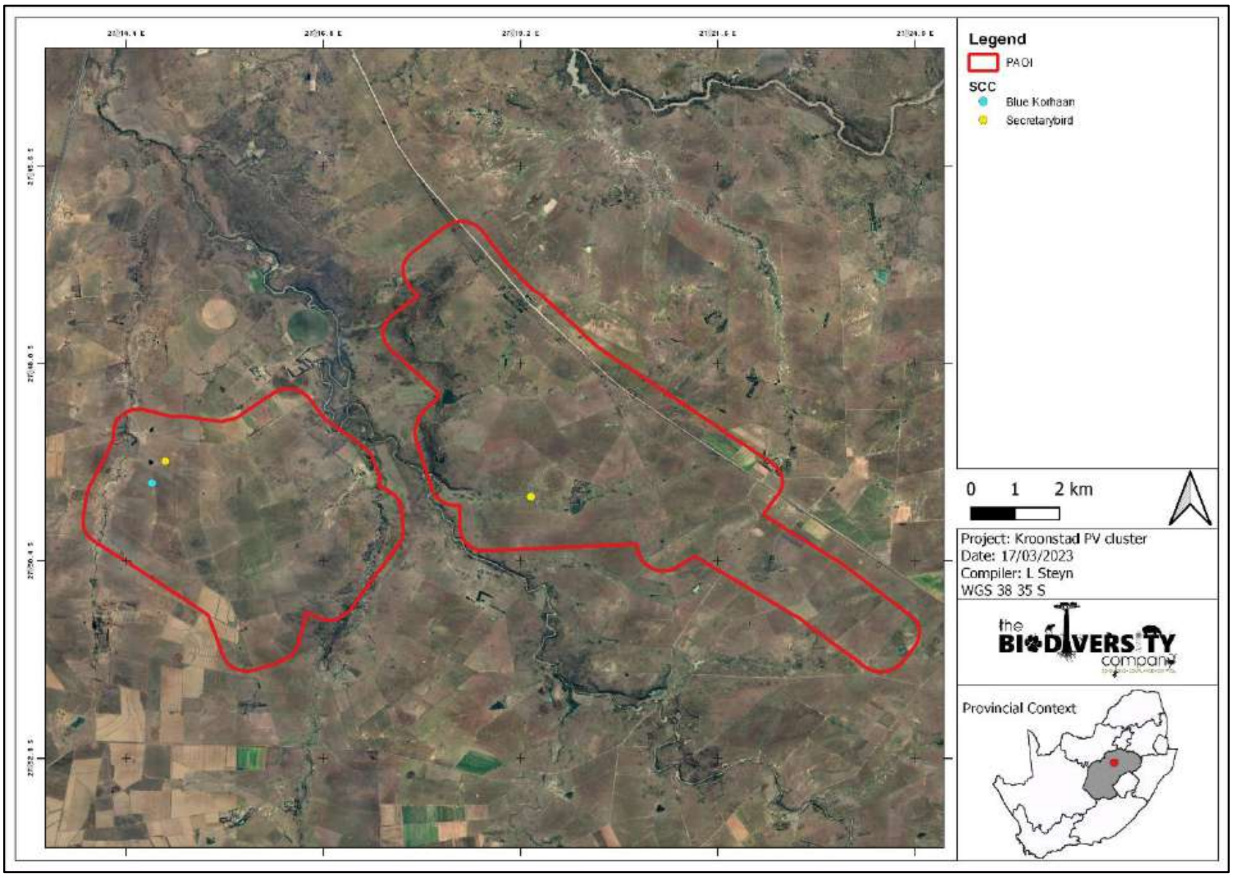


Figure 5-2 Location of the SCC during the first assessment

5.1.2 Priority Species

'Priority Species' are those avifauna that are particularly susceptible to energy developments, and although these priority species were developed for Wind Energy developments (Ralston Paton *et al*, 2017), the type of impact is congruent with Solar Energy Facilities (SEFs), i.e., collision, electrocution, and habitat loss. Even though the panels may not pose an extensive collision risk for larger avifauna species, power lines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species. Fifteen of the species observed within the PAOI are regarded as priority species (Table 5-2). Photographs of some of the species are shown in Figure 5-3, while Figure 5-4 shows the location of these priority species.

Table 5-2 Summary of Priority Species recorded within and around the proposed PAOI

Common Name	Scientific Name	Collisions	Electrocutions	Habitats Loss
Black-headed Heron	*Ardea melanocephala*	x	x	
Black-winged Kite	*Elanus caeruleus*		x	
Blue Korhaan	*Eupodotis caerulescens*	x		x
Common Ostrich	*Struthio camelus*			x
Egyptian Goose	*Alopochen aegyptiaca*	x		
Greater Kestrel	*Falco rupicoloides*		x	
Grey Heron	*Ardea cinerea*	x	x	
Hamerkop	*Scopus umbretta*	x		
Northern Black Korhaan	*Afrotis afraoides*	x		x

Purple Heron	*Ardea purpurea*	x	x	
Red-billed Teal	*Anas erythrorhyncha*	x		
Secretarybird	*Sagittarius serpentarius*	x		
Spur-winged Goose	*Plectropterus gambensis*	x		
White-faced Whistling Duck	*Dendrocygna viduata*	x		
Yellow-billed Duck	*Anas undulata*	x		

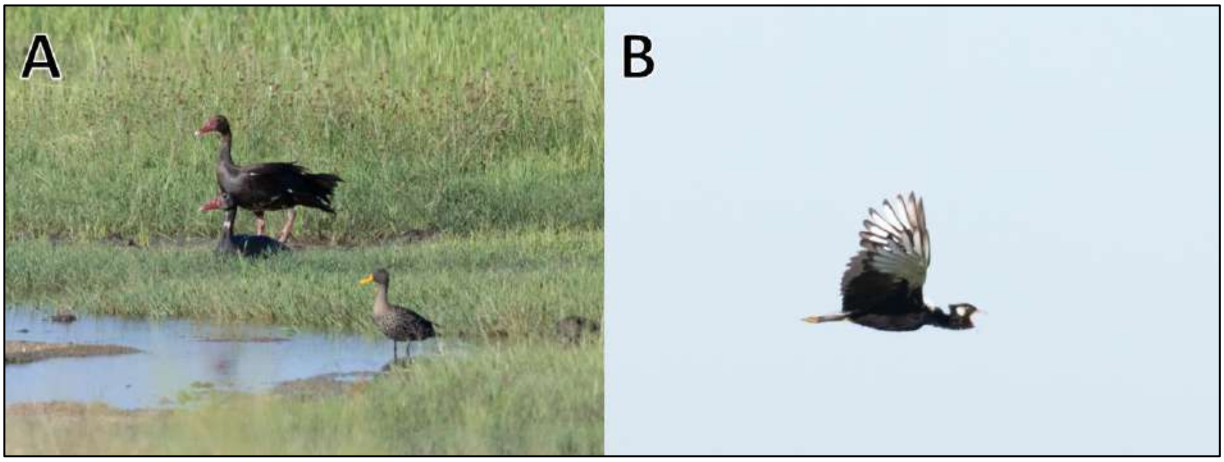


Figure 5-3 Some of the risk species identified; A) Spur-winged Goose and Yellow-billed Duck, and D) Northern Black Korhaan

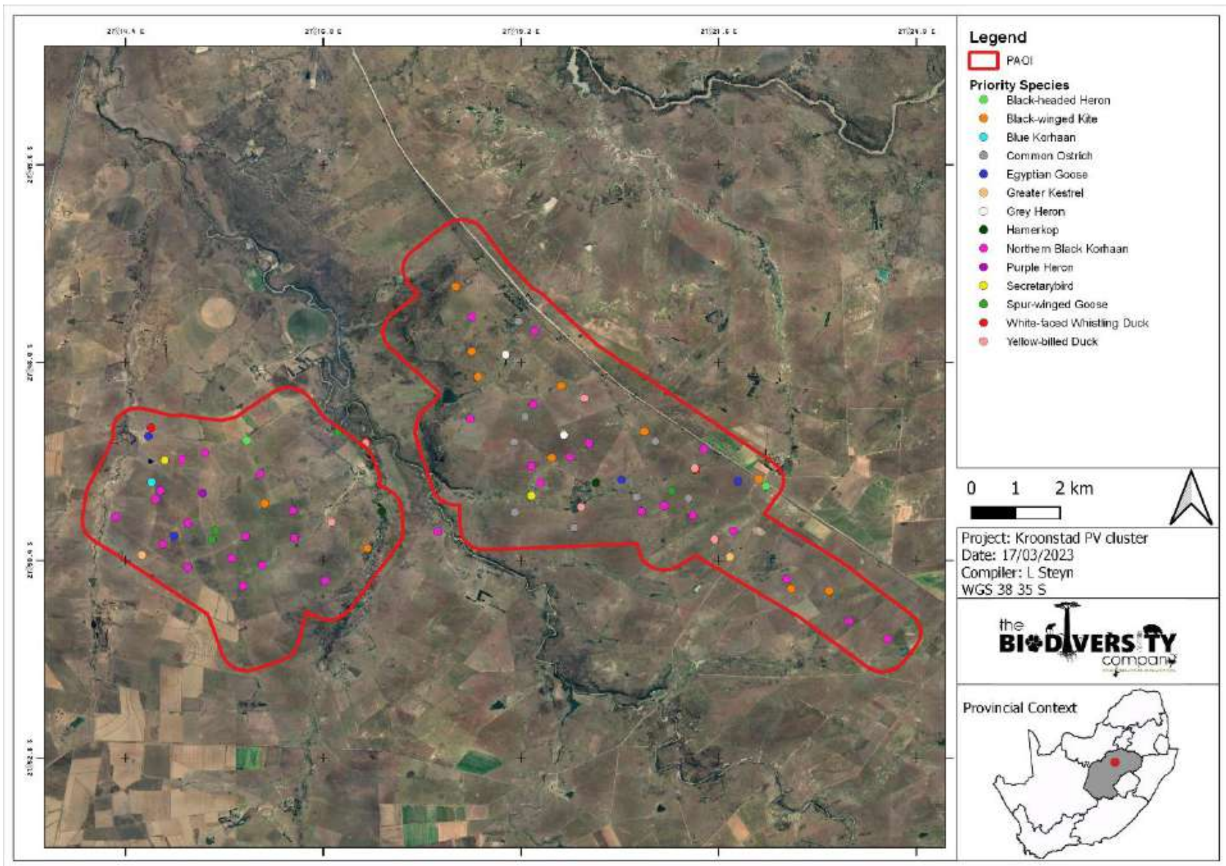


Figure 5-4 The locations of the priority species in the PAOI

5.1.3 Dominant Species

Table 5-3 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. Nineteen of the recorded species accounted for more than 79.9% of the total number of individuals recorded. The species with the highest abundance found was the South African Cliff Swallow (Table 5-3).

Table 5-3 Relative abundance and frequency of occurrence of dominant avifauna species recorded within the PAOI during the field survey. Dominant species cumulatively account for more than 79.9% of the overall abundance. Only data from the standardized point counts were considered.

Common Name	Scientific Name	Guild code	Relative abundance	Frequency (%)
South African Cliff Swallow	*Petrochelidon spilodera*	IAD	0,194	47,761
Red-billed Quelea	*Quelea quelea*	GGD	0,140	13,433
Southern Red Bishop	*Euplectes orix*	GGD	0,097	26,866
Long-tailed Widowbird	*Euplectes progne*	GGD	0,076	67,164
Cloud Cisticola	*Cisticola textrix*	IGD	0,046	76,119
Yellow-crowned Bishop	*Euplectes afer*	GGD	0,028	31,343
Common Quail	*Coturnix coturnix*	OMD	0,024	47,761
Ant-eating Chat	*Myrmecocichla formicivora*	IGD	0,022	26,866
Desert Cisticola	*Cisticola aridulus*	IGD	0,020	50,746
Cape Longclaw	*Macronyx capensis*	IGD	0,019	34,328
Western Cattle Egret	*Bubulcus ibis*	IGD	0,018	19,403
Zitting Cisticola	*Cisticola juncidis*	IGD	0,018	46,269
African Quail-finch	*Ortygospiza atricollis*	GGD	0,018	22,388
Diederik Cuckoo	*Chrysococcyx caprius*	IGD	0,017	46,269
Northern Black Korhaan	*Afrotis afraoides*	IGD	0,015	35,821
Eastern Clapper Lark	*Mirafra fasciolata*	IGD	0,013	25,373
Crowned Lapwing	*Vanellus coronatus*	IGD	0,012	5,970
Rufous-naped Lark	*Mirafra africana*	IGD	0,011	23,881
Black-chested Prinia	*Prinia flavicans*	IGD	0,010	23,881

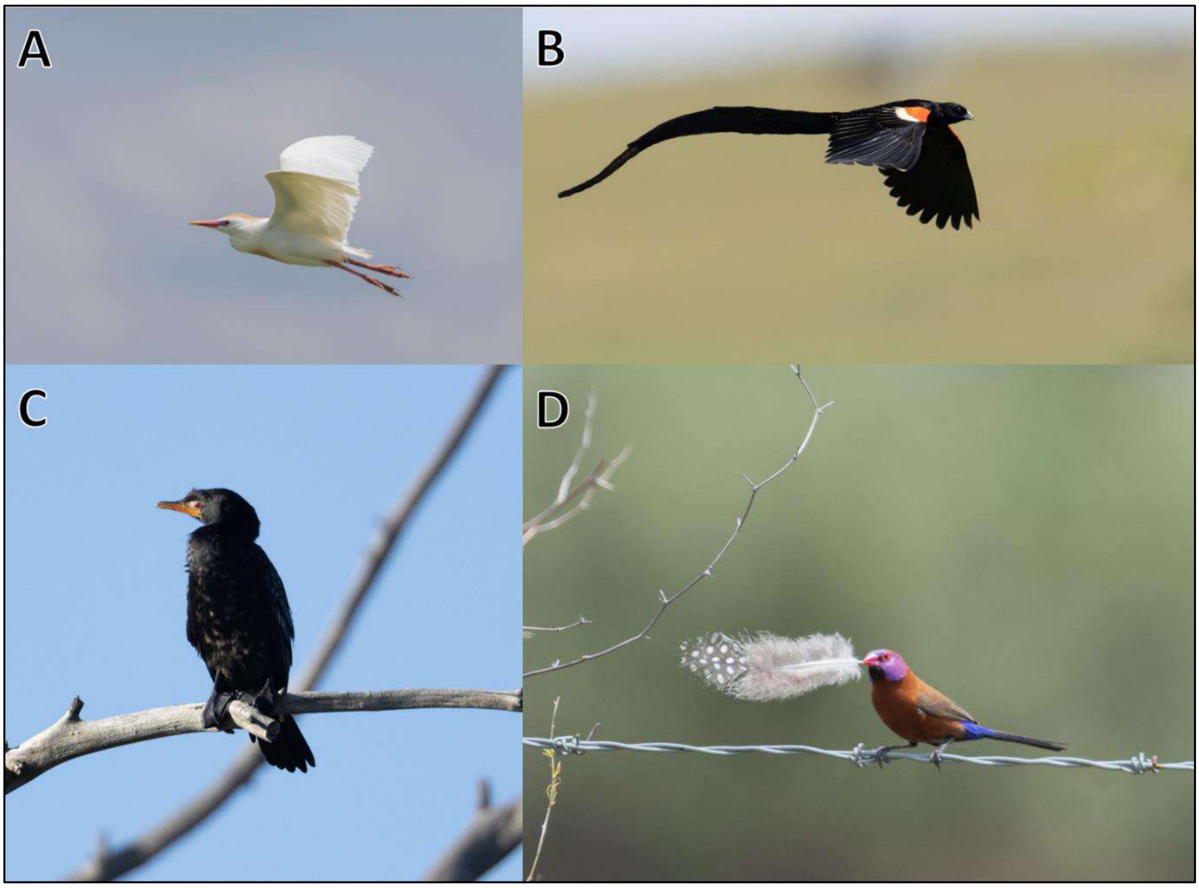


Figure 5-5 Some of the species recorded in the PAOI; A) Cattle Egret, B) Long-tailed Widowbird, C) Reed Cormorant and D) Violet-eared Waxbill

5.1.4 Trophic Guilds

Trophic guilds are defined as a group of species that exploit the same class of environmental resources in a similar way (González-Salazar *et al,* 2014). The guild classification used in this assessment is as per González-Salazar *et al* (2014); they divided avifauna into 13 major groups based on their diet, habitat, and main area of activity. Although species tend to exhibit varied diet with invertivores consuming fruit and frugivores consuming insects for example, the dominant composition of the diet was considered.

The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by insectivorous birds that feed on the ground during the day (IGD). Followed by Omnivores (OMD) and Granivores (GGD) (Figure 5-6). The species composition is spread throughout the various groups, nocturnal surveys were not performed due to safety risk and might not represent the infield composition.

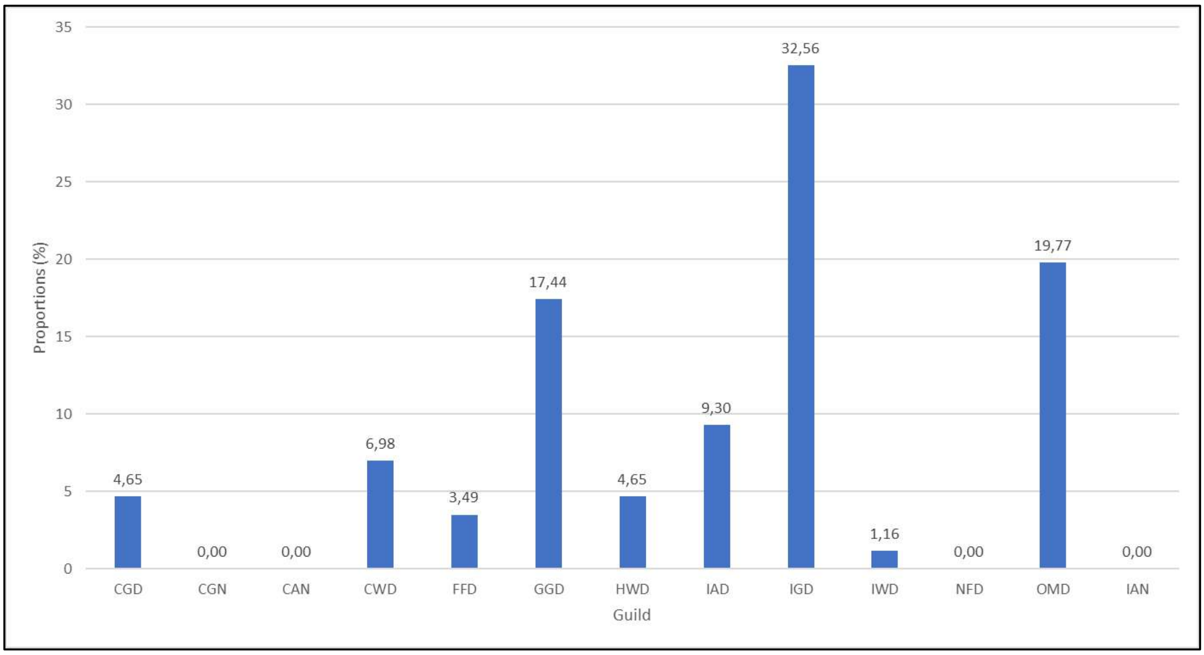


Figure 5-6 ***Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance (Avifaunal trophic guilds. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal, CAN, carnivore air nocturnal, CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GGD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal).***

5.2 Second Survey

5.2.1 Species List of Second Field Survey

During the second assessment performed in the summer (6th to 10th of March 2023) 109 species were recorded during the point counts (Appendix D) and 34 during the incidental counts (Appendix E).

Black-winged Pratincole (*Glareola nordmanni*) were observed during the second survey. These birds were observed on three occasions and 170 birds were observed. Table 5-4 lists the species recorded, Figure 5-7 are photographic evidence of the species while Figure 5-8 shows the location of the observed species.

Table 5-4 ***Summary of the avifauna species of conservation concern recorded within the proposed PAOI during the second field survey.***

Common Name	Scientific Name	RD (Regional, Global)	Relative abundance	Frequency (%)
Black-winged Pratincole	*Glareola nordmanni*	NT, NT	0,061	2,985

Figure 5-7 Photographs illustrating some of the Black-winged Pratincole recorded within the proposed PAOI during the second field survey

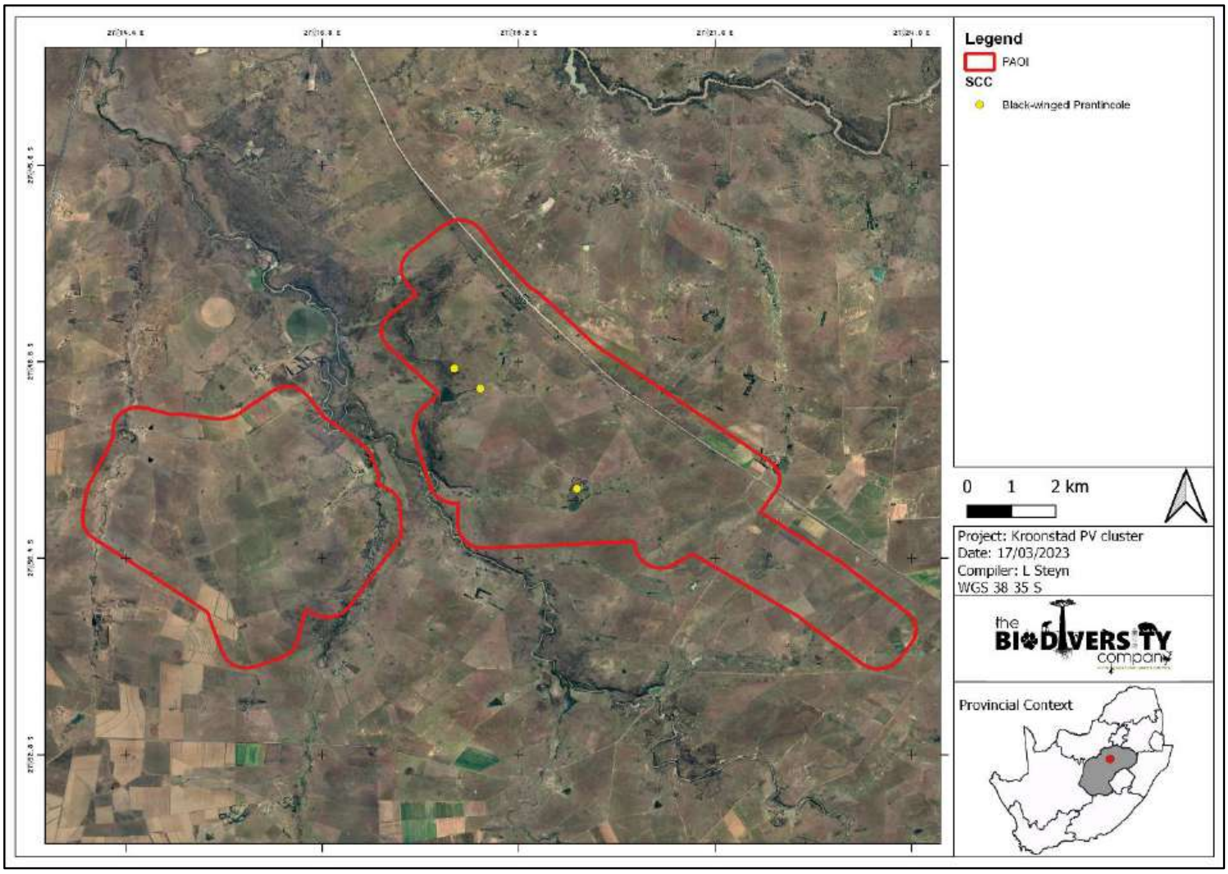


Figure 5-8 Location of the SCC during the second assessment

5.2.2 Priority Species

'Priority Species' are those avifauna that are particularly susceptible to energy developments, and although these priority species were developed for Wind Energy developments (Ralston Paton *et al*, 2017), the type of impact is congruent with SEFs, i.e., collision, electrocution, and habitat loss. Even though the panels may not pose an extensive collision risk for larger avifauna species, power lines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species. Eighteen of the species observed within the PAOI are regarded as priority species (Table 5-2). Photographs of some of the species are shown in Figure 5-3.

Table 5-5 Summary of Priority Species recorded during the second survey within and around the proposed project.

Common Name	Scientific Name	Collisions	Electrocutions	Habitats Loss
African Sacred Ibis	*Threskiornis aethiopicus*		x	
Amur Falcon	*Falco amurensis*		x	
Black Sparrowhawk	*Accipiter melanoleucus*	x	x	
Black-headed Heron	*Ardea melanocephala*	x	x	
Black-winged Kite	*Elanus caeruleus*		x	
Black-winged Pratincole	*Glareola nordmanni*			x
Common (Steppe) Buzzard	*Buteo buteo*	x	x	
Common Ostrich	*Struthio camelus*			x
Egyptian Goose	*Alopochen aegyptiaca*	x		
Glossy Ibis	*Plegadis falcinellus*		x	
Greater Kestrel	*Falco rupicoloides*		x	
Grey Heron	*Ardea cinerea*	x	x	
Hamerkop	*Scopus umbretta*	x		
Northern Black Korhaan	*Afrotis afraoides*	x		x
Pale Chanting Goshawk	*Melierax canorus*		x	
South African Shelduck	*Tadorna cana*	x		
White-faced Whistling Duck	*Dendrocygna viduata*	x		
Yellow-billed Duck	*Anas undulata*	x		

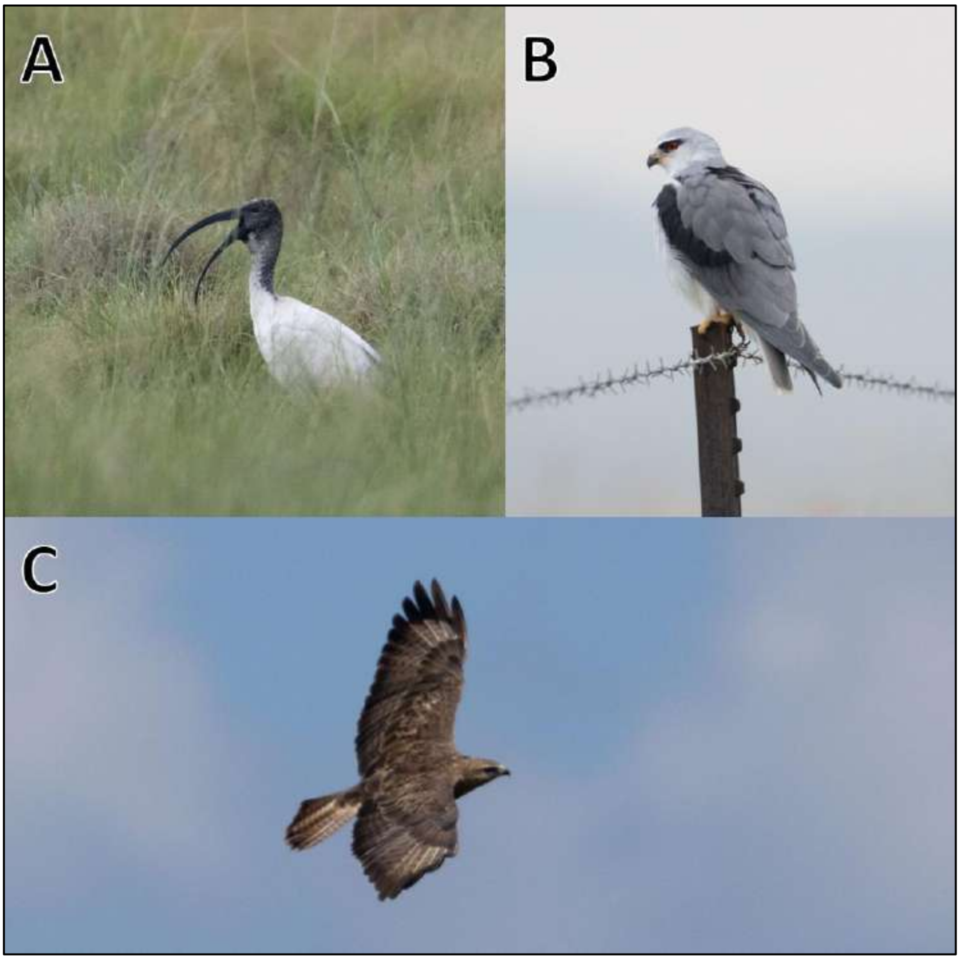


Figure 5-9 Some of the risk species identified; A) African Sacred Ibis, B) Black-winged Kite, and D) Common Buzzard

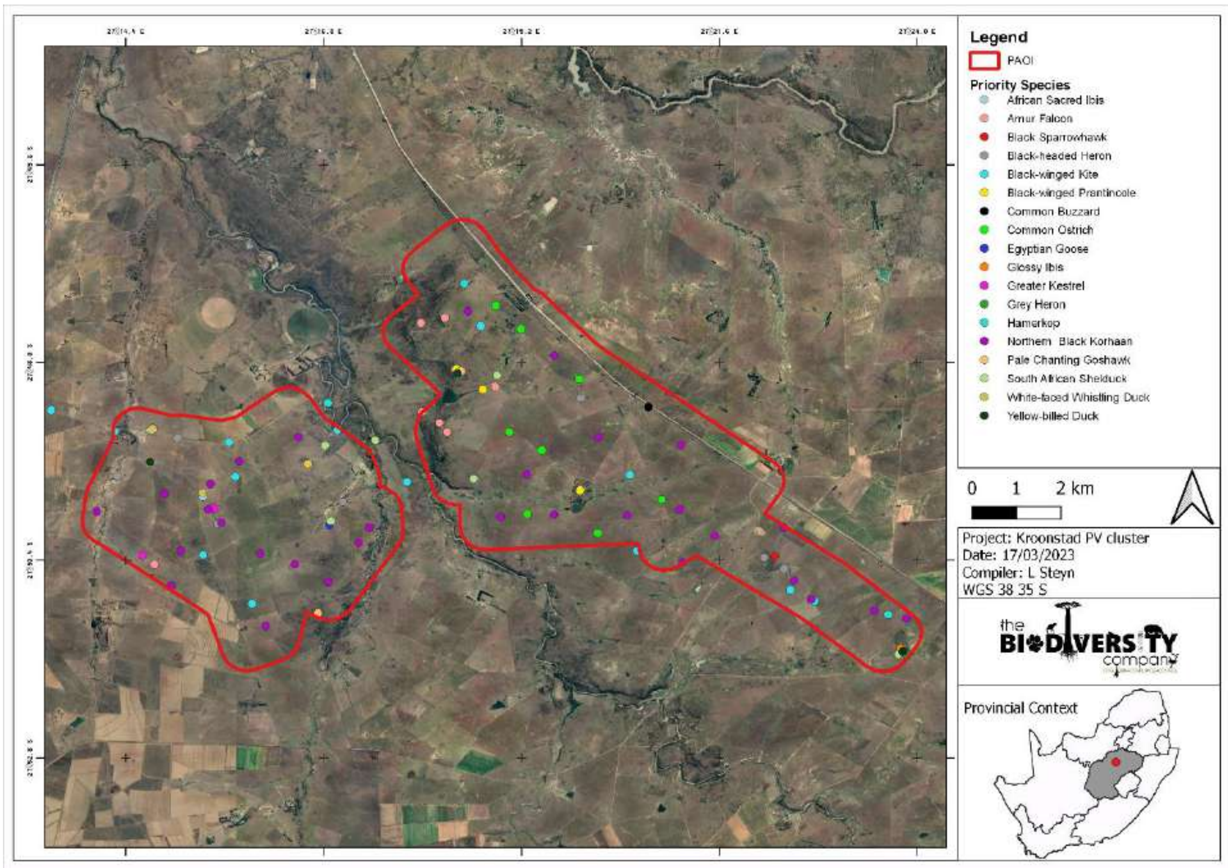


Figure 5-10 Location of the priority species observed.

5.2.3 Dominant Species

Table 5-3 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. Eighteen of the recorded species accounted for more than 79% of the total number of individuals recorded. The most abundant species were *Petrochelidon spilodera* (South African Cliff Swallow) with a relative abundance of 0.213 and a frequency of occurrence of 34.33%. Additional ubiquitous species comprised of *Macronyx capensis* (Cape Longclaw) and *Ortygospiza atricollis* (African Quail-Finch), with a frequency of occurrence of 47.7% and 46.3%, respectively.

Table 5-6 Relative abundance and frequency of occurrence of dominant avifauna species recorded within the PAOI during the field survey. Dominant species cumulatively account for more than 79% of the overall abundance. Only data from the standardized point counts were considered.

Common Name	Scientific Name	Relative abundance	Frequency (%)
South African Cliff Swallow	*Petrochelidon spilodera*	0,213	34,328
Long-tailed Widowbird	*Euplectes progne*	0,089	38,806
Barn Swallow	*Hirundo rustica*	0,081	29,851
Black-winged Pratincole	*Glareola nordmanni*	0,061	2,985
Southern Red Bishop	*Euplectes orix*	0,044	11,940
Red-billed Quelea	*Quelea quelea*	0,043	4,478
African Quail-Finch	*Ortygospiza atricollis*	0,026	46,269
Western Cattle Egret	*Bubulcus ibis*	0,024	10,448

Cape Longclaw	*Macronyx capensis*	0,023	47,761
Speckled Pigeon	*Columba guinea*	0,023	5,970
Bokmakierie	*Telophorus zeylonus*	0,018	35,821
Zitting Cisticola	*Cisticola juncidis*	0,017	38,806
Black-chested Prinia	*Prinia flavicans*	0,014	32,836
Levaillant's Cisticola	*Cisticola tinniens*	0,014	22,388
Ant-eating Chat	*Myrmecocichla formicivora*	0,013	22,388
Desert Cisticola	*Cisticola aridulus*	0,013	29,851
White-rumped Swift	*Apus caffer*	0,013	10,448
Northern Black Korhaan	*Afrotis afraoides*	0,012	28,358
White-browed Sparrow-Weaver	*Plocepasser mahali*	0,012	16,418
Cloud Cisticola	*Cisticola textrix*	0,010	23,881
European Bee-eater	*Merops apiaster*	0,010	7,463
Helmeted Guineafowl	*Numida meleagris*	0,010	4,478
Red-faced Mousebird	*Urocolius indicus*	0,010	13,433

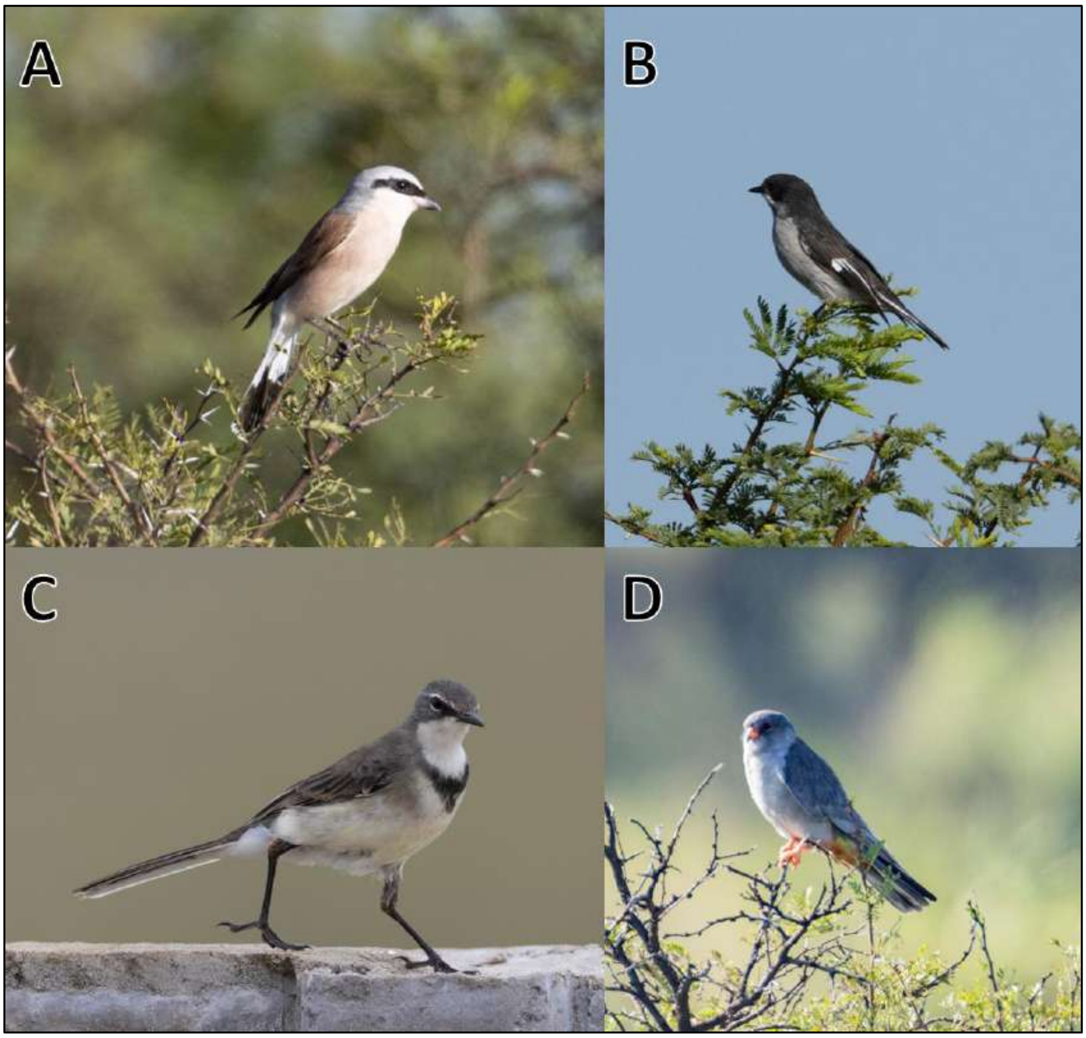


Figure 5-11 Some of the species recorded in the PAOI; A) Red-backed Shrike, B) Fiscal Flycatcher, C) Cape Wagtail, and D) Amur Falcon

5.2.4 Trophic Guilds

Trophic guilds are defined as a group of species that exploit the same class of environmental resources in a similar way (González-Salazar *et al,* 2014). The guild classification used in this assessment is as per González-Salazar *et al* (2014); they divided avifauna into 13 major groups based on their diet, habitat, and main area of activity. Although species to tend to exhibit varied diet with invertivores consuming fruit and frugivores consuming insects for example, the dominant composition of the diet was considered.

The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by insectivorous birds that feed on the ground during the day (IGD). Followed by Granivores (GGD) and Omnivores (OMD) (Figure 5-12).

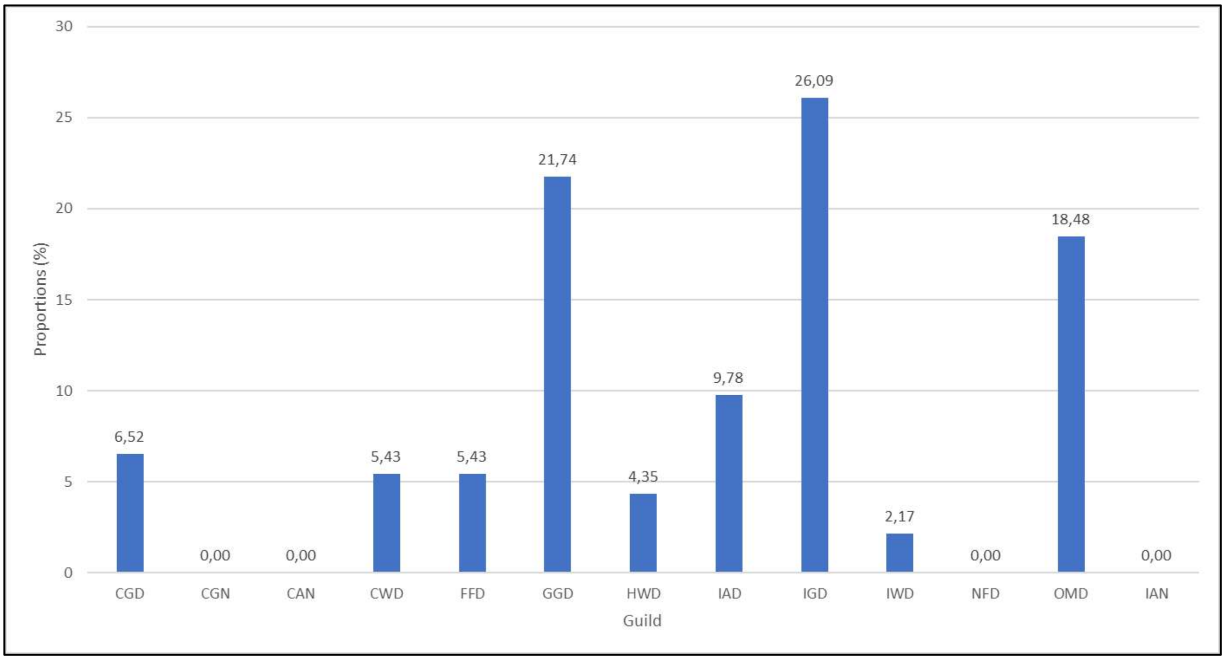


Figure 5-12 ***Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance (Avifaunal trophic guilds. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal, CAN, carnivore air nocturnal, CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GGD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal).***

5.3 Nests

Nests of seven species were observed of which five are priority species (Figure 5-13 and Figure 5-14). A 100 m buffer was placed around the priority species nests. If the nests are in the development footprint then these nests must be regarded as no go buffers for the duration of the breeding season (January-April), if the nests can be found just outside of the development areas then these nests and their buffers must be treated as long term (for the duration of the development) no go areas.

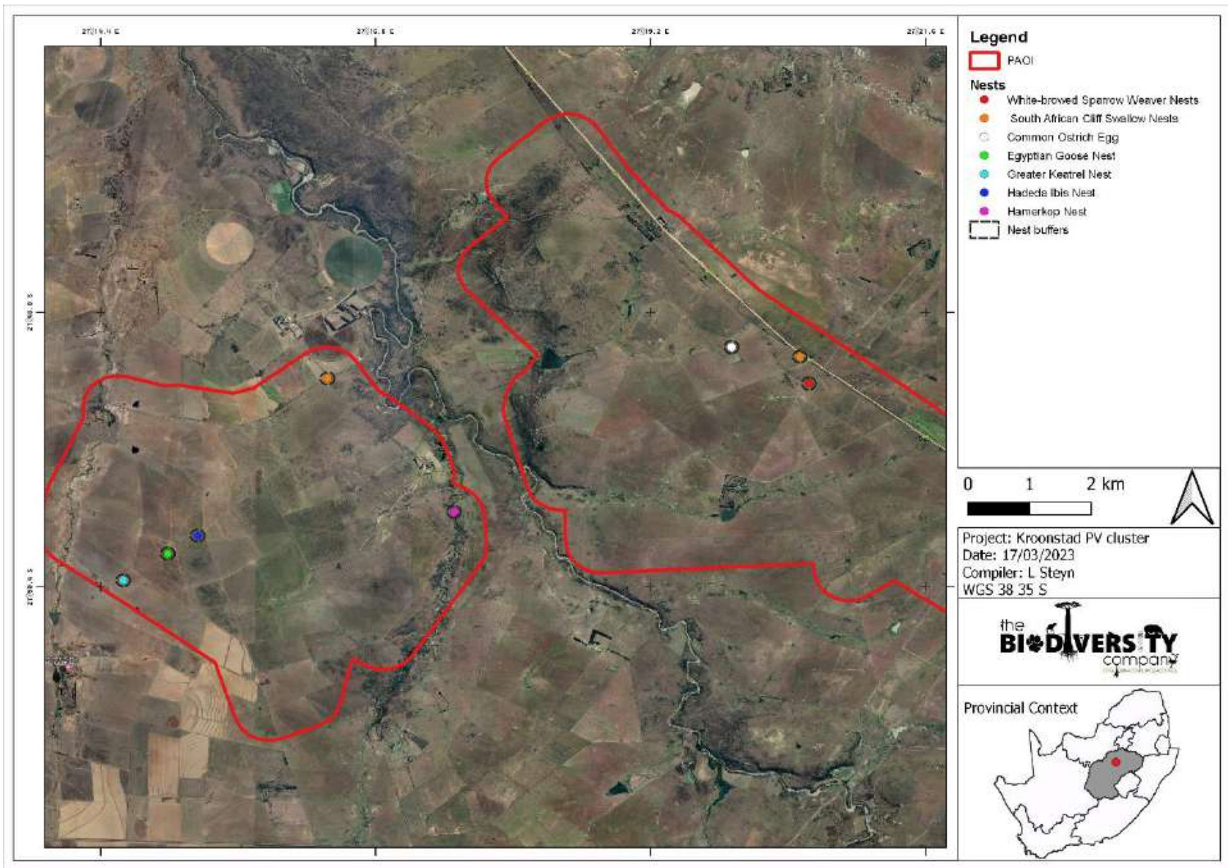


Figure 5-13 ***Locations of the nests in the PAOI***

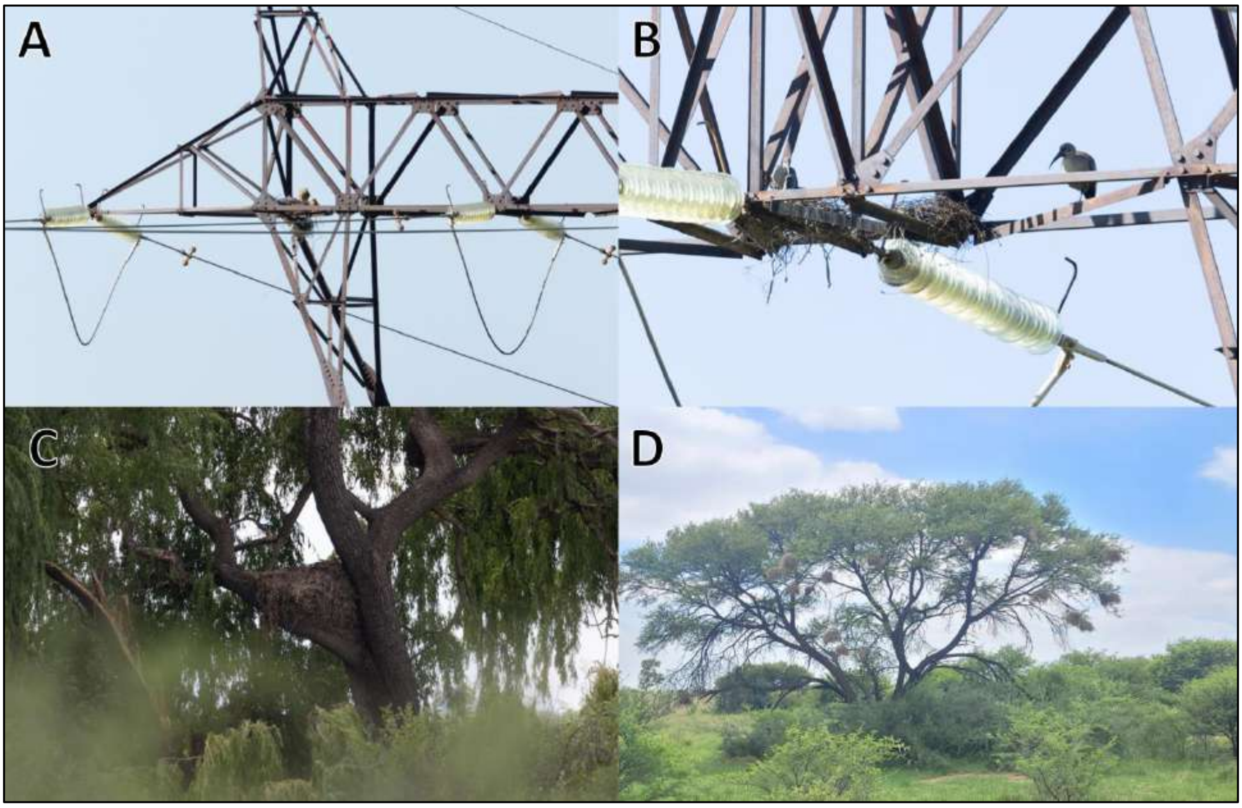


Figure 5-14 ***Photos of some of the nests found, A) Greater Kestrel nest, B) Hadeda Ibis nest, C) Hamerkop nest and D) White-browed Sparrow Weaver nests***

6 Fine-Scale Habitat Use

Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities. During the field assessment three habitat units were identified from an avifauna perspective. They were Transformed-Degraded Grassland, Grassland and Water Resource. The delineations of these habitats are shown in Figure 6-4.

Grassland

The majority of the PAOI comprised of grassland which is typically characterised by open grassland areas with scattered medium to large tree/shrubs clustered together. Some portions of this habitat consist of old agricultural fields that have recovered, the avifauna species compositions in these areas were the same resulting in the grouping of these habitats (Figure 6-1). Avifauna species found here included Ant-eating Chats, Northern Black Korhaan, and Zitting Cisticola.

Figure 6-1 Photograph illustrating the grassland habitat associated with the PAOI

Degraded- Transformed Grassland

This habitat is areas associated with housing, agriculture, some main roads where the edge of the road has been degraded, and areas where overgrazing has taken place (Figure 6-2). Some portions of this habitat type is still semi natural while others have been completely transformed. Avifauna species that were found here included Pied Crow, Cape Turtle Dove and Helmeted Guineafowl.

Figure 6-2 Photograph illustrating the degraded-transformed grassland habitat associated with the PAOI

Water resource

The water resources found in the PAOI consisted of wetlands, rivers, farm dams and pans. The habitat adjacent to these features were incorporated into this habitat classification as the avifauna species compositions here differed from that of the adjacent grasslands (Figure 6-4). Avifauna species found here included Yellow-billed Ducks, White-faced Whistling Ducks, Grey Heron and Little Grebe.

Figure 6-3 Photograph illustrating the water resource habitat in the nearby vicinity of the PAOI

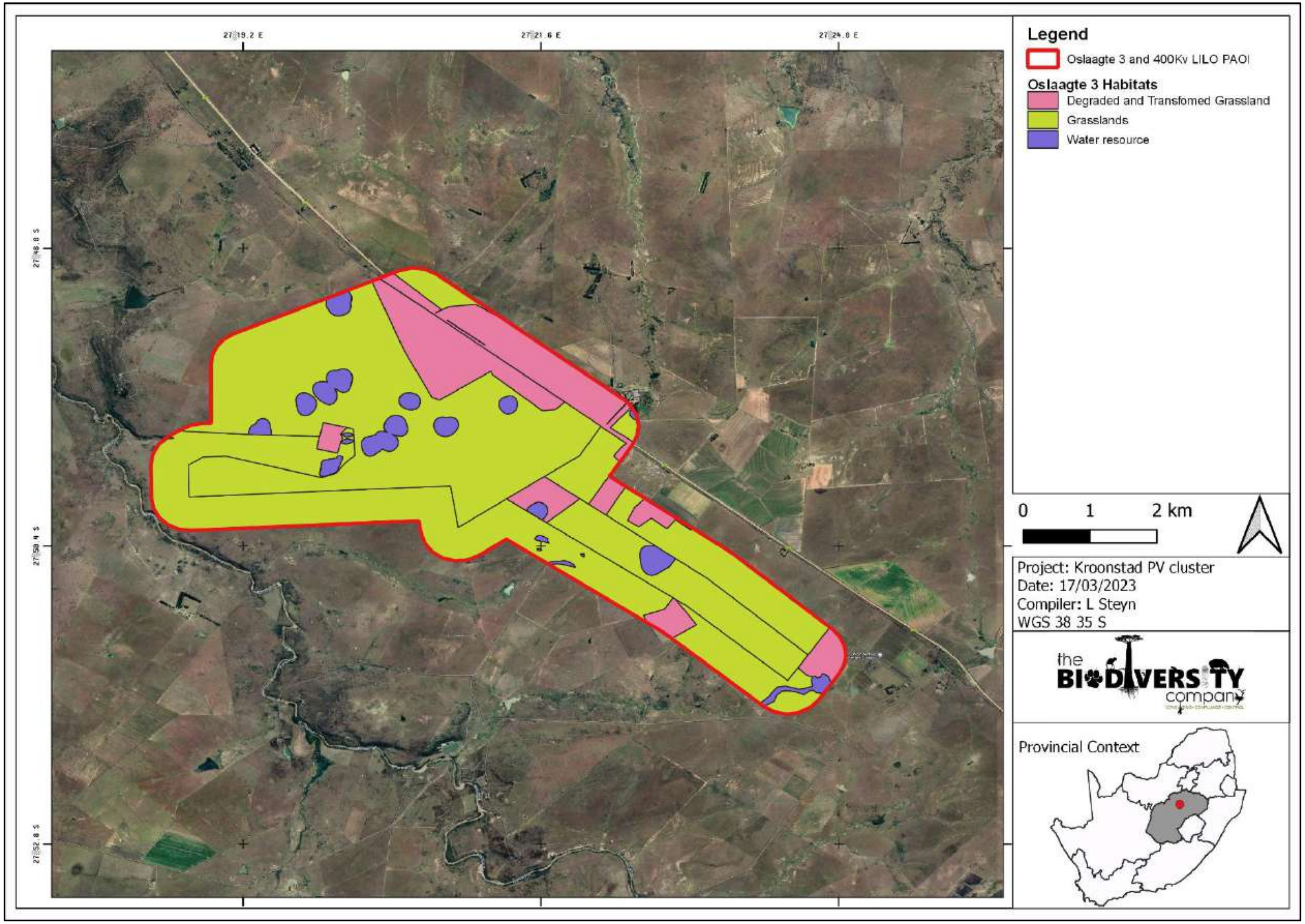
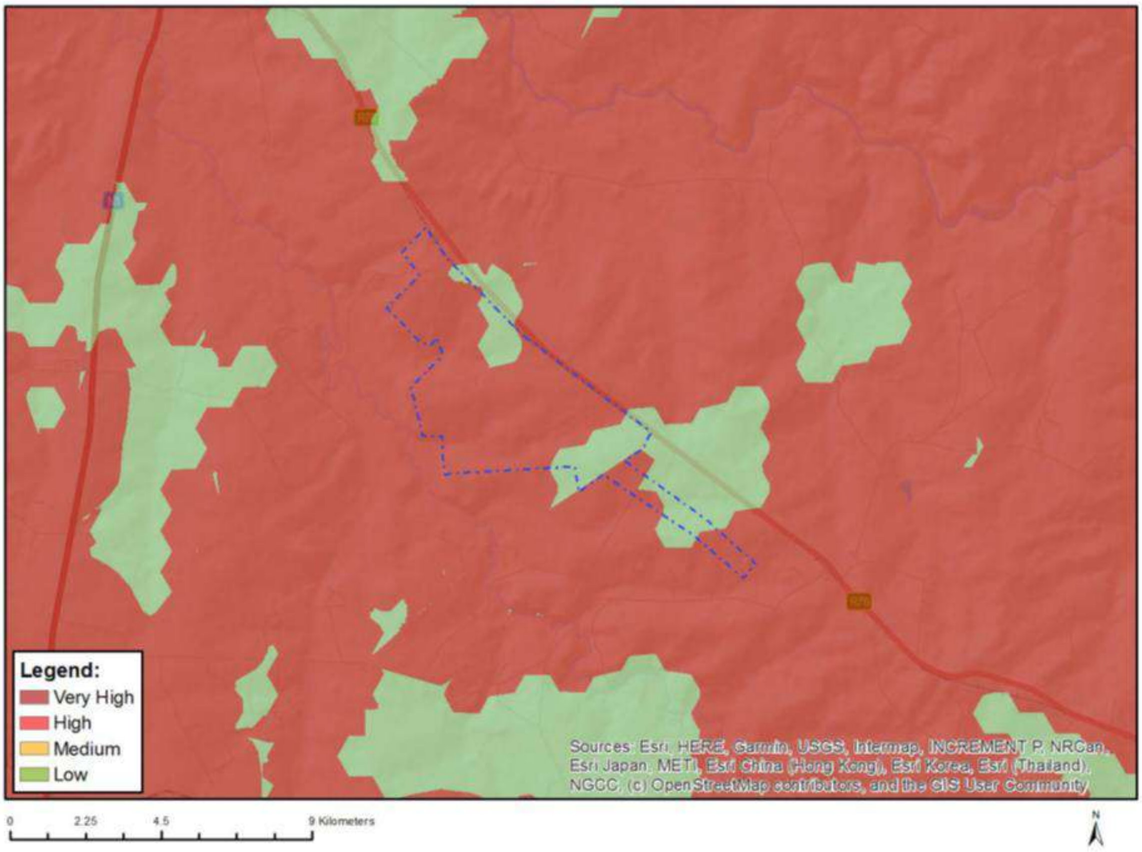


Figure 6-4 ***Map illustrating the habitat types delineated within the proposed PAOI***

7 Site Ecological Importance (SEI)

7.1 Environmental Screening Tool

The terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the PAOI was derived to be 'Very High' (Figure 7-1). The classification is due to the CBA1, CBA2, ESA1, ESA2, NPAES, EN ecosystem and protected area status of the PAOI.



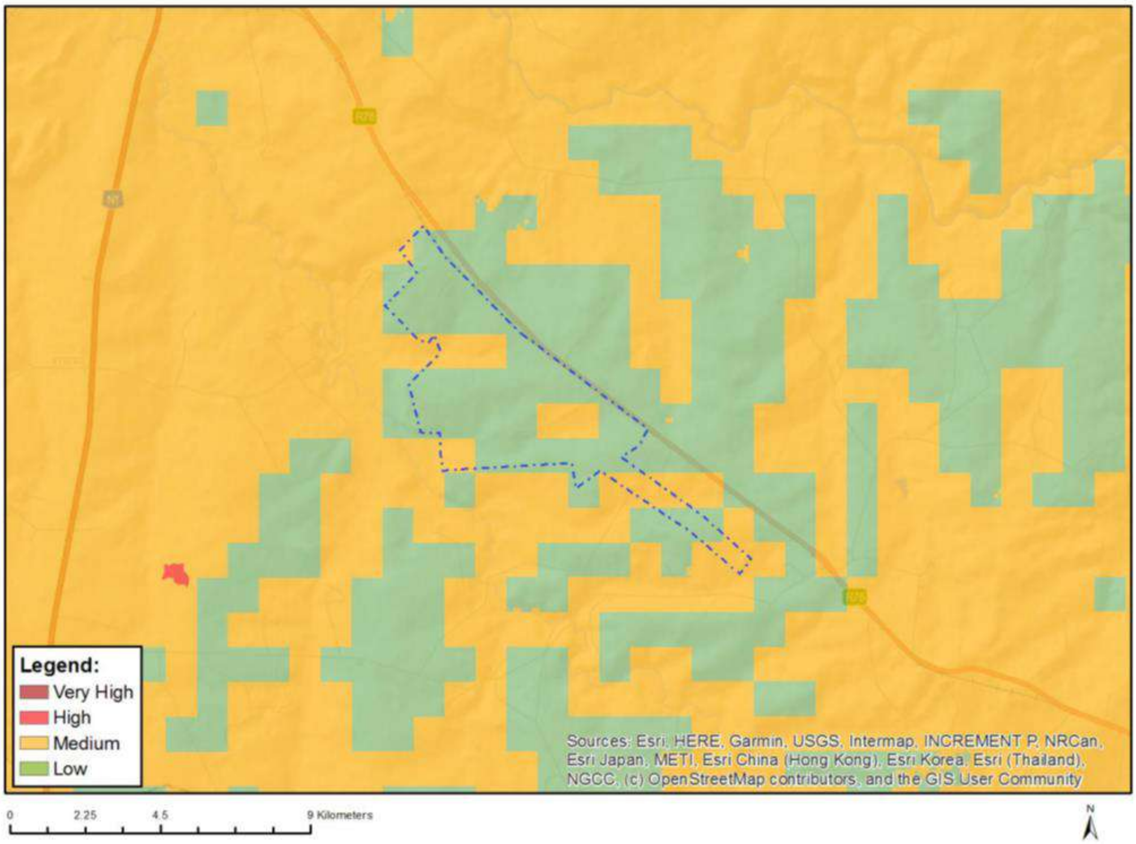
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Ecological support area 1
Very High	Ecological support area 2
Very High	Protected Areas Expansion Strategy
Very High	Serendipidie Private Nature Reserve

Figure 7-1 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool

The Animal Species Theme sensitivity, as indicated in the screening report, was derived to be 'Medium' (Figure 7-2). The medium sensitivity was due to the likely presence of mammal and herpetofauna species.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Subject to confirmation
Medium	Mammalia-Hydrictis maculicollis
Medium	Sensitive species 15

Figure 7-2 Fauna Theme Sensitivity, National Web based Environmental Screening Tool

7.2 Site Ecological Importance (SEI)

Based on the criteria provided in Section 3.1.5 of this report, all habitats within the assessment area of the proposed project were allocated a sensitivity or SEI category (Table 7-1).The SEI of the PAOI within an avifauna context was based on both, the field results and desktop information. The SEI of the habitat types delineated are illustrated in Figure 7-3. The water resources are where the Black-winged Pratincoles were observed, while in the grasslands the Secretarybird and Blue Korhaan were found. All the habitats also have a further potential to support additional SCCs.

Table 7-1 SEI Summary of habitat types delineated within field assessment area of PAOI

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Grassland	High Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity	**Medium**	Medium Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality	**Medium**
Transformed- Degraded Grassland	Low No confirmed or highly likely populations of SCC.	Low Almost no habitat connectivity but migrations still possible	**Low**	High Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition	**Very Low**
Water resources	. High Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity	**Medium**	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality	**High**

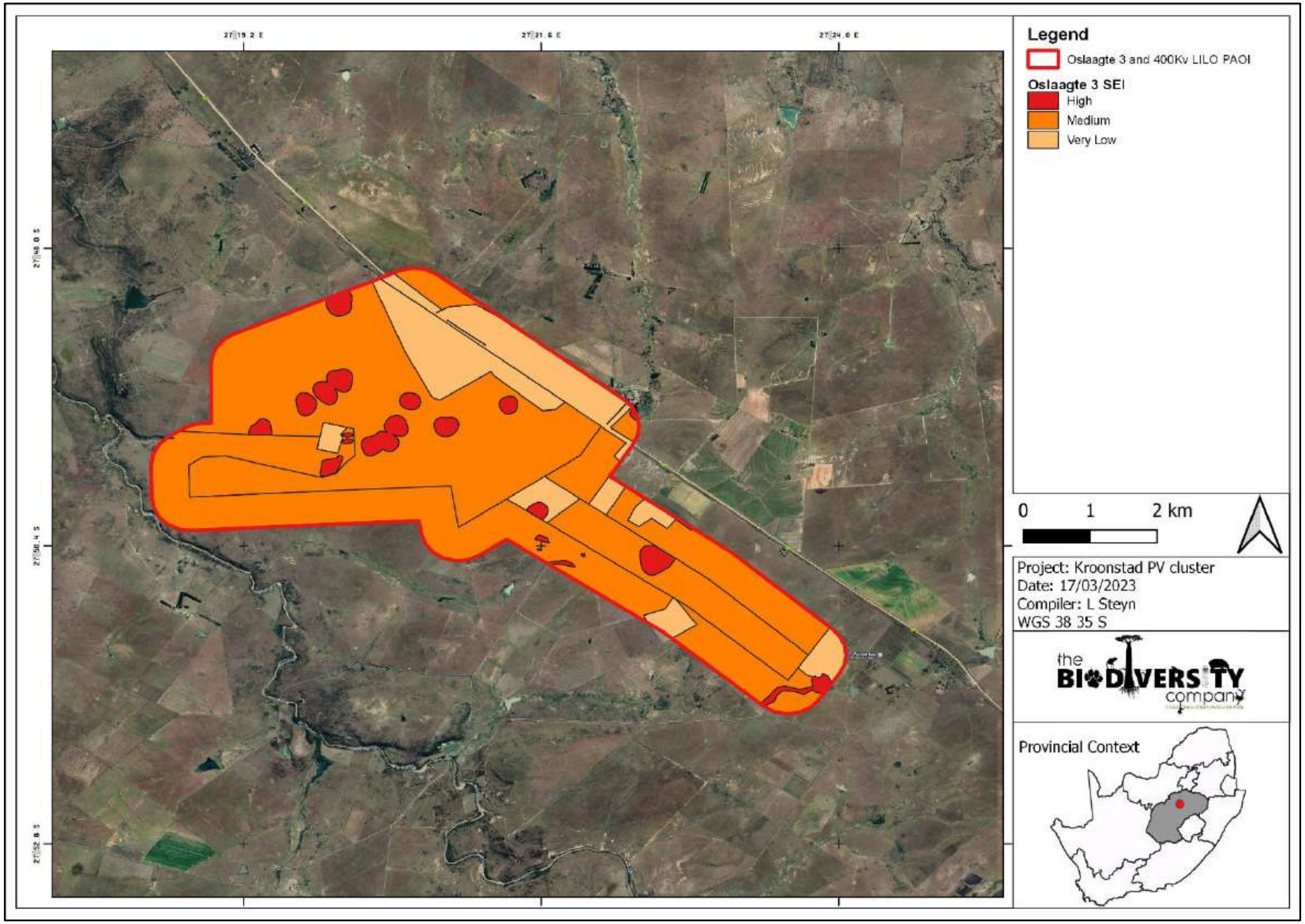


Figure 7-3 Map illustrating the Site Ecological Importance of the proposed PAOI within an avifauna context

Interpretation of the SEI in the context of the proposed project is provided in Table 7-2.

Table 7-2 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance	Interpretation in relation to proposed development activities
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

7.2.1 Site Sensitivity Verification

The allocated sensitivities for each of the relevant themes are either disputed or validated for the overall Project Area in Table 7-3 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the SEI process followed in the previous section, and consideration is given to any observed or likely presence of SCC or protected species.

Table 7-3 Summary of the screening tool vs. specialist assigned sensitivities

Screening Tool Theme	Screening Tool	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Animal Theme	Medium	Medium	Validated – Three SCC were recorded, nests of these species were however not found they therefore utilize the area for foraging alone

8 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork and from a desktop perspective to identify relevance to the PAOI. The assessment of the significance of direct, indirect and cumulative impacts was undertaken. The methods used is available on request.

Bennun *et al* (2021) describes three broad types of impacts associated with solar energy development:

- Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat fragmentation as a result of project infrastructure and species disturbance or mortality as a result of project operations.
- Indirect impacts – Impacts induced by, or ‘by-products’ of, project activities within a project’s area of influence.
- Cumulative impacts – Impacts that result from the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts.

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Closure/Rehabilitation Phase.

8.1 Present Impacts to Avifauna

In consideration that there are anthropogenic activities and influences present within the landscape, there are currently several negative impacts to biodiversity, including avifauna. These include:

- Historic land modification largely in the form of road and powerline infrastructure, and the associated land clearing and edge effects;
- Livestock grazing;
- Minor and major gravel roads (and associated vehicle traffic and the possibility of wildlife road mortalities);
- Invasive Alien Plant infestations; and
- Fences and the associated infrastructure.

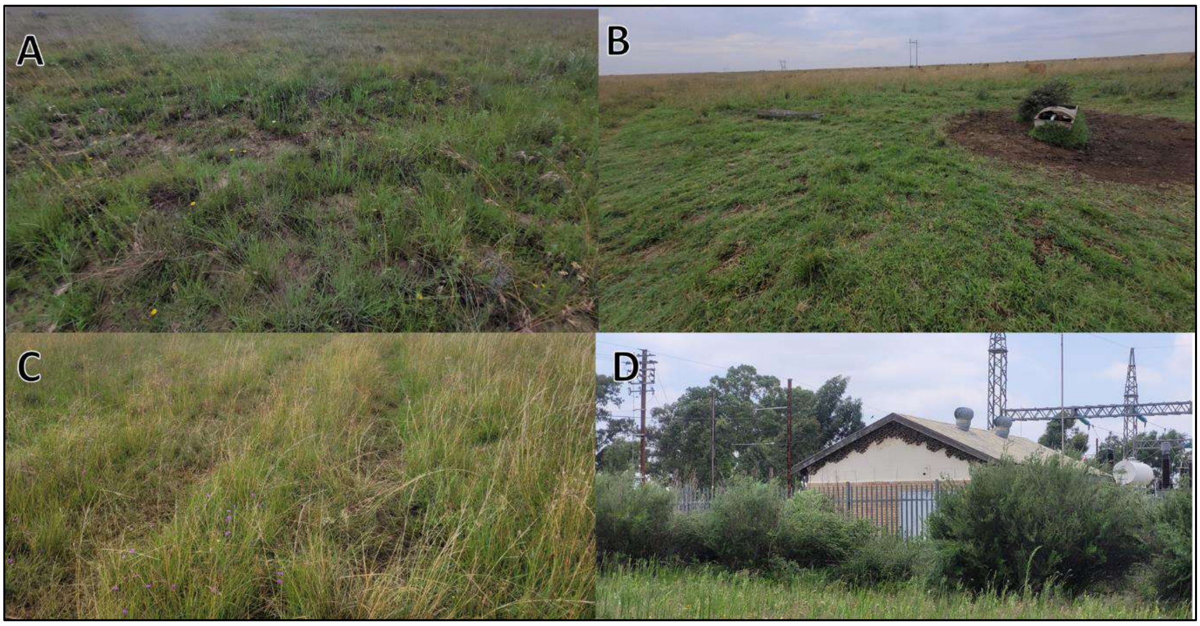


Figure 8-1 Photograph illustrating current negative impacts associated with the PAOI: A) Overgrazed habitat; B) Livestock grazing ad existing powerlines; C) Farm roads; and D) Substation and associated infrastructure.

8.2 Anticipated Impacts

This section describes the potential impacts on avifauna associated with the construction and operational phases of the proposed development and is only relevant to the PV site and associated infrastructure.

During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise pollution. Increased human presence can lead to poaching and the increase in vehicle traffic and heavy machinery will potentially lead to roadkill.

The principal impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the “lake effect” (Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This "lake-effect" hypothesis has not been substantiated or refuted to date (Visser *et al,* 2019). It can however be said that the combination of power lines, fencing and large infrastructure will influence avifauna species. Visser *et al* (2019) performed a study at a utility-scale PV SEF in the Northern Cape and found that most of the species affected by the facility were passerine species. This is due to collisions with solar panels from underneath. During a predator attack while foraging under the panels, individuals may alight and then collide with the panel. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions with infrastructure.

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties.

Fencing of the PV site can influence birds in six ways (BirdLife South Africa, 2015):

- Snagging – occurs when a body part is impaled on one or more barbs or razor points of a fence;
- Snaring – when a bird's foot/leg becomes trapped between two overlapping wires;
- Impact injuries – birds flying into a fence, the impact may kill or injure the bird;
- Snarling – when birds try and push through a mesh or wire stands, ultimately becoming trapped (uncommon);
- Electrocution – electrified fence can kill or severely injure birds; and
- Barrier effect – fences may limit flightless birds including moulting waterfowl from resources.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either acute or chronic affects. Should this chemical penetrate into the surrounding environment, it would impact populations on a larger scale and not just species found in and around the PV footprint.

8.3 Alternatives Considered

The design was changed to take into account the sensitive areas (Figure 8-2) as identified by the various studies, this is now considered below as Alternative 2.

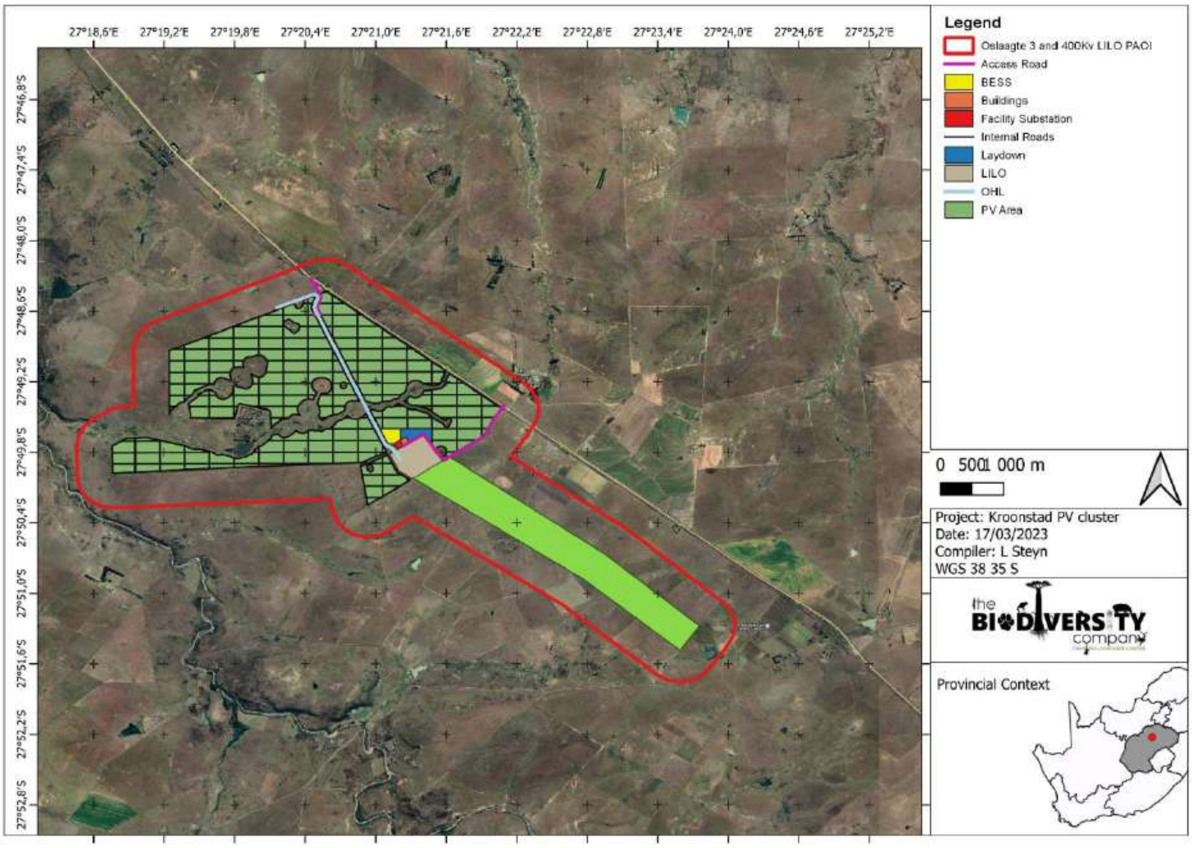


Figure 8-2 Alternative layout provided

8.4 Loss of Irreplaceable Resources

The proposed development will lead to the loss of the following irreplaceable resources:

- Ecological Support Area;
- Protected Area; and
- Habitat and possible nesting sites for avifauna SCC.

8.5 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Although different species and groups will react differently to the development, the risk assessment was undertaken bearing in mind the potential impacts to the priority species listed in this report. Except for the habitat destruction, all in the impacts for the original and alternative design will be the same and were assessed simultaneously.

8.5.1 Construction Phase

8.5.1.1 Habitat destruction within the project footprint

Habitat destruction of the proposed development is inevitable. For the original design pre-mitigation the significance of the impact is a Negative High Impact but with the implementation of mitigation measures can be reduced to a Negative Moderately High Impact. With the alternative design, the pre-mitigation impact will be high, but the post mitigation as the sensitive areas are successfully avoided will be lowered to Moderate.

Prior to mitigation (original Design)					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	3	4	4	5	
Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	2	4	4	4	
Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Prior to mitigation (Alternative Design)					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	3	4	4	5	
Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	2	4	3	4	
Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Significant / ecosystem structure and function moderately altered	Highly likely	**Moderate**

Mitigation Actions:

- Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun et al, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas;

- Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents;

- Vegetation clearing to commence only after the necessary permits have been obtained; and

- Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.

8.5.1.2 Destruction, degradation and fragmentation of surrounding habitats

Construction activities can lead to destruction of surrounding habitats. Pre-mitigation this impact has a Negative Moderately High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	3	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc.;
- All solid waste must be managed in accordance with a Solid Waste Management Plan. Recycling is encouraged;
- All construction activities and roads to be within the clearly defined and demarcated areas;
- Temporary laydown areas should be clearly demarcated and rehabilitated with indigenous vegetation subsequent to end of use;
- Appropriate dust control measures to be implemented;
- Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act;
- Cement mixed on site must be mixed in a bunded area or on a removable surface such as thick plastic sheeting at least 50 m away from any wetlands or water resources; and
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.

8.5.1.3 Displacement/emigration of avifauna community (including SCC) due to noise pollution

Noise pollution generated from construction activities will lead to the displacement/emigration of the local avifauna community including the proximal surrounding area. This will include SCC that occur or are likely to occur within the area. Pre-mitigation this impact has a Negative Moderately High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	3	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- No construction activity is to occur at night, as nocturnal species are highly dependent on sound and/or vocalisations for behavioural processes;

- All vehicles speed must be restricted to 20 km/h, to reduce the noise emitted by them; and
- If generators are to be used these must be soundproofed.

8.5.1.4 Direct mortality from persecution or poaching of avifauna species and collection of eggs

There is the possibility of construction staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Moderately High Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting species and collecting eggs;
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any avifauna and so they have a chance to vacate the area; and
- Any avifauna threatened by the construction activities that does not vacate the area should be removed safely by an appropriately qualified environmental officer or removal specialist.

8.5.1.5 Direct mortality from increased vehicle and heavy machinery traffic

The increased vehicle and heavy machinery traffic associated with construction activities will lead to roadkill. This impact was determined to have a Negative Moderately High Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	1	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha		Ecology with limited sensitivity/importance	Highly unlikely	**Absent**

	impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged			

Mitigation Actions:

- All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill; and
- All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

8.5.2 Operational Phase

8.5.2.1 Collisions with infrastructure associated with the PV Facility and powerlines

The proposed project comprises of components that pose a collision risk to avifauna species. This includes collisions with PV panels, connection infrastructure, powerlines and fences. This impact was determined to have a Negative High significance but can be reduced to a Negative Moderate significance with the implementation of appropriate mitigation measures.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	4	4	4	4	
Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance

4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Mitigation Actions:

- The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun et al, 2021). This is especially pertinent to waders and aquatic species that may recognise the panel array as water bodies (lake effect as described above) and collide with the panels, causing mortality;
- The air space used by the gridlines must be minimised by burying them where possible;
- Overhead cables/lines across water resource areas must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw et al (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites;

- Fencing mitigations:
  - Top 2 strands must be smooth wire;
  - Routinely retention loose wires;
  - Minimum distance between wires is 300 mm; and
  - Place markers on fences.

8.5.2.2 Electrocution due to infrastructure associated with the PV Facility

This impact was determined to have a Negative Moderately High significance but can be reduced to a Negative Moderate significance with the implementation of appropriate mitigation measures.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	2	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Possible	**Moderate**

Mitigation Actions:

- The design of the proposed solar plant and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered; and
- Perch discouragers can be used such as perch guards or spikes. Considerable success achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts (Prinsen *et al,* 2012).

8.5.2.3 Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs

There is the possibility of operational staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance

4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	2	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

Mitigation Actions:

- All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting avifauna species and collecting eggs.
- Signs must be put up to enforce this, should someone be caught a R1000 fine must be enforced;
- All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill; and
- All vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

8.5.2.4 Pollution of water sources and surrounding habitat due to cleaning products of the PV panels

It is likely that the panels will be cleaned with chemicals in addition to water to ensure they function optimally. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- Only environmentally friendly chemicals are to be used for cleaning of the panels.

8.5.2.5 Heat radiation from the BESS and PV panels

Heat radiation from the infrastructure can result in an overall increase of temperature in the surrounding area, it can also lead to veld fires. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- The BESS must be enclosed in a structure with a non-reflective surface;
- A fire management plan needs to be put in place; and
- Grass must be kept under the panels to ensure that additional reflection is not taking place from the surface below the panels.

8.5.2.6 Encroachment of Invasive Alien Plants into disturbed areas

Invasive Alien Plants (IAPs) tend to encroach into disturbed areas and outcompete/displace indigenous vegetation. This will lead to a shift in the vegetation composition and structure, and consequently will cause a negative shift in the wellbeing of the avifauna community. This impact was determined to have a Negative Moderate significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

	impacted / Linear features affected < 100m				

Mitigation Actions:

- An IAP Management Plan must be written and implemented for the development. The developer must contract a specialist to develop the plan and the developer is responsible for its implementation;
- Regular monitoring for IAP encroachment during the operation phase must be undertaken to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project; and
- All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.

8.5.3 Decommissioning Phase

8.5.3.1 Direct mortality due to earthworks, vehicle collisions and persecution

Decommissioning activity will likely lead to direct mortality of avifauna due to earthworks, vehicle collisions and persecution. This impact was determined to have a Negative Moderate significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance

2	2	3	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- All personnel should undergo environmental awareness training including educating about not harming or collecting species;
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate;
- Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist;
- All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected;
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner;
- Any excavations should not be left open for extended periods of time as avifauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter;
- All infrastructure must be removed if the facility is decommissioned, this includes the powerlines; and
- The PAOI must be rehabilitated, and a management plan must be in place to ensure that it is done successfully.

8.5.3.2 Continued habitat degradation due to Invasive Alien Plant encroachment and erosion

Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years. Pre-mitigation this impact has a Negative Moderately-High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation

Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase;
- Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase;
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques; and
- There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.

8.6 Unplanned Events

The planned activities will have anticipated impacts as discussed above; however, unplanned events may occur on any project, and these could lead to potential impacts which will require appropriate management.

Table 8-1 is a summary of the findings of an unplanned event assessment conducted from an avifaunal perspective. Note that not all potential unplanned events may be captured herein, and this process must therefore be managed throughout all phases and according to events that take place or have a high likelihood of taking place.

Table 8-1 Summary of unplanned events, potential impacts and mitigations

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on, and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural savannah.	An appropriate fire management plan needs to be compiled and implemented.
Erosion caused by water runoff from the surface	Erosion on the side of the roads and cleared areas.	A storm water management plan must be compiled and implemented.

8.7 Cumulative Impacts

Cumulative impacts are assessed within the context of the extent of the proposed PAOI, other developments and activities in the area (existing and proposed) and general habitat loss and disturbance resulting from any other anthropogenic activities in the area. The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on the local and regional avifauna community.

Localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

A total area of 30 km surrounding the PAOI were used to assess the total habitat loss in the area and subsequently the cumulative impact. To determine the intact remnant habitat the NBA (2018) remnant spatial data was utilised. The future renewable energy projects were also considered by utilising the REEA Q4 (2022) spatial dataset. In order to remove any duplication, only the areas that overlap with the remanence areas were considered. The total cumulative loss was found to be 41.97% (Table 8-2), a visual representation of this is shown in Figure 8-3.

Table 8-2 The cumulative impacts considered for avifauna

Total Area of 30 km^2	Intact Remnant Habitat	REEA area that does not overlap with disturbed areas	Total Disturbed/Transformed habitat	Percentage area lost
415292.42 Ha	239001.68 Ha	1970.48 Ha	174320 Ha	41.97%

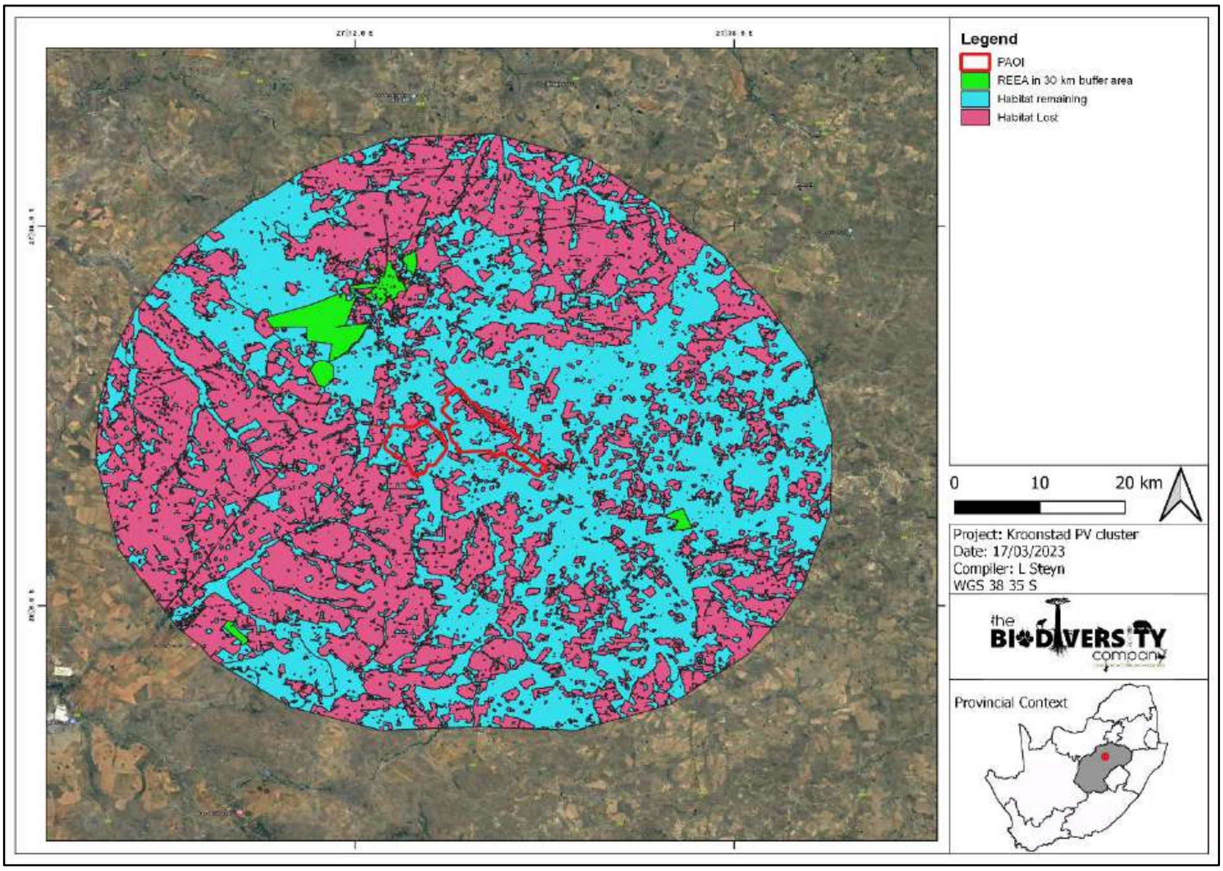


Figure 8-3 Map illustrating the additional renewable energy developments within the landscape overlaid onto the remnant vegetation types

The proposed Solar PV facility in isolation has a Negative Low impact significance (Table 8-3). In consideration of the aforementioned information, the cumulative impact was determined to be of a Negative Medium significance (Table 8-4).

Table 8-3 Cumulative Impacts to avifauna associated with the proposed project – Project in Isolation

Impact	Project in Isolation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of habitat	1	4	2	2	3	2	2	
	Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

Table 8-4 Cumulative Impacts to avifauna associated with the proposed project – Cumulative Effect

Impact	Cumulative Effect							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of habitat, and disruption of surrounding ecological corridors.	3	4	3	3	3	4	2	
	Province/region: Will affect the entire province or region.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

9 Avifauna Impact Management Actions

The purpose of the Biodiversity Impact Management Actions of is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines.

Table 9-1 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators pertaining to the avifaunal component.

Table 9-1 Summary of management outcomes pertaining to impacts to avifauna and their habitats

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
The areas to be developed must be specifically demarcated to prevent movement into surrounding environments.	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity.	Life of operation	Project Manager	Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity	Life of operation
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation	Project Manager	Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning /Rehabilitation	Project Manager	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed	Decommissioning /Rehabilitation

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
			area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer Contractor	Spill events, Vehicles dripping.	Ongoing
Cement mixed on site must be mixed in a bunded area or on a removable surface such as thick plastic sheeting at least 50 m away from any wetlands or water resources.	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Water pollution and restricted rehabilitation	During phase
Leaking equipment and vehicles must be repaired immediately or be removed from PAOI to facilitate repair.	Life of operation	Environmental Officer Contractor	Leaks and spills	Ongoing
A fire management plan needs to be complied to restrict the impact of fire.	Life of operation	Environmental Officer Contractor	Fire Management	During Phase
Management outcome: Avifauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel must undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species, and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be kept to a minimum to avoid disturbing avifauna.	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
Outside lighting must be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Light pollution and period of light.	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
lighting should be avoided, and sodium vapor (red/green) lights should be used wherever possible.				
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (20 km/h), to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Life of Operation	Health and Safety Officer	Compliance to the training.	Ongoing
All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region	Construction/Operational Phase	Project Manager Environmental Officer	Noise	Ongoing
Powerlines must be fitted with bird diverters in the high sensitivity areas	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of electrocuted birds or bird strikes	During Phase
All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any Species of Conservation Concern be found and not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction	Environmental Officer	Presence of avifauna species and nests	During Phase
The design of the proposed PV and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins *et al.*, 2015).	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of electrocuted birds or bird strikes	During Phase
Infrastructure must be consolidated where possible in order to minimise the amount of ground and air space used.	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of bird collisions	During phase
All the parts of the infrastructure must be nest proofed and anti-perch devices placed on areas that can lead to electrocution	Planning and Construction	Environmental Officer Contractor Engineer	Presence of electrocuted birds	During phase
Use environmentally friendly cleaning and dust suppressant products	Construction and Operation	Environmental Officer Contractor Engineer	Chemicals used	During phase
Fencing mitigations: • Top 2 strands must be smooth wire; • Routinely retention loose wires; • Minimum 300 mm between wires; and	Life of Operation	Project Manager Environmental Officer Contractor Design Engineer	Presence of birds stuck /dead in fences Monitor fences for slack wires	During phase

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
• Place markers on fences.				
As far as possible power cables within the PAOI should be thoroughly insulated and preferably buried.	Construction and Operation	Project Manager Environmental Officer Design Engineer	Exposed cables	During phase
Any exposed parts must be covered (insulated) to reduce electrocution risk	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
The BESS must be enclosed in a structure with a non-reflective surface	Construction and Operation	Project Manager Environmental Officer Design Engineer	Reflective surfaces on BESS	During phase
Non-polarising white strips can be fitted along the edges of the panels to reduce reflection and therefore similarity to water and deter birds and insects (Horvath *et al,* 2010).	Operational	Project Manager Environmental Officer Design Engineer	Presence of dead birds in the project site. Monitoring must be undertaken in accordance with the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). The precise location of any dead birds found should be recorded and mapped (using GPS). All carcasses should be photographed as found then placed in a plastic bag, labelled as to the location and date, and preserved (refrigerated or frozen) until identified. Feather spots (e.g., a group of feathers attached to skin) and body parts should also be collected.	During phase. The monitoring frequency is based on the collision rate.
All infrastructure, must be removed if the facility is decommissioned.	Closure/Rehabilitation	Project Manager Environmental Officer	Infrastructure removal	During Process

10 Monitoring

Nest monitoring must be performed for two years post development to determine the effect the development is having on these priority species outside of the direct footprint.

11 Conclusion and Impact Statement

11.1 Conclusion

The aim of this Avifauna Impact Assessment was to provide information to guide the risk of the proposed Solar PV facility to the avifauna community likely affected by its development.

During the assessment three SCCs were observed, the Blue Korhaan (*Eupodotis caerulescens*; LC (Regional), NT (Global)) ; Secretarybird (*Sagittarius serpentarius;* VU, EN) and Black-winged Pratincole (*Glareola nordmanni;* NT, NT). The Black-winged Pratincoles were observed on three occasions and a total of 150 birds were recorded. Two Blue Korhaans and two Secretarybirds were observed. Fifteen and eighteen priority species respectively were recorded in the first and second survey. These species are at risk of either habitat loss, collisions or electrocutions. If the mitigations and recommendations are implemented these risks can be reduced to moderate. Nests of seven species were observed of which five are priority species. A 100 m buffer were placed around the priority species nests. If the nests are in the development footprint then these nests must be regarded as no go buffers for the duration of the breeding season (January- April), if the nests can be found just outside of the development areas then these nests and their buffers must be treated as long term (for the lifetime of the development) no go areas. Three habitats were delineated in the assessment namely, Grassland, Degraded-transformed grassland and Water Resources. All these habitats support a number of avifauna species with the grasslands being the most species rich. The Water Resources were given a high SEI rating based on the SCCs that are dependent on this habitat for both water and habitation. The overall impact of the project is regarded as acceptable should the mitigations and recommendations be implemented. The alternative design is the preferred layout.

11.2 Impact Statement

The main expected impacts of the proposed PV facility and associated infrastructure will include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable residual risk level. Considering the above-mentioned information it is the opinion of the specialist that the project may be favourably considered, on condition that all the mitigation, monitoring and recommendations provided in this report and other specialist reports are implemented.

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13 Appendix Items

13.1 Appendix A: Summary of Expected species

Common Name	Scientific Name	RD (Regional, Global)
Abdim's Stork	*Ciconia abdimii*	NT, LC
Acacia Pied Barbet	*Tricholaema leucomelas*	
African Black Duck	*Anas sparsa*	
African Black Swift	*Apus barbatus*	
African Darter	*Anhinga rufa*	
African Fish Eagle	*Haliaeetus vocifer*	
African Harrier-Hawk	*Polyboroides typus*	
African Hoopoe	*Upupa africana*	
African Openbill	*Anastomus lamelligerus*	
African Palm Swift	*Cypsiurus parvus*	
African Paradise Flycatcher	*Terpsiphone viridis*	
African Pipit	*Anthus cinnamomeus*	
African Quail-finch	*Ortygospiza atricollis*	
African Red-eyed Bulbul	*Pycnonotus nigricans*	
African Reed Warbler	*Acrocephalus baeticatus*	
African Rock Pipit	*Anthus crenatus*	NT, LC
African Sacred Ibis	*Threskiornis aethiopicus*	
African Snipe	*Gallinago nigripennis*	
African Spoonbill	*Platalea alba*	
African Stonechat	*Saxicola torquatus*	
African Wattled Lapwing	*Vanellus senegallus*	
Alpine Swift	*Tachymarptis melba*	
Amethyst Sunbird	*Chalcomitra amethystina*	
Amur Falcon	*Falco amurensis*	
Ant-eating Chat	*Myrmecocichla formicivora*	
Ashy Tit	*Melaniparus cinerascens*	
Banded Martin	*Riparia cincta*	
Barn Swallow	*Hirundo rustica*	
Barred Wren-Warbler	*Calamonastes fasciolatus*	
Black Crake	*Zapornia flavirostra*	
Black Cuckoo	*Cuculus clamosus*	
Black Harrier	*Circus maurus*	EN, EN
Black Sparrowhawk	*Accipiter melanoleucus*	
Black-chested Prinia	*Prinia flavicans*	
Black-chested Snake Eagle	*Circaetus pectoralis*	
Black-collared Barbet	*Lybius torquatus*	

Black-crowned Night Heron	*Nycticorax nycticorax*	
Black-faced Waxbill	*Brunhilda erythronotos*	
Black-headed Heron	*Ardea melanocephala*	
Black-necked Grebe	*Podiceps nigricollis*	
Blacksmith Lapwing	*Vanellus armatus*	
Black-throated Canary	*Crithagra atrogularis*	
Black-winged Kite	*Elanus caeruleus*	
Black-winged Pratincole	*Glareola nordmanni*	NT, NT
Black-winged Stilt	*Himantopus himantopus*	
Blue Korhaan	*Eupodotis caerulescens*	LC, NT
Blue Waxbill	*Uraeginthus angolensis*	
Bokmakierie	*Telophorus zeylonus*	
Booted Eagle	*Hieraaetus pennatus*	
Bronze-winged Courser	*Rhinoptilus chalcopterus*	
Brown Snake Eagle	*Circaetus cinereus*	
Brown-crowned Tchagra	*Tchagra australis*	
Brown-hooded Kingfisher	*Halcyon albiventris*	
Brown-throated Martin	*Riparia paludicola*	
Brubru	*Nilaus afer*	
Buffy Pipit	*Anthus vaalensis*	
Burchell's Coucal	*Centropus burchellii*	
Cape Bunting	*Emberiza capensis*	
Cape Canary	*Serinus canicollis*	
Cape Glossy (Cape) Starling	*Lamprotornis nitens*	
Cape Longclaw	*Macronyx capensis*	
Cape Penduline-tit	*Anthoscopus minutus*	
Cape Robin-chat	*Cossypha caffra*	
Cape Shoveler	*Spatula smithii*	
Cape Sparrow	*Passer melanurus*	
Cape Teal	*Anas capensis*	
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*	
Cape Wagtail	*Motacilla capensis*	
Cape Weaver	*Ploceus capensis*	
Cape White-eye	*Zosterops virens*	
Capped Wheatear	*Oenanthe pileata*	
Cardinal Woodpecker	*Dendropicos fuscescens*	
Caspian Tern	*Hydropogne caspia*	VU, LC
Chestnut-backed Sparrow-lark	*Eremopterix leucotis*	
Chestnut-vented Tit-Babbler (Warbler)	*Curruca subcoerulea*	

Cinnamon-breasted Bunting	*Emberiza tahapisi*	
Cloud Cisticola	*Cisticola textrix*	
Common (Kurrichane) Buttonquail	*Turnix sylvaticus*	
Common (Steppe) Buzzard	*Buteo buteo*	
Common Cuckoo	*Cuculus canorus*	
Common Greenshank	*Tringa nebularia*	
Common House Martin	*Delichon urbicum*	
Common Moorhen	*Gallinula chloropus*	
Common Myna	*Acridotheres tristis*	
Common Ostrich	*Struthio camelus*	
Common Quail	*Coturnix coturnix*	
Common Ringed Plover	*Charadrius hiaticula*	
Common Sandpiper	*Actitis hypoleucos*	
Common Scimitarbill	*Rhinopomastus cyanomelas*	
Common Starling	*Sturnus vulgaris*	
Common Swift	*Apus apus*	
Common Waxbill	*Estrilda astrild*	
Common Whitethroat	*Curruca communis*	
Crested Barbet	*Trachyphonus vaillantii*	
Crimson-breasted Shrike	*Laniarius atrococcineus*	
Crowned Lapwing	*Vanellus coronatus*	
Curlew Sandpiper	*Calidris ferruginea*	LC, NT
Desert Cisticola	*Cisticola aridulus*	
Diederik Cuckoo	*Chrysococcyx caprius*	
Double-banded Courser	*Rhinoptilus africanus*	
Dwarf Bittern	*Ixobrychus sturmii*	
Eastern Clapper Lark	*Mirafra fasciolata*	
Eastern Long-billed Lark	*Certhilauda semitorquata*	
Egyptian Goose	*Alopochen aegyptiaca*	
Eurasian Golden Oriole	*Oriolus oriolus*	
European Bee-eater	*Merops apiaster*	
European Honey Buzzard	*Pernis apivorus*	
European Roller	*Coracias garrulus*	NT, LC
Fairy Flycatcher	*Stenostira scita*	
Familiar Chat	*Oenanthe familiaris*	
Fiscal Flycatcher	*Melaenornis silens*	
Fork-tailed Drongo	*Dicrurus adsimilis*	
Fulvous Whistling Duck	*Dendrocygna bicolor*	
Gabar Goshawk	*Micronisus gabar*	

Garden Warbler	*Sylvia borin*	
Giant Kingfisher	*Megaceryle maxima*	
Glossy Ibis	*Plegadis falcinellus*	
Golden-breasted Bunting	*Emberiza flaviventris*	
Goliath Heron	*Ardea goliath*	
Great Crested Grebe	*Podiceps cristatus*	
Great Egret	*Ardea alba*	
Great Reed Warbler	*Acrocephalus arundinaceus*	
Greater Flamingo	*Phoenicopterus roseus*	NT, LC
Greater Honeyguide	*Indicator indicator*	
Greater Kestrel	*Falco rupicoloides*	
Greater Striped Swallow	*Cecropis cucullata*	
Green Wood-hoopoe	*Phoeniculus purpureus*	
Green-winged Pytilia	*Pytilia melba*	
Grey Heron	*Ardea cinerea*	
Grey-headed Gull	*Chroicocephalus cirrocephalus*	
Hadeda (Hadada) Ibis	*Bostrychia hagedash*	
Hamerkop	*Scopus umbretta*	
Helmeted Guineafowl	*Numida meleagris*	
Horus Swift	*Apus horus*	
House Sparrow	*Passer domesticus*	
Icterine Warbler	*Hippolais icterina*	
Jackal Buzzard	*Buteo rufofuscus*	
Jacobin Cuckoo	*Clamator jacobinus*	
Jameson's Firefinch	*Lagonosticta rhodopareia*	
Kalahari Scrub Robin	*Cercotrichas paena*	
Karoo Prinia	*Prinia maculosa*	
Karoo Scrub Robin	*Cercotrichas coryphoeus*	
Karoo Thrush	*Turdus smithi*	
Kittlitz’s Plover	*Charadrius pecuarius*	
Klaas's Cuckoo	*Chrysococcyx klaas*	
Knob-billed Duck	*Sarkidiornis melanotos*	
Lanner Falcon	*Falco biarmicus*	VU, LC
Lark-like Bunting	*Emberiza impetuani*	
Laughing Dove	*Spilopelia senegalensis*	
Lesser Black-backed Gull	*Larus fuscus*	
Lesser Flamingo	*Phoeniconaias minor*	NT, NT
Lesser Grey Shrike	*Lanius minor*	
Lesser Honeyguide	*Indicator minor*	

Lesser Kestrel	*Falco naumanni*	
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	
Levaillant's Cisticola	*Cisticola tinniens*	
Lilac-breasted Roller	*Coracias caudatus*	
Little Bee-eater	*Merops pusillus*	
Little Egret	*Egretta garzetta*	
Little Grebe	*Tachybaptus ruficollis*	
Little Stint	*Calidris minuta*	
Little Swift	*Apus affinis*	
Long-billed crombec	*Sylvietta rufescens*	
Long-tailed Paradise Whydah	*Vidua paradisaea*	
Long-tailed Widowbird	*Euplectes progne*	
Maccoa Duck	*Oxyura maccoa*	NT, EN
Magpie Shrike	*Urolestes melanoleucus*	
Malachite Kingfisher	*Corythornis cristatus*	
Malachite Sunbird	*Nectarinia famosa*	
Marsh Owl	*Asio capensis*	
Marsh Sandpiper	*Tringa stagnatilis*	
Marsh Warbler	*Acrocephalus palustris*	
Martial Eagle	*Polemaetus bellicosus*	EN, EN
Melodious Lark	*Mirafra cheniana*	
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*	
Mountain Wheatear	*Myrmecocichla monticola*	
Namaqua Dove	*Oena capensis*	
Namaqua Sandgrouse	*Pterocles namaqua*	
Natal Spurfowl	*Pternistis natalensis*	
Neddicky	*Cisticola fulvicapilla*	
Nicholson's Pipit	*Anthus nicholsoni*	
Northern Black Korhaan	*Afrotis afraoides*	
Orange River Francolin	*Scleroptila gutturalis*	
Orange River White-eye	*Zosterops pallidus*	
Pale Chanting Goshawk	*Melierax canorus*	
Pearl-breasted Swallow	*Hirundo dimidiata*	
Pied Avocet	*Recurvirostra avosetta*	
Pied Crow	*Corvus albus*	
Pied Kingfisher	*Ceryle rudis*	
Pied Starling	*Lamprotornis bicolor*	
Pink-billed Lark	*Spizocorys conirostris*	
Pin-tailed Whydah	*Vidua macroura*	

Plain-backed Pipit	*Anthus leucophrys*	
Pririt Batis	*Batis pririt*	
Purple Heron	*Ardea purpurea*	
Rattling Cisticola	*Cisticola chiniana*	
Red-backed Shrike	*Lanius collurio*	
Red-billed Firefinch	*Lagonosticta senegala*	
Red-billed Quelea	*Quelea quelea*	
Red-billed Teal	*Anas erythrorhyncha*	
Red-breasted Swallow	*Cecropis semirufa*	
Red-capped Lark	*Calandrella cinerea*	
Red-chested Cuckoo	*Cuculus solitarius*	
Red-collared Widowbird	*Euplectes ardens*	
Red-eyed Dove	*Streptopelia semitorquata*	
Red-faced Mousebird	*Urocolius indicus*	
Red-footed Falcon	*Falco vespertinus*	NT, VU
Red-headed Finch	*Amadina erythrocephala*	
Red-knobbed coot	*Fulica cristata*	
Red-throated Wryneck	*Jynx ruficollis*	
Red-winged Starling	*Onychognathus morio*	
Reed Cormorant	*Microcarbo africanus*	
Rock Dove	*Columba livia*	
Rock Kestrel	*Falco rupicolus*	
Rock Martin	*Ptyonoprogne fuligula*	
Ruff	*Calidris pugnax*	
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	
Rufous-eared Warbler	*Malcorus pectoralis*	
Rufous-naped Lark	*Mirafra africana*	
Sabota Lark	*Calendulauda sabota*	
Scaly-feathered Finch (Weaver)	*Sporopipes squamifrons*	
Secretarybird	*Sagittarius serpentarius*	VU, EN
Shaft-tailed Whydah	*Vidua regia*	
Sickle-winged Chat	*Emarginata sinuata*	
South African Cliff Swallow	*Petrochelidon spilodera*	
South African Shelduck	*Tadorna cana*	
South African Shelduck	*Tadorna cana*	
Southern (Common) Fiscal	*Lanius collaris*	
Southern Boubou	*Laniarius ferrugineus*	
Southern Grey-headed Sparrow	*Passer diffusus*	
Southern Masked Weaver	*Ploceus velatus*	

Southern Pochard	*Netta erythrophthalma*	
Southern Red Bishop	*Euplectes orix*	
Speckled Mousebird	*Colius striatus*	
Speckled Pigeon	*Columba guinea*	
Spike-heeled Lark	*Chersomanes albofasciata*	
Spotted Eagle-Owl	*Bubo africanus*	
Spotted flycatcher	*Muscicapa striata*	
Spotted Thick-knee	*Burhinus capensis*	
Spur-winged Goose	*Plectropterus gambensis*	
Squacco Heron	*Ardeola ralloides*	
Streaky-headed Seedeater	*Crithagra gularis*	
Swainson's Spurfowl	*Pternistis swainsonii*	
Swallow-tailed Bee-eater	*Merops hirundineus*	
Three-banded Plover	*Charadrius tricollaris*	
Verreaux's Eagle	*Aquila verreauxii*	VU, LC
Village Indigobird	*Vidua chalybeata*	
Violet-backed Starling	*Cinnyricinclus leucogaster*	
Violet-eared Waxbill	*Granatina granatina*	
Wailing Cisticola	*Cisticola lais*	
Wattled Starling	*Creatophora cinerea*	
Western Barn Owl	*Tyto alba*	
Western Cattle Egret	*Bubulcus ibis*	
Western Osprey	*Pandion haliaetus*	
Whiskered Tern	*Chlidonias hybrida*	
White Stork	*Ciconia ciconia*	
White-backed Duck	*Thalassornis leuconotus*	
White-backed Mousebird	*Colius colius*	
White-bellied Sunbird	*Cinnyris talatala*	
White-breasted Cormorant	*Phalacrocorax lucidus*	
White-browed Sparrow-Weaver	*Plocepasser mahali*	
White-faced Whistling Duck	*Dendrocygna viduata*	
White-fronted Bee-eater	*Merops bullockoides*	
White-rumped Swift	*Apus caffer*	
White-throated Canary	*Crithagra albogularis*	
White-throated Swallow	*Hirundo albigularis*	
White-winged Tern	*Chlidonias leucopterus*	
White-winged Widowbird	*Euplectes albonotatus*	
Willow Warbler	*Phylloscopus trochilus*	
Wing-snapping Cisticola	*Cisticola ayresii*	

Wood Sandpiper	*Tringa glareola*	
Yellow Canary	*Crithagra flaviventris*	
Yellow-bellied Eremomela	*Eremomela icteropygialis*	
Yellow-billed (Intermediate) Egret	*Ardea intermedia*	
Yellow-billed Duck	*Anas undulata*	
Yellow-billed Kite	*Milvus aegyptius*	
Yellow-billed Stork	*Mycteria ibis*	EN, LC
Yellow-crowned Bishop	*Euplectes afer*	
Yellow-fronted Canary	*Crithagra mozambica*	
Zitting Cisticola	*Cisticola juncidis*	

13.2 Appendix A: Point count data of the first assessment

Common Name	Scientific Name	RD (Regional, Global)	Endemism in South Africa (E)	Guild code	Relative abundance	Frequency (%)
Acacia Pied Barbet	*Tricholaema leucomelas*			OMD	0,004	10,448
African Pipit	*Anthus cinnamomeus*			IGD	0,007	17,910
African Quail-finch	*Ortygospiza atricollis*			GGD	0,018	22,388
African Red-eyed Bulbul	*Pycnonotus nigricans*			OMD	0,001	1,493
African Stonechat	*Saxicola torquatus*			IGD	0,003	5,970
Ant-eating Chat	*Myrmecocichla formicivora*			IGD	0,022	26,866
Barn Swallow	*Hirundo rustica*			IAD	0,002	2,985
Black-chested Prinia	*Prinia flavicans*			IGD	0,010	23,881
Black-headed Heron	*Ardea melanocephala*			CGD	0,001	2,985
Blacksmith Lapwing	*Vanellus armatus*			IGD	0,001	1,493
Black-winged Kite	*Elanus caeruleus*			CGD	0,002	5,970
Blue Korhaan	*Eupodotis caerulescens*	LC, NT	SLS	OMD	0,001	1,493
Bokmakierie	*Telophorus zeylonus*			OMD	0,009	17,910
Brown-crowned Tchagra	*Tchagra australis*			OMD	0,001	1,493
Cape Glossy (Cape) Starling	*Lamprotornis nitens*			IGD	0,004	5,970
Cape Longclaw	*Macronyx capensis*			IGD	0,019	34,328
Cape Robin-Chat	*Cossypha caffra*			OMD	0,001	1,493
Cape Sparrow	*Passer melanurus*			GGD	0,002	2,985
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*			GGD	0,006	13,433
Cape Wagtail	*Motacilla capensis*			IGD	0,003	4,478
Cardinal Woodpecker	*Dendropicos fuscescens*			IGD	0,001	1,493
Chestnut-vented Tit-Babbler (Warbler)	*Curruca subcoerulea*			IGD	0,003	8,955
Cloud Cisticola	*Cisticola textrix*		NE	IGD	0,046	76,119
common Ostrich	*Struthio camelus*			OMD	0,005	7,463
Common Quail	*Coturnix coturnix*			OMD	0,024	47,761
Common Scimitarbill	*Rhinopomastus cyanomelas*			IGD	0,001	1,493
Crowned Lapwing	*Vanellus coronatus*			IGD	0,012	5,970
Desert Cisticola	*Cisticola aridulus*			IGD	0,020	50,746
Diederik Cuckoo	*Chrysococcyx caprius*			IGD	0,017	46,269
Double-banded Courser	*Rhinoptilus africanus*			IGD	0,001	1,493
Eastern Clapper Lark	*Mirafra fasciolata*			IGD	0,013	25,373
Egyptian Goose	*Alopochen aegyptiaca*			HWD	0,004	5,970
European Bee-eater	*Merops apiaster*			IAD	0,005	7,463

Fiscal Flycatcher	*Melaenornis silens*		NE	OMD	0,002	2,985
Greater Kestrel	*Falco rupicoloides*			CGD	0,002	1,493
Greater Striped Swallow	*Cecropis cucullata*			IAD	0,001	1,493
Grey Heron	*Ardea cinerea*			CWD	0,001	2,985
Hadeda (Hadada) Ibis	*Bostrychia hagedash*			OMD	0,007	14,925
Hamerkop	*Scopus umbretta*			CWD	0,001	1,493
Helmeted Guineafowl	*Numida meleagris*			OMD	0,006	5,970
Jacobin Cuckoo	*Clamator jacobinus*			IGD	0,001	1,493
Kalahari Scrub Robin	*Cercotrichas paena*			IGD	0,002	5,970
Laughing Dove	*Spilopelia senegalensis*			GGD	0,001	1,493
Levaillant's Cisticola	*Cisticola tinniens*			IGD	0,006	16,418
Little Grebe	*Tachybaptus ruficollis*			CWD	0,009	11,940
Little Swift	*Apus affinis*			IAD	0,005	2,985
Long-tailed Widowbird	*Euplectes progne*			GGD	0,076	67,164
Malachite Kingfisher	*Corythornis cristatus*			CWD	0,001	1,493
Namaqua Dove	*Oena capensis*			GGD	0,001	1,493
Northern Black Korhaan	*Afrotis afraoides*			IGD	0,015	35,821
Orange River Francolin	*Scleroptila gutturalis*			GGD	0,003	4,478
Orange River White-eye	*Zosterops pallidus*			OMD	0,002	2,985
Pied Crow	*Corvus albus*			OMD	0,005	7,463
Pin-tailed Whydah	*Vidua macroura*			GGD	0,005	5,970
Purple Heron	*Ardea purpurea*			CWD	0,001	1,493
Red-billed Firefinch	*Lagonosticta senegala*			GGD	0,001	2,985
Red-billed Quelea	*Quelea quelea*			GGD	0,140	13,433
Red-billed Teal	*Anas erythrorhyncha*			OMD	0,001	1,493
Red-chested Cuckoo	*Cuculus solitarius*			IGD	0,001	2,985
Red-faced Mousebird	*Urocolius indicus*			FFD	0,003	2,985
Red-knobbed Coot	*Fulica cristata*			HWD	0,005	8,955
Red-throated Wryneck	*Jynx ruficollis*			IGD	0,002	4,478
Reed Cormorant	*Microcarbo africanus*			CWD	0,002	4,478
Rufous-naped Lark	*Mirafra africana*			IGD	0,011	23,881
Secretarybird	*Sagittarius serpentarius*	VU, EN		CGD	0,001	1,493
South African Cliff Swallow	*Petrochelidon spilodera*		BNE	IAD	0,194	47,761
Southern (Common) Fiscal	*Lanius collaris*			IAD	0,005	13,433
Southern Masked Weaver	*Ploceus velatus*			GGD	0,008	14,925
Southern Red Bishop	*Euplectes orix*			GGD	0,097	26,866

Speckled Pigeon	*Columba guinea*			FFD	0,005	2,985
Spike-heeled Lark	*Chersomanes albofasciata*			IGD	0,009	13,433
Spur-winged Goose	*Plectropterus gambensis*			OMD	0,003	5,970
Swainson's Spurfowl	*Pternistis swainsonii*			OMD	0,005	11,940
Three-banded Plover	*Charadrius tricollaris*			IWD	0,001	2,985
Violet-eared Waxbill	*Granatina granatina*			IGD	0,001	1,493
Western Cattle Egret	*Bubulcus ibis*			IGD	0,018	19,403
White-backed Mousebird	*Colius colius*			FFD	0,001	1,493
White-browed Sparrow-Weaver	*Plocepasser mahali*			OMD	0,008	11,940
White-faced Whistling Duck	*Dendrocygna viduata*			HWD	0,002	2,985
White-fronted Bee-eater	*Merops bullockoides*			IAD	0,004	4,478
White-throated Swallow	*Hirundo albigularis*			IAD	0,001	1,493
White-winged Widowbird	*Euplectes albonotatus*			GGD	0,002	2,985
Yellow-billed Duck	*Anas undulata*			HWD	0,007	10,448
Yellow-crowned Bishop	*Euplectes afer*			GGD	0,028	31,343
Yellow-fronted Canary	*Crithagra mozambica*			GGD	0,001	1,493
Zitting Cisticola	*Cisticola juncidis*			IGD	0,018	46,269

13.3 Appendix C: Incidental records during the first assessment

Common Name	Scientific Name
African Pipit	*Anthus cinnamomeus*
African Red-eyed Bulbul	*Pycnonotus nigricans*
Black-winged Kite	*Elanus caeruleus*
Buffy Pipit	*Anthus vaalensis*
Chestnut-vented Tit-Babbler (Warbler)	*Curruca subcoerulea*
Karoo Thrush	*Turdus smithi*
Little Swift	*Apus affinis*
Mountain Wheatear	*Myrmecocichla monticola*
Pink-billed Lark	*Spizocorys conirostris*
Red-billed Firefinch	*Lagonosticta senegala*
Sabota Lark	*Calendulauda sabota*
Scaly-feathered Finch (Weaver)	*Sporopipes squamifrons*
Spike-heeled Lark	*Chersomanes albofasciata*
Swainson's Spurfowl	*Pternistis swainsonii*
Violet-eared Waxbill	*Granatina granatina*
Whiskered Tern	*Chlidonias hybrida*
White-winged Widowbird	*Euplectes albonotatus*

13.4 Appendix D: Point count data of the second assessment

Common Name	Scientific Name	RD (Regional, Global)	Endemism in South Africa (E)	Guild code	Relative abundance	Frequency (%)
Acacia Pied Barbet	*Tricholaema leucomelas*		0	OMD	0,005	13,433
African Pipit	*Anthus cinnamomeus*		0	IGD	0,007	16,418
African Quail-Finch	*Ortygospiza atricollis*		0	GGD	0,026	46,269
African Red-eyed Bulbul	*Pycnonotus nigricans*		0	OMD	0,003	5,970
African Sacred Ibis	*Threskiornis aethiopicus*		0	CGD	0,001	1,493
African Stonechat	*Saxicola torquatus*		0	IGD	0,005	8,955
Amur Falcon	*Falco amurensis*		0	CGD	0,006	5,970
Ant-eating Chat	*Myrmecocichla formicivora*		0	IGD	0,013	22,388
Barn Swallow	*Hirundo rustica*		0	IAD	0,081	29,851
Black-chested Prinia	*Prinia flavicans*		0	IGD	0,014	32,836
Black-collared Barbet	*Lybius torquatus*		0	FFD	0,001	1,493
Black-headed Heron	*Ardea melanocephala*		0	CGD	0,002	5,970
Blacksmith Lapwing	*Vanellus armatus*		0	IGD	0,004	2,985
Black-winged Kite	*Elanus caeruleus*		0	CGD	0,004	10,448
Black-winged Pratincole	*Glareola nordmanni*	NT, NT	0	IAD	0,061	2,985
Bokmakierie	*Telophorus zeylonus*		0	OMD	0,018	35,821
Brown-crowned Tchagra	*Tchagra australis*		0	OMD	0,001	2,985
Cape Longclaw	*Macronyx capensis*		0	IGD	0,023	47,761
Cape Robin-Chat	*Cossypha caffra*		0	OMD	0,001	1,493
Cape Sparrow	*Passer melanurus*		0	GGD	0,001	1,493
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*		0	GGD	0,009	22,388
Cape Wagtail	*Motacilla capensis*		0	IGD	0,002	4,478
Cape White-eye	*Zosterops virens*		NE	OMD	0,001	1,493
Chestnut-vented Tit-Babbler (Warbler)	*Curruca subcoerulea*		0	IGD	0,004	10,448
Cloud Cisticola	*Cisticola textrix*		NE	IGD	0,010	23,881
Common Ostrich	*Struthio camelus*		0	OMD	0,008	10,448
Common Quail	*Coturnix coturnix*		0	OMD	0,009	22,388
Common Scimitarbill	*Rhinopomastus cyanomelas*		0	IGD	0,001	1,493
Common Waxbill	*Estrilda astrild*		0	GGD	0,006	4,478
Crested Barbet	*Trachyphonus vaillantii*		0	FFD	0,002	2,985
Crowned Lapwing	*Vanellus coronatus*		0	IGD	0,006	8,955
Desert Cisticola	*Cisticola aridulus*		0	IGD	0,013	29,851
Diederik Cuckoo	*Chrysococcyx caprius*		0	IGD	0,004	10,448
Eastern Clapper Lark	*Mirafra fasciolata*		0	IGD	0,001	1,493
Egyptian Goose	*Alopochen aegyptiaca*		0	HWD	0,001	1,493

European Bee-eater	*Merops apiaster*		0	IAD	0,010	7,463
Fiscal Flycatcher	*Melaenornis silens*		NE	OMD	0,002	2,985
Glossy Ibis	*Plegadis falcinellus*		0	IWD	0,001	1,493
Greater Kestrel	*Falco rupicoloides*		0	CGD	0,001	1,493
Greater Striped Swallow	*Cecropis cucullata*		0	IAD	0,003	4,478
Grey Heron	*Ardea cinerea*		0	CWD	0,001	1,493
Hadeda (Hadada) Ibis	*Bostrychia hagedash*		0	OMD	0,003	4,478
Hamerkop	*Scopus umbretta*		0	CWD	0,001	1,493
Helmeted Guineafowl	*Numida meleagris*		0	OMD	0,010	4,478
Laughing Dove	*Spilopelia senegalensis*		0	GGD	0,002	2,985
Levaillant's Cisticola	*Cisticola tinniens*		0	IGD	0,014	22,388
Little Grebe	*Tachybaptus ruficollis*		0	CWD	0,006	7,463
Little Swift	*Apus affinis*		0	IAD	0,002	1,493
Long-billed Crombec	*Sylvietta rufescens*		0	IGD	0,001	1,493
Long-tailed Widowbird	*Euplectes progne*		0	GGD	0,089	38,806
Malachite Kingfisher	*Corythornis cristatus*		0	CWD	0,001	1,493
Namaqua Dove	*Oena capensis*		0	GGD	0,002	4,478
Northern Black Korhaan	*Afrotis afraoides*		0	IGD	0,012	28,358
Orange River Francolin	*Scleroptila gutturalis*		0	GGD	0,003	4,478
Orange River White-eye	*Zosterops pallidus*		0	OMD	0,002	4,478
Pale Chanting Goshawk	*Melierax canorus*		0	CGD	0,001	1,493
Pied Crow	*Corvus albus*		0	OMD	0,002	1,493
Pink-billed Lark	*Spizocorys conirostris*		0	GGD	0,002	4,478
Pin-tailed Whydah	*Vidua macroura*		0	GGD	0,005	8,955
Red-billed Quelea	*Quelea quelea*		0	GGD	0,043	4,478
Red-billed Teal	*Anas erythrorhyncha*		0	OMD	0,003	4,478
Red-capped Lark	*Calandrella cinerea*		0	GGD	0,003	1,493
Red-eyed Dove	*Streptopelia semitorquata*		0	GGD	0,002	1,493
Red-faced Mousebird	*Urocolius indicus*		0	FFD	0,010	13,433
Red-knobbed Coot	*Fulica cristata*		0	HWD	0,001	2,985
Red-throated Wryneck	*Jynx ruficollis*		0	IGD	0,001	1,493
Reed Cormorant	*Microcarbo africanus*		0	CWD	0,003	7,463
Rufous-naped Lark	*Mirafra africana*		0	IGD	0,005	11,940
Scaly-feathered Finch (Weaver)	*Sporopipes squamifrons*		0	GGD	0,008	5,970
Shaft-tailed Whydah	*Vidua regia*		0	GGD	0,001	1,493
South African Cliff Swallow	*Petrochelidon spilodera*		BNE	IAD	0,213	34,328
South African Shelduck	*Tadorna cana*		0	OMD	0,006	7,463
Southern (Common) Fiscal	*Lanius collaris*		0	IAD	0,009	20,896
Southern Grey-headed Sparrow	*Passer diffusus*		0	GGD	0,002	2,985

Southern Masked Weaver	*Ploceus velatus*		0	GGD	0,005	10,448
Southern Red Bishop	*Euplectes orix*		0	GGD	0,044	11,940
Speckled Pigeon	*Columba guinea*		0	FFD	0,023	5,970
Spike-heeled Lark	*Chersomanes albofasciata*		0	IGD	0,006	11,940
Spotted Thick-knee	*Burhinus capensis*		0	IGD	0,001	1,493
Swainson's Spurfowl	*Pternistis swainsonii*		0	OMD	0,007	19,403
Three-banded Plover	*Charadrius tricollaris*		0	IWD	0,001	1,493
Western Cattle Egret	*Bubulcus ibis*		0	IGD	0,024	10,448
White-backed Mousebird	*Colius colius*		0	FFD	0,007	8,955
White-browed Sparrow-Weaver	*Plocepasser mahali*		0	OMD	0,012	16,418
White-faced Whistling Duck	*Dendrocygna viduata*		0	HWD	0,002	4,478
White-rumped Swift	*Apus caffer*		0	IAD	0,013	10,448
White-throated Swallow	*Hirundo albigularis*		0	IAD	0,001	1,493
Yellow Canary	*Crithagra flaviventris*		0	GGD	0,002	2,985
Yellow-billed (Intermediate) Egret	*Ardea intermedia*		0	IGD	0,001	1,493
Yellow-billed Duck	*Anas undulata*		0	HWD	0,006	4,478
Yellow-crowned Bishop	*Euplectes afer*		0	GGD	0,006	2,985
Zitting Cisticola	*Cisticola juncidis*		0	IGD	0,017	38,806

13.5 Appendix E: Incidental records during the second survey

Common Name	Scientific Name
Acacia Pied Barbet	*Tricholaema leucomelas*
African Paradise Flycatcher	*Terpsiphone viridis*
Bokmakierie	*Telophorus zeylonus*
Cape Glossy (Cape) Starling	*Lamprotornis nitens*
Cape Sparrow	*Passer melanurus*
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*
Cinnamon-breasted Bunting	*Emberiza tahapisi*
Common Waxbill	*Estrilda astrild*
Crowned Lapwing	*Vanellus coronatus*
Fawn-coloured Lark	*Calendulauda africanoides*
Fiscal Flycatcher	*Melaenornis silens*
Great Spotted Cuckoo	*Clamator glandarius*
Greater Striped Swallow	*Cecropis cucullata*
Jacobin Cuckoo	*Clamator jacobinus*
Kalahari Scrub Robin	*Cercotrichas paena*
Karoo Thrush	*Turdus smithi*
Namaqua Dove	*Oena capensis*

Neddicky	*Cisticola fulvicapilla*
Orange River Francolin	*Scleroptila gutturalis*
Red-backed Shrike	*Lanius collurio*
Red-billed Firefinch	*Lagonosticta senegala*
Red-capped Lark	*Calandrella cinerea*
Red-eyed Dove	*Streptopelia semitorquata*
Sabota Lark	*Calendulauda sabota*
Scaly-feathered Finch (Weaver)	*Sporopipes squamifrons*
Southern (Common) Fiscal	*Lanius collaris*
Southern Grey-headed Sparrow	*Passer diffusus*
Southern Masked Weaver	*Ploceus velatus*
Speckled Pigeon	*Columba guinea*
Spotted Thick-knee	*Burhinus capensis*
Violet-eared Waxbill	*Granatina granatina*
White-browed Sparrow-Weaver	*Plocepasser mahali*
White-fronted Bee-eater	*Merops bullockoides*
Yellow Canary	*Crithagra flaviventris*

13.6 Appendix F: Specialist Declaration of Independence

I, Lindi Steyn, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Lindi Steyn

Biodiversity Specialist

The Biodiversity Company

April 2023

APPENDIX E4: Agricultural Compliance Statement

AGRICULTURAL ASSESSMENT:

COMPLIANCE STATEMENT

Oslaagte Solar 3 and 400 kV powerlines between new MTS and existing Eskom 400 kV powerlines

Kroonstad South Cluster - Free State Province

Compiled for:

Nemai Consulting

Compiled by

Dr Andries Gouws Index

April 2023

DECLARATION

The observations, conclusions and recommendations made in this report are based on the best available data and on best scientific and professional knowledge of the directors of INDEX (Pty) Ltd. The report is based on GIS programming and utilises satellite tracking to map survey points. Survey points are normally accurate to within 3 metres; which must be considered in the use of the information.

The directors of INDEX (Pty) Ltd exercises due care and diligence in rendering services and preparing documents. However, the company accepts no liability, and the client, by receiving this document, indemnifies INDEX (Pty) Ltd and its directors and employees, by the use of the information contained in this document, against any action, claim, demand, loss, liability, cost, damage and expense arising from or in connection with services rendered.

The property and copyright of this report shall remain vested in INDEX (Pty) Ltd. The client that commissioned the report may use the information as it may think fit; but only for the land for which it was commissioned.

General declaration:

- INDEX acted as the independent specialist in this application;
- Performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- There were no circumstances that may compromise INDEX's objectivity in performing such work;
- INDEX have expertise in conducting the specialist report relevant to this application, including knowledge of NEMA and its regulations and any guidelines that have relevance to the proposed activity;
- Have not and will not engage in conflicting interests in the undertaking of the activity.
- The study was undertaken by Dr Andries Gouws. He is a registered member of SACNASP in the category of Agriculture.

April 2023

CONTENTS

SUMMARY

The site is located Southeast of Kroonstad in Free State Province.

The Department of Forestry, Fisheries and Environment published Notice 320 in 2020 that describes the minimum criteria when applying for environmental authorisation, which was followed for this investigation.

SENSITIVITY ACCORDING TO THE SCREENING TOOL

1) Field crop boundary: The sensitivity tool incorrectly indicates cultivated land. There is no land that is cultivated on the site.
2) The sensitivity screening tool indicates land with a medium sensitivity. In our professional view this grading is correct.

SITE INVESTIGATION

The outcome of the site sensitivity verification found the following:

1) The survey disagrees with the screening tool that there is no cultivated land on the proposed PV site and the land on which the grid connection transmission line will be located. It is used for cattle farming.
2) The environmental sensitivity according to the tool is indicated as moderately to highly sensitive. This was found as correct by the site investigation. Using the same guidelines as DALRRD, the land has low/moderate arable potential.

In line with the provisions of the Protocol, a compliance statement is required for the EIA scoping report.

LOSS OF HIGH POTENTIAL LAND

No high potential or sensitive soils were found; therefore, there will not be a loss of high potential land if Oslaagte Solar 3 is implemented. The impact is low, temporary and totally reversable.

LOSS OF AGRICULTURAL PRODUCTION

The site is used for cattle farming. These cattle can be moved to another part of the farm. It is also possible to introduce sheep to replace the cattle.

No production will be lost on the proposed PV site and the land on which the grid connection transmission line will be located. Only the footprint of the pylons will be permanently lost and that is only a few metres for each.

The grazing opportunity that the farm provides cannot be replaced.

- The impact is low on a regional or national scale.
- The loss is temporary and will be for the medium term or life of the project.
- There will be no loss of labour opportunities. The labourer that tends the cattle can be employed elsewhere on the farm or on the PV project.

LOSS OF AGRICULTURAL INFRASTRUCTURE

There is little farming infrastructure on the site. The kraals and watering facilities can be moved or used for other animals.

LOSS OF SOIL DUE TO EROSION

The soil is very erodible because of the strongly developed structure in the subsoil.

Runoff from hard surfaces should be dealt with by a Stormwater Management Plan (SWMP). This is an engineering function and is normally addressed as part of the project design.

The land on which the grid connection transmission line will be located will only be disturbed where the pylons are placed. There will be no impact on the grazing once they have been installed.

RECOMMENDATION

No key issues or triggers were identified that should be addressed in the Scoping Report.

The conclusion is that there will be no permanent loss of high potential land and only limited loss of agricultural production from cattle. It is still possible to farm with sheep below the PV panels if the panels are raised.

There were no gaps found in knowledge in the investigation. The recommendations made in this report is based on the findings during the investigation.

The PV site development takes place on medium/low potential land with low fertility. It has a medium sensitivity related to agriculture.

It is the author's opinion that there is no reason to prevent the project from being implemented.

Further, any measures or projects that can help to relieve the country's electricity problems should be encouraged.

1 SPECIALIST DECLARATION

COMPLIANCE STATEMENT

Main findings of the study are as follows:

SENSITIVITY SCREENING TOOL

- Field crop boundary. The sensitivity tool incorrectly indicates cultivated land.
- Land sensitivity to agriculture. The tool indicates the sensitivity of the site as moderate.

SITE INVESTIGATION

The outcome of the site sensitivity verification found the following:

1. The survey disagrees with the screening tool. No cultivation takes place on the proposed site. It is used for cattle farming.
2. The environmental sensitivity according to the tool is indicated as moderately sensitive. This was confirmed by the site investigation. Using the same guidelines as DALRRD, the land has low/moderate arable potential. This is because of slope as well as the shallow and highly erodible nature of the soils.

In line with the provisions of the Protocol, a compliance statement is required for the EIA scoping report.

THE AUTHOR OF THE REPORT CONFIRMS THE FOLLOWING:

3.3.1. Details and relevant experience as well as the SACNASP registration number of the soil scientist/agricultural specialist/s preparing the assessment including a curriculum vita;	Dr Andries Gouws is a soil scientist and is registered with SACNASP. Refer to Section 10.
3.3.2. A signed statement of independence by the specialist;	Refer to the preamble of the report.
3.3.3. A map showing the proposed development footprint (including supporting infrastructure), overlaid on the agricultural sensitivity map generated by the national environmental screening tool;	The entire PV site will be developed. See Figure 4 for the development footprint. Although the screening tool indicate highly sensitive land, the detailed assessment found that the climatic conditions and crop yield are such that profitable crop farming is not possible.
3.3.4. Calculations of the physical development footprint area for each land parcel as well as the total physical development footprint area of the proposed development including supporting infrastructure;	Total survey area was confined to the land of 991ha which will be under PV and support infrastructure. It is expected that the footprint of the transmission grid pylon will be less than 10 square metres per pylon.
3.3.5. Confirmation that the development footprint is in line with the allowable development limits contained in Table 1 above;	No detail at this stage

3.3.6. confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities;	991ha will be developed. The PV project will not disturb any adjacent farming activities. The site will be leased to the developer and will not be subdivided in terms of Act 70. It will, therefore not lead to fragmentation of farm land.
3.3.7. A substantiated statement from the soil scientist or agricultural specialist on the acceptability of the proposed development and a recommendation on the approval of the proposed development;	The PV site development takes place on low/medium potential land that has a medium sensitivity related to agriculture. It consists of moderately deep and shallow and rocky soils. It is the author's opinion that there is no reason to prevent the project from being implemented. Further, any measure or project that can help to relieve the country's electricity problems should be encouraged.
3.3.8. Any conditions to which this statement is subjected	There are no conditions imposed on the approval of the project
3.3.9. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase.	The PV site is not a linear activity. An OHL will be installed and the land that will be cleared from grass during installation will take time to recover. However, only the transmission line footprint will be disturbed and by planting locally occurring grass species, the line will have no negative impact of cattle grazing.
3.3.10. Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	The only recommendation is that the EMP includes erosion control measures and that the SWMP be implemented.
3.3.11. A description of the assumptions made and any uncertainties or gaps in knowledge or data.	The observations are accepted as representative of the soil conditions. The author feels confident that this is the case. There were sufficient observations made that no gaps in knowledge or data is expected.
The duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Assessment date: April 2023. The duration, date and season of the site inspection and the significance of the season to the outcome of the assessment is not relevant. The main criteria for farming potential are soils, climate and water availability. These are not bound to seasons.
A description of the methodology used to undertake the on-site assessment	Refer to Section 5.

2 BACKGROUND

Nemai Consulting was appointed for a number of solar projects at Kroonstad. They are located south west of the town in the Free state Province. INDEX was then appointed as agricultural specialist to do the agricultural impact statement in terms of Notice 320 of the National Environmental Management Act in May 2020 of the Department of Environmental Affairs.

This report will describe the findings of the initial site verification and then assess the agricultural potential of the site in terms of the guidelines of Notice 320.

The location is indicated in Figure 1.

The Kroonstad South Cluster consists of the following five PV units.

1) Leeuwspruit Solar 1.
2) Leeuwspruit Solar 2.
3) Oslaagte Solar 1.
4) Oslaagte Solar 2.
5) Oslaagte Solar 3 and the connecting grid.

The survey was done for all three the projects on Oslaagte. The area was then split into the three different PV projects.

This report deals with Oslaagte Solar 3 (referred to as OL3 in this report) and the grid connection.

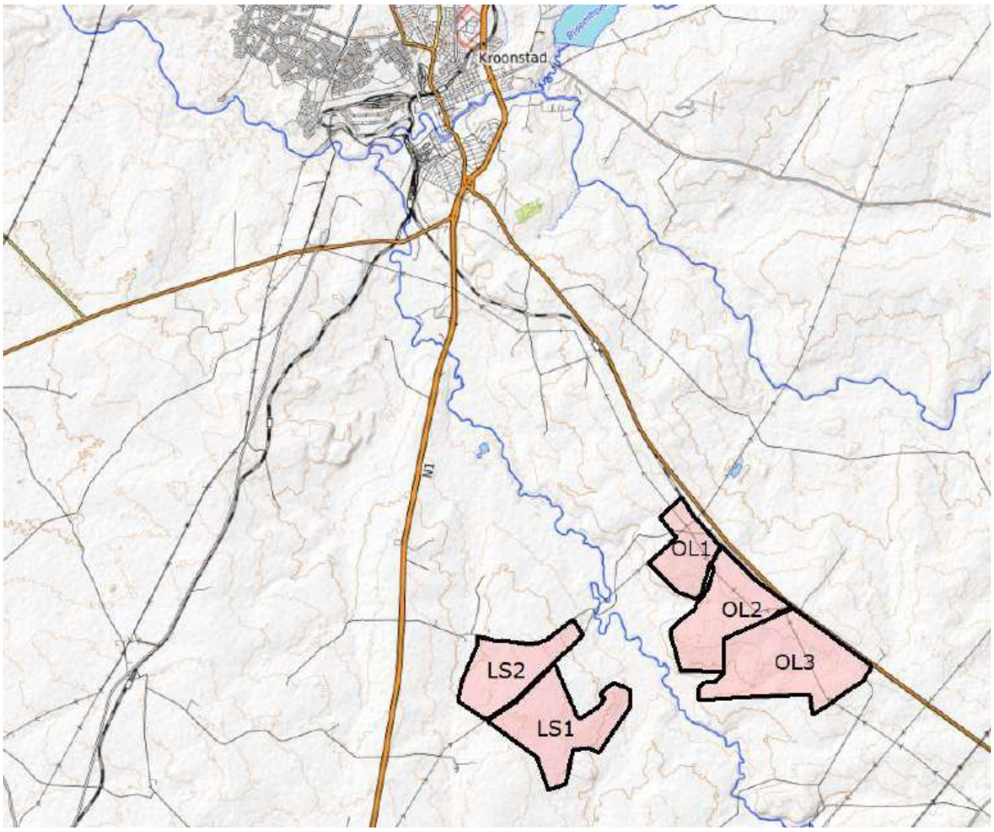


Figure 1. Locality of the project

The details of the site are as follows:

SITE DESCRIPTION

The total Oslaagte 2564 is 3077ha. Of this approximately 2017ha is proposed for the three PV projects. 810ha will be OL3.

Grid Connection: new 132/400 kV MTS and 400 kV powerlines (LILO) between new MTS and existing Eskom 400 kV powerlines.

REVISED LAYOUT – ALTERNATIVE 2

A layout of the infrastructure was provided to the sectoral specialist to evaluate in terms of Notice 320 of NEMA. This layout was evaluated. Some sensitivities were highlighted be specialist that led to a revised layout that incorporated all their findings.

The new layout is minor as far as agriculture is concerned because their placement is not on highly sensitive land; all supporting infrastructure is on low/moderate or moderately sensitive land. The two layouts are indicated below:

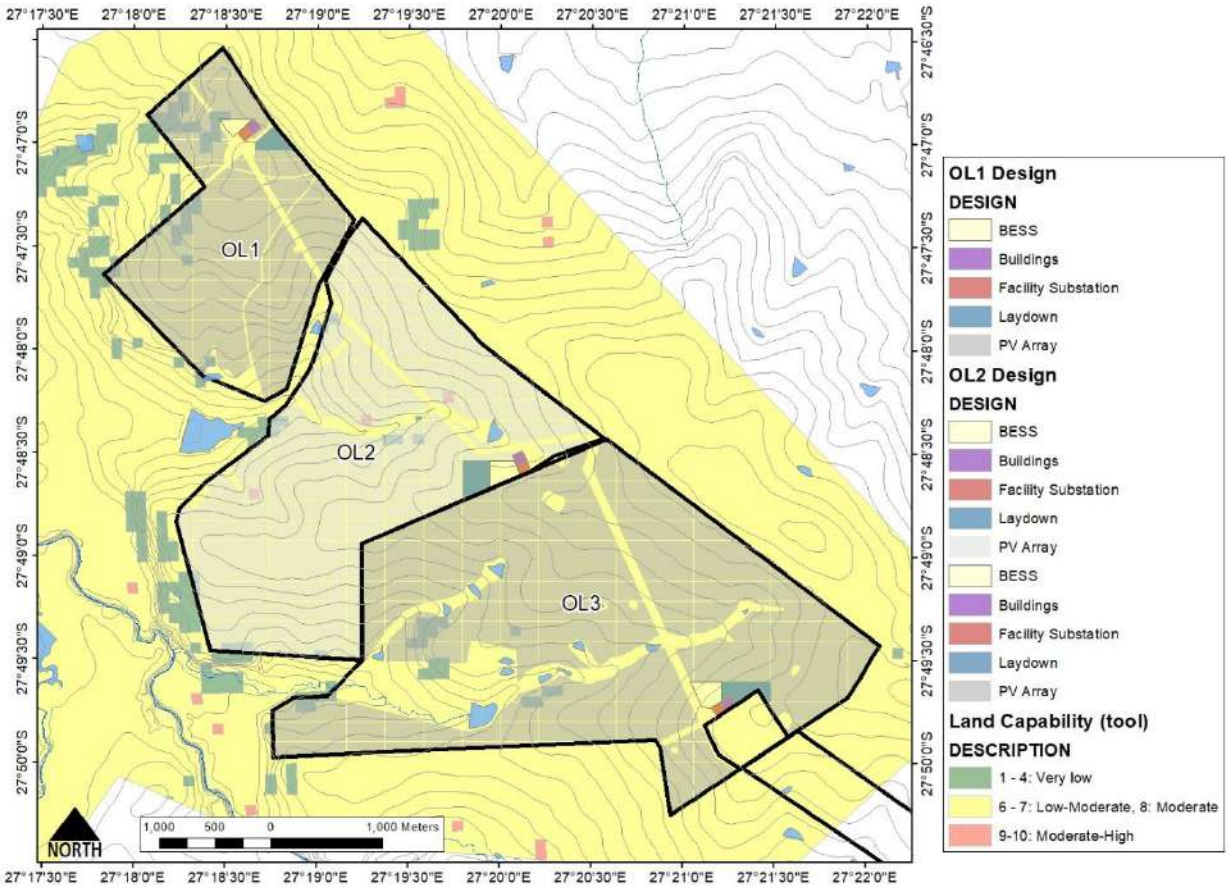


Figure 2. Original layout – Alternative 1

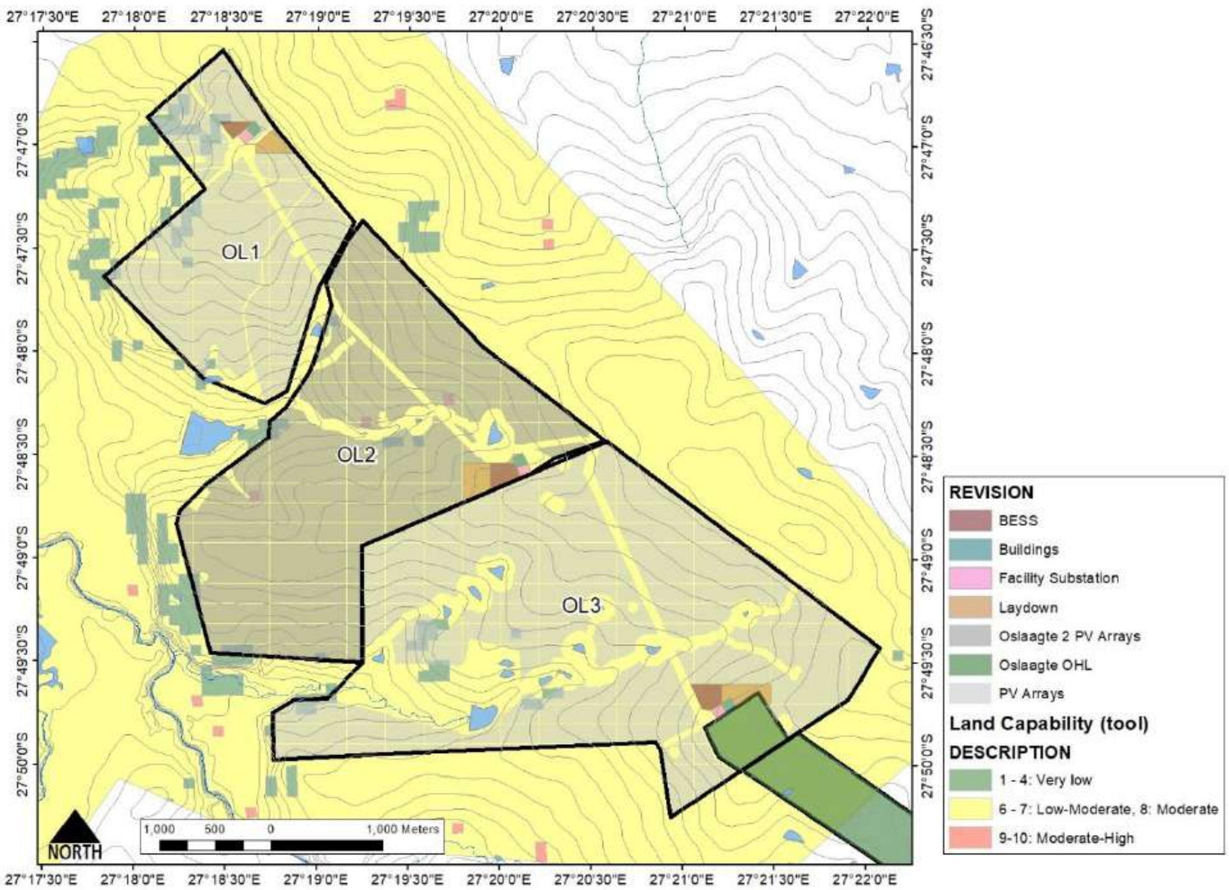


Figure 3. Revised layout - Alternative 2

Because there is no difference on the two option's impact on agriculture, the figures and description will be done based on the layout of Alternative 2.

3 TERMS OF REFERENCE

Nemai Consulting was appointed for this solar project located at Oslaagte No 2564. It consists of a solar PV plant, BESS and support infrastructure. In turn, they appointed Index to do a specialist assessment for agriculture.

APPROACH

- Determine agricultural potential in the Project's footprint.
- Determine impacts of the Project from an agricultural perspective.
- Suggest suitable mitigation measures to address the identified impacts.

The following were indicated by the client as particular outputs:

- Indicate Key Issues & Triggers Identified During Scoping.
- Indicate loss of agricultural land with high capability due to direct occupation by the development footprint.
- Indicate loss of fertile soil (high potential land).
- Soil erosion due to inadequate stormwater management.

4 PROPOSED DEVELOPMENT

The project consists of a PV site and the associated infrastructure (refer to Figure 4 for the location for the different projects in the Kroonstad South Cluster. Refer to 'OL3' on the map below.
Grid Connection is a new 132/400 kV MTS and 400 kV powerlines (LILO) between new MTS and existing Eskom 400 kV powerlines.
Theme layers and the crop boundaries were downloaded from the screening tool and incorporated in the GIS as layer. These varies somewhat from the map generated by the tool.

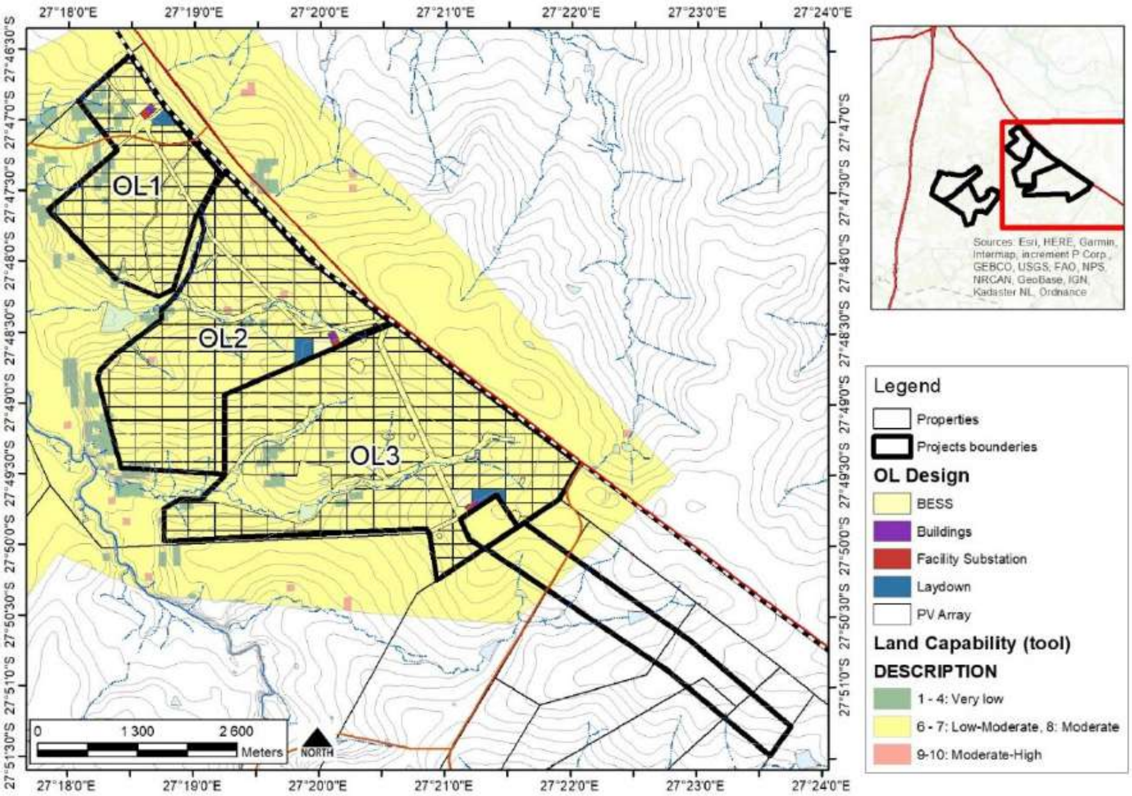


Figure 4. Main components of the development on site sensitivity map

5 METHODS AND PROCEDURES

SITE SENSITIVITY VERIFICATION

The verification is a review of existing information on soils and topography on a desktop level to determine areas with high sensitivity in terms of Notice 320 of the National Environmental Management Act published in May 2020 of the Department of Environmental Affairs.

Theme layers of crop boundaries as well as the environmental sensitivities were downloaded from the screening tool and incorporated in the GIS as layer. These varies somewhat from the map generated by the tool.
Because the downloaded date is more specific and descriptive, it was used for analyses.
Theme layers and the crop boundaries were downloaded from the screening tool and incorporated in the GIS as layer. These varies somewhat from the map generated by the tool.

The current use of the land and the environmental sensitivity of the site as indicated in the screening tool, is indicated below.

- The desktop verification was done through use of satellite imagery and a site visit took place on 25 April 2023.
- The aim of the site servery was to verify the findings of the interpretation done on the satellite images and of the data obtained from the Screening Tool.
- The outcome of the site verification is included in this report.

The report compared the current crop land and the environmental sensitivity as identified by the screening tool with the present situation.

The results are indicated in Section 7.

SITE EVALUATION PROCESS

Satellite images were used as backdrop and the present land uses digitised.

Soil profiles were augured to determine soil depth, clay content estimated by hand and to determine land conditions.

Capability classification is according to the guidelines published on the AGIS website of the National Department of Agriculture (NDA) was used to determine the capability of soils and their agricultural potential (DALRRD, 2019).

6 ECOLOGICAL SENSITIVITY

BACKGROUND

The Department of Forestry, Fisheries and Environment published Notice 320 in 2020 that describes the minimum criteria when applying for environmental authorisation.

This protocol provides the criteria for the assessment and reporting of impacts on agricultural resources for activities requiring environmental authorisation. The requirements of this protocol are according to the level of environmental sensitivity as indicated by the national web-based environmental screening tool for agricultural resources. It is based on the most recent land capability evaluation as provided by the DALRRD.

According to the protocol, an applicant intending to undertake an activity on land with '*very high*' or '*high'* sensitivity for agricultural resources must submit an Agricultural Agro-Ecosystem Specialist Assessment. Alternatively, a Compliance Statement will suffice.

6.1 Sensitivity Screening Tool findings

- Field crop boundary

The sensitivity tool indicates cultivated land on the north western portion of the property (see below).

- Land sensitivity to agriculture

The tool indicates the sensitivity of the site as moderately (Category 6 and 7).

See Figure 7 for the results of the Sensitivity Screening Tool.

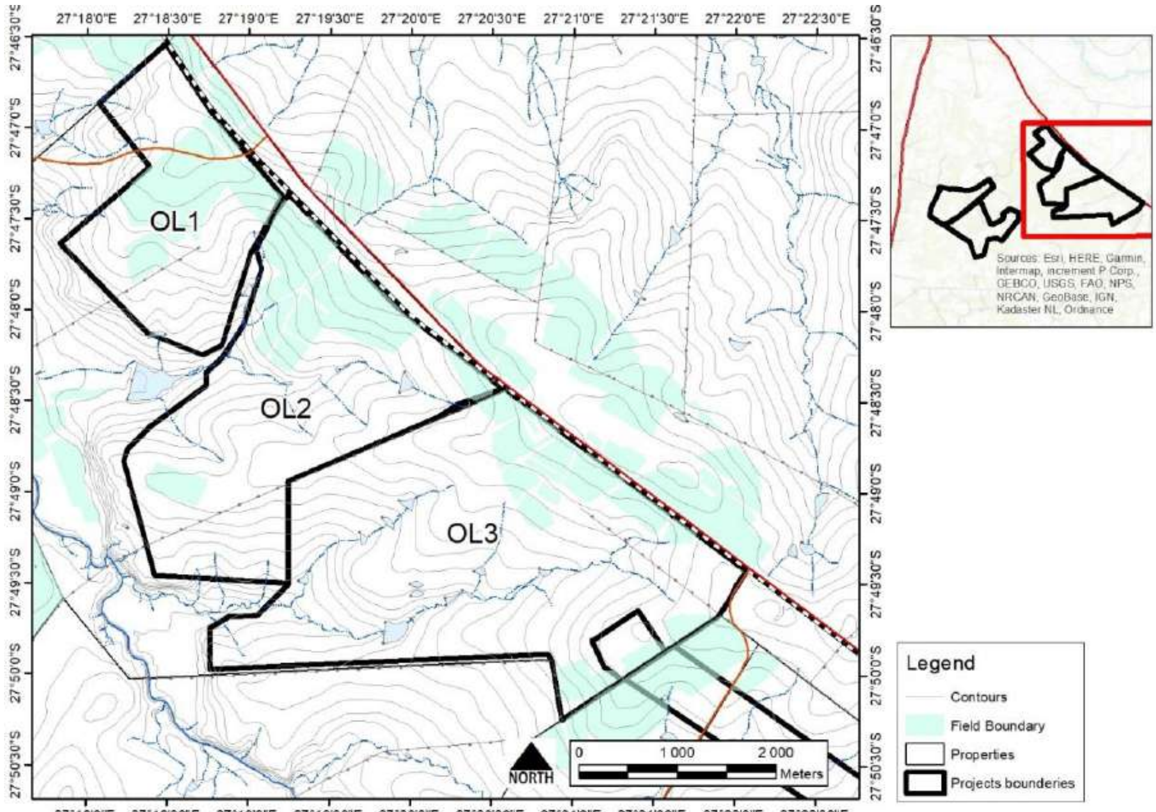


Figure 5. Cultivated land boundary according to the Screening Tool (see OL3)

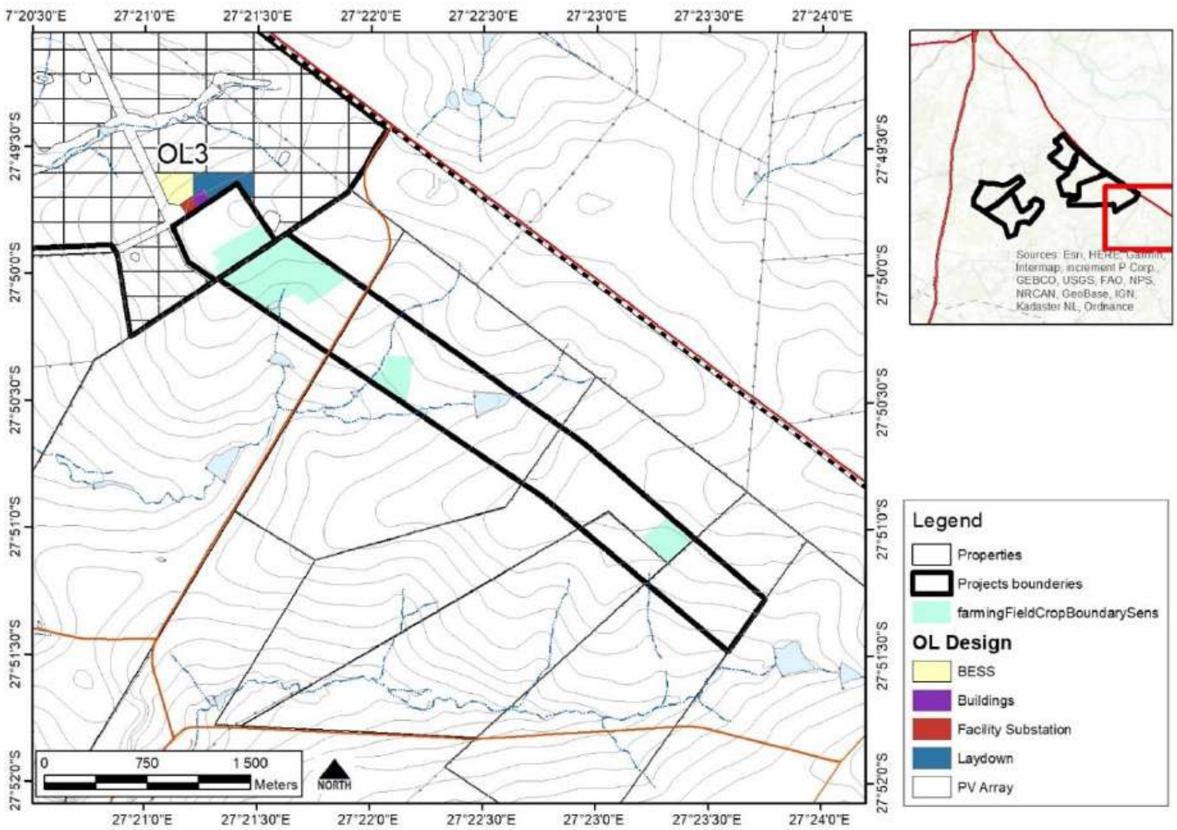


Figure 6. Cultivated land boundary according to the Screening Tool

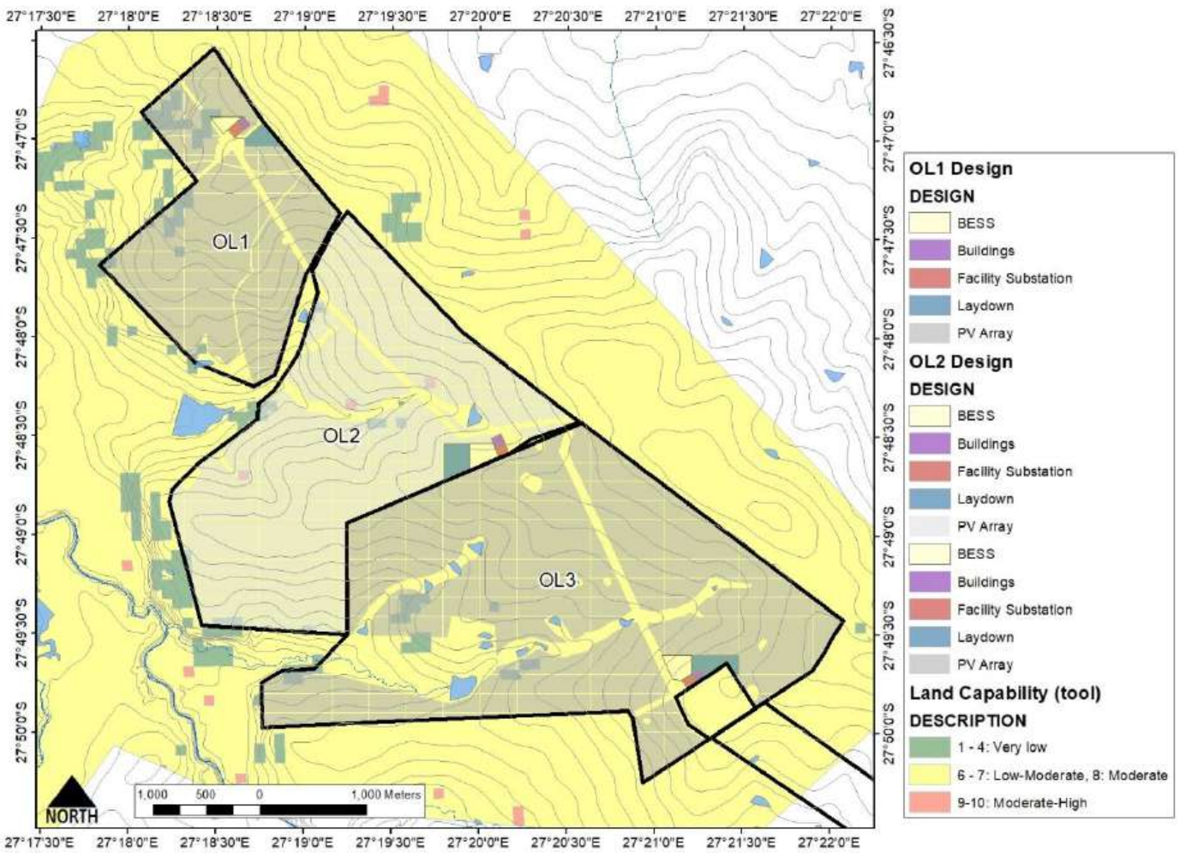


Figure 7. Sensitivity of the PV (screening tool)

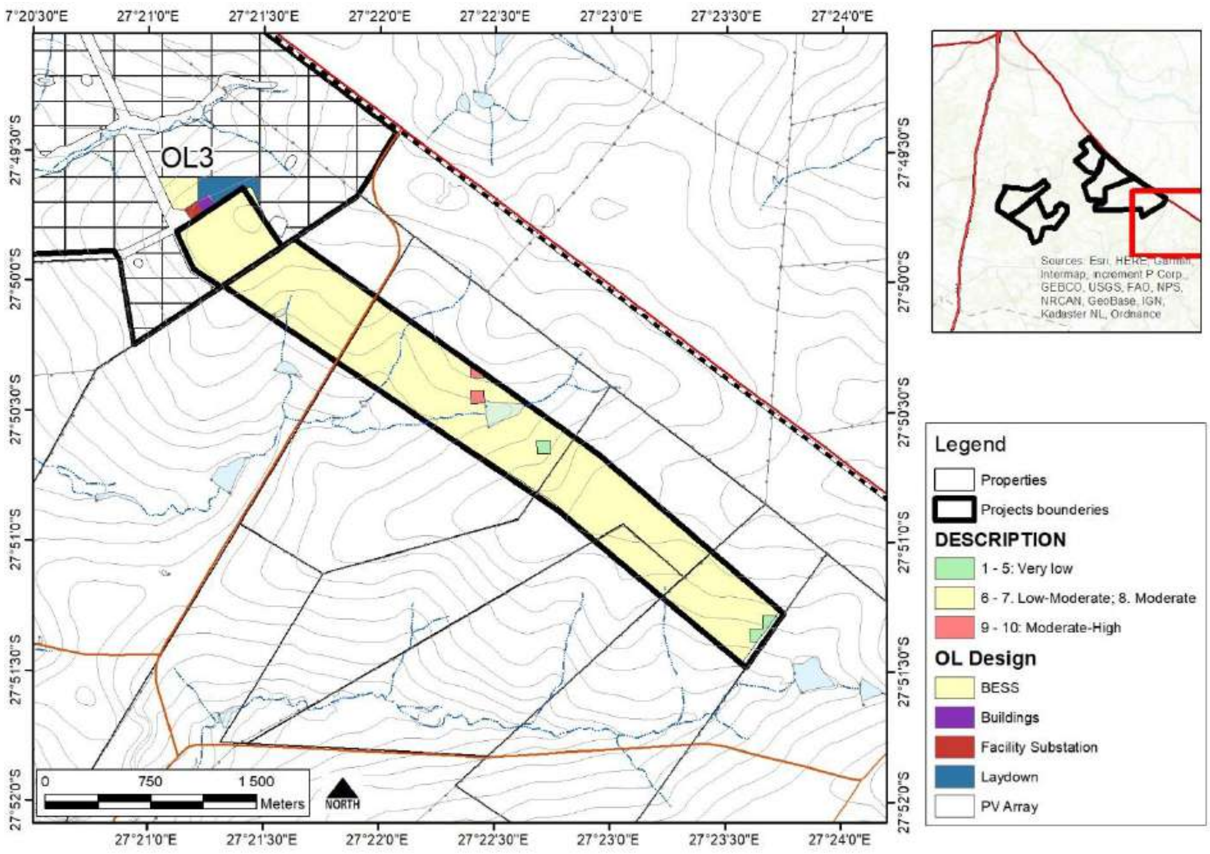


Figure 8. Sensitivity of the Grid connection (screening tool)

6.2 FINDINGS OF THE SITE SENSITIVITY INVESTIGATION

Theme layers and the crop boundaries were downloaded from the screening tool and incorporated in the GIS as layer and is indicated below.

The verification was done by desk top analysis, using satellite imagery and then a site inspection. The outcome of the site sensitivity verification found the following:

6.2.1 FIELD CROP BOUNDARY

The survey disagrees with the screening tool. There is no cultivated land on the proposed PV site. The entire site is used for cattle farming.

6.2.2 LAND SENSITIVITY (CAPABILITY)

- The environmental sensitivity of nearly all land, according to the tool is indicated as moderately sensitive. This was confirmed by the site investigation.
- Using the same guidelines as in AGIS (DALRRD), the land has low/moderate arable potential. There is a small portion of land that was not recognized as highly sensitive, but it is too small to be used for commercial crop production. A map of the soil and land capability was compiled of the site and is shown in Figure 9. See Section 7.5 for a detailed description and results of the site visit related to soil and agricultural potential.
- In line with the provisions of the Protocol, a compliance statement is required for the EIA Scoping Report.

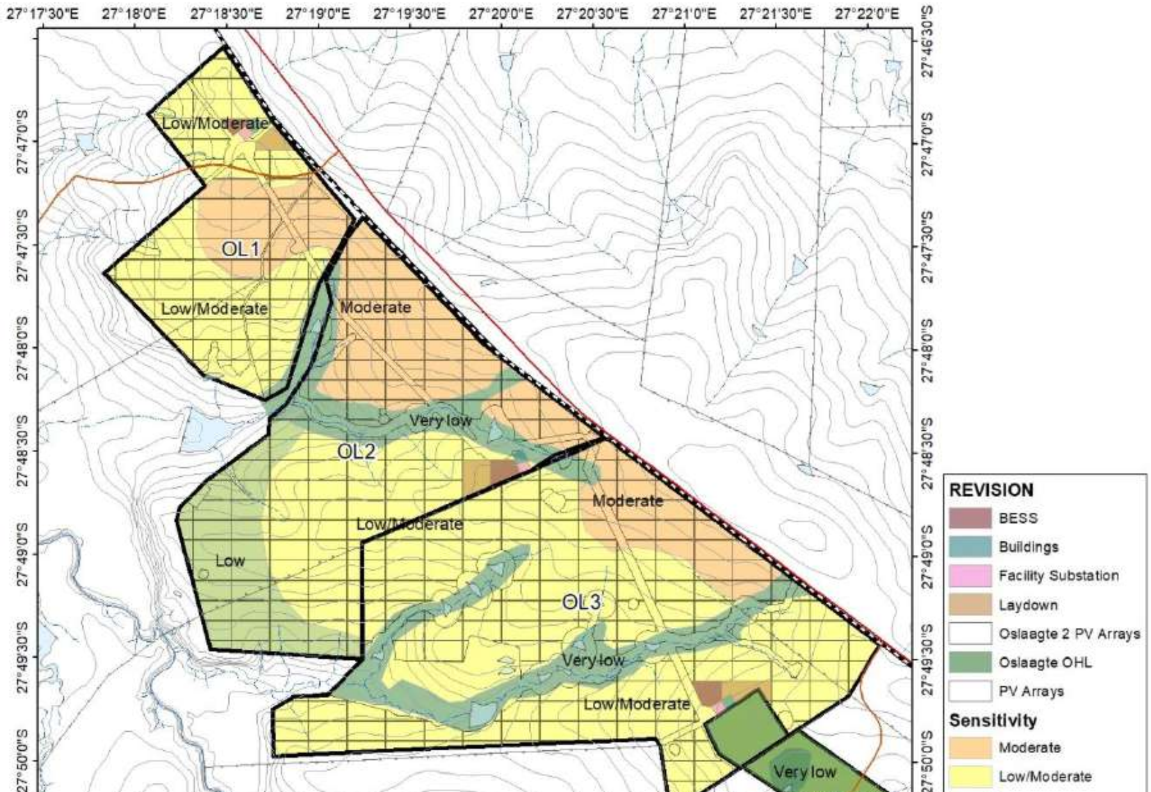


Figure 9. Site sensitivity compiled by Index following the site visit (refer to OL3 and grid connection)

7 SITE EVALUATION

7.1 PRESENT LAND USES

The entire PV site as well as the area where the transmission line will be placed, is used for cattle farming. The veld is in relatively good condition with a large percentage of palatable grass species.

Photo 1. Grazing on the Oslaagte indicated by the screening tool as lands

7.2 CLIMATE

RAINFALL

The average annual rainfall varies between 515mm and 560mm for the different stations around the site. Rain occurs mainly during the summer months, commencing in October lasting to March. This is typical of the summer rainfall pattern of the Highveld region of South Africa.

The rainfall is sufficient for crop production provided that the soils are suitable.

WIND

The predominant wind direction is north, varying between north-easterly and north-westerly. Wind damage is not normally expected to be a deciding factor in crop selection.

TEMPERATURE

The average daily temperature varies from 18,5°C in July to 27,9°C in January. The lowest daily minimum temperature is below freezing for June and July, with frost risk from as early as March and as late as September.

Kroonstad can be classified as a high frost risk area. It has, however, 500 to 750 accumulated chill units for the winter months.

The temperature is suitable for crop production.

7.3 WATER

There is no surface runoff on the property that can be used for irrigation. The irrigated lands south of the site was excluded from the development.

7.4 VEGETATION

The land in its natural state is grassland with *Themeda triandra* the dominant species. Annual *Aristida* occurs in the lower laying portions and where the soils are shallow.

The grazing capacity according to DALRRD is estimated at 5-6 ha/large livestock unit (LSU). The carrying capacity for the PV site is approximately 165 LSU.

7.5 SOIL AND LAND SENSITIVITY CAPABILITY

SOIL TYPES

The PV site is located on mudstone of the Beaufort formations. These are notorious for their high erodibility as can be seen, among other places, in the Eastern Cape at East London and in the former Transkei and Ciskei where deep gullies are common.

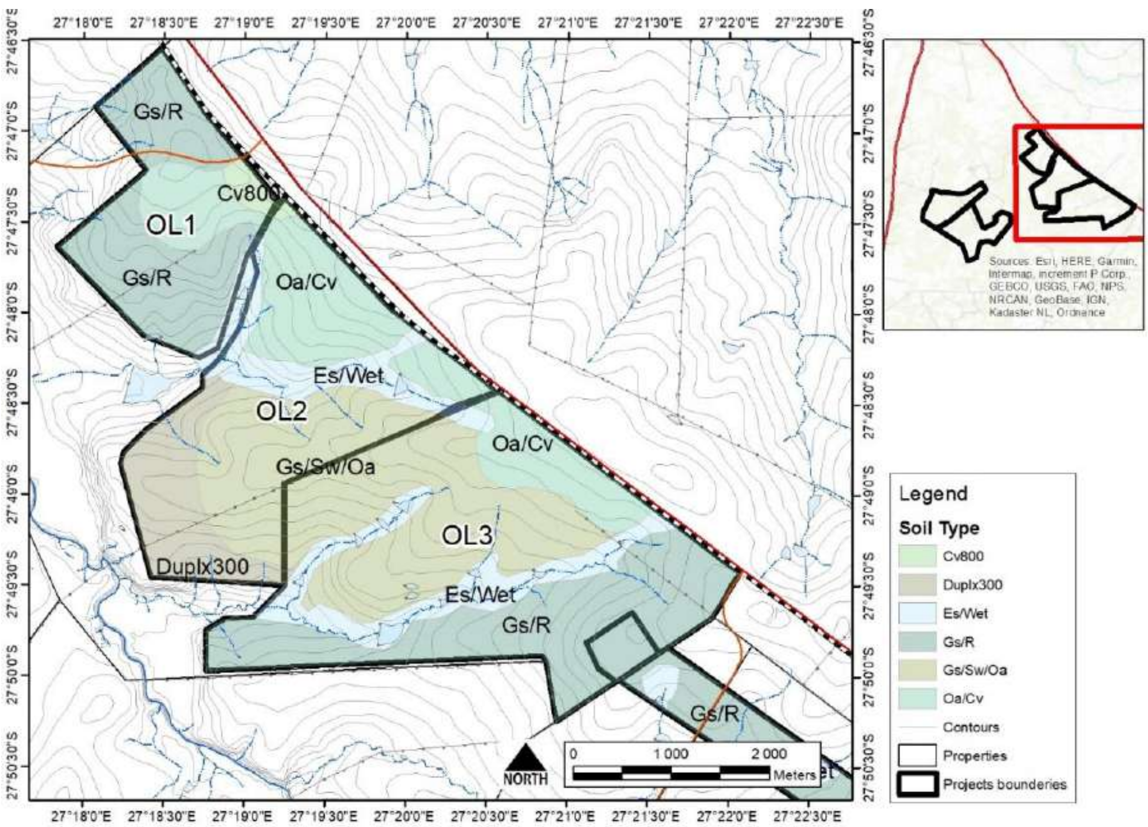
Clay migrates to above the bedrock where cutanic structures are formed. These seem to dissolve or fall apart when the protective topsoil is eroded. Dongas are often the result.

The Gs/R is shallow greyish brown soils with scattered rock outcrops. These soils are sometimes cultivated but is low potential cropping land. The dominant soil forms that occur on this unit is Glenrosa.

Sw/Oa and Duplex 300 soils are moderately deep greyish brown soils. The Swartland soils are highly erodible, but where the structured layer is deeper than 500mm, it is sometimes ploughed. The soil has a medium potential for crop production.

There are already gullies that have formed due to erosion. The farmer attempted to slow down flow speeds during high intensity rains by placing car tyres in gullies. High erosion susceptibility is one of the main reasons why the land use potential is low or that the ecological sensitivity is high.

As indicated earlier, erosion is a major concern on soil that derived from Beaufort sediments. Erosion control measures should receive special attention in the design of the stormwater plan.



Erosion is a major concern on soil that derived from Beaufort sediments. Erosion control measures should receive special attention in the design of the stormwater plan.

LAND CAPABILITY DETERMINATION

In 2002 the Directorate: Land Use and Soil Management within DALRRD developed a national spatial land capability data set to indicate the spatial delineation of the then defined eight land capability classes. The approach followed was based on the approach of Klingebiel and Montgomery (1961) but adapted for South

Africa. The aim was to develop a system for soil and land capability classification. It further aimed to incorporate the parameters within a Geographic Information System (GIS). The resulted spatial data set was derived at from a 1:250 000 land type data set being the main input data set for the derived land capability classes together with climatic and terrain parameters.

This dataset is used within the Sensitivity Screening tool.

While the new dataset is more complex than that of Klingebiel *et al*, the latter has clear guidelines and is generally still followed when assigning capability to land. A comparison between the two systems is provided below.

Table 1. Relationship between grading of the Sensitivity Screening tool and that of Klingebiel *et al*.

DALRRD (2016)	Klingebiel	Capability	Arability
1-2	viii	Very low	Not arable
3-4	vii	Very low to low	
5-6	vi	Low	
7	v	Low to moderate	
8	iv	Moderate	Arable
9-10	iii	Moderate to high	
11-12	ii	High	
13-14	i	High to very high	
15	i	very high	

Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards. Land capability involves consideration of difficulties in land use owing to physical land characteristics, climate and the risks of land damage from erosion and other causes.

The classic eight-class land capability system (Klingebiel & Montgomery, 1961) was adapted for use by the South African Department of Agriculture in their Agriculture Geographic Information System (AGIS).

Table 2 indicates the dominant soils in each soil unit as well as the grading used by Montgomery et al to determine soil potential or sensitivity towards agriculture.

Together with the climate and topography it will indicate sensitivity as per guidelines used by the Screening tool. The land use criteria are indicated in the addenda (Section **Error! Reference source not found.**).

Table 2. Capability description according to Montgomery *et al*.

Soil Type	Soil description	Capability (Montgomery)	Sensitivity	Flood hazard	Erosion susceptibility	Depth restriction	Texture restriction	Drainage restriction	Restriction to cultivation
Duplx300	Escourt, Swartland dominant. Shallow highly erodible soils.	v	Low	1	5	4	2	4	3
Es/Wet	Structured soils in watercourses and their headlands.	v	Very low	1	5	4	2	5	3
Gs/R	Glenrosa soils. Shallow and moderately deep soils on	iv	Moderate	1	4	3	2	4	2

Soil Type	Soil description	Capability (Montgomery)	Sensitivity	Flood hazard	Erosion susceptibility	Depth restriction	Texture restriction	Drainage restriction	Restriction to cultivation
	semi-weathered mudstone or shale.								
Gs/Sw/Oa	Glenrosa, Swartland and Oakleaf are dominant. Shallow and moderately deep soils on semi-weathered mudstone or shale. Some deep yellowish brown high potential soils are present	iv	Moderate	1	3	3	2	4	2
Oa/Cv Cv800	Oakleaf and Clovelly soils are dominant. Shallow and moderately deep soils on semi-weathered mudstone or shale. Some portions have concretions at 400 – 600mm These soils are arable but has a moderate potential for crop production.	iv	Moderate	1	3	3	2	3	2

- According to Klingebiel *et al*, the soil capability is Class v and lower, mainly because of soil properties.
- Using the same criteria as AGIS, the farm is Class 7 (or Class iv or v according to Montgomery *et al*) or poorer, which has *moderate/low* sensitivity.
- A small portion of land in the north eastern corner consists of deep yellowish-brown soils (classified as Clovelly). This is arable but is too small to cultivate and is, therefore, low or medium sensitivity.
- In general, the site is grazing land with little potential for cultivation.
- According to the land capability classification, the soils have medium capability (or sensitivity as related to the Sensitivity Screening Tool).

8 IMPACT ASSESSMENT

8.1 LOSS OF HIGH POTENTIAL LAND

Only small pieces of high potential or sensitive soils were found; therefore, there will not be a loss of high potential land. According to the guidelines of various publications of DALRRD that deals with land capability and crop yield, the land is not high potential.

These soils are also not fertile because they have not been cultivated during which fertilised would have been added. Their change in land use will, therefore, also not lead to the loss of fertile soils.

Further, the PV infrastructure does not alter the soil properties or land conditions, and once removed after the project life, it can be utilised for grazing once again.

- The impact is low, temporary and totally reversable.

8.2 LOSS OF AGRICULTURAL PRODUCTION

The site is used for cattle farming. These animals can be moved to another part of the farm without any impact on farming income. It is also possible to utilise the grazing below the panels with sheep.

The grazing opportunity that the farm provides cannot be replaced or mitigated on a national level.

Our national electricity problems far outweigh the loss of income that the farm will sacrifice.

- The impact is low on a regional or national scale.
- The loss is temporary and will be for the medium term.
- There will be no loss of labour opportunities. The labourer that tends the livestock can be employed elsewhere on the farm or by the PV project.

8.3 LOSS OF AGRICULTURAL INFRASTRUCTURE

There is little farming infrastructure on the site but for watering facilities and fences.

- In conclusion, no agricultural infrastructure will be lost.
- There is no impact.

8.4 LOSS OF SOIL DUE TO EROSION

The soil is very erodible (see section 6.2.2) because of the strongly developed structure of the B2 horizon.

Nevertheless, the PV projects creates areas that are cleared of vegetation, and that could be subject to erosion. Runoff from hard surfaces should be dealt with by a SWMP. This is an engineering function and is normally addressed as part of the project design.

- Severe erosion can be expected if the topsoil is removed, especially where the slope is high. It is essential that the stormwater management plan includes orderly runoff and that there are no or little bare surfaces that can be subject to erosion.
- Mitigation is achieved by allowing grass to re-establish after construction and by guidelines in the SWMP.
- All stormwater runoff structures should be grassed and flow retarding structures should be placed where runoff speeds become too high.
- Wetlands areas should not be disturbed and where eroded areas should be repaired.

8.5 CUMULATIVE IMPACTS

Because of land ownership and individual land use or farming enterprise preference, the impact of any development rarely transcend farm boundaries. In the case of Oslaagte, the development is a cluster of three projects; Oslaagte 1, 2 and 3 which can introduce increased runoff and erosion if the stormwater management is not carefully designed. The fear is that rivers and streams may silt up or due to increased runoff speed may damage wetlands of dam structures.

As discussed in the soils section of this report, the Beaufort geological formation is extremely erodible and could lead to precious farming land to become derelict and unproductive if the topsoil is not protected. It is critical that the soil is not stripped of vegetation

The proposed development will not have impacts on farming land due to fragmentation or subdivisions of land that can lead to unsustainable farming units. This is also the fear expressed in the Subdivision of Land Act no 70 of 1970.

There is no subdivision proposed and the land will as is return to farming after the life of the project.

9 CONCLUSIONS AND RECOMMENDATIONS

- The Screening Tool incorrectly indicates that there is cultivated land.
- It indicates no highly sensitive land that needs to be protected. This is correct.

The Screening Tool incorrectly indicates that there is cultivated land and also highly sensitive land that needs to be protected. According to the Protocols for agricultural impact assessment in terms of Notice No. 320 Government Gazette 43110 20 March 2020 of the proposed PV site, a compliance statement is required for inclusion into the Project Scoping Report.

The impacts of the development are as follows:

- Loss of high potential land

There will not be permanent loss of high potential land. According to the guidelines of various publications of DALRRD that deals with land capability, the land is not high potential.

- Loss of agricultural production

The impact of the project on agricultural production is low.

- Loss of Agricultural infrastructure

There is no agricultural infrastructure on the site.

- Loss of soil due to erosion

Severe erosion can be expected if the topsoil is removed. It is essential that the SWMP includes orderly runoff and that there are no or little bare surfaces that can be subject to erosion.

Mitigation is achieved by allowing grass to re-establish after construction.

Wetlands areas should not be disturbed and where eroded areas should be repaired.

Runoff from hard surfaces should be dealt with by a SWMP.

RECOMMENDATIONS

The conclusion is that there will be no permanent loss of high potential land and only limited loss of agricultural production from the cattle farming.

There were no gaps found in knowledge in the investigation. The recommendations made in this report is based on the findings during the investigation.

The PV site as well as the land on which the power lines will be placed, will take place on low/moderate potential land that has a low or moderate sensitivity related to agriculture.

It is the author's opinion that there is no reason to prevent the project from being implemented.

Further, any measures or projects that can help to relieve the country's electricity problems should be encouraged.

10 ADDENDA

10.1 SOURCES OF INFORMATION

a) Criteria for high potential agricultural land in South Africa, Department of Agriculture, Directorate Land Use and Soil Management, 2002.

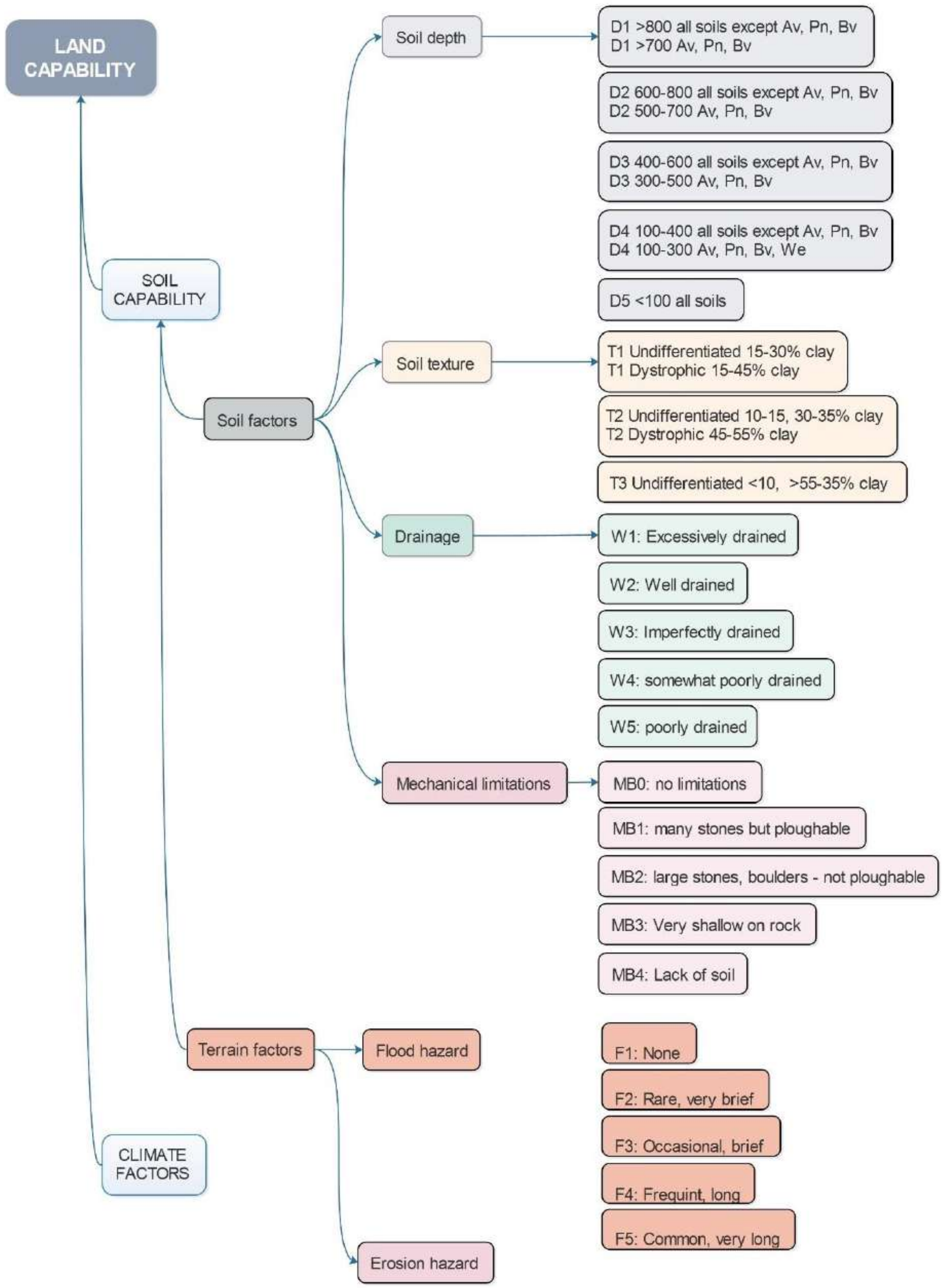
b) Grondklassifikasie Werkgroep, 1991. Grondklassifikasie, 'n Taksonomiese sisteem vir Suid Afrika, Departement van Landbou-ontwikkeling, Pretoria.

c) Department of Agriculture. Grazing capacity. Development of Agricultural Land Framework Bill, 2016

d) WRC, 2003 South African Atlas of Agrohydrology and Climatology, Water Research Commission

e) CROPWAT 8.0 has been developed by Joss Swennenhuis for the Water Resources Development and Management Service of FAO.

10.2 LAND USE CAPABILITY CRITERIA



10.3 SACNASP CERTIFICATE

THE SOUTH AFRICAN COUNCIL
FOR
NATURAL SCIENTIFIC PROFESSIONS

herewith certifies that

Johan Andries Gouws
Registration number: 400140/06

has been registered as a

Professional Natural Scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice
(Schedule I of the Act)

Agricultural Science

11 July 2006		
Pretoria	President	Chief Executive Officer

10.4 CURRICULUM VITAE (CV)

Position Title and No.	Agriculture, Land use planning and wetland specialist. INDEX
Name of Expert:	Andries Gouws
Date of Birth	12/04/1955
Country of Citizenship /Residence	South Africa

Education

Name of institution: College/University or other	Degree/diploma/certificate or other specialized education	Date completed
University of Pretoria, South Africa	BSc. Agriculture	1979
University of Bloemfontein	BSc. Honours, Agriculture	1987
Potchefstroom Collage for Agriculture	Diploma: Stereoscopic aerial photo interpretation of natural resources for farm planning	1981
University of South Africa	Diploma: Financial management	1992
University of Trinity	PhD: Integrated agricultural development	2007

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact info for references	Country	Summary of activities performed relevant to the Assignment
1993 - current	INDEX - Director and co-owner: Responsibility: Agriculture and land use planning. Contact: Eugene Gouws - Director +27 82 55 33 787	RSA	Provided specialist assessment services in agriculture and land use planning for various development projects.

Membership in Professional Associations and Publications:

Soil Science society of South Africa.

South African Council for Natural Scientific Professions – Registered Professional Scientist (Reg no: 400140/06)

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks
Position: Agricultural Specialist	Agricultural Impact Assessment for the Proposed Mookodi-Mahikeng 400kv Line. 2018. Client: Nemai Consulting
	Agricultural Impact Assessment for the Proposed Foxwood Dam 2015 – 2016 Compiled the specialist report on Agricultural impact

	Client: Nemai Consulting, DWS
	Agricultural Impact Assessment for the Proposed Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP) (2017 – 2019) Compiled the specialist report on Agricultural impact Client: Nemai Consulting, DWS
	MSOBO COAL – HARWAR; economic study for the farming enterprises Discussion of the natural resources that influences agricultural potential; Farming and the potential for different enterprises; Indicate the potential income from main enterprises and Indicate the financial impact of the development on the farmers. (2013/4) Client: Demacon
	Agricultural potential study of Portion 21 (Portion 1) of the farm Koppieskraal 1157-IR 2019. Client: Adv Johan du Plessis
	Agricultural Potential Assessment: Albany Wind Energy Facility & Grid Infrastructure Near Makhanda, Eastern Cape Province 2020 Client: CES Environmental and Social advisory Services
	Agricultural potential and impact assessment of Available Land At Mopeia, Mozambique 2016 Client: Barari Forest Management. Department: Research & Development Abu Dhabi

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Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes my qualifications, my experience and myself.

Andries Gouws		April 2023
Name of Expert	Signature	Date

10.5 OBSERVATIONS