AVIFAUNAL IMPACT ASSESSMENT

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE LEEUDORINGSTAD SUBSTATION ON PORTION 37 OF FARM LEEUWBOSCH NO. 44 NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

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EXECUTIVE SUMMARY

Leeudoringstad Solar Plant is proposing to construct a substation approximately 7km north-east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, which falls within the Dr Kenneth Kaunda District Municipality in the North West Province of South Africa (hereafter referred to as the 'proposed development'). The proposed development will have a capacity of 132/11 kilovolts (kV) and will be referred to as the Leeudoringstad Solar Plant Substation. SiVEST Environmental Division (hereafter referred to as 'SiVEST') has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) process for the proposed construction of the Leeudoringstad Solar Plant Substation. The overall objective of the proposed development is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of a separate respective BA processes) into the national grid and 'wheel' the power to customers based on a power purchase agreement.

The potential impacts of the Leeudoringstad Solar Plant Substation on avifauna are tabled below:

Environmental parameter	Issues	Rating prior to mitigation	Rating post mitigation
Avifauna	Displacement due to disturbance and habitat transformation linked to the construction of the substation	18 (low)	17 (low)
	Electrocution of priority species in the substation yard	12 (low)	8 (low)
	Displacement of priority species due to activities linked to the decommissioning of the substation	10 (low)	9 (low)
	Cumulative impact: Displacement and electrocution of priority avifauna on a broader scale	13 (low)	12 (low)
	Average	**13.25 (low)**	**11.5 (low)**

There is very little to choose from an avifaunal impact perspective between the two alternatives as far as the proposed Leeudoringstad Solar Plant Substation is concerned as the major driver relates to the footprint, which are all equal, and in identical habitat. Both alternatives are acceptable from a bird impact assessment perspective.

The cumulative impact of the proposed solar substation on priority avifauna within a 30km radius around the proposed development (considering all current impacts on avifauna) is assessed to be low, mainly due to the small size of the proposed development, and the small likelihood of regular electrocutions of priority species in the substation yard.

No fatal flaws were discovered in the course of the investigations. The proposed development is supported provided the proposed mitigation measures to limit the impact on avifauna is strictly implemented.

CONTENTS

DETAILS OF THE SPECIALIST AND EXPERTISE TO COMPILE A SPECIALIST REPORT

Chris van Rooyen

Chris has 22 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in numerous power line and wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2016) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Albert Froneman

Albert has an M. Sc. in Conservation Biology from the University of Cape Town and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at Council for Scientific and Industrial Research (CSIR). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – EWT Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and he is currently jointly coordinating pre-construction monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

SPECIALIST DECLARATION

I, Chris van Rooyen as duly authorised representative of Chris van Rooyen Consulting, and working under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003, hereby confirm my independence (as well as that of Chris van Rooyen Consulting) as a specialist and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SiVest 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 Basic Assessment for the proposed Leeuwbosch PV Facility.

Full Name: Chris van Rooyen

Position: Director

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6)

Section in EIA Regulations 2014 (as amended)		Clause	Section in Report
Appendix 6	(1)	A specialist report prepared in terms of these Regulations must contain —	
	(a)	details of –	
		(i) the specialist who prepared the report; and	Pg.4
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae.	Pg.4
	(b)	A declaration that the person is independent in a form as may be specified by the competent authority;	Pg.4
	(c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 2
	(cA)	An indication of the quality and age of base data used for the specialist report;	Section 3
	(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9
	(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 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 3
	(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 8
	(g)	An indication of any areas to be avoided, including buffers;	Not applicable
	(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;	Not applicable
	(i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section4
	(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;	Section 10
	(k)	Any mitigation measures for inclusion in the EMPr;	Section 9
	(l)	Any conditions for inclusion in the environmental authorization;	Section 9
	(m)	Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Section 9
	(n)	A reasoned opinion –	
		(i) as to whether the proposed activity, activities or portions thereof should be authorized;	Section 10
		(iA) regarding the acceptability of the proposed activity or activities; and	Section 10
		(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 10
	(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
	(p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
	(q)	Any other information requested by the authority.	Not applicable
	(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 6

1. INTRODUCTION

Leeudoringstad Solar Plant is proposing to construct a substation approximately 7km north-east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, which falls within the Dr Kenneth Kaunda District Municipality in the North West Province of South Africa (hereafter referred to as the 'proposed development'). The proposed development will have a capacity of 132/11 kilovolts (kV) and will be referred to as the Leeudoringstad Solar Plant Substation. SiVEST Environmental Division (hereafter referred to as 'SiVEST') has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) process for the proposed construction of the Leeudoringstad Solar Plant Substation. The overall objective of the proposed development is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of a separate respective BA processes) into the national grid and 'wheel' the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a National Energy Regulator of South Africa (NERSA)-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The proposed substation will be located on the following property, and is fully contained within the application site for the Leeuwbosch 1 and Leeuwbosch 2 solar PV plants:

- Portion 37 of the Farm Leeuwbosch No. 44.

The above-mentioned property is approximately 124.691ha in extent. The proposed substation assessed as part of this BA (the application site) will however only cover an area of up to approximately 10 016m^2 (≈1ha). It is located directly west of the Harvard Substation, where the current supply of electricity for the local areas and businesses is extracted from.

The construction phase will be between 12 and 24 months and the operational lifespan will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.

No site alternatives for this proposed development were considered as the placement of the proposed substation is dependent on the location of the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate BA processes). In addition, design and layout alternatives were considered and assessed as part of a previous BA process that was never completed, as such the substation site has been placed to avoid site sensitivities identified. Two (2) different location alternatives for the substation site were however identified and assessed (see Figure 1).

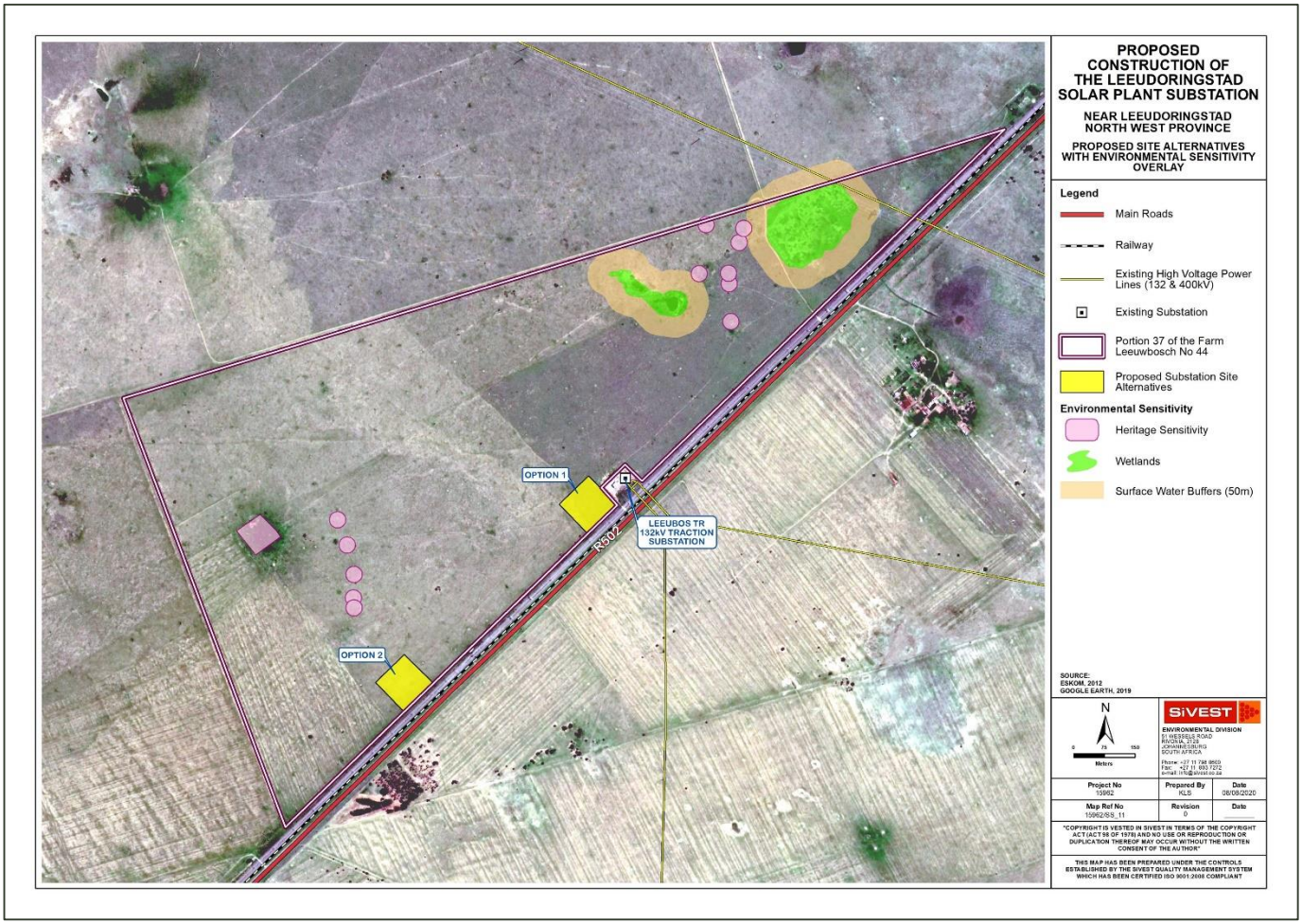

Figure 1: Locality map of proposed substation site alternatives (yellow square) relative to the application site for the Leeuwbosch 1 and Leeuwbosch 2 solar PV plants.

1.1 Project History

The original BA process for the proposed Leeudoringstad Solar Plant Substation was initiated in August 2016. All specialist studies were undertaken and subsequently all site sensitivities were identified. The specialist studies and draft basic assessment reports (DBARs) were completed and released for 30-day public review. The BA was however put out on hold prior to submitting the final basic assessment reports (FBARs) to the Department of Environmental Affairs (DEA). In February 2017, the proposed capacity and location of the substation was amended, and a new connection point was assessed. However, the project was put on hold prior to submitting the application forms to the DEA or commencing with the legislated public participation process. In August of 2020, Leeudoringstad Solar Plant Substation proposed a new substation site (now referred to as the Leeudoringstad Solar Plant Substation) outside of all site sensitivities that were identified in 2016, and as such specialist studies have been commissioned to assess and verify the substation under the new Gazetted specialist protocols[1].

[1] GOVERNMENT GAZETTE No. 43110, 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, 20 MARCH 2020.

In terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998, prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation, as contained in the Schedule hereto. When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements. Each protocol applies exclusively to the environmental theme identified within its scope. Multiple themes may apply to a single application for environmental authorisation, and assessments for these themes must be undertaken in accordance with the relevant protocol, or where no specific protocol has been prescribed, in accordance with the requirements of the EIA Regulations.

1.2 Substation Components

At this stage, it is anticipated that the proposed development will include the following components:

- One (1) new 132/11kV substation (namely the Leeudoringstad Solar Plant Substation) to serve the Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & !32kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective BA processes).

As mentioned, once fully developed, the intention is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line into the national grid and 'wheel' the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a NERSA-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The construction phase will be between 12 and 24 months and the operational lifespan will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.

2 PROJECT SCOPE

The terms of reference for this assessment report are as follows:

- Describe the affected environment from an avifaunal perspective
- Discuss gaps in baseline data and other limitations
- List and describe the expected impacts associated with the solar facilities and associated infrastructure
- Do an assessment of the potential impacts;
- Rank the alternatives in order of preference; and
- Recommend mitigation measures to reduce the impact of the expected impacts.

3 OUTLINE OF METHODOLOGY AND INFORMATION REVIEWED

The following information sources were consulted to conduct this study:

- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 9 pentads some of which intersect and others that are near the development. The decision to include multiple pentads around the application site was influenced by the fact that many of the pentads in the area have very few completed full protocol surveys. Given that the habitat is largely homogenous the additional pentads and their data augments the otherwise sparse bird distribution data. The 9 pentad grid cells are the following: 2705_2610; 2705_2615; 2705_2620; 2710_2610; 2710_2615; 2710_2620; 2715_2610; 2715_2615; 2715_2620 (see Figure 22). A total of 26 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 20 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the 9 pentads where the application site is located, with a total of 1 220 birds recorded. The SABAP2 data was therefore regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during the site surveys and general knowledge of the area.
- A classification of the vegetation types in the application site was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).

- The global threatened status of all priority species was determined by consulting the latest (2020.2) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2020) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the application site relative to National Protected Areas, National Protected Areas Expansion Strategy (NPEAS) focus areas and Critical Biodiversity Areas in the North-West Province.
- The DEFF National Screening Tool was used to determine the assigned avian sensitivity of the application site.
- The BirdLife South Africa (BLSA) Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. BirdLife South Africa by Jenkins, A.R., Ralston-Patton, Smit- Robinson, A.H. 2017 (hereafter referred to as the Solar Guidelines) were consulted to determine the level of survey effort that is required.
- A one-day site visit was conducted in November 2016 and again in August 2020. During the latter, data was collected by means of transect and incidental counts at the application site, and in the area immediately surrounding the application site.

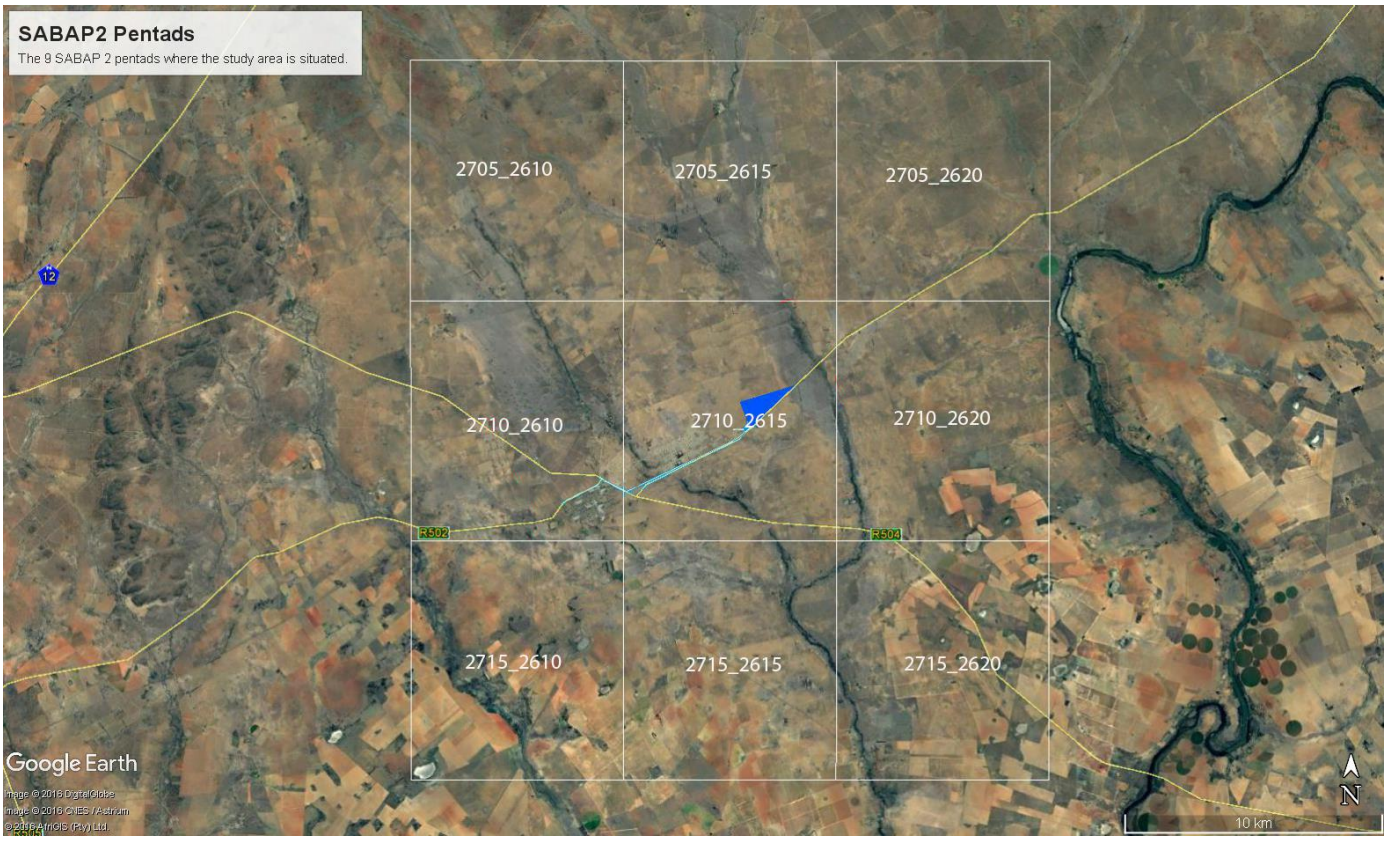

Figure 2: Area covered by the nine SABAP2 pentads. Both substation site alternatives are located within the blue polygon.

4 ASSUMPTIONS AND LIMITATIONS

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- The focus of the study is primarily on the potential impacts on priority species which were defined as follows:
  - South African Red Data species;
  - South African endemics and near-endemics;
  - Waterbirds; and
  - Raptors

- The assessment of impacts is based on the baseline environment as it currently exists in the application site.
- Cumulative impacts include all solar PV projects within a 50km radius that currently have open applications or have been approved by the Competent Authority.
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The Leeuwbosch PV application site (namely Portion 37 of the Farm Leeuwbosch No. 44), where the substation will be located, was classified as a Low Sensitivity site as defined in the Solar Guidelines, requiring a Regime 1 protocol to be followed for data collection i.e. a minimum of one site visit of 1 to 5 days in duration.

5 LEGISLATIVE CONTEXT

There is no legislation pertaining specifically to the impact of electrical infrastructure on avifauna.

5.1 Agreements and conventions

Table 1 below lists agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna[2].

Table 1: Agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international conservation community in an effort to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: The conservation of biological diversity The sustainable use of the components of biological diversity The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the United Nations Environment Programme, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

[2] (BirdLife International (2016) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south_africa. Checked: 2016-04-02).

Birds of Prey in Africa and Eurasia		

5.2 National legislation

5.2.1 Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

  (i) prevent pollution and ecological degradation;

  (ii) promote conservation; and

  (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

5.2.2 The National Environmental Management Act 107 of 1998 (NEMA)

The National Environmental Management Act 107 of 1998 (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated.

NEMA also provides that a wide variety of listed developmental activities, which may significantly affect the environment, may be performed only after an environmental impact assessment has been done and authorization has been obtained from the relevant authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

5.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act 10 of 2004 read with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the Convention on Biological Diversity, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals. The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

5.3 Provincial Legislation

The North West Biodiversity Management Act No 4 of 2016 was published on 3 January 2017 but has not yet come into force.

6 BASELINE ASSESSMENT

6.1 Important Bird Areas

There are no Important Bird Areas (IBA) within a 30km radius around the application site. It is therefore highly unlikely that the proposed development will have a negative impact on any IBA.

6.2 6.2 Critical Biodiversity Areas (CBAs)

The application site is not within a CBA but is classified as an Ecological Support Area (ESA) (more specifically an ESA 1). Please refer to Figure 3 below.

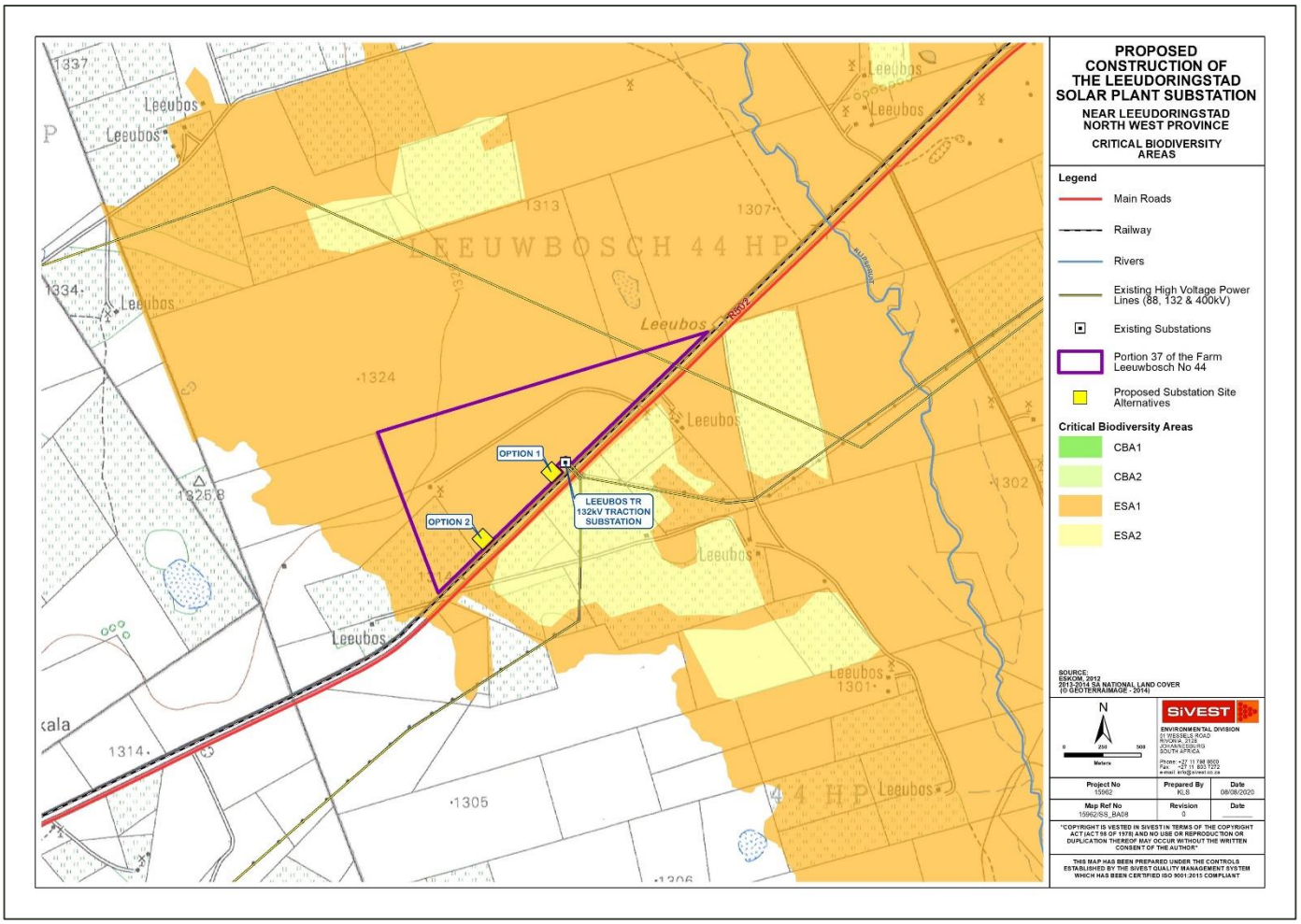

Figure 3: CBA Map – Leeudoringstad Solar Plant Substation.

6.3 DEFF National Screening Tool

The Department of Environment, Forestry and Fisheries (DEFF) National Screening Tool classifies the application site as low sensitive from a general terrestrial animal perspective – no provision is made for avifauna specifically for substations. The site investigations revealed that the application site is low from an avifaunal perspective.

6.4 National Protected Areas Expansion Strategy (NPEAS) focus areas

The application site forms part of the Vaal Grasslands NPEAS focus area.

6.5 Biomes and vegetation types

The application site is situated approximately 5-10km north-east of the towns of Leeudoringstad and Kgagala, in the North-West Province. It is located in the grassland biome (Mucina & Rutherford 2006). Only one vegetation type occurs in the application site, namely Vaal-Vet Sandy Grassland (Mucina & Rutherford 2006) (Figure 4).

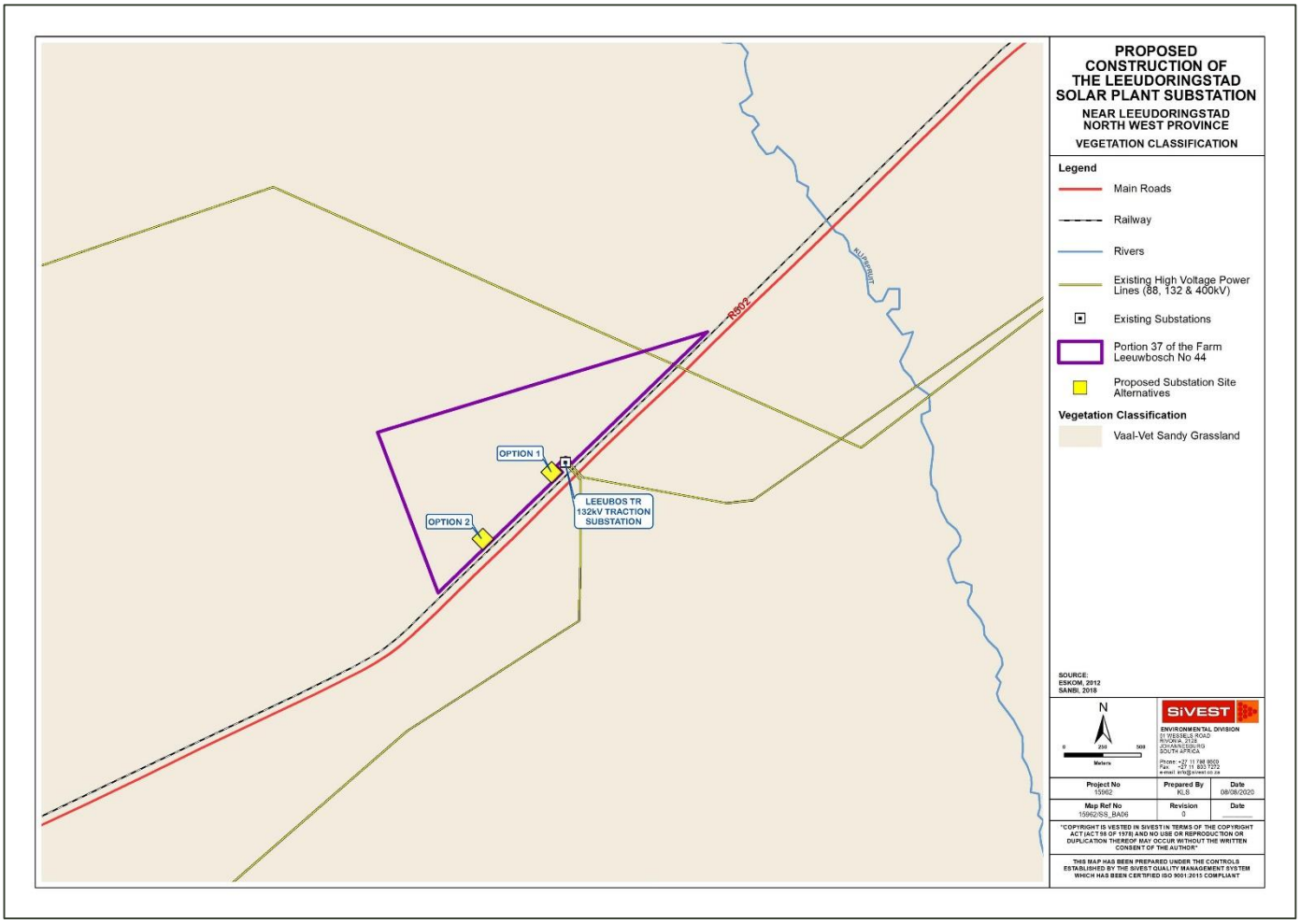

Figure 4: Vegetation Unit Map – Leeuwbosch 1 Solar PV Plant

This vegetation type occurs on plains-dominated landscapes with some scattered, slightly irregular undulating plains and hills. Consists mainly of low-tussock grasslands with an abundant karroid element. Dominance of redgrass/rooigras *Themeda triandra* is an important feature of this vegetation unit. This vegetation type occurs in a warm-temperate, summer-rainfall climate, with overall mean annual precipitation of 530 mm. Severe frost (37 days per year on average) occurs in winter (Mucina & Rutherford 2006). Average temperatures in the vicinity of the application site range from a low of 2˚C in July to 32˚C in December/January[3]. See Figure 5 for an example of the habitat in the application site.

[3] https://www.worldweatheronline.com/v2/weather-averages.aspx?locid=2756218&root_id=2750634&wc=local_weather&map=~/leeudoringstad-weather-averages/north-west/za.aspx

Figure 5: Typical grassland habitat at the application site

7 AVIFAUNA IN THE APPLICATION SITE

7.1 South African Bird Atlas Project 2

The SABAP2 data indicates that a total of 161 bird species could potentially occur within the application site and/or immediate surroundings – Appendix 1 provides a comprehensive list of all the species. Of these, 50 species are classified as priority species (see definition of priority species in section 4) and 5 of these are South African Red Data species.

Table 2 below lists all the priority species and the possible impact on the respective species by the proposed substation. The following abbreviations and acronyms are used:

- EN = Endangered
- VU = Vulnerable
- NT = Near threatened
- End = South African Endemic
- N-End = South African near endemic
- H = High
- M = Medium
- L = Low

Table 2: Priority species potentially occurring at the site and immediate surroundings.

		Status								Habitat		Impact		
Species	Taxonomic name	Global status	Regional status	SA endemic status	Raptor	Waterbird	SABAP2 Full protocol reporting rate	Probability of occurrence	Recorded during surveys	Grassland	HV lines	Electrocutions in substation	Displacement due to habitat transformation	Displacement due to disturbance
Buzzard, Steppe	*Buteo vulpinus*				x		3.85	M		x	x	x		
Chat, Sickle-winged	*Cercomela sinuata*			N-end			3.85	L		x			x	x
Cisticola, Cloud	*Cisticola textrix*			N-end			23.08	H	x	x			x	x
Cliff-swallow, South African	*Hirundo spilodera*			End			42.31	H	x	x				
Eagle, Martial	*Polemaetus bellicosus*	EN	EN		x		0.00	L		x	x	x		
Eagle-owl, Spotted	*Bubo africanus*				x		0.00	M		x		x		
Egret, Cattle	*Bubulcus ibis*					x	92.31	H		x				
Falcon, Amur	*Falco amurensis*				x		3.85	L		x				
Falcon, Lanner	*Falco biarmicus*	LC	VU		x		0.00	L		x	x	x		
Goose, Egyptian	*Alopochen aegyptiacus*					x	30.77	M	x		x	x		
Goose, Spur-winged	*Plectropterus gambensis*					x	11.54	M		x				
Heron, Black-headed	*Ardea melanocephala*					x	26.92	H		x	x			
Kestrel, Greater	*Falco rupicoloides*				x		11.54	M		x	x	x		
Kestrel, Lesser	*Falco naumanni*				x		30.77	H		x	x	x		
Kite, Black-shouldered	*Elanus caeruleus*				x		38.46	H	x	x	x	x		
Kite, Yellow-billed	*Milvus aegyptius*				x		0.00	L		x				
Lark, Eastern Long-billed	*Certhilauda semitorquata*			End			3.85	L		x			x	x
Lark, Melodious	*Mirafra cheniana*			N-end			3.85	L		x			x	x
Secretarybird	*Sagittarius serpentarius*				x		3.85	M		x				
Snake-Eagle, Black-chested	*Circaetus pectoralis*				x		0.00	M		x	x	x		
Stonechat, African	*Saxicola torquatus*						23.08	H		x			x	x

7.2 On-site surveys

On-site surveys at the Leeuwbosch PV site (namely Portion 37 of the Farm Leeuwbosch No. 44), where the application site is located, were conducted on 8 August 2020 by means of transect counts.

The abundance of avifauna recorded during the transect counts are displayed in Figures 6 and 7.

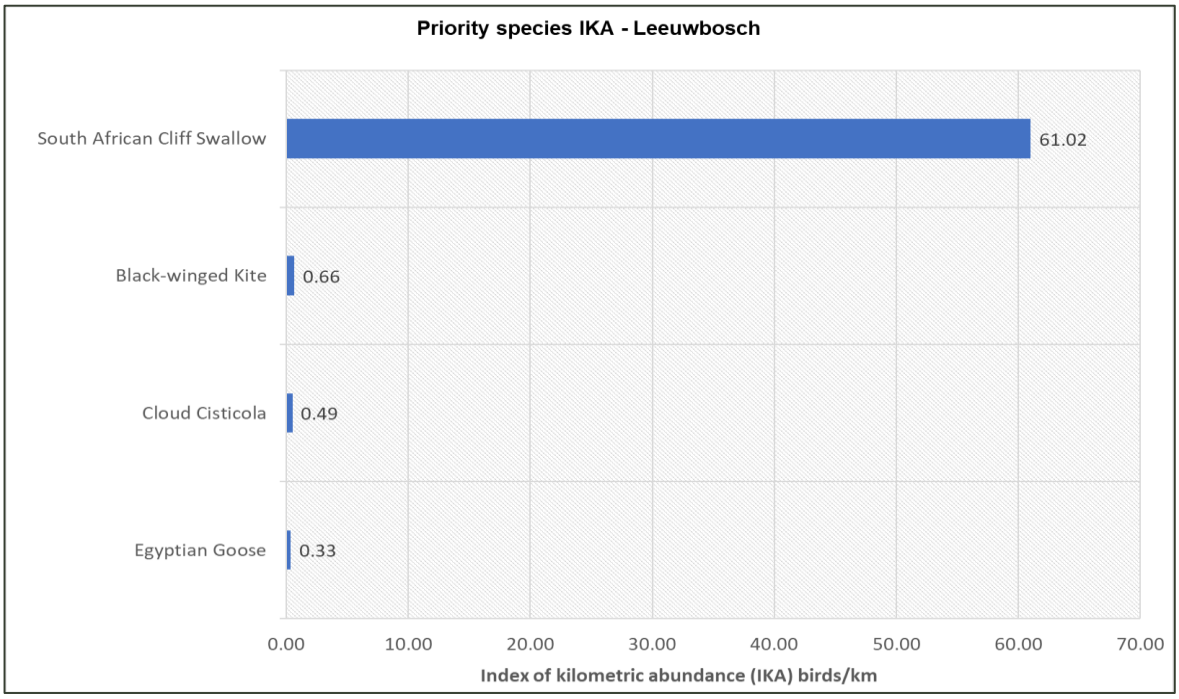

Figure 6: Index of kilometric abundance (IKA) for all priority species recorded by means of walk transects during the surveys in the study area, conducted in August 2020.

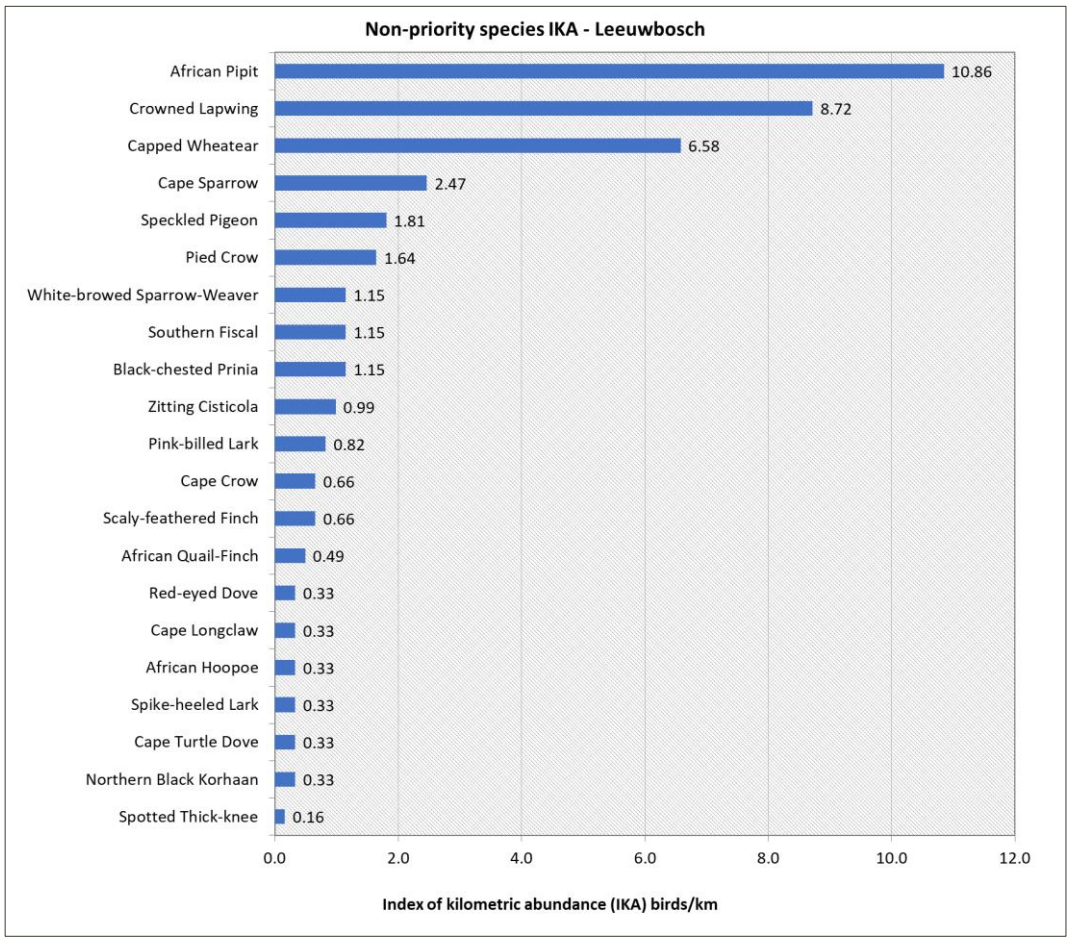

Figure 7: Index of kilometric abundance (IKA) for all non-priority species recorded by means of walk transects during the surveys, conducted in August 2020.

8 IMPACT ASSESSMENT

8.1 Introduction

Negative impacts on birds by electricity infrastructure generally take two principal forms, namely electrocution and collisions (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs and Ledger 1986a; Hobbs & Ledger 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000; Van Rooyen 2004; Jenkins *et al.* 2010). Birds also impact on the infrastructure through nesting and streamers, which can cause interruptions in the electricity supply (Van Rooyen *et al.* 2002). During the construction phase of power lines and substations, displacement of birds can also happen due to disturbance and habitat transformation. In the case of the proposed development, the following three potential impacts on priority species are envisaged:

- Electrocutions in the substation yard
- Displacement due to disturbance and habitat transformation linked to the construction of the substation
- Displacement due to disturbance linked to the de-commissioning of the substation

8.2 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). The electrocution risk is largely determined by the design of the electrical hardware. There could be an electrocution risk to certain species, mostly raptors, but also some waterbirds, in the substation yard. This is however unlikely to be a major problem for the larger Red Listed species, as it is not envisaged that they will frequently perch in the substation yard.

Species potentially at risk of electrocution in the substation yard are listed in Table 2.

8.3 Displacement due to disturbance and habitat transformation during construction phase

The construction activities could impact on birds through permanent displacement due to disturbance and habitat transformation, particularly for ground nesting species. It is assumed that the entire application site will be transformed, with no natural vegetation remaining. This could lead to breeding failure if it happens during a critical stage of the breeding cycle. The reporting rates for Red List species in the broader area are generally low, which is an indication that they are not regularly utilising the area. However, there is a possibility of displacing a breeding pair of ground nesting priority species during the construction of the substation.

Priority species at risk of permanent displacement are listed in Table 2.

8.4 Displacement due to disturbance during decommissioning phase

Birds breeding in the vicinity of the substation could be temporarily displaced due to disturbance associated with the activities linked to the decommissioning of the substation. This could affect a number of ground nesting species.

Priority species at risk of temporary displacement due to disturbance are listed in Table 2.

9 IMPACT RATING

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

9.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in the table below.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

9.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning
- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact has been detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		

This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects 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).
3	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 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	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).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude / intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

9.3 Impact Assessments – All phases

An assessment of the impacts is conducted in Table 3 below, with proposed mitigation measures.

The impacts were summarized, and a comparison made between pre-and post-mitigation phases as shown in Table 3 below. The rating of environmental issues associated with different parameters prior to and post mitigation of a proposed activity was averaged. A comparison was then made to determine the effectiveness of the proposed mitigation measures. The comparison identified critical issues related to the environmental parameters.

Table 3: Rating of impacts

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Planning / Pre-construction Phase																				
Not applicable																				
Construction Phase																				
Displacement due to disturbance and habitat transformation linked to the construction of the substation	The construction activities could impact on priority species through permanent displacement due to disturbance and habitat transformation, particularly for ground nesting species on and immediately adjacent to the application site. This could lead to breeding failure if it happens during a critical stage of the breeding cycle. However, there is a possibility of displacing a breeding pair of ground nesting priority species during the	1	3	4	4	4	2	18	-	Low	• Construction activity should be restricted to the immediate footprint of the infrastructure as much as possible. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access	1	2	4	4	4	2	17	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
	construction of the substation.										roads and the construction of new roads should be kept to a minimum.									
Operational Phase																				
Electrocution of priority species in the substation yard	Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. There could be an electrocution risk to certain priority species, mostly raptors, but also some waterbirds, in the substation yard. This is however unlikely to be a major problem for the larger Red Listed species, as it is not envisaged that they will frequently perch in the substation yard.	1	2	2	2	3	2	12	-	Low	The complexity of the electrical hardware in the substation is such that proactive mitigation is not a practical option. Instead, if an electrocution occurs, the causes must be established to see if the application of mitigation measures e.g. the insulation of live components could be implemented	1	1	2	2	1	1	8	-	Low
Decommissioning Phase																				

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Displacement of priority species due to activities linked to the decommissioning of the substation	Birds breeding in the vicinity of the substation could be temporarily displaced due to disturbance associated with the activities linked to the decommissioning of the substation. This could affect a number of ground-nesting species, including some priority species.	1	3	1	2	1	2	10	-	Low	• Activities should be restricted to the immediate footprint of the infrastructure as much as possible. • Access to the remainder of the site outside the actual footprint should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.	1	2	1	2	1	2	9	-	Low
Cumulative																				
Displacement and electrocution of priority avifauna on a broader scale	The construction and operation of the substation will contribute to cumulative habitat loss and electrocution mortality of priority	1	3	2	2	3	2	13	-	Low	All the mitigation measures listed in the construction, operational and decommissioning phases	1	2	2	2	3	2	12	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
	species in the broader region (50km radius)																			

Table 4: Comparison of summarised impacts on environmental parameters

Environmental parameter	Issues	Rating prior to mitigation	Rating post mitigation
Avifauna	Displacement due to disturbance and habitat transformation linked to the construction of the substation	18 (low)	17 (low)
	Electrocution of priority species in the substation yard	12 (low)	8 (low)
	Displacement of priority species due to activities linked to the decommissioning of the substation	10 (low)	9 (low)
	Cumulative impact: Displacement and electrocution of priority avifauna on a broader scale	13 (low)	12 (low)
	Average	**13.25 (low)**	**11.5 (low)**

As mentioned in section 1, no site alternatives for the proposed substation development were considered. In addition, design and layout alternatives were considered and assessed as part of a previous BA process that was never completed and as such, the substation site has been placed to avoid site sensitivities identified. Two (2) different location alternatives for the substation site were however identified and assessed (see Figure 1). As such, a comparative assessment of alternatives for the proposed substation site alternatives has been undertaken. Tables 5 and 6 below sets out the comparative assessment of the various substation site alternatives.

Table 5: Criteria used to arrive at a preferred alternative

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 6: Alternative Assessment summarising the impacts, highlighting issues/concerns and indicating the preference associated with each proposed substation site alternatives

Alternative	Preference	Concerns / Impact Summary	Fatal Flaws
Option 1	The impact will be relatively insignificant due to the small size of the footprint and the habitat is not highly sensitive	▪ No specific concerns are associated with this alternative	None
Option 2	The impact will be relatively insignificant due to the small size of the footprint and the habitat is not highly sensitive	▪ No specific concerns are associated with this alternative	None

As can be seen from the tables above, both alternatives are equally acceptable and no fatal flaws have been identified. The substation site being proposed for authorisation is therefore deemed acceptable form an avifauna perspective and should be approved / authorised.

9.4 Cumulative impacts

The broader area has seen a notable interest from developers of various renewable energy projects, which could be associated with the solar energy resource potential found in the region, proximity to the existing sub-station and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create numerous cumulative impacts, whether positive or negative, if implemented.

Table 7: 7 lists the projects that were considered when examining the cumulative impacts.

Table 7: Proposed renewable energy projects in the area

Proposed Development	Reference Number	Current Status of BA / EIA	Proponent	Proposed Capacity	Farm Details
Leeuwbosch 1 Solar PV Plant Project	TBA	BA ongoing	Leeuwbosch PV Generation (Pty) Ltd	9.9MW	Farm Leeuwbosch 44
Leeuwbosch 2 Solar PV Plant Project	TBA	BA ongoing	Leeuwbosch PV Generation (Pty) Ltd	9.9MW	Farm Leeuwbosch 44
Wildebeestkuil 1 Solar PV Plant Project	TBA	BA ongoing	Wildebeestkuil PV Generation (Pty) Ltd	9.9MW	Farm Wildebeestkuil 59
Wildebeestkuil 2 Solar PV Plant Project	TBA	BA ongoing	Wildebeestkuil PV Generation (Pty) Ltd	9.9MW	Farm Wildebeestkuil 59
Bokamoso Solar Energy Facility	14/12/16/3/3/2/559	Project has received environmental authorisation	SunEdison	75MW	A portion of the farm Matjesspruit 145,

Figure 8 below shows the renewable projects which are planned or authorised within a 50km radius of the proposed development.

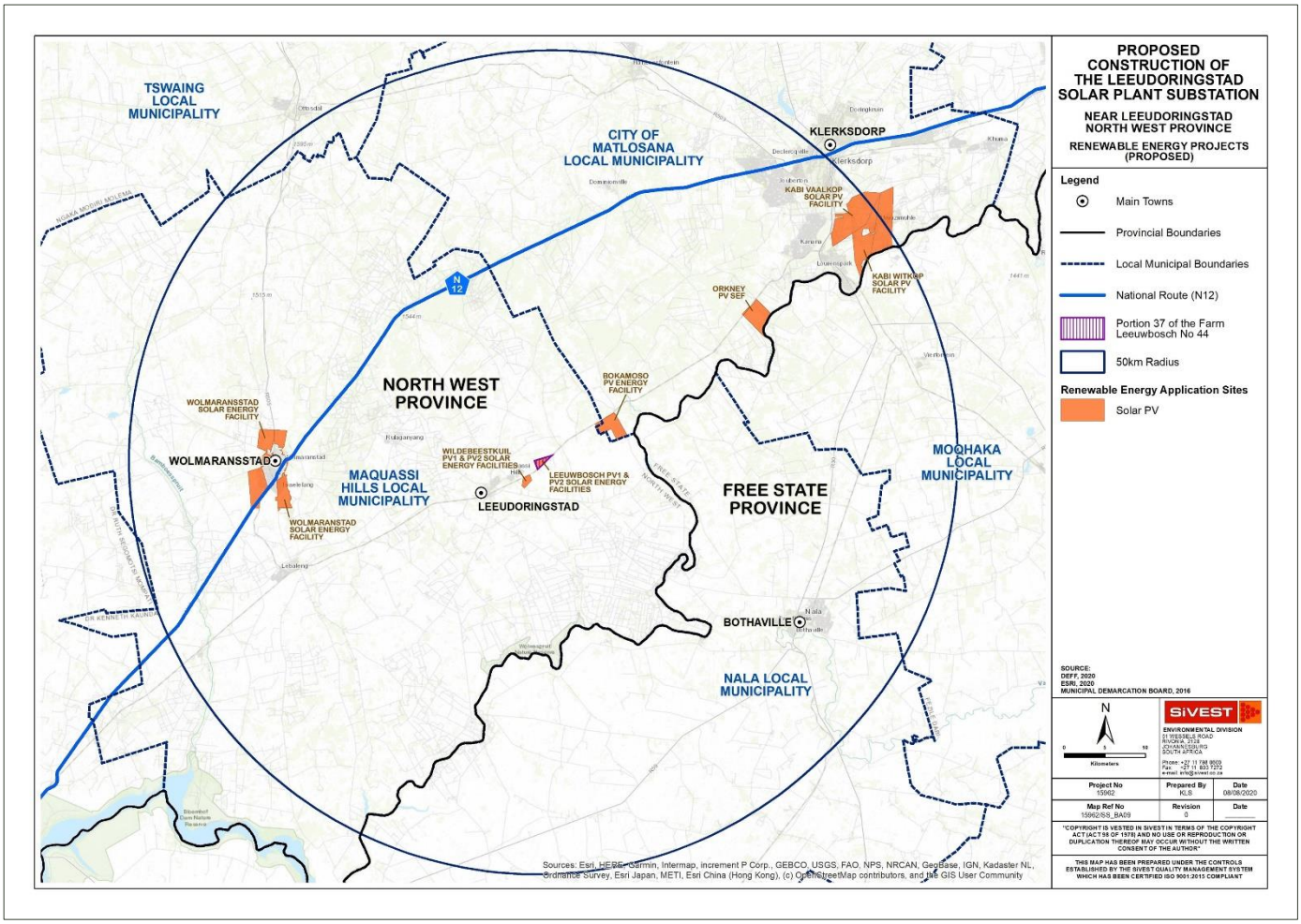

Figure 8: The locality of existing and proposed renewable energy projects within a 50km radius around the proposed Leeudoringstad Solar Plant Substation

A cumulative impact, in relation to an activity, is the impact of an activity that may not be significant on its own but may become significant when added to the existing and potential impacts arising from similar or other activities in the area[4].

[4] These were active or approved applications for solar facilities situated with a 50km radius of the current project.

Currently there is no agreed method for determining significant adverse cumulative impacts on ornithological receptors. The Scottish Natural Heritage (2005) recommends a five-stage process to aid in the ornithological assessment:

- Define the species/habitat to be considered;
- Consider the limits or 'search area' of the study;
- Decide the methods to be employed;
- Review the findings of existing studies; and
- Draw conclusions of cumulative effects within the application site.

Table 8 below sets out the criteria applied to rank potential cumulative impacts.

Table 8: Framework for assessing significance of cumulative effects.

Significance	Effect
Severe	Effects that the decision-maker must consider because the receptor/resource is irretrievably compromised, resulting in a fatal flaw.
Major	Effects that may become a key decision-making issue, potential fatal flaw.
Moderate	Effects that are unlikely to affect the viability of the project, but mitigation might be required.
Minor	Effects which might be locally/site significant, but probably insignificant for the greater application site.
Not Significant	Effects that are within the ability of the resource to absorb such change both at local/site level and within the greater application site.

9.4.1 Current impacts on avifauna

In the current instance, not all the criteria proposed above by the Scottish Natural Heritage can be met in assessing the cumulative impact of the proposed substation. In the absence of comprehensive scientifically verified data, general knowledge and experience will have to suffice. The following impacts on avifauna can reasonably be assumed in the 50km radius around the development:

- Overgrazing results in degradation of habitat, potentially reducing populations of wide-ranging species such as bustards, which depend on large foraging areas.
- Extensive agricultural operations have led to large areas of grassland having been converted into agricultural crops, which is relatively sterile environments for most priority species.
- Invasive alien plants are a continuing threat, especially along drainage lines.
- Renewable energy developments are a new threat. The most significant impact on birds is displacement due to loss of habitat.
- Powerlines and substations pose a collision and electrocution risk.

9.4.2 The cumulative impact of the proposed Leeudoringstad Solar Plant Substation on avifauna within a 50km radius

9.4.2.1 Displacement of priority species due to habitat transformation and disturbance

The difficulties associated with the quantification of cumulative impacts of the renewable energy facilities have already been explained above. Stock farming is not displacing any priority species although it may be that periodic overgrazing might have an impact on the habitat and therefore the densities of some species. However, that cannot be categorically confirmed without more research. The extensive habitat transformation due to the cultivation of agricultural crops has a catastrophic impact on the natural grassland (Harrison *et al.* 1997). As far as potential future impacts are concerned, the cumulative impact of displacement due to disturbance and habitat transformation linked to the combined effect of all the proposed solar facilities and associated infrastructure in the area is currently low, due to the small number and small size of proposed developments.

Overall, the cumulative significance of this impact is rated at **Low**, due to the small size of the proposed development.

9.4.2.2 Potential mortality due to electrocutions in the substation yard

Electrocutions on electrical infrastructure are a possible threat to priority species known to potentially occur at the development area. The cumulative impact of this mortality factor linked to the combined effect of all the proposed solar facilities in the area is currently low, due to the small number and small size of proposed developments and associated electrical infrastructure.

Overall, the cumulative significance of this impact is rated at **Low**, due to the small size of the proposed development, and the low likelihood of electrocutions happening in the substation yard.

An assessment of the cumulative impacts is conducted in Table 3, with proposed mitigation measures. The cumulative impact of the proposed solar substation on priority avifauna within a 50km radius around the proposed development (considering all current impacts on avifauna) is assessed to be low, mainly due to the small size of the proposed development, and the small likelihood of regular electrocutions of priority species in the substation yard.

9.5 No-Go Alternative

The no-go option assumes that the site remains in its current state, i.e. there is no construction of a substation in the proposed project area and the *status quo* would proceed. The no-go alternative will thus result in the current *status quo* being maintained at the proposed application site as far as the avifauna is concerned. The application site itself consist mostly of natural grassland. The no-go option would maintain the natural grassland which would be beneficial to the avifauna currently occurring there.

10 CONCLUSIONS

There is very little to choose from an avifaunal impact perspective between the two alternatives as far as the proposed Leeudoringstad Solar Plant Substation is concerned as the major driver relates to the footprint, which are all equal, and in identical habitat. Both alternatives are acceptable from a bird impact assessment perspective.

As mentioned above, the cumulative impact of the proposed solar substation on priority avifauna within a 50km radius around the proposed development (considering all current impacts on avifauna) is assessed to be low, mainly due to the small size of the proposed development, and the small likelihood of regular electrocutions of priority species in the substation yard.

The proposed development is supported provided the proposed mitigation measures is strictly implemented to limit the impact on avifauna.

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APPENDIX 1: SABAP 2 SPECIES LIST FOR THE APPLICATION SITE AND SURROUNDINGS

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate
Acacia Pied Barbet	*Tricholaema leucomelas*	73.08	0
African Black Swift	*Apus barbatus*	3.85	0
African Darter	*Anhinga rufa*	3.85	0
African Hoopoe	*Upupa africana*	26.92	0
African Palm-swift	*Cypsiurus parvus*	15.38	5
African Pipit	*Anthus cinnamomeus*	23.08	0
African Quailfinch	*Ortygospiza atricollis*	69.23	0
African Red-eyed Bulbul	*Pycnonotus nigricans*	73.08	5
African Sacred Ibis	*Threskiornis aethiopicus*	23.08	0
African Spoonbill	*Platalea alba*	3.85	0
African Stonechat	*Saxicola torquatus*	23.08	0
Amur Falcon	*Falco amurensis*	3.85	15
Anteating Chat	*Myrmecocichla formicivora*	53.85	15
Ashy Tit	*Parus cinerascens*	11.54	0
Barn Swallow	*Hirundo rustica*	38.46	15
Black-chested Prinia	*Prinia flavicans*	80.77	0
Black-chested Snake-eagle	*Circaetus pectoralis*	0.00	5
Black-crowned Night-Heron	*Nycticorax nycticorax*	3.85	0
Black-headed Heron	*Ardea melanocephala*	26.92	5
Black-shouldered Kite	*Elanus caeruleus*	38.46	10
Blacksmith Lapwing	*Vanellus armatus*	84.62	0
Black-throated Canary	*Crithagra atrogularis*	57.69	0
Black-winged Stilt	*Himantopus himantopus*	11.54	0
Blue Waxbill	*Uraeginthus angolensis*	23.08	0
Bokmakierie	*Telophorus zeylonus*	30.77	0
Brown-crowned Tchagra	*Tchagra australis*	30.77	0
Brown-hooded Kingfisher	*Halcyon albiventris*	3.85	0
Brown-throated Martin	*Riparia paludicola*	7.69	0
Brubru	*Nilaus afer*	3.85	0
Cape Glossy Starling	*Lamprotornis nitens*	61.54	5
Cape Longclaw	*Macronyx capensis*	50.00	0
Cape Penduline-tit	*Anthoscopus minutus*	11.54	0
Cape Robin-chat	*Cossypha caffra*	30.77	0
Cape Shoveler	*Anas smithii*	3.85	0

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate
Cape Sparrow	*Passer melanurus*	80.77	0
Cape Teal	*Anas capensis*	15.38	0
Cape Turtle-dove	*Streptopelia capicola*	34.62	10
Cape Wagtail	*Motacilla capensis*	42.31	0
Cape White-eye	*Zosterops virens*	11.54	0
Capped Wheatear	*Oenanthe pileata*	3.85	0
Cardinal Woodpecker	*Dendropicos fuscescens*	3.85	0
Cattle Egret	*Bubulcus ibis*	92.31	10
Chestnut-backed Sparrowlark	*Eremopterix leucotis*	3.85	0
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	80.77	0
Cinnamon-breasted Bunting	*Emberiza tahapisi*	19.23	0
Cloud Cisticola	*Cisticola textrix*	23.08	0
Common (Southern) Fiscal	*Lanius collaris*	88.46	20
Common Myna	*Acridotheres tristis*	69.23	5
Common Ostrich	*Struthio camelus*	15.38	5
Common Scimitarbill	*Rhinopomastus cyanomelas*	7.69	0
Common Swift	*Apus apus*	3.85	0
Common Waxbill	*Estrilda astrild*	3.85	0
Crested Barbet	*Trachyphonus vaillantii*	69.23	0
Crowned Lapwing	*Vanellus coronatus*	84.62	5
Desert Cisticola	*Cisticola aridulus*	38.46	0
Diderick Cuckoo	*Chrysococcyx caprius*	30.77	0
Domestic Goose	*Anser anser*	3.85	0
Eastern Clapper Lark	*Mirafra fasciolata*	34.62	0
Eastern Long-billed Lark	*Certhilauda semitorquata*	3.85	0
Egyptian Goose	*Alopochen aegyptiacus*	30.77	0
European Bee-eater	*Merops apiaster*	30.77	5
Fiscal Flycatcher	*Sigelus silens*	30.77	0
Fork-tailed Drongo	*Dicrurus adsimilis*	7.69	0
Gabar Goshawk	*Melierax gabar*	3.85	0
Glossy Ibis	*Plegadis falcinellus*	7.69	0
Great Egret	*Egretta alba*	3.85	0
Greater Flamingo	*Phoenicopterus ruber*	3.85	0
Greater Kestrel	*Falco rupicoloides*	11.54	5
Greater Striped Swallow	*Hirundo cucullata*	46.15	10
Green-winged Pytilia	*Pytilia melba*	15.38	0

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate
Grey Heron	*Ardea cinerea*	15.38	0
Hadeda Ibis	*Bostrychia hagedash*	65.38	10
Helmeted Guineafowl	*Numida meleagris*	53.85	15
House Sparrow	*Passer domesticus*	46.15	0
Kalahari Scrub-robin	*Cercotrichas paena*	50.00	0
Karoo Thrush	*Turdus smithi*	15.38	0
Lark-like Bunting	*Emberiza impetuani*	3.85	0
Laughing Dove	*Streptopelia senegalensis*	96.15	25
Lesser Flamingo	*Phoenicopterus minor*	3.85	0
Lesser Grey Shrike	*Lanius minor*	15.38	0
Lesser Kestrel	*Falco naumanni*	30.77	15
Lesser Swamp-warbler	*Acrocephalus gracilirostris*	7.69	0
Levaillant's Cisticola	*Cisticola tinniens*	26.92	0
Lilac-breasted Roller	*Coracias caudatus*	3.85	0
Little Egret	*Egretta garzetta*	3.85	0
Little Grebe	*Tachybaptus ruficollis*	26.92	0
Little Stint	*Calidris minuta*	3.85	0
Little Swift	*Apus affinis*	57.69	5
Long-billed Crombec	*Sylvietta rufescens*	3.85	0
Long-tailed Paradise-whydah	*Vidua paradisaea*	23.08	0
Long-tailed Widowbird	*Euplectes progne*	69.23	15
Maccoa Duck	*Oxyura maccoa*	3.85	0
Malachite Kingfisher	*Alcedo cristata*	3.85	0
Mallard Duck	*Anas platyrhynchos*	3.85	0
Marsh Sandpiper	*Tringa stagnatilis*	3.85	0
Melodious Lark	*Mirafra cheniana*	3.85	0
Namaqua Dove	*Oena capensis*	38.46	5
Neddicky	*Cisticola fulvicapilla*	65.38	0
Northern Black Korhaan	*Afrotis afraoides*	69.23	5
Orange River Francolin	*Scleroptila levaillantoides*	15.38	0
Orange River White-eye	*Zosterops pallidus*	26.92	0
Pied Crow	*Corvus albus*	46.15	20
Pied Kingfisher	*Ceryle rudis*	7.69	0
Pin-tailed Whydah	*Vidua macroura*	11.54	0
Pririt Batis	*Batis pririt*	26.92	0
Rattling Cisticola	*Cisticola chiniana*	3.85	0

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate
Red-backed Shrike	*Lanius collurio*	30.77	0
Red-billed Firefinch	*Lagonosticta senegala*	15.38	0
Red-billed Quelea	*Quelea quelea*	50.00	0
Red-billed Teal	*Anas erythrorhyncha*	15.38	0
Red-breasted Swallow	*Hirundo semirufa*	15.38	5
Red-capped Lark	*Calandrella cinerea*	11.54	0
Red-crested Korhaan	*Lophotis ruficrista*	3.85	0
Red-eyed Dove	*Streptopelia semitorquata*	65.38	10
Red-faced Mousebird	*Urocolius indicus*	65.38	0
Red-headed Finch	*Amadina erythrocephala*	15.38	0
Red-knobbed Coot	*Fulica cristata*	30.77	0
Reed Cormorant	*Phalacrocorax africanus*	15.38	0
Rock Dove	*Columba livia*	23.08	10
Ruff	*Philomachus pugnax*	3.85	0
Rufous-naped Lark	*Mirafra africana*	23.08	5
Sabota Lark	*Calendulauda sabota*	26.92	0
Scaly-feathered Finch	*Sporopipes squamifrons*	96.15	0
Secretarybird Secretarybird	*Sagittarius serpentarius*	3.85	0
Shaft-tailed Whydah	*Vidua regia*	7.69	0
Sickle-winged Chat	*Cercomela sinuata*	3.85	0
South African Cliff-swallow	*Hirundo spilodera*	42.31	30
South African Shelduck	*Tadorna cana*	15.38	0
Southern Grey-headed Sparrow	*Passer diffusus*	76.92	0
Southern Masked-weaver	*Ploceus velatus*	84.62	15
Southern Pochard	*Netta erythrophthalma*	3.85	0
Southern Red Bishop	*Euplectes orix*	42.31	5
Southern Yellow-billed Hornbill	*Tockus leucomelas*	3.85	0
Speckled Mousebird	*Colius striatus*	11.54	0
Speckled Pigeon	*Columba guinea*	53.85	5
Spike-heeled Lark	*Chersomanes albofasciata*	3.85	0
Spotted Flycatcher	*Muscicapa striata*	15.38	0
Spur-winged Goose	*Plectropterus gambensis*	11.54	5
Steppe Buzzard	*Buteo vulpinus*	3.85	10
Swainson's Spurfowl	*Pternistis swainsonii*	69.23	0
Swallow-tailed Bee-eater	*Merops hirundineus*	7.69	0
Village Indigobird	*Vidua chalybeata*	11.54	0

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate
Violet-eared Waxbill	*Granatina granatina*	15.38	0
Wattled Starling	*Creatophora cinerea*	30.77	0
Whiskered Tern	*Chlidonias hybrida*	7.69	0
White-backed Mousebird	*Colius colius*	50.00	0
White-bellied Sunbird	*Cinnyris talatala*	7.69	0
White-breasted Cormorant	*Phalacrocorax carbo*	3.85	0
White-browed Sparrow-weaver	*Plocepasser mahali*	96.15	10
White-faced Duck	*Dendrocygna viduata*	15.38	0
White-fronted Bee-eater	*Merops bullockoides*	15.38	0
White-rumped Swift	*Apus caffer*	7.69	10
White-throated Swallow	*Hirundo albigularis*	3.85	0
White-winged Tern	*Chlidonias leucopterus*	3.85	0
White-winged Widowbird	*Euplectes albonotatus*	7.69	0
Wood Sandpiper	*Tringa glareola*	7.69	0
Yellow Canary	*Crithagra flaviventris*	57.69	0
Yellow-billed Duck	*Anas undulata*	19.23	0
Yellow-crowned Bishop	*Euplectes afer*	19.23	0
Yellow-fronted Canary	*Crithagra mozambicus*	11.54	0
Zitting Cisticola	*Cisticola juncidis*	11.54	0